Draft
Supplemental Recirculated Environmental Impact Report

SCH# 2014041005

Volume 14
Volume 10 Appendix L through Appendix Q of the Previously Circulated DEIR

GRAPEVINE SPECIFIC AND COMMUNITY PLAN (2019)
Tejon Ranchcorp

Specific Plan Amendment No. 157, Map 500
General Plan Amendment No. 9, Map 202
General Plan Amendment No. 10, Map 202
General Plan Amendment No. 4, Map 218R
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Agricultural Preserve #19 - Exclusion

Kern County
Planning and Natural Resources Department
Bakersfield, California

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Appendices

NOTE TO REVIEWER OF ELECTRONIC FILES:

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Appendix M Master Drainage Study

Appendix N Evaluation of Potable, Non-Potable, and Recycled Water Demands

Appendix O Water Treatment Facility Engineering Report

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WATER QUALITY TECHNICAL REPORT

Grapevine Project

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ACRONYMS

ACOE	Army Corps of Engineers
AGR	Agricultural Supply Beneficial Use
AMSL	Above Mean Sea Level
BAT/BCT	Best Available Technology Economically Achievable and Best Conventional Pollutant Control Technology
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
BOD_5	Five-Day Biochemical Oxygen Demand
CASQA	California Stormwater Quality Association
CC&Rs	Conditions, Covenants and Restrictions
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CDPH	California Department of Public Health
CEC	Constituent of Emerging Concern
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CSDD	Capital Storm Design Discharge
CSMP	Construction Site Monitoring Program
CTR	California Toxics Rule
CVWB	Central Valley *Regional* Water *Quality Control* Board
CWA	Clean Water Act
DBCP	dibromochloropropane
DU	Dwelling unit
EIR	Environmental Impact Report
EMC	Event Mean Concentration
ET	Evapotranspiration
°F	Degree in Fahrenheit
FEMA	Federal Emergency Management Act
GCOC	Geomorphic Conditions of Concern
GWR	Groundwater Recharge Beneficial Use

HOAs	Home Owner Associations
HSC	Hydrologic Source Control
HU	Hydrologic Unit
I-5	Interstate Highway 5
IND	Industrial Service Supply Beneficial Use
IPM	Integrated Pest Management
ISDD	Intermediate Storm Design Discharge
LACDPW	Los Angeles County Department of Public Works
LARWQCB	Los Angeles Regional Water Quality Control Board
LID	Low Impact Development
MCL	Maximum Contaminant Level
MDP	Master Drainage Plans
MFR	Multi-Family Residential
MS4	Municipal Separate Storm Sewer System
MUN	Municipal and Domestic Supply Beneficial Use
NAL	Numeric Action Level
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	Nephelometric Turbidity Units
O&M	Operation and Maintenance
PAHs	Polycyclic Aromatic Hydrocarbons
PDF	Project Design Feature
PPOCs	Pollutants and Parameters of Concern
PRO	Industrial Process Supply Beneficial Use
QSD	Qualified SWPPP Developer
QSP	Qualified SWPPP Practitioner
RARE	Rare, Threatened or Endangered Species Beneficial Use
RCS	Rainwater Collection System
REAP	Rain Event Action Plan

REC-1	Water Contact Recreation Beneficial Use
REC-2	Non-Contact Water Recreation Beneficial Use
SCCWRP	Southern California Coastal Water Research Project
SPAs	Special Plan Area
SR	California State Route
SWAMP	Surface Water Ambient Monitoring Program
SWPPP	Storm Water Pollution Prevention Plan
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TRC	Tejon Ranchcorp
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
VC	Village Center
WARM	Warm Freshwater Habitat Beneficial Use
WDR	Waste Discharge Requirement
WEF	Water Environment Federation
WILD	Wildlife Habitat Beneficial Use
WRCC	Western Regional Climate Center
WWTF	Wastewater Treatment Facility

GLOSSARY OF KEY TERMS

Alluvial Channel: A stream channel for which the bed material is made up of sediment that has been generated from upstream sources and is deposited by the water of rivers, floods, etc.

Basin Plan: Refers to the Tulare Lake Basin Plan (CVWB, 2004), which designates beneficial uses and water quality objectives for waters of the State, including surface waters and groundwater. It also includes programs of implementation to achieve water quality objectives.

Beneficial Use: The existing or potential uses of receiving waters as designated by the CVWB in the Basin Plan (e.g., municipal, recreational, etc.).

Best Management Practice (BMP): Practices or physical devices or systems designed to prevent or reduce pollutant loading from stormwater or non-stormwater discharges to receiving waters, or designed to reduce the volume of stormwater or non-stormwater discharged to receiving waters.

Capital Storm Design Discharge (CSDD): The flow determined based upon a precipitation event having a one percent probability of being equaled or exceeded in any given year, commonly referred to as the 100-year storm.

Community-Scale BMP: A BMP designed to treat runoff from a large drainage area expected to include multiple parcels and/or multiple land uses.

- **Community-Scale BMP Scenario #1** includes community-scale BMPs that are sized according to the Kern County Hydrology Manual flood control sizing procedure and does not allow for direct consideration of distributed bioretention BMP features up gradient of the community-scale BMPs.
- **Community-Scale BMP Scenario #2** includes community-scale BMPs that are sized using a simplified parameter adjustment for impervious cover (reduction of 48.8%) in the Kern County Hydrology Manual flood control sizing procedure. This method incorporates the effects of distributed bioretention BMPs and downspout disconnections (both of which reduce effective impervious area).

Constituent of Emerging Concern (CEC): A pollutant belonging to a diverse group of relatively unmonitored chemicals such as pharmaceuticals, personal care products, and other trace organic chemicals that have traditionally not been the focus of water quality studies and regulations.

Distributed BMP: A BMP designed to treat runoff from smaller drainage areas and normally installed to collect runoff close to the source from a limited number of parcels.

Erosion Potential (Ep): The ratio of long-term total effective work (or sediment transport capacity) done on the channel boundary for the post- and pre-project conditions (post/pre) based on continuous hydrologic, hydraulic, and geomorphic modeling. Ep is used as a metric to predict the likelihood of channel adjustment given watershed and stream hydrologic and geomorphic variables. Ep is a function of changes in hydrology, channel geometry, and bed and bank material, due to land use alteration.

Event Mean Concentration (EMC): The average concentration of a given pollutant observed or assumed to be present in runoff from a given land use. An EMC for a land use-specific pollutant is equivalent to the total constituent mass discharged divided by the total runoff volume. For the project, EMCs for the project land uses were estimated from data collected in Los Angeles County and Ventura County (LACDPW, 2000 and Ventura County, 2011) from similar land uses as land use EMC data in Kern County is not available.

Fluvial: Of, relating to, or occurring in a river or stream.

Geomorphic Conditions of Concern (GCOC): Potential changes to the project site's geomorphic setting (i.e., alteration of hydrology, sediment supply, channel geometry, and/or bed/bank material) that potentially could lead to a significant impact on downstream natural channels and habitat integrity, whether alone or in conjunction with impacts of other projects, if not mitigated.

Geomorphology: The scientific study of landforms and the processes that shape them.

Hydrologic Source Control (HSC): A practice that is implemented in order to minimize and/or avoid hydromodification impacts by reducing surface runoff volumes. Such practices may include site design strategies, treatment BMPs, and storage of excess runoff for irrigation use.

Hydrologic Unit (HU): A watershed, as determined by the United States Geological Survey. The project site is located in two HUs: the Grapevine HU and the South Valley Floor HU.

Hydromodification: The alteration of the hydrologic characteristics of a watershed (i.e., change in hydrology and/or sediment supply) or its receiving stream (i.e., change in channel geometry or bed/bank material) due to development, which in turn could cause degradation of receiving waters. Hydromodification, in combination with sediment supply changes, can cause excessive erosion and/or sedimentation rates, causing excessive turbidity, channel aggradation, and/or degradation. It can also include an increase in dry weather flows (irrigation return flows) that can cause habitat changes.

Intermediate Storm Design Discharge (ISDD): The design storm required by Kern County that must be used to size retention basins. The ISDD is equivalent to the 10 year, 5-day storm event, which must be obtained from NOAA Atlas 14, Vol 6, Ver 2.0.

Low Impact Development (LID): An approach to runoff management that seeks to control stormwater and associated pollutants at or close to the source, using small-scale site design and management practices designed to mimic the sites' natural hydrology. LID can also refer to physical building and landscape features designed to retain or filter stormwater runoff. LID can also apply to the project or community-scale scale when mimicking of overall hydrology is achieved.

Maximum Contaminant Level (MCL): The water quality threshold that limits the amount of a given pollutant that is allowed in public water systems.

Municipal Separate Storm Sewer System (MS4): A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains): (i) owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the U.S.; (2) designed or used or collecting or conveying stormwater; (3) which is not a combined sewer; and (4) which is not part of a Publicly Owned Treatment Works.

Numeric Action Level (NAL): A water quality threshold used to assess BMP effectiveness and trigger corrective action. A NAL is not an enforceable effluent limit.

Pollutants and Parameters of Concern (PPOCs): A pollutant or parameter that has the potential to be present in runoff discharges at levels that may cause or contribute to exceedances of applicable water quality standards based on the source and nature of the discharge.

Project Design Feature (PDF): A water quality feature incorporated into the project to address surface water quality and/or hydromodification impacts. PDFs may include erosion and sediment control BMPs during the construction phase of the project and site design, source control, LID, and hydromodification control BMPs during the operational phase.

Rainwater Collection System (RCS): A facility designed to capture, retain, and store rainwater flowing off of a building, parking lot, or other manmade, impervious surface, for subsequent onsite use.

Risk Level: The perceived risk a project site poses to downstream water quality, as defined by the California Construction General Permit. Risk levels are established by determining two factors: first, calculating the site's sediment risk; and second, establishing the site's receiving water risk during periods of soil exposure (i.e. grading and site stabilization). Higher risk levels are associated with more stringent requirements.

Source Control: Any schedules of activities, prohibitions of practices, maintenance procedures, managerial practices, operational practices, or BMPs that aim to prevent stormwater pollution by reducing the potential for contamination at the source of pollution.

Storm Water Pollution Prevention Plan (SWPPP): A plan, as required by a State General Permit (e.g., Construction General Permit), identifying potential pollutant sources and describing the design, placement, and implementation of BMPs, to effectively prevent non-stormwater discharges and reduce pollutants in stormwater discharges during activities covered by the General Permit.

Threshold Channel: A threshold channel is a channel in which movement of the channel boundary material is negligible during the design flow. The term threshold is used because the applied forces from the flow are below the threshold for movement of the boundary material.

Total Maximum Daily Load (TMDL): The sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background sources.

Water Quality Design Storm Volume: The volume of water designed to be captured, retained, and/or treated by a given project design feature.

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EXECUTIVE SUMMARY

The proposed Grapevine project (Project) is located in the west-central portion of Tejon Ranch (the Ranch). The approximately 270,000-acre Ranch is currently held in private ownership by Tejon Ranchcorp (TRC). The Ranch includes a large portion of the Tehachapi Mountains as well as smaller portions of the San Joaquin and Antelope Valleys. Generally, the Ranch extends from Interstate 5 (I-5) on the western side to Highway 58 on the northern side and State Route (SR) 138 on the southern side (Figure ES-1).

The 8,010-acre project site is entirely within unincorporated Kern County just south of the junction of I-5 and SR 99. It is immediately adjacent to the extensive open space that was conserved in the Tejon Ranch Land Use and Conservation Agreement. Downtown Bakersfield is approximately 25 miles north of the project. The majority of the project is on the east side of I-5, but a smaller portion lies on the west side of I-5. The project site is bisected by the California Aqueduct (Figures ES-1 and ES-2). Oil and gas bearing geological strata are also located beneath the project site approximately 2,000 to 2,600-feet below surface, in the Tejon Oil Field and the Tejon North Oil Field.

Of the approximately 8,010 acre project site, approximately 3,197 acres (or about 40%) would be designated for agriculture (with grazing and open space as the predominant land uses) and approximately 4,813 acres (about 60%) would be developed as a new residential community (community) and employment center, including up to 12,000 residential units and 10.7 million square feet of commercial/light industrial land uses composed of village center commercial, office/research and development, freeway oriented commercial, and light industrial/warehouse. The community would leverage and build upon the economic expansion and job growth that has occurred at Tejon Ranch Commerce Center (Figure ES-2), located immediately north of the project site on I-5. The Grapevine project would feature a series of compact neighborhoods linked by bicycle and pedestrian trails and roads that will provide convenient access to grocery and drugstores, professional services, schools, and parks. Access to the first phases of the Grapevine community will be from Interstate 5 at the existing Grapevine Road and Laval Road interchanges. During later phases of development, the existing Grapevine Road/ Interstate 5 interchange may be expanded and relocated to the north. To allow for the relocation and replacement of the interchange, an existing Vehicle Enforcement Facility may be relocated to a TRC owned parcel on the west side of the junction of I-5 and CA-99. The project would also improve an existing TRC agricultural road east of the project area to provide access for truck traffic currently using Edmonston Pumping Plant Road to travel to properties east of the project. These potential projects have been included in this evaluation.

The project site is located in two Hydrologic Units (HUs), as defined by the United States Geological Survey (USGS) – the Grapevine HU and the South Valley Floor HU. There are no United States Army Corps of Engineers (ACOE) jurisdictional waters of the United States within the Grapevine project area (Dudek, 2013). Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into non-jurisdictional streams.

Project Design Features

In the existing condition, most all precipitation, surface runoff, and stormwater, percolates from the project site into groundwater, with negligible on-site or off-site flows. This overall drainage pattern would remain largely unchanged following project buildout. The Grapevine project has been designed to incorporate a broad range of sustainability features designed to minimize significant adverse impacts, including both surface waters and groundwater. Project Design Features (PDFs) have been incorporated into the project to address potential water quality and hydromodification impacts as well as impacts to groundwater, and are considered a part of the project for the impact analysis. The PDFs as they relate to water quality, are listed below and described in detail in Section 1.2.3 of the report following:

PDF#1: Erosion and Sediment Control Best Management Practices (BMPs) to be implemented during Construction

The project will meet or exceed the requirements of the statewide Construction General Permit for discharges from construction sites, including determination of the project risk level and development of a Storm Water Pollution Prevention Plan (SWPPP) tailored to address the specified risk level. The SWPPP will describe BMPs to be implemented to address each phase of construction, including erosion controls (e.g., physical stabilization through hydraulic mulch, dust control, stockpile protection, etc.), sediment controls (e.g., perimeter protection, storm drain inlet protection, etc.), waste and materials management (storage and secondary containment for solid and liquid wastes, spoil response program and materials, etc.), non-stormwater management (e.g., water conservation practices, vehicle and equipment cleaning and fueling practices, etc.), and training and education (e.g., inclusion of "Qualified SWPPP Developers" (QSDs) and "Qualified SWPPP Practitioners" (QSPs), contractor training, proper signage, etc.). The SWPPP will also detail planned inspections, maintenance, monitoring, and sampling practices to be implemented before and after storm events, as well as routine site inspections, BMP maintenance, and monitoring of non-visible pollutants in the case of a spill or leak. An emphasis of the SWPPP will be to prevent impacts to infiltration BMPs from sediment and potential clogging.

PDF#2: Source Control Features

The Grapevine project will implement source control features (for post-development condition) to reduce pollutants from either being introduced in the first place or conveyed from their source to downstream locations, thereby reducing the level of treatment required. The Grapevine project will include the following source control features:

- Storm drain stenciling and signage to limit illegal dumping to receiving waters,
- Proof of ongoing stormwater BMP inspection and maintenance,
- Proper design of outdoor material storage areas (e.g., paved storage areas to contain leaks, covered areas to prevent stormwater contact and contamination, etc.),
- Proper design of other pollutant source areas (e.g., covered trash storage areas, loading docks, etc.),
- Education of property owners, tenants, and occupants (e.g., proper chemical usage, handling, and disposal, alternative products, used oil recycling programs, approved carwash facilities, alternatives to driving, pet waste management, etc.),
- Activity restrictions (e.g., prohibition of outdoor car washing outside of regional wash areas),
- Common area litter control,
- Street sweeping,
- Landscape management and integrated pest management (IPM), and
- Efficient irrigation systems and landscape design (e.g., primary use of an approved native and/or non-native/non-invasive, low water use plant palette, weather- or soil moisture-based irrigation controllers, etc.).

PDF#3: Low Impact Development (LID) and Treatment BMP Features

The project will implement LID and treatment BMPs with the primary goal being to maintain an overall site landscape that is functionally equivalent to pre-development hydrologic conditions for aquifer recharge purposes and to minimize hydrological changes as well as to minimize the generation of pollutants of concern (note that there are additional hydromodification control features in PDF#4; PDF#3 features contribute to hydromodification control). Site preservation practices coupled with small scale distributed infiltration, evapotranspiration, and treatment measures that rely on vegetation and soils, or systems that mimic the treatment obtained by soils and vegetation, comprise the LID control approach. LID site design practices can also reduce local infrastructure requirements and benefit energy conservation, air quality, open space, and habitat. The principles of LID include maintaining natural drainage paths and landscape features to slow and filter runoff and maintain/increase groundwater quality (by lowering TDS and other pollutants) and recharge, reducing and disconnecting impervious cover created by the development and the associated transportation network, and managing runoff as close to the source as possible.

The following site design measures will be incorporated into the Grapevine project:

- Minimization of impervious area (or maximization of permeability) by preserving open space, using permeable paving materials where feasible, reducing street widths, etc.
- Minimizing directly connected impervious areas by directing runoff from impervious areas to landscaped areas or infiltration/treatment BMPs,
- Conserving and enhancing stream corridors and other natural areas,
- Selecting appropriate building materials to reduce the generation and discharge of pollutants of concern in runoff, and
- Protecting slopes and channels.

Structural treatment BMPs will also be incorporated into the Grapevine project. Treatment BMPs will be selected and sized to treat the larger of the volume of stormwater runoff produced from the 85th percentile, 24-hour storm event (water quality design volume) or the volume required to attain 80% capture. Retention BMPs[1] will be selected to retain and infiltrate/evapotranspirate the water quality design volume or greater to the extent feasible. If it is infeasible to retain all or part of the water quality design volume in a particular area, biotreatment BMPs[2] will be selected and sized to capture and treat the remaining portion of the water quality design volume, to the extent feasible. Any remaining portion of the water quality design volume will be treated with effective treatment BMPs that are selected to address the pollutants of concern. LID and treatment BMPs

[1] Retention BMPs incorporate infiltration, evapotranspiration, and/or harvest and use elements to eliminate surface (or piped) discharge for the water quality design storm event.
[2] Biotreatment BMPs are practices that effectively treat stormwater to address pollutants of concern and provide incidental volume reduction by incorporating amended soil and vegetation elements.

may be located onsite or at a community-scale[3] stormwater treatment facility within the project site. Runoff that bypasses distributed BMPs (approximately 20%, based on 80% capture) would flow to the downstream community-scale BMPs where it would be retained when capacity is available (non-flood conditions). All infiltration BMPs will include filtering treatment of stormwater to remove pollutants prior to deeper infiltration.

Table ES-1 summarizes the land-use specific treatment BMP concepts, both those planned and those that could be used to achieve mitigation performance goals ("Mitigation Menu Items"). If implemented, the additional "Mitigation Menu Items" would result in improved water quality and groundwater recharge beyond the planned scenario. Detailed descriptions and conceptual illustrations of each BMP are provided in Appendix A.

Table ES-1
Planned and Mitigation Menu BMP Concepts

Land Use	Planned BMP Concepts	Mitigation Menu BMP Concepts
Single-family residential	• Bioretention in landscaping for runoff from roofs and local impervious areas (requires 5-ft building setback from buildings) • Infiltration trenches in landscaping for runoff from roofs and local impervious area (requires 5-ft building setback) • Stormwater planter boxes for rooftop runoff when landscape area is limited • Community-scale system (see below) • Combinations of the above, potentially with "neighborhood-scale" combinations (i.e., shared common area locations for bioretention for example)	• Permeable pavement for driveways, surface parking, and walkways • Flow dispersion of roof and driveway runoff into landscaped areas (no formal bioretention) (requires minimum 5-ft building setback)[4]
Village (multi-family) residential	• Same options as for single-family residential (but advantage of landscaped areas being in common areas for O&M)	• Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing

[3] "Community-scale" BMP, also typically known as a regional BMP, is a BMP designed to treat runoff from a large drainage area expected to include multiple parcels and various land uses.
[4] Rooftop flow dispersion (or disconnected downspouts) are included as a "Mitigation Menu" item for detached SFR units, but would need to be implemented as a "Planned BMP Concept" to achieve the water quality performance of Community Scale BMP Scenario #2.

Land Use	Planned BMP Concepts	Mitigation Menu BMP Concepts
Commercial, schools, and parks	• Bioretention in courtyards and stormwater planter boxes for roof top runoff • Bioretention or infiltration trenches in landscaped areas for local impervious areas • Community-scale system (see below) • Combinations of the above	• Permeable pavement for walkways and courtyards • Permeable asphalt for parking lots • Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing
Light Industrial	• Community-scale system (see below) • Infiltration trenches in landscaping for runoff from roofs and local impervious area (requires minimum 5-ft building setback) • Stormwater planter boxes for rooftop runoff when landscape area is limited • Combinations of the above	
Local streets and public access ways	• Bioretention in roadway bulbouts, or in place of some parking spaces (standing water must drain within 48 hours) • Community-scale system (see below) • Combinations of the above	• Permeable pavement for walkways and bikeways • Drain low gradient trails directly to edge for sheet flow dispersion
Relocated interchange	• Caltrans managed community-scale system (see below)	• Vegetated swale in roadways for treatment/infiltration of roadway runoff and adjacent development where feasible • Vegetated swale adjacent to roadway • Bioretention/infiltration basin island in traffic turnabout
Community-scale systems	• Infiltration facilities • Community-scale vegetated detention basin(s) where infiltration rates are limiting	• Vegetated swales route runoff to community-scale infiltration basin(s) • Infiltration trenches or bioretention along riverbanks

PDF#4: Hydromodification Controls

The Grapevine project will implement hydromodification controls to minimize and control hydromodification impacts to local streams as outlined above. The site will, to the extent feasible, preserve natural hydrologic and geomorphic conditions on the overall project site, and protect sensitive hydrologic features, sediment sources, and sensitive habitats. The state of the current science in hydromodification evaluations and selection and design of controls if needed is to use the Erosion Potential metric to: predict the likelihood of channel adjustment given watershed and stream hydrologic and geomorphic variables; and size and situate hydromodification controls to manage potential geomorphic impacts. Erosion Potential (Ep) is defined as the ratio of long-term effective work or sediment transport capacity done on the channel boundary for the post- and pre-project conditions (i.e., post/pre). Ep is a function of changes in hydrology, channel geometry, and bed and bank material, due to land use alteration. As the project will be incorporating many BMPs that include significant infiltration of stormwater, the change in Ep is expected to be small due to both surface runoff volume losses as well as slowing of runoff flows. In fact, due to the planned BMPs, there is predicted to be less surface runoff than pre-project.

The project will be designed to the following hydromodification control performance standard[5]:

> *The erosion potential (Ep) of susceptible watercourses associated with the Project shall be maintained within an appropriate range of the target value. The target Ep shall be 1.0 unless a more appropriate value is derived based on best available science. The target Ep shall account for changes in sediment supply at the point of analysis. If the Project does not significantly alter the hydrology, bed sediment supply, channel geometry, and/or bed/bank material of a receiving stream, then the Project is assumed to be in compliance with the Ep based hydromodification management objective for this watercourse.*

The following hydromodification control PDFs, organized according to the four key factors affecting geomorphic stability, will be incorporated into the Grapevine project to meet the hydromodification control performance standard.

- *Hydrologic Management Measures*: Increases in surface water hydrology, due to impervious cover, will be managed by a combination of one or more of the following (including measures associated with PDF #3):
  - Hydrologic source controls that limit impervious areas and minimize directly connected imperviousness;

[5] Additional flood control standards for hydrograph attenuation and in-stream erosion and sedimentation associated with peak storm events, including protection against localized scour velocities at outfalls and in-stream culverts, are provided in the Kern County Development Standards (2010). Although these flood control considerations are related to hydromodification control, they are inherently different in their objectives as well as methods of analysis, and are therefore distinguished from one another.

- LID and treatment BMPs which provide volume reduction (via infiltration and evaporation) of both wet and dry weather runoff;
- Storage of excess runoff volume for irrigation reuse; and
- Regional flood control sump basins which can retain runoff that overflows or is surface released from the distributed BMPs upgradient and which could also provide flow-duration control if needed.

- *Sediment Management Measures (PDF #4a)*: Reductions in bed sediment supply will be managed by one or more of the following:
  - Avoiding reducing significant bed material supply sources in site design by preserving open space (particularly in the steeper mountainous portion of the project which have the highest sediment yield rates) and protecting existing slopes and channels;
  - Allowing for upstream sediment to pass through from upgradient open spaces through the project's conserved stream corridors;
  - Compensating for significant losses in bed sediment supply by providing additional flow attenuation (i.e., increased retention or detention storage) within hydrologic source controls, LID and treatment BMP facilities, and regional sumps; and
  - Replacing significant bed material sources that are eliminated through active sediment management, if needed.
- *Channel Geometry Management Measures (PDF #4b)*: Changes in channel geometry will be managed by one or more of the following:
  - Establishing riparian buffer zones that conserve existing riparian corridor widths while avoiding in-stream constrictions (i.e., culverts, bridges, and at-grade crossings) to the extent possible;
  - If necessary, reinforcing steam banks along the edges of the proposed stream corridor that are adjacent to development in order to withstand natural avulsion/migration processes.
  - Designing for stream constrictions by dissipating the energy of concentrated flow at unavoidable stream constrictions, allowing for anticipated toe down scour without undermining infrastructure, and configuring stream crossings with higher and longer spans that limit reductions in cross-sectional flow area.

- *Bed and Bank Material Management Measures (PDF #4c)*: Changes to bed and bank material will be managed by:
  - o Prohibiting cattle from accessing the riparian corridors throughout the project because grazing on bank vegetation and stepping within the channels decreases the resistance of the banks and bed; and
  - o Dissipating the energy of concentrated flow at outfalls that discharge to receiving streams.

Significance Criteria

Significance criteria and thresholds for significance are based on Appendix G of the CEQA Guidelines (Environmental Checklist Form) (California Resources Agency, 2009) and the Kern County Guide for the Preparation of Environmental Impact Reports (County of Kern, 2006). Significant adverse surface water impacts are presumed to occur if the project would:

- **WQ-1:** Violate any water quality standards or waste discharge requirements.
- **WQ-2:** Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).
- **WQ-3:** Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site.
- **WQ-4:** Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site.
- **WQ-5:** Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.
- **WQ-6:** Otherwise substantially degrade water quality.

Pollutants and Parameters of Concern

Based on a review of the environmental and regulatory setting applicable to the project (Section 2.2), pollutants and parameters of concern (PPOCs) were identified for both surface waters and ground waters. PPOCs are discussed in detail in Section 3 of this report. Post-construction impacts were assessed for each PPOC either quantitatively (modeled) or qualitatively, as listed in Table ES-2, depending on the pollutant characteristics (e.g., pathogens are not typically modeled due to their natural variability), data availability (e.g., whether or not there is sufficient data available to numerically assess contaminants of emerging concern), and other limitations.

Table ES-2
Quantitatively and Qualitatively Addressed Pollutants and Parameters of Concern

Matrix	Pollutant/Parameter of Concern	Addressed Quantitatively (Modeled)	Addressed Qualitatively
Surface Water	Runoff Volume	X	
	Sediment	X	
	Total Phosphorus	X	
	Nitrate-N	X	
	Nitrite-N	X	
	Ammonia-N	X	
	Total Nitrogen	X	
	Copper (Total and Dissolved)	X	
	Lead (Total)	X	
	Zinc (Total and Dissolved)	X	
	Pathogens		X
	Trash and Debris		X
	Temperature		X
	Constituents of Emerging Concern (CECs)		X
	Turbidity		X
	Pesticides		X
	Petroleum Hydrocarbons		X
Groundwater	Nitrate		X
	Constituents of Emerging Concern (CECs)		X
	Total Dissolved Solids (TDS)		X

Geomorphic Conditions of Concern (Hydromodification)

The non-quantitative component of the hydromodification control performance standard above states, "If the Project does not significantly alter the hydrology, bed sediment supply, channel geometry, and/or bed/bank material of a receiving stream, then the Project is in compliance with the Ep management objective for this watercourse." Therefore, anticipated geomorphic conditions were assessed by characterizing anticipated changes to the dominant controls on channel form, hydrology and bed sediment supply, as well as the form itself, which consists of channel geometry (in plan, profile, and cross-section) and bed/bank material (described in Section 4) either semi-quantitatively or qualitatively (Table ES-3).

Table ES-3
Quantitatively and Qualitatively Addressed Geomorphic Conditions

Geomorphic Condition	Addressed Semi-Quantitatively	Addressed Qualitatively
Change in Hydrology	X	
Change in Bed Sediment Supply	X	
Change in Channel Geometry		X
Change in Bed and Bank Material		X

These geomorphic conditions were evaluated for each of the six California Department of Fish and Wildlife (CDFW) and Central Valley Regional Water Board (CVWB) jurisdictional receiving streams associated with the project:

- Tecuya Creek;
- Grapevine Creek,
- Cattle Creek-2 (CC-2),
- Live Oak Creek,
- Cattle Creek-1 (CC-1), and
- Pastoria Creek.

While the characterization of changes to channel geometry and bed/bank material was done qualitatively based on available field photographs, historical aerial images, land use maps, and previous studies; changes to the dominant controls on channel form were done semi-qualitatively. Hydrologic changes were characterized by: comparing the average annual runoff volume calculated for the existing and proposed conditions from the surface water quality model; and comparing the proposed drainage areas of the project tributary to each jurisdictional receiving stream to the respective total watershed area. Bed sediment supply changes were characterized for each receiving stream based on screening-level GIS calculations of area and stream length to be eliminated by the project and other planned development in the watersheds. These reductions in area and stream length were then compared to the totals by watershed. Soar and Thorne (2001) indicate that a greater than 10% reduction in sediment supply can have potentially significant effects on stream stability. On this basis, reductions less than 10% were used as a preliminary significance threshold. The screening-level sediment supply source calculations do not account for the higher sediment supply rates associated with steep terrain (i.e., sources in the upstream Tehachapi and San Emigdio Mountains) compared to the relatively low sediment supply rates on flat terrain (i.e., the Valley Floor alluvial fan). Considering that the project is situated on the alluvial fan, the calculated reductions in sediment supply sources for the project are considered conservative.

Therefore, the above geomorphic conditions have been evaluated to determine if the project does not significantly alter the hydrology, bed sediment supply, channel geometry, and/or bed/bank material of a receiving stream to the extent that potential impacts would occur, in which case then the Project would be in compliance with the Ep management objective for this watercourse.

Surface Water and Groundwater Modeling Methodology

Potential impacts with respect to modeled PPOCs were assessed using a water quality model (described in Section 5 with details and assumptions provided in Appendix F) to estimate pollutant loads and concentrations in project stormwater runoff for certain pollutants of concern for pre-development (existing) condition and post-development (project) condition. The water quality model takes into account the observed variability in stormwater hydrology and water quality by characterizing the probability distribution of observed rainfall event depths, the probability distribution of event mean concentrations (EMCs) (based on land use types), and the probability distribution of the number of storm events per year over the 1949-2010 period of record. These distributions were then sampled randomly using a Monte Carlo approach to develop estimates of mean annual loads and concentrations in the existing condition, the project condition without PDFs, and the project condition with PDFs. The modeled representation of treatment controls and community-scale basin drainage areas are depicted in Figure ES-3.

The project overlies four groundwater basins, two of which have designated beneficial uses, including ‘Municipal’, which is water used for military, community, or individual water supply systems. Groundwater recharge impacts were also addressed through modeling by 1) A comparison of pre-project to post-project stormwater runoff volumes to inform the change in runoff retained on-site, which would have the potential to infiltrate and potentially recharge the underlying groundwater basins; and 2) a comparison of pre-project to post-project approximate irrigation demands to inform the change in volume of reclaimed or potable water that could contribute to groundwater recharge.

IMPACT ANALYSIS SUMMARY

Construction Impacts

Construction impacts resulting from the project would be minimized through compliance with the Construction General Permit (PDF#1). As such, the impacts of construction-related runoff from the project would be less than significant with respect to significance criteria WQ-1 through WQ-6, with no mitigation required.

Operational Impacts

Surface Water Impacts

Operational impacts to surface waters are discussed in detail in Sections 6.5.1 and 6.5.2 of this report. Surface water quality model results were analyzed for two scenarios, intended to bracket the predicted water quality impacts that may occur with two scenarios of flood control basin and LID sizing approaches:

- Community-Scale BMP Scenario #1 (CS BMP Scenario #1): Community-scale BMPs are sized according to the Kern County Hydrology Manual flood control sizing procedure, not allowing for direct consideration of distributed bioretention BMPs or downspout disconnections upgradient of the community-scale BMPs.

- Community-Scale BMP Scenario #2 (CS BMP Scenario #2): Community-scale BMPs sized using a simplified parameter adjustment for impervious cover (reduction of 48.8%) in the Kern County Hydrology Manual flood control sizing procedure. This method incorporates the effects of distributed bioretention BMPs and downspout disconnections (both of which reduce effective impervious areas and therefore runoff). This approach is based on the findings of the memorandums submitted to Kern County entitled, *Task 1: Test Catchment Selection of Pilot Analysis of Potential Flood Control Calculation Parameter Adjustments*, and *Task 2: Results of Test Catchment for Assessment of Parameter Adjustments* (Geosyntec, 2014a and b), attached as Appendix F.

Therefore, the potential impacts associated with a level of design for flood control basin sizing and LID approaches between CS BMP Scenarios #1 and #2 are anticipated to fall within the range of impacts described for CS BMP Scenarios #1 and #2.

Runoff volume and pollutant load results for CS BMP Scenarios #1 and #2 are presented in Tables ES-4 and ES-6, respectively. Pollutant concentration results for CS BMP Scenarios #1 and #2 are presented in Tables ES-5 and ES-7, respectively. As summarized in Tables ES-4 and ES-6, average annual runoff volumes are expected to decrease in the project (w/PDFs) condition for both scenarios, even with the increase in percent imperviousness associated with the project and the decrease in infiltration capacity of existing site soils associated with the compaction of site soils during construction. The decrease can be attributed to the routing of stormwater runoff to highly infiltrating BMPs, both the distributed and community-scale treatment facilities. The decrease in stormwater runoff is not anticipated to have significant impacts on downstream users due to the ephemeral nature of the creeks running through the project, which experience extended dry periods between storm events.

While the annual average runoff volume and loads of all modeled pollutants of concern are predicted to increase in the project condition without PDFs considered, they are all predicted to decrease in the project condition with PDFs included. This offset is due primarily to the routing of runoff to distributed and community-scale treatment BMPs (primarily infiltration basins), which are designed as nearly “full capture” systems (for the water quality design storm volume, the full volume is infiltrated and/or evapotranspired). While the concentrations of some pollutants of concern are predicted to increase in the project condition for both CS BMP Scenarios #1 and #2 (e.g., dissolved copper and total and dissolved zinc), further qualitative analyses (see Section 6.5.1) have determined that the project is expected to have less than significant impacts on all modeled pollutants. For example, a comparison of predicted total lead concentrations in runoff in the project condition (with PDFs) to the benchmark CTR values shows that not only is a decrease in concentration is predicted, but the predicted total lead concentrations are also well below the benchmark water quality criteria. For dissolved copper and dissolved zinc concentrations, which are predicted to be above the CTR criteria in the project condition (with PDFs), the predicted existing condition average annual concentrations are actually above the CTR criteria for dissolved zinc and equal to the CTR criteria for dissolved copper. Furthermore, the increase in concentration in the project condition can be attributed to the reduction in dilution in the stormwater runoff due to high levels of infiltration (i.e., the model does not account for metal removal via infiltration). Finally, the overall loading from the project is significantly less in the project condition (with PDFs) for these pollutants (and others), compared to the existing condition. Additionally, the water quality model does not account for the further reduction of trace metals via “Mitigation Menu” source control and site design BMPs.

Based on a combination of modeled PPOC concentration and load results, as well as a qualitative review of changes between the existing and proposed conditions with respect to applicable water quality standards, project impacts for both CS BMP Scenarios #1 and #2 were found to be less than significant for each of the PPOCs evaluated quantitatively (TSS, nutrients, and metals) evaluated (see Section 6.5.1 for details).

The project was similarly found to have less than significant impacts on the PPOCs that were addressed qualitatively (pathogens, trash and debris, temperature, CECs, turbidity, pesticides, and petroleum hydrocarbons) (see Section 6.5.2 for details). Therefore, based on the comprehensive site design, source control, LID, and treatment control BMP strategy and the comparison between existing and project condition results as well as benchmark water quality criteria, the project is not anticipated to have significant impacts on the identified PPOCs for either of CS BMP Scenarios #1 and #2.

Therefore, potential project-related surface water impacts resulting in violation of any water quality standards or waste discharge requirements (WQ-1), creating or contributing runoff water exceeding the capacity of existing or planned stormwater drainage systems or adding substantial additional sources of polluted runoff (WQ-5), or otherwise substantially degrading water quality (WQ-6) are all considered less than significant for both CS BMP Scenarios #1 and #2, with no mitigation required beyond the planned PDFs.

Table ES-4
Average Annual Runoff Volume and Pollutant Loads for the Grapevine Project and Off-Site Roads (Results from Water Quality Model for CS BMP Scenario #1), 1949-2010[a]

Parameter	Units	Existing	Project w/o PDFs			Project with PDFs		
		Result	*Result*	*Difference from Existing*	*Percent Difference from Existing*	*Result*	*Difference from Existing*	*Percent Difference from Existing*
Runoff Volume	acre-ft	106	2,979	+2,873	+2,706%	20	-86	-82%
TSS	tons/yr	25.1	496.6	+471.5	+1,882%	2.5	-22.6	-90%
Total Phosphorus	lbs/yr	357	2,984	+2,627	+736%	28	-329	-92%
Nitrate-N	lbs/yr	787	6,119	+5,332	+677%	40	-747	-95%
Nitrite-N	lbs/yr	51.2	734.2	+683.0	+1,333%	5.2	-46.0	-90%
Ammonia-N	lbs/yr	359	4,375	+4,016	+1,119%	25	-334	-93%
Total Nitrogen	lbs/yr	1,929	26,773	+24,844	+1,288%	160	-1769	-92%
Total Copper	lbs/yr	11.6	208.6	+197.0	+1,703%	2.1	-9.5	-82%
Dissolved Copper	lbs/yr	3.9	102.7	+98.8	+2,547%	1.2	-2.7	-69%
Total Zinc	lbs/yr	60	2,037	+1,977	+3,273%	14	-46	-77%
Dissolved Zinc	lbs/yr	40	1,487	+1,447	+3,641%	10	-30	-74%
Total Lead	lbs/yr	4.3	88.1	+83.8	+1,955%	0.5	-3.8	-88%

[a] The 1949-2010 period of record was sampled randomly using a Monte Carlo approach to predict average annual runoff volumes and pollutant loads in each project condition.

Table ES-5
Average Annual Pollutant Concentrations for the Grapevine Project and Off-Site Roads (Results from Water Quality Model for CS BMP Scenario #1), 1949-2010[a]

Parameter	Units	Existing	Project w/o PDFs			Project with PDFs		
		Result	*Result*	*Difference from Existing*	*Percent Difference from Existing*	*Result*	*Difference from Existing*	*Percent Difference from Existing*
TSS	mg/L	174	123	-51	-29%	93	-81	-46%
Total Phosphorus	mg/L	1.24	0.37	-0.87	-70%	0.52	-0.72	-58%
Nitrate-N	mg/L	2.73	0.76	-1.97	-72%	0.75	-1.98	-72%
Nitrite-N	mg/L	0.18	0.09	-0.09	-49%	0.10	-0.08	-45%
Ammonia-N	mg/L	1.24	0.54	-0.70	-57%	0.48	-0.76	-62%
Total Nitrogen	mg/L	6.7	3.3	-3.4	-51%	3.0	-3.7	-55%
Total Copper	µg/L	40	26	-14	-36%	39	-1	-3%
Dissolved Copper	µg/L	13	13	0	-6%	23	+10	+68%
Total Zinc	µg/L	209	251	+42	+20%	264	+55	+26%
Dissolved Zinc	µg/L	138	184	+46	+33%	195	+57	+42%
Total Lead	µg/L	15	11	-4	-27%	10	-5	-32%

[a] The 1949-2010 period of record was sampled randomly using a Monte Carlo approach to predict average annual pollutant concentrations in each project condition.

Table ES-6
Average Annual Runoff Volume and Pollutant Loads for the Grapevine Project and Off-Site Roads (Results from Water Quality Model for CS BMP Scenario #2), 1949-2010[a]

		Existing	Project w/o PDFs			Project with PDFs		
Parameter	Units	*Result*	*Result*	*Difference from Existing*	*Percent Difference from Existing*	*Result*	*Difference from Existing*	*Percent Difference from Existing*
Runoff Volume	acre-ft	106	2,979	+2,873	+2,706%	40	-66	-62%
TSS	tons/yr	25.1	496.6	+471.5	+1,882%	6.5	-18.6	-74%
Total Phosphorus	lbs/yr	357	2,984	+2,627	+736%	50	-307	-86%
Nitrate-N	lbs/yr	787	6,119	+5,332	+677%	80	-707	-90%
Nitrite-N	lbs/yr	51.2	734.2	+683.0	+1,333%	9.7	-41.5	-81%
Ammonia-N	lbs/yr	359	4,375	+4,016	+1,119%	54	-305	-85%
Total Nitrogen	lbs/yr	1,929	26,773	+24,844	+1,288%	346	-1,583	-82%
Total Copper	lbs/yr	11.6	208.6	+197.0	+1,703%	3.5	-8.1	-70%
Dissolved Copper	lbs/yr	3.9	102.7	+98.8	+2,547%	1.9	-2.0	-52%
Total Zinc	lbs/yr	60	2,037	+1,977	+3,273%	28	-32	-53%
Dissolved Zinc	lbs/yr	40	1,487	+1,447	+3,641%	22	-18	-44%
Total Lead	lbs/yr	4.3	88.1	+83.8	+1,955%	1.1	-3.2	-74%

[a] The 1949-2010 period of record was sampled randomly using a Monte Carlo approach to predict average annual runoff volumes and pollutant loads in each project condition.

Table ES-7
Average Annual Pollutant Concentrations for the Grapevine Project and Off-Site Roads (Results from Water Quality Model for CS BMP Scenario #2), 1949-2010[a]

Parameter	Units	Existing	Project w/o PDFs			Project with PDFs		
		Result	*Result*	*Difference from Existing*	*Percent Difference from Existing*	*Result*	*Difference from Existing*	*Percent Difference from Existing*
TSS	mg/L	174	123	-51	-29%	119	-55	-31%
Total Phosphorus	mg/L	1.24	0.37	-0.87	-70%	0.45	-0.79	-63%
Nitrate-N	mg/L	2.73	0.76	-1.97	-72%	0.73	-2.00	-73%
Nitrite-N	mg/L	0.18	0.09	-0.09	-49%	0.09	-0.09	-50%
Ammonia-N	mg/L	1.24	0.54	-0.70	-57%	0.49	-0.75	-61%
Total Nitrogen	mg/L	6.7	3.3	-3.4	-51%	3.1	-3.6	-53%
Total Copper	µg/L	40	26	-14	-36%	32	-8	-21%
Dissolved Copper	µg/L	13	13	0	-6%	17	+4	+26%
Total Zinc	µg/L	209	251	+42	+20%	256	+47	+23%
Dissolved Zinc	µg/L	138	184	+46	+33%	203	+65	+47%
Total Lead	µg/L	15	11	-4	-27%	10	-5	-32%

[a] The 1949-2010 period of record was sampled randomly using a Monte Carlo approach to predict average annual pollutant concentrations in each project condition.

Flooding Impacts

Flooding impacts are discussed in detail in Section 6.5.4. The project is designed to retain on-site the 10-year, 5-day design storm per the Kern County Development Standards. The County requirements for alluvial fan development and flood control facilities on alluvial fans would also be complied with. Additionally, levees have been proposed along Grapevine Creek between the water body and the development to reduce the potential of flooding. The surface water model has also demonstrated that the average annual runoff volume is predicted to be less in the project condition with PDFs than in the existing condition due to the PDFs/BMPs for both CS BMP Scenarios #1 and #2.

Therefore, potential project-related impacts associated with drainage pattern modifications resulting in on-site flooding (WQ-4) are found to be less than significant for both CS BMP Scenarios #1 and #2, with no additional mitigation required beyond the PDFs.

Hydromodification Impacts

Hydromodification impacts are discussed in detail in Section 6.5.3. The hydromodification control performance standard is based in part on the Ep metric that is a function of changes in hydrology, bed sediment supply, channel geometry, and bed and bank material. For the purposes of this report, the project's hydromodification impacts have been qualitatively and semi-quantitatively evaluated against the qualitative portion of the performance standard, "If the Project does not significantly alter the hydrology, bed sediment supply, channel geometry, and/or bed/bank material of a receiving stream, then the Project is in compliance with the Ep management objective for this watercourse." Quantification of Ep and bed sediment supply reductions would be performed in the next stage of modeling and design.

The severity of concern for geomorphic conditions (i.e., none, negligible, low, medium, and high) associated with the Project for each jurisdictional receiving stream are summarized in the **Table ES-8**, which is organized according to the four key factors that affect stream stability. Geomorphic conditions of concern include those which have low, medium, or high severity. In Cattle Creek 2 reductions in bed sediment supply is of medium concern due to the proportion of sediment sources (i.e., tributary area and stream length) being reduced by Project development. However, given that the screening-level sediment supply source calculations do not account for the higher sediment supply rates associated with steep terrain (i.e., sources in the upstream Tehachapi Mountains) compared to the relatively low sediment supply rates on flat terrain (i.e., the Valley Floor alluvial fan), and that project development in the Cattle Creek 2 watershed is located on the alluvial fan and not in steep terrain, then there is justification to consider this condition of concern to have low severity. Bed sediment supply reductions are of low concern in

Grapevine Creek because source reductions are anticipated, but are relatively minor. Changes in channel geometry are of medium concern in Grapevine Creek because the project would reduce the existing floodplain width[6] and restrict the corridor that natural channel avulsion/migration can occur within its alluvial fan setting. However, the project would conserve the existing active riparian corridor of Grapevine Creek, which appears to be incising over time into a more entrenched morphology due to bed sediment supply reductions and localized channel constrictions associated with existing development (i.e., Interstate-5 debris basins and culverts crossing Edmonston Pumping Plant Road). The severity of concern in Grapevine Creek and Cattle Creek 2 would likely be partially offset by the predicted decrease in project runoff.

Table ES-8
Severity of Concern for Changes in Geomorphic Conditions

Receiving Stream	Change in Hydrology	Change in Bed Sediment Supply	Change in Channel Geometry	Change in Bed and Bank Material
Tecuya Creek	None	Negligible	Negligible	None
Grapevine Creek	Negligible[2]	Low[1]	Medium[1]	Negligible
Cattle Creek 2	Negligible[2]	Medium to Low[1]	Negligible	Negligible
Live Oak Creek	None	None	None	None
Cattle Creek 1	None	None	None	None
Pastoria Creek	None	None	None	None

[1]Geomorphic condition of concern.

[2]Changes in hydrology in Grapevine Creek and Cattle Creek 2 are associated with project runoff reductions. These reductions result in a small net positive impact with regard to long-term stream stability.

Hydromodification impacts are discussed in more detail below according to the four key factors to channel stability:

- Hydrologic changes to receiving streams are not anticipated to be significantly impacted for either CS BMP Scenarios #1 or #2 since: 1) the treatment BMPs (PDF #3) will be sized such that average annual runoff volumes are predicted to significantly decrease in the post project condition (from approximately 117 acre-ft/year to 20 acre-ft/year for CS BMP Scenario #1 and from approximately 117 acre-ft/year to 40 acre-ft/year for CS BMP Scenario #2), and 2) the Project development contributes a minor fraction of the watershed area tributary to five of the six receiving streams of concern (except Cattle Creek 2). Additionally, as mentioned for flooding impacts, peak flows will inherently be

[6] Although this analysis uses the FEMA 100-year floodplain as currently mapped, the floodplain and floodway are currently under review and may be revised based on site-specific topographic contours. If the mapped floodplain is ultimately reduced, this analysis would remain conservative, in that it is based on a wider floodplain.

reduced due to the holding capacity of the planned stormwater PDFs, flooding will be mitigated by the flood control basins designed to meet the Kern County Development Standards for alluvial development, and captured runoff will be infiltrated on-site rather than being discharged to a local water body.

- Changes in bed sediment supply are expected, but are not anticipated to create significant impact since: based on a screening-level analysis bed sediment reductions are not anticipated to be significantly reduced by the Project for four of six of the receiving streams of concern. In Cattle Creek 2 reductions in bed sediment supply is of low to medium concern for the "Grapevine project only" condition due to the relatively high potential proportion of sediment sources (i.e., tributary area and stream length) being reduced by Project development (24 to 45 percent). Bed sediment supply reductions are of low concern in Grapevine Creek because source reductions are anticipated up to just below the 10 percent significance threshold, but are relatively minor (1 to 8 percent). Concern for changes in bed sediment supply are negligible for Tecuya Creek and do not exist for Live Oak Creek, Cattle Creek 1, and Pastoria Creek. Lastly, bed sediment supply reductions will also be compensated for through the implementation of sediment management measures (PDF #4a) that are necessary to meet the hydromodification control performance standard.
- Changes in channel geometry are expected, but are not anticipated to create significant impact since: active riparian corridors through the Project will be preserved in place; and narrowing of the floodplain will be compensated for through the implementation of channel geometry management measures (PDF #4b) that are necessary to meet the hydromodification control performance standard.
- Changes in bed and bank material are not anticipated to be significantly impacted since: no modifications of bed and bank material are anticipated in the active riparian corridor; and potential threats to bed and bank material alteration (i.e., localized scour at outfall discharge locations and potential cattle grazing on riparian vegetation) will be managed through the implementation of bed and bank material management measures (PDF #4c).

Therefore, with the proposed PDFs, it is anticipated that the qualitative Ep-based hydromodification performance standard will be met, and potential project-related hydromodification impacts resulting in substantial erosion or siltation on- or off-site (WQ-3) are considered less than significant, with no mitigation required.

<u>Groundwater Quality Impacts</u>

Groundwater quality impacts are discussed in detail in Section 6.5.5. Groundwater quality would potentially be impacted by the infiltration of retained stormwater and urban runoff or surface infiltration of recycled wastewater from the WWTF used for landscape irrigation. Nitrate, CECs, and total dissolved solids (TDS) have been identified as the pollutants of concern for groundwaters.

The Kern County groundwater basin has a groundwater quality objective that is equal to the nitrate-N drinking water MCL (10 mg/L [as nitrogen]). The predicted nitrate-N concentration in runoff from the project with PDFs is 0.75 mg/L for CS BMP Scenario #1 (see Table 17) and is 0.73 mg/L for CS BMP Scenario #2 (see Table 19). The concentrations in urban runoff in national and regional data sets are also significantly below the nitrate-N MCL of 10 mg/L (EMCs range from 0.61 to 1.5 mg/L, excluding agriculture). The concentrations in agricultural runoff (existing condition) are also higher than the EMCs for urban runoff (proposed condition), which for the project with PDFs for both of the CS BMP Scenarios #1 and #2, results in an overall predicted decrease in both total loading and concentration for nitrate-N.

Wastewater generated by the project would be treated in either existing or proposed WWTF. Three existing WWTFs are currently in operation within or near the Grapevine project boundaries. Where feasible, it is anticipated that the project would utilize these existing WWTFs if capacity is available, either permanently or temporarily at the start of project occupancy. Two of the existing WWTFs are owned by the Tejon-Castac Water District (TCWD) and could receive wastewater from Planning Areas 6a through 6e. The third WWTF, the existing WWTF, is owned by the Tejon Ranchcorp and is located within Planning Area 3. The existing Grapevine WWTF may be utilized during the initial project stages, but would likely be decommissioned prior to Planning Area 3 construction. Two new proposed WWTFs would be constructed to receive flows from Planning Areas 1 through 5b. Implementation and construction of the WWTFs would require the acquisition of numerous permits and the approval of several agencies, including the CVWB, California Department of Public Health (CDPH), and Kern County. The WWTF's water quality would comply with WDRs that would be obtained from the Regional Water Board. As required by the Porter-Cologne Act and the Basin Plan, the WDRs will include effluent limitations that will be protective of groundwater quality and designated beneficial uses. Additionally, an Engineering Report for the production, distribution, and use of reclaimed water, focused on protecting public health and groundwaters, will be submitted to both the Regional Water Board and the CDPH. Included in the PDFs will be irrigation controls to limit overwatering and resulting infiltration of wastewaters. On this basis, the potential for infiltration of recycled irrigation water to adversely affect groundwater quality for nitrate-N would be less than significant.

The Basin Plan identifies salts as a crucial problem in the Tulare Lake Basin "due to evaporation and crop transpiration removing water from soils, resulting in an accumulation of salts in the root zone of the soils at levels that retard or inhibit plant growth. Additional amounts of water often are applied to leach the salts below the root zone. The leached salts eventually enter ground or surface water." The Basin Plan also states, "All ground waters shall be maintained as close to natural concentrations of dissolved matter as is reasonable considering careful use and management of water resources." The Kern River Hydrographic Unit, in which the project site is located, is limited to a maximum average annual increase in salinity in groundwater, as measured by electrical conductivity, of 5 µmhos/cm. The applicable water quality objective for TDS is the secondary Federal MCL (taste and odor or welfare based), which is 500 mg/L; in California, the CDPH has set a recommended MCL of 500 mg/L, and upper concentration of 1,000 mg/L.

Reclaimed water that would be used for the project would meet California Code of Regulations (CCR) Title 22 standards for tertiary treatment as appropriate for unrestricted use. This requires a specific effluent quality for BOD, TSS, total coliform, and turbidity, but the salinity of reclaimed water is often elevated compared to the salinity of potable water sources, unless salinity removal process is incorporated into the wastewater treatment process. The *Wastewater Treatment Facilities Engineering Report* (EKI, 2014b) states that "the TDS concentration added by domestic use is assumed to be at or below 275 mg/L, in compliance with the Basin Plan objectives [for discharge to the White Wolf Subbasin]. To limit the salinity addition by indoor uses, the project would implement a pretreatment program for commercial and industrial properties and a salinity education and minimization program." The project would obtain its potable water from the Kern County Water Agency via the California Aqueduct. The highest reported concentration of TDS between January 2010 and October 2013 was 352 mg/L, and TDS concentrations added by domestic water use have been measured between 150 mg/L and 380 mg/L above the TDS levels in the source water supply (EKI, 2014b). Therefore, TDS concentration in project wastewater influent could be as high as approximately 625 mg/L. The conceptual wastewater treatment system design includes disinfection with UV light. Therefore, in the absence of chlorination, the wastewater effluent and wastewater influent can be assumed to have the same approximate concentration of TDS.

The TDS concentrations for groundwater in the project area range from 655-1,200 mg/L from nearby drinking water wells (reported as 1,180 and 1,670 µmhos/cm converted to mg/L using 1 mg/L equal to between 1.4 and 1.8 µmhos/cm) (MWH, 2013). WZI has also reported TDS concentrations in groundwater between 2,200 and 32,000 mg/L in the project area (WZI, 2013). Therefore, TDS concentrations in recycled water are expected to be on the low end of the range of existing groundwater quality, and are unlikely to adversely affect groundwater quality. In addition, the expected recycled water TDS concentration is well below the recommended upper concentration of the California MCL. Lastly, the predicted increased infiltration stormwater is also anticipated to provide low-TDS waters to the groundwater.

To manage salts and nutrients, the Recycled Water Policy requires every groundwater basin or sub-basin in California to have a consistent salt/nutrient management plan. Each salt/nutrient plan must include a monitoring plan, which includes monitoring of CECs consistent with CDPH recommendations; be protective of water sources; and encourage recycling to meet the Policy's reuse goals.

The application of recycled water for landscape irrigation would be regulated under the General Permit for Landscape Irrigation Uses of Municipal Recycled Water. The permit requires implementation of BMPs, such as implementation of an Irrigation Management Plan to ensure the use of recycled water occurs at an agronomic rate while employing practices to ensure irrigation efficiency necessary to minimize application of salinity constituents.

Oil and gas bearing geological strata are located beneath the project site, in the Tejon Oil Field and Tejon North Oil Field. These strata are located 2000 to 2600-feet below ground surface, well below the groundwater aquifers that are potentially suitable for drinking water purposes. Groundwater in the area of the Tejon Oil Field and Tejon North Oil Field is obtained from the Quaternary Kern River Formation at a depth of approximately 800 to 1000 feet below ground surface. The water quality of this zone is impacted by the approximately 1400 ppm TDS. The shallowest oil producing zones are the lowermost portion of the Mio-Pliocene Chanac and the Transition-Santa Margarita Formations at depths of approximately 2000 to 2600 feet. The water quality in these zones is impacted by approximately 2200 ppm TDS. Injection for purposes of water disposal and enhanced oil production (water flooding) has occurred within the Santa Margarita Formation within the oil field. Water produced during oil and gas production activities (Produced Water) is injected utilizing Class II disposal wells permitted through the Division of Oil, Gas, and Geothermal Resources (DOGGR).

Additionally, implementation of a state-level program to evaluate the occurrence and effects of CECs in stormwater would result in the development of control measures that would ultimately reduce groundwater quality impacts to a less than significant level.

Therefore, per the discussion above, potential project-related groundwater quality impacts resulting in the violation of any water quality standards or waste discharge requirements or the degradation of water quality (WQ-1 and WQ-6) would be less than significant, with no mitigation required.

Groundwater Recharge Impacts

Groundwater recharge impacts are discussed in detail in Section 6.5.6. Groundwater recharge is anticipated to increase in the project condition due to reductions in evapotranspiration of precipitation in the developed areas and the resulting increase in infiltrating runoff in the large infiltration basins and distributed bioretention BMPs that would be designed into the project plan.

Therefore, potential project-related groundwater recharge impacts resulting in a net deficit in aquifer volume or a lowering of the local groundwater table level (WQ-2) are considered less than significant, with no mitigation required. The project in fact would result in a positive impact by increasing infiltration to groundwaters of relatively low TDS waters.

Cumulative Impacts

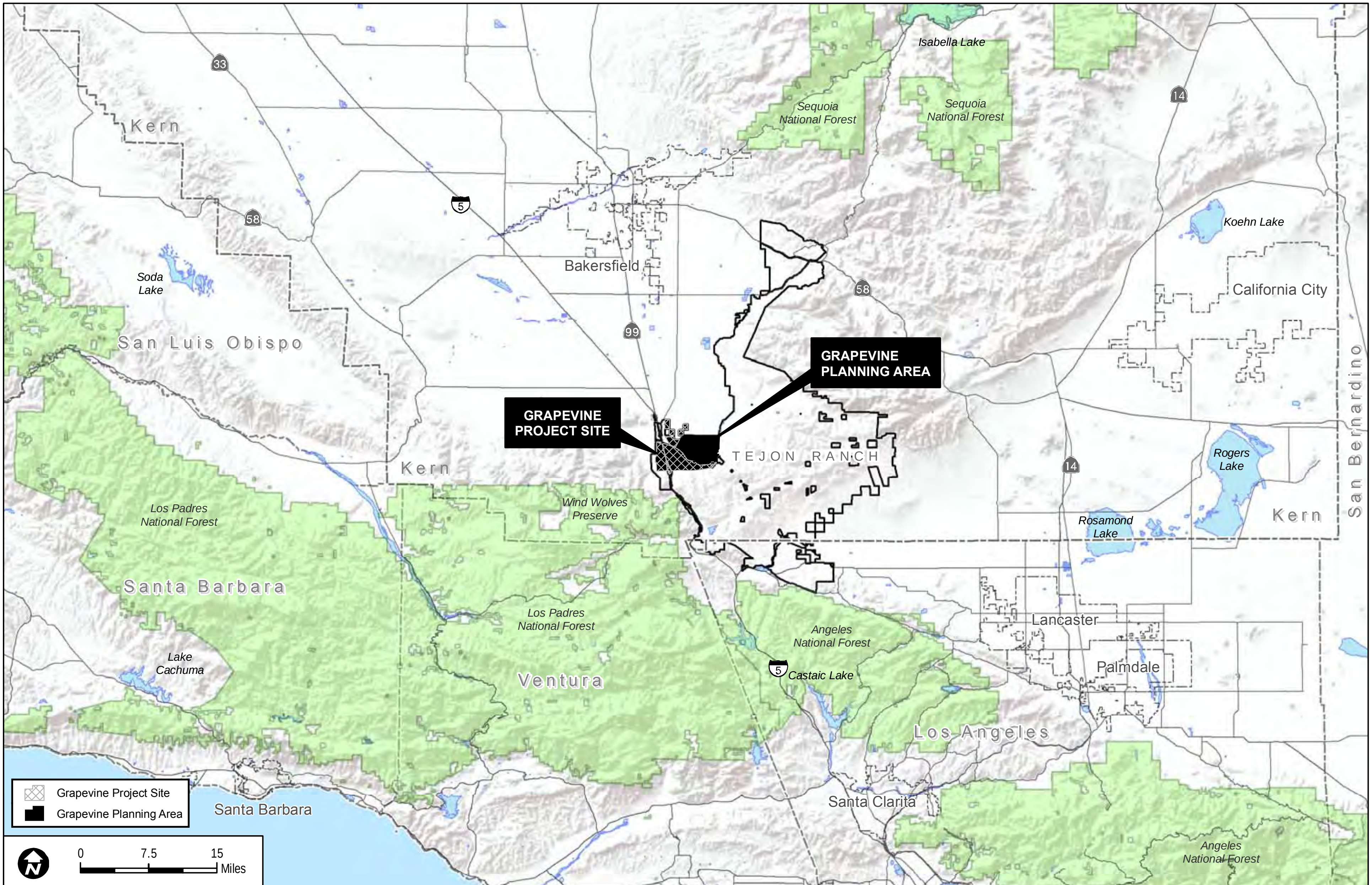
Cumulative impacts to surface water quality resulting from the project and future similar developments in the Grapevine and South Valley Floor HUs are addressed through implementation of source control and structural BMPs; compliance with the Construction General Permit; and Basin Plan water quality objectives, CTR criteria, and CWA 303(d) listings, which are intended to be protective of beneficial uses of the receiving waters. Based on compliance with these requirements, cumulative surface water quality impacts would be less than significant.

Per the State Water Board's Recycled Water Policy, cumulative groundwater impacts shall be managed under a regional salt and nutrient management plan. These requirements are designed to protect beneficial uses, so cumulative groundwater quality impacts would be less than significant. Additionally, a methodology to assess impacts from CECs in stormwater runoff (which could impact groundwater if infiltrated) is being addressed at the State level, which will result in the development of control measures that would ultimately reduce groundwater quality impacts to a less than significant level.

Cumulative impacts to hydromodification resulting from the project and future similar developments in the watersheds tributary to the project's jurisdictional receiving streams are addressed through implementation of hydromodification control PDFs in compliance with the hydromodification control performance standard, which is intended to be protective of beneficial uses of receiving streams. The only other project identified within the watersheds to have potential impacts to hydromodification is portions of the Tejon Mountain Village project which drain to Grapevine Creek, due to sediment supply losses[7]. It is the intent of the hydromodification control performance standard that, "the target Ep shall account for cumulative changes in bed sediment supply at the point of analysis for the ultimate buildout condition." This clarification is made because if bed sediment supply reductions were accounted for from only the Grapevine project and not the portions of Tejon Mountain Village that drain to Grapevine Creek, then cumulative hydromodification impacts would possibly be significant. However, based on compliance with the hydromodification control performance standard for both Grapevine and Tejon Mountain Village, as it is intended, cumulative hydromodification impacts would be less than significant.

Given that no significant adverse impacts to WQ-1 through WQ-6 would result from the project with PDFs, no additional mitigation measures are required beyond the projects PDFs.

[7] Drainage from Tejon Mountain Village to Castac Lake is excluded from the bed sediment supply evaluation because it is assumed that coarse bed sediment generated upstream is trapped within the lake.

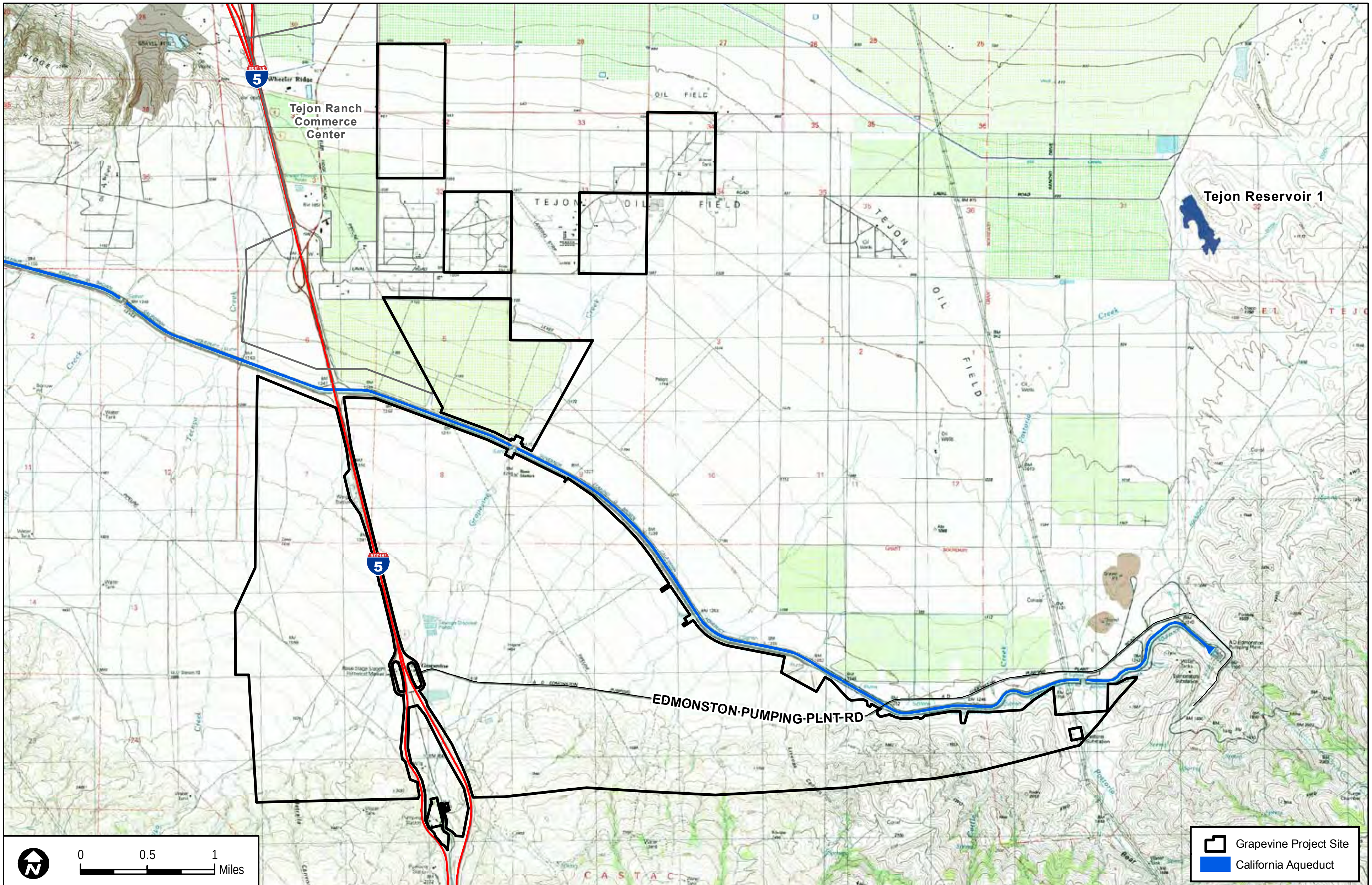


SOURCES: McIntosh & Associates 2013; TRC 2013a

FIGURE ES-1

Regional Location

GRAPEVINE PROJECT

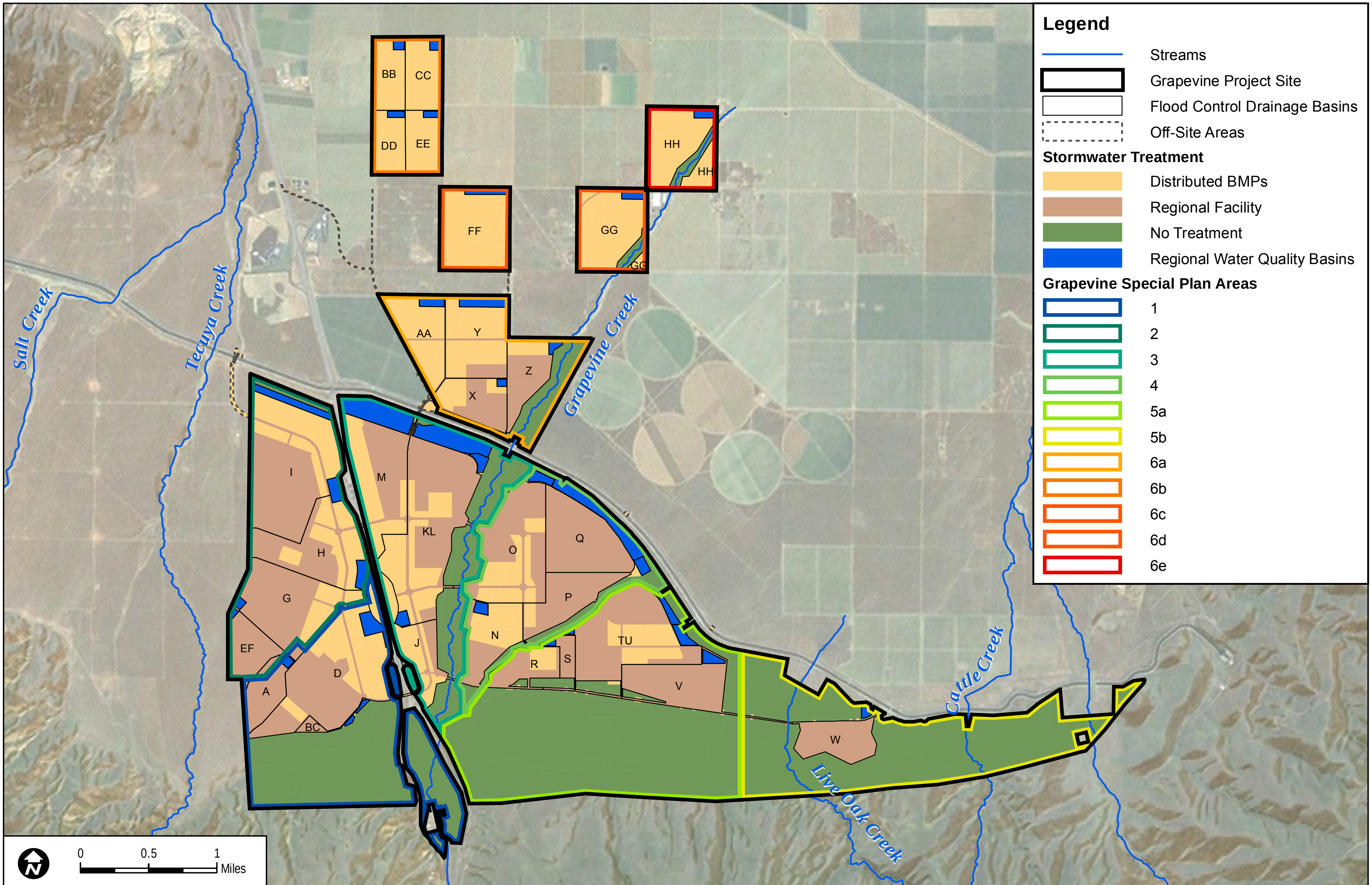


SOURCES: McIntosh & Associates 2013; TRC 2013b

FIGURE ES-2

Vicinity Map

GRAPEVINE PROJECT



SOURCES: ESRI

FIGURE ES-3

Hydrologic and Water Quality Modeling Areas and PDFs

GRAPEVINE PROJECT

1 INTRODUCTION

1.1 Purpose and Scope

This Water Quality Technical Report evaluates the potential environmental impacts of the proposed Grapevine project (Project) and associated off-site improvements on surface water, groundwater quality, and hydromodification. Section 1 of this report describes the proposed Grapevine project development including the project location, overview, PDFs, project construction scenario, and the project operation scenario. Section 2 describes the environmental and regulatory setting, including a summary of applicable water quality regulations at the federal, state, regional, and local scale. Section 3 identifies the pollutants of concern (PPOCs) for the water quality analysis based on applicable regulations and the pollutants that are anticipated or potentially could be generated by the project (based on the proposed land uses) that have been identified by regulatory agencies as causing impairment of the project's receiving waters. Geomorphic conditions of concern (GCOCs) are also identified in Section 4 based upon the applied hydromodification benchmarks. Section 5 presents the surface water and groundwater recharge analysis methodology. Section 6 of this report provides an analysis of potential impacts to water quality and hydromodification consistent with California Environmental Quality Act (CEQA), Appendix G. Potential impacts from both the construction and post-development (operational) phases are addressed. Section 7 provides conclusions with respect to surface water, groundwater quality, groundwater recharge, hydromodification, and cumulative impacts.

1.2 Project Description and Project Design Features

1.2.1 Project Location

The proposed Grapevine project is located in the west-central portion of Tejon Ranch (the Ranch). The approximately 270,000-acre Ranch is currently held in private ownership by TRC. The Ranch includes a large portion of the Tehachapi Mountains as well as smaller portions of the San Joaquin and Antelope Valleys. Generally, the Ranch extends from Interstate 5 (I-5) on the western side to Highway 58 on the northern side and State Route (SR) 138 on the southern side (Figure 1-1).

The 8,010-acre project site is entirely within unincorporated Kern County just south of the junction of I-5 and SR 99. Downtown Bakersfield is approximately 25 miles north of the project. The majority of the project site is on the east side of I-5, but a smaller portion lies on the west side of I-5. The project site is bisected by the California Aqueduct (Figures 1-1 and 1-2).

The Grapevine project site lies mainly in the Grapevine and Pastoria Creek U.S. Geological Survey (USGS) 7.5-minute quadrangles (90% and 7% of the total project area, respectively). There is one parcel and a portion of two other parcels in the project site that lie entirely within the Mettler USGS 7.5-minute quadrangles (3% of the total project area). The latitude and longitude of the approximate center of the site is 34°57′9″ N and 118°55′39″ W. The Universal Transverse Mercator (UTM) coordinates for the approximate center are UTM Easting (meters) 323999 and UTM Northing (meters) 3869472 in Zone 11.

1.2.2 Project Overview

The 8,010-acre project site, or Specific Plan Area, is within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement, a landmark agreement reached in 2008 with leading environmental organizations (including the Sierra Club, Natural Resources Defense Council, California Audubon Society, Endangered Habitats League, and Planning and Conservation League) to permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as I-5.

The project site includes approximately 8,010 acres, of which approximately 3,197 acres (or about 40%) would be designated for agriculture (with grazing and open space as the predominant land uses) and approximately 4,813 acres (about 60%) would be developed as a new residential community and employment center (Figure 1-3). The community would leverage and build upon the economic expansion and job growth that has occurred at Tejon Ranch Commerce Center (Figure 1-2), located immediately north of the project on I-5. The Grapevine project would feature a series of compact neighborhoods linked by bicycle and pedestrian trails and roads that will provide convenient access to grocery and drugstores, professional services, schools, and parks. The project site is located along I-5, at the gateway to the Central Valley, and is immediately adjacent to the extensive open space that was conserved in the Tejon Ranch Land Use and Conservation Agreement.

The project, which would include up to 12,000 residential units and 10.7 million square feet of commercial land uses (composed of village center commercial, office/research and development, freeway oriented commercial, and light industrial/warehouse), is designed as a series of conveniently located village centers (VCs), each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside the village cores, the Grapevine project includes a mix of residential uses, office, research and development, regional commercial, freeway-oriented commercial and light industrial/warehouse uses. Other potential public facilities, including a fire station, sheriff substation, transit facility/park-and-ride, water treatment plant, waste transfer station facility and wastewater treatment facilities (WWTF), are proposed throughout the community. Off-site potential public facility improvements associated with the project include the CHP Weigh Station, expansion of the existing TCWD WWTPs, and Aqueduct Water Turnouts.

Access to the first phases of the Grapevine community will be from Interstate 5 at the existing Grapevine Road and Laval Road interchanges. During later phases of development, the existing Grapevine Road/ Interstate 5 interchange may be expanded and relocated to the north. To allow for the relocation and replacement of the interchange, an existing Vehicle Enforcement Facility may be relocated to a TRC owned parcel on the west side of the junction of I-5 and CA-99. The project would also improve an existing TRC agricultural road east of the project area to provide access for truck traffic currently using Edmonston Pumping Plant Road to travel to properties east of the project as well as connector roads to the TCWD WWTP (West) and over the Aqueduct. The circulation network within the project is composed of two- and four-lane arterials, collector streets, and local streets organized in a grid pattern. All roads within the project site would be public. Multipurpose trails are proposed along Grapevine Creek, Cattle Creek, the southern foothills, and the open space adjacent to the California Aqueduct and at other locations throughout the project site. Some of these trails would connect to on-street, Class 2 bike lanes. Water and sewer service would be provided by the Tejon–Castac Water District.

1.2.3 Project Design Features

Project Design Features (PDFs) incorporated into the project to address surface water quality and hydromodification impacts include erosion and sediment control BMPs during the construction phase of the project and site design, source control, LID, and hydromodification control BMPs during the operational phase. These PDFs (i.e., water quality features) are considered a part of the project for the impacts analysis.

Effective management of construction phase runoff means protecting bare areas from erosion and keeping sediment and other pollutants associated with construction activities (for example, trash, paint, solvents, sanitary waste from portable restrooms, and concrete curing compounds) from discharging from the site. Effective management of post-development wet and dry weather runoff water quality begins with limiting increases in runoff pollutants and flows at the source. Site design, source control, and treatment BMPs are practices designed to minimize runoff and the introduction of pollutants into runoff or treatment to remove pollutants in runoff. Hydromodification control BMPs are designed to control increases in post-development runoff flow magnitudes and durations, reductions in bed sediment supply, narrowing of the channel width, and alteration of bed and bank material to protect stream channel geomorphology and habitat.

This section describes the construction phase and post-development (operational) source control, LID, and hydromodification control PDFs for the project. The process for selecting, sizing, and maintaining these PDFs is consistent with the Construction General Permit, as well as common benchmarks for BMP design.

1.2.3.1 PDF #1: BMPs to be implemented during Construction

The project will meet or exceed the requirements of the State Water Resources Control Board's National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities, Order No. 2012-0006-DWQ (NPDES No. CAS000002) (Construction General Permit). The SWPPP is required to include BMPs to be selected and implemented based on the determined project risk level to effectively control erosion and sediment to the Best Available Technology Economically Achievable and Best Conventional Pollutant Control Technology (BAT/BCT)[8]. An emphasis of the SWPPP will be to prevent impacts to infiltration BMPs from sediment and potential clogging.

The project will reduce or prevent erosion, sediment transport, and transport of other potential pollutants from the project site during the construction phase through implementation of BMPs meeting BAT/BCT. Erosion control BMPs are designed to prevent erosion, whereas sediment controls are designed to trap or filter sediment once it has been mobilized. The intent is to prevent or minimize environmental impacts and to ensure that discharges during the project construction phase would not cause or contribute to any exceedance of water quality standards in the receiving waters. All discharges from qualifying storm events will be sampled for turbidity and pH and results will be compared to Numeric Action Levels (NALs) (250 NTU and 6.5-8.5, respectively) to ensure that BMPs are functioning as intended. If discharge sample results fall outside of these action levels, a review of causative agents and the existing site BMPs will be

[8] BAT/BCT are CWA technology-based standards that are applicable to construction site stormwater discharges. Federal law specifies factors relating to the assessment of BAT including: age of the equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; the cost of achieving effluent reduction; non-water quality environmental impacts (including energy requirements); and other factors as the Administrator deems appropriate. CWA §304(b)(2)(B). Factors relating to the assessment of BCT include: reasonableness of the relationship between the costs of attaining a reduction in effluent and the effluent reduction benefits derived; comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources; the age of the equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; non-water quality environmental impact (including energy requirements); and other factors as the Administrator deems appropriate. CWA §304(b)(4)(B). The Administrator of U.S. EPA has not issued regulations specifying BAT or BCT for construction site discharges.

undertaken, and maintenance and repair on existing BMPs will be performed and/or additional BMPs will be provided to ensure that future discharges meet these criteria.

The construction-phase BMPs would assure effective control of not only sediment discharge, but also of pollutants associated with sediments, such as nutrients, heavy metals, and certain pesticides, including legacy pesticides. In addition, compliance with BAT/BCT requires that BMPs used to control construction water quality are updated over time as new water quality control technologies are developed and become available for use. Therefore, compliance with the BAT/BCT performance standard ensures effective control of construction water quality impacts over time.

The following types of BMPs will be implemented as-needed during construction:

Erosion Control

- Physical stabilization through hydraulic mulch, soil binders, straw mulch, bonded and stabilized fiber matrices, compost blankets, and erosion control blankets (i.e., rolled erosion control products).
- Contain and securely protect stockpiled materials from wind and rain at all times, unless actively being used.
- Soil roughening of graded areas (through track walking, scarifying, sheepsfoot rolling, or imprinting) to slow runoff, enhance infiltration, and reduce erosion.
- Vegetative stabilization through temporary seeding and mulching to establish interim vegetation.
- Wind erosion (dust) control through the application of water or other dust palliatives as necessary to prevent and alleviate dust nuisance.

Sediment Control

- Perimeter protection to prevent sediment discharges (silt fences, fiber rolls, gravel bag berms, sand bag barriers, and compost socks).
- Storm drain inlet protection.
- Sediment capture and drainage control through sediment traps and sediment basins.
- Velocity reduction through check dams, sediment basins, and outlet protection/velocity dissipation devices.
- Reduction in off-site sediment tracking through stabilized construction entrance/exit, construction road stabilization, and entrance /exit tire wash.

- Slope interruption at permit-prescribed intervals (fiber rolls, gravel bag berms, sand bag berms, compost socks, biofilter bags).

Waste and Materials Management

- Management of the following types of materials, products, and wastes: solid, liquid, sanitary, concrete, hazardous and equipment-related wastes. Management measures include covered storage and secondary containment for material storage areas, secondary containment for portable toilets, covered dumpsters, dedicated and lined concrete washout/waste areas, proper application of chemicals, and proper disposal of all manners of wastes.
- Protection of soil, landscaping and construction material stockpiles through covers, the application of water or soil binders, and perimeter control measures.
- A spill response and prevention program will be incorporated as part of the SWPPP and spill response materials will be available and conspicuously located at all times on-site.

Non-Stormwater Management

- BMPs that reduce or limit pollutants at their source before they are exposed to stormwater, including such measures as: water conservation practices, vehicle and equipment cleaning and fueling practices, and street sweeping. All such measures will be recorded and maintained as part of the project SWPPP.
- If construction dewatering or discharges from other specific construction activities such as water line testing, and sprinkler system testing are required, comply with the requirements of the LARWQCB's General Waste Discharge Requirements (WDRs) under Order No. R4-2013-0095 (NPDES No. CAG994004) governing construction-related dewatering discharges.

Training and Education

- Inclusion of Construction General Permit defined "Qualified SWPPP Developers" (QSDs) and "Qualified SWPPP Practitioners" (QSPs). QSDs and QSPs shall have required certifications and shall attend State Board sponsored training.
- Training of individuals responsible for SWPPP implementation and permit compliance, including contractors and subcontractors.
- Signage (bilingual, if appropriate) to address SWPPP-related issues (such as site cleanup policies, BMP protection, washout locations, etc).

Inspections, Maintenance, Monitoring, and Sampling

- Performing routine site inspections and inspections before, during (for storm events > 0.5 inches), and after storm events.
- Preparing and implementing Rain Event Action Plans (REAPs) prior to any storm event with 50 percent probability of producing 0.5 inches of rainfall, including performing required preparatory procedures and site inspections.
- Implementing maintenance and repairs of BMPs as indicated by routine, storm-event, and REAP inspections.
- Implementation of the Construction Site Monitoring Plan (CSMP) for non-visible pollutants, if a leak or spill is detected.
- Sampling of discharge points for turbidity and pH, at minimum, three times per qualifying storm event and recording and retention of results.

1.2.3.2 PDF #2: Post-Construction Source Control Features

Source control features will to be incorporated into the operational phase of the project to reduce pollutants from either being introduced in the first place or conveyed from their source to downstream locations, thereby reducing the level of treatment required. The following are the source control PDFs that will be incorporated into the project:

Storm Drain Stenciling and Signage. Storm drain stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets. A stencil contains a brief statement that prohibits the dumping of improper materials into the stormwater drainage system. Graphical icons, either illustrating anti-dumping symbols or images of receiving water fauna, are effective supplements to the anti-dumping message.

Proof of Ongoing Stormwater BMP Inspection and Maintenance. Improper maintenance is one of the most common reasons why stormwater BMPs do not function as designed, or fail entirely. It is important to identify responsibility for implementation of each non-structural source control BMP and scheduled cleaning and/or maintenance of all LID, treatment control, and hydromodification control facilities. The Community Service District or Home Owners Association (HOA) would be responsible for inspection and maintenance of all LID, treatment control, and hydromodification control facilities. Language regarding the responsibility for maintenance will be included in the project’s conditions, covenants and restrictions (CC&Rs). Printed educational materials will highlight the existence of the requirement and provide information on what stormwater PDFs are present, indications that maintenance is needed, and how the necessary maintenance should be performed.

Proper Design of Outdoor Material Storage Areas. Improper storage of materials outdoors provides an opportunity for pollutants of concern to enter the stormwater conveyance system. The project will incorporate the following source control PDFs for outdoor material storage areas:

- Materials with the potential to contaminate stormwater will be placed in an enclosure such as a shed or cabinet, or protected by secondary containment structures such as berms, dikes, or curbs.
- Permanent storage areas will be paved and sufficiently impervious to contain leaks and spills.
- Permanent storage areas will have a roof or awning to reduce collection of stormwater within the secondary containment area.

Proper Design of Other Potential Pollutant Source Areas

- Proper design of trash storage areas will prevent transport of trash and debris and other pollutants by wind or water into nearby storm drain inlets and receiving waters.
- Proper design of loading docks will reduce the potential for spilled materials to enter the storm drain system.
- Proper design of repair/maintenance bays will prevent the discharge of metals, oil and grease, solvents, battery acid, coolant, and fuels to the storm drain system.
- Proper design of vehicle/equipment wash areas and restaurant equipment/ accessory wash areas will prevent the discharge of metals, oil and grease, solvents, phosphates, and suspended solids to the storm drain system.
- Proper design of fueling areas at retail gasoline outlets and automotive repair shops will prevent the discharge of oil and grease, solvents, car battery acid, coolant, and fuels to the storm drain system.
- Proper design of parking areas will reduce the discharge of heavy metals, oil and grease, Polycyclic Aromatic Hydrocarbons (PAHs), and suspended solids to the storm drain system. Heavily used lots will incorporate treatment measures to remove oil and petroleum hydrocarbons from the parking lot runoff. Adequate operation and maintenance (O&M) will be conducted for sludge and oil removal systems and to prevent system fouling and plugging.

Education of Property Owners, Tenants, and Occupants. The Community Service District or HOAs will provide environmental awareness education materials to all members and employees. At a minimum, these materials will cover the following topics:

- The use of chemicals (including household type) that should be limited to the property, with no discharge of specified wastes via hosing or other direct discharge to gutters, catch basins, and storm drains.
- The proper handling of materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, and swimming pool chemicals.
- The environmental and legal impacts of illegal dumping of harmful substances into storm drains and sewers.
- Alternative household products that are safer for the environment.
- Household hazardous waste collection programs.
- Used oil recycling programs.
- Proper procedures for spill prevention and clean up.
- Proper storage of materials that pose pollution risks to local waters.
- Public or private transportation alternatives to driving.
- Approved car washing facilities/areas in multi-unit residential complexes.
- The proper management of animal wastes, such as the importance of cleaning up after pets and not feeding pigeons, seagulls, ducks, and geese.

Activity Restrictions (Conditions, Covenants, and Restrictions [CC&Rs])). Community Service District/HOA CC&Rs shall be required for the purpose of water quality protection. Alternatively, use restrictions may be developed by a building operator through lease terms or other mechanisms. An example would be not allowing car washing outside established community car wash areas in multi-unit residential complexes.

Common Area Litter Control. The Community Service District or HOAs will be responsible for conducting litter patrol and emptying trash receptacles in common areas.

Street Sweeping. In higher use areas, private streets and parking lots will be swept prior to start of the rainy season, at a minimum.

Landscape Management Plan and Integrated Pest Management (IPM). A landscape management plan will be developed and implemented for common area landscaping within the project that addresses IPM and pesticide and fertilizer application guidelines. IPM is a strategy that focuses on long-term prevention or suppression of pest problems (i.e., insects, diseases and weeds) through a combination of techniques including: using pest-resistant plants; biological controls; cultural practices; habitat modification; and the judicious use of pesticides according to treatment thresholds, when monitoring indicates pesticides are needed because pest populations exceed established thresholds. The Landscape Management Plan will include the following components:

- Pesticide applicator certifications, licenses and training – in particular, all pesticide applicators must be certified by the California Department of Pesticide Regulation.
- Pest identification.
- Practices to prevent pest incidence and reduce pest buildup.
- Monitoring to examine vegetation and surrounding areas for pests to evaluate trends and to identify when controls are needed.
- Establishment of action thresholds that trigger control actions.
- Pest control methods- cultural, mechanical, environmental, and biological controls, as well as appropriate, more conventional pesticides.
- Pesticide management –safety (e.g., Material Safety Data Sheets, precautionary statements, protective equipment), regulatory requirements, spill mitigation, groundwater and surface water protection measures associated with pesticide use.
- Recommendations for fertilizer management - The guidelines will include soil assessment, fertilizer types, application methods, and storage and handling.

Efficient Irrigation Systems and Landscape Design. The project requires landscape materials to be selected from an approved plant palette. Usage of non-native ornamentals will be reduced and native and/or non-native/non-invasive, low water use plants will primarily be utilized. This applies also to plants used in the vegetated stormwater management facilities (e.g., bioretention, bioinfiltration, biotreatment, and community-scale basins). Use of a native plant palette will reduce pesticide and fertilizer application requirements. Irrigation systems will incorporate weather- or soil moisture-based controllers that automatically adjust irrigation in response to changes in plants' needs as weather conditions change to reduce water usage and irrigation runoff.

1.2.3.3 PDF #3: Post-Construction Low Impact Development and Treatment Features

The project will implement LID and treatment BMPs with the primary goal being to maintain an overall site landscape that is functionally equivalent to pre-development hydrologic conditions for aquifer recharge purposes, to minimize hydrological changes, as well as to minimize the generation of pollutants of concern (note that there are additional hydromodification control features in PDF#4; PDF#3 features contribute to hydromodification control). Site preservation practices coupled with small scale distributed infiltration, evapotranspiration, and treatment mitigation measures that rely on vegetation and soils, or systems that mimic the treatment obtained by soils and vegetation, comprise the LID control approach. These practices, taken in aggregate, can limit the observed hydromodification on a developed site and provide a comprehensive and beneficial control approach. LID site design practices can also reduce local infrastructure requirements and benefit energy conservation, air quality, open space, and habitat. The principles of LID include:

- Maintaining natural drainage paths and landscape features to slow and filter runoff and maintain/increase groundwater quality (by lowering TDS and other pollutants) and recharge,
- Reducing and disconnecting impervious cover created by development and the associated transportation network, and
- Managing runoff as close to the source as possible.

Site Design Measures

The project will incorporate the following general LID site design measures as PDFs:

Minimize Impervious Area/Maximize Permeability. Principles include preserving natural open space, reducing impervious surfaces such as roads, using more permeable paving materials where feasible, reducing street widths, using minimal disturbance techniques during development to avoid soil compaction, reducing the land coverage of buildings by building taller and narrower footprints, minimizing the use of impervious materials such as decorative concrete in landscape design, and incorporating detention or infiltration into landscape design.

Minimize Directly Connected Impervious Areas. Minimizing directly connected impervious areas can be achieved by directing runoff from impervious areas to landscaped areas or treatment BMPs.

Conserve Natural Areas. Conserving and protecting native soils, vegetation, and stream corridors helps to mimic the site's pre-development hydrologic regime. This may be accomplished by clustering development within portions of the site to conserve as much natural open space as possible, conforming the site layout along the natural landforms to avoid excessive grading and disturbance of soils and vegetation, planting additional vegetation, preserving significant trees, using native and/or non-native/non-invasive vegetation in parking lot islands and other landscape areas, and preserving and/or restoring riparian areas and wetlands. The project would preserve approximately 3,197 acres of land as exclusive agriculture.

Select Appropriate Building Materials. Use of appropriate building materials reduces the generation and discharge of pollutants of concern in runoff (and is therefore also a source control BMP). For example, restricting the use of architectural copper on the outside of buildings and reducing the use of galvanized materials would reduce the impact of copper and zinc to stormwater runoff.

Protect Slopes and Channels. Protecting slopes and channels, including setting development back from creeks, wetlands, and riparian habitats, and replicating the site's natural drainage patterns reduces the potential for erosion and preserves natural sediment supply.

LID Performance Standard

Treatment BMPs will be selected and sized to treat the larger of the volume of stormwater runoff produced from the 85th percentile, 24-hour storm event (water quality design volume) or the volume required to attain 80% capture. Retention BMPs[9] will be selected to retain the water quality design volume or greater to the extent feasible. If it is infeasible to retain all or part of the water quality design volume in a particular area, biotreatment BMPs[10] will be selected and sized to capture and treat the remaining portion of the water quality design volume, to the extent feasible. Any remaining portion of the water quality design volume will be treated with effective treatment control BMPs that are selected to address the pollutants of concern. LID and treatment control BMPs may be located close to source areas as distributed BMPs (on a parcel or neighborhood scale) or at a community-scale stormwater treatment facility (on a larger, multi-parcel, multi-land use scale) within the project site, potentially integrated with the flood control sumps. Runoff that bypasses distributed BMPs (approximately 20%, based on 80% capture) would flow to the downstream community-scale BMPs where it would be retained assuming capacity was available.

The Grapevine Project LID Performance Standard will be implemented as a PDF as described below and depicted in Appendix F, in Figure F-9. The menu of proposed LID and treatment control BMPs are described and illustrated in Appendix A. These may be used individually or in combination to meet the project's LID Performance Standard:

- Village commercial, village residential, commercial, residential, park, school, and roadway land uses will implement infiltration BMPs on-site or at a community-scale location. Agriculture, relocated interchange, and light industrial parcels will implement

[9] LID retention BMPs incorporate infiltration, ET and/or harvest and use elements to eliminate surface (piped) discharge for the water quality design storm event.

[10] LID biotreatment BMPs are practices that effectively treat stormwater to address pollutants of concern and provide incidental volume reduction by incorporating amended soil and vegetation elements.

infiltration BMPs at a community-scale location. Undeveloped areas would not be treated. If it is feasible and technically appropriate to infiltrate all of the water quality design volume, infiltration BMPs will be used. Infiltration BMPs include bioretention (without an underdrain), flow dispersion into landscaped areas, permeable pavement, infiltration trenches or galleries, or an equivalent infiltration BMP.

- Runoff from roofs, patios, and walkways in single and multi-family family residential parcels will be disconnected over landscaped areas designed to retain the water quality design volume if feasible. Runoff from the remaining parcel area and that which does not infiltrate in the landscaped area will flow through the storm drain system to a community-scale infiltration/biotreatment facility.
- Runoff from off-site public roads included in the project will be treated by distributed BMPs sized to meet the 85th percentile, 24-hour event.
- For areas that cannot be feasibly managed in on-site or community-scale retention or biotreatment BMPs, treatment control BMPs will be provided that effectively address pollutants of concern and are sized to capture and treat and discharge the water quality design volume.
- The best available data at each stage of planning relative to geology, groundwater, and rough grading plans will be used to characterize anticipated feasibility of infiltration[11]. Additional site investigations, including testing and monitoring, will be conducted, as needed, prior to the recordation of any final subdivision map (except those maps for financing or conveyance purposes only) or the issuance of any rough grading or building permit, to verify or revise feasibility determinations and modify PDF selection, as needed.

1.2.3.4 PDF #4: Post-Construction Hydromodification Controls

The Grapevine project will implement hydromodification controls to minimize and control hydromodification impacts to local streams. The site will, to the extent feasible, preserve natural hydrologic and geomorphic conditions on the overall project site, and protect sensitive hydrologic features, sediment sources, and sensitive habitats. A series of progressive hydromodification control measures will be used in the project to prevent and control hydromodification impacts to Grapevine Creek and other local streams:

[11] Feasibility determination will include factors beyond technical infeasibility, including factors related to physical feasibility, risks of creation of hazards, risk of adverse environmental impacts, multiple competing uses for space (i.e., constrained right of way; high density clustered development), and project economics.

- Avoid, to the extent possible, the need to mitigate for hydromodification impacts by preserving natural hydrologic conditions and protecting sensitive hydrologic features, sediment sources, and sensitive habitats.
- Minimize the effects of development through site design practices (e.g., reducing connected impervious surfaces), and implementation of stormwater volume-reducing LID PDFs (project-based HSCs), as needed.

In some cases, hydromodification control measures that provide habitat, water quality treatment, hydromodification control, and flood control in one integrated solution may be feasible.

Additionally, hydromodification will be managed to ensure that changes to the dominant controls on channel form (i.e., hydrology and bed sediment supply) as well as the form itself (i.e., channel geometry and bed/bank material) will not cause a decrease in lateral (bank) and vertical (channel bed) stability in receiving stream channels.

Hydromodification Control Performance Standard

The state of the current science in hydromodification evaluation and selection and design of controls if needed is to use the Erosion Potential (Ep) metric to: predict the likelihood of channel adjustment given watershed and stream hydrologic and geomorphic variables; and size and situate hydromodification controls to manage potential geomorphic impacts. Ep is defined as the ratio of long-term effective work or sediment transport capacity done on the channel boundary for the post- and pre-project conditions (i.e., post/pre). Ep is a function of changes in hydrology, channel geometry, and bed and bank material, due to land use alteration.

The project will be designed to the following hydromodification control performance standard:

> *The erosion potential (Ep) of susceptible watercourses associated with the Project shall be maintained within an appropriate range of the target value. The target Ep shall be 1.0 unless a more appropriate value is derived based on best available science. The target Ep shall account for changes in sediment supply at the point of analysis. If the Project does not significantly alter the hydrology, bed sediment supply, channel geometry, and bed/bank material of a receiving stream, then the Project is in compliance with the Ep based hydromodification management objective for this watercourse.*

Susceptible Watercourses

The hydromodification control performance standard applies to susceptible watercourses associated with the Project. These susceptible watercourses correspond to the jurisdictional receiving streams within and downstream of the project, which includes (from west to east)

Tecuya Creek, Grapevine Creek, Cattle Creek 2, Live Oak Creek, Cattle Creek 1, and Pastoria Creek (described in Section 2.1.6). Engineered canal systems are not considered to be susceptible to hydromodification impacts.

Alternative Target Ep

Based on the best available science to date, an appropriate alternative target Ep is:

- Ep = 1.0 if the bed sediment median grain size (D_{50}) is less than or equal to 8 mm; and
- Ep = 0.78 * $D_{50}^{0.12}$ if the bed sediment D50 is greater than 8 mm.

This alternative target Ep standard is based on the findings of SCCWRP Technical Report 753 (2013). The equation provided is the logistic regression function for 25% risk of channel instability. A 25% probability of channel instability is acceptable because the logistic regression model of the 61 sites evaluated in Southern California indicates that an Ep of 1.0 relates to a 25% risk of channel instability.

Adjustment of the Target Ep for Bed Sediment Supply Reduction

Changes in sediment supply are accounted for by deviating the target Ep from 1.0, or another appropriate alternative, in proportion to the change in bed sediment supply (post-project/pre-project), expressed as Sp. This represents the best current understanding of how to quantitatively account for sediment supply changes without replacing bed sediment sources (Palhegyi and Rathfelder, 2007). While accounting for changes in sediment supply is appropriate for quantifying geomorphic impacts in alluvial stream systems, where the bed is made up of materials that are generated from upstream sources, it is not considered appropriate for threshold channels, where the sediment transport capacity greatly exceeds the inflowing sediment load so that there is no significant exchange of material between the sediment carried by the stream and the bed (NRCS, 2007).

Appropriate Range of the Target Ep

Based on the best available science to date, the appropriate range of the target Ep is:

- 5% in systems with a bed sediment D_{50} less than or equal to 16 mm; and
- 20% in systems with a D_{50} greater than 16 mm.

This range is based on findings presented in the Journal of Hydrology article titled *Channel Enlargement in Semiarid Suburbanizing Watersheds: A Southern California Case Study* (Hawley and Bledsoe, 2013). The article states that, "the threshold corresponding to the presence/absence of headcutting varied based on substrate type, and was roughly quantified as a sediment-transport ratio greater than ~1.20 in systems with a median grain size > 16mm, and [Ep] ~ 1.05 when d50 < 16 mm."

Hydromodification Control PDFs

The following hydromodification controls, organized according to the four key factors affecting geomorphic stability, will be incorporated into the Grapevine project to meet the hydromodification control performance standard.

Hydrologic Management Measures

Disconnecting impervious areas from the drainage network and adjacent impervious areas is a key approach to protecting channel stability. Hydrologic Source Controls (HSCs) will be included in the project to limit impervious area and disconnect imperviousness to avoid and minimize hydromodification impacts. Hydrologic management measures, which vary in scale from smaller distributed HSCs to larger centralized stormwater facilities, include the following (including measures associated with PDF #3):

- ***Site Design***. Site design PDFs that help to reduce runoff volume from the project include the clustering of development, leaving large amounts of undeveloped open space within the project; routing of stormwater runoff to vegetated areas and/or LID PDFs; use of native and/or non-native/non-invasive vegetation in landscaped areas; and the use of efficient irrigation systems in common area landscaped areas.
- ***LID and Treatment BMPs***. The project's LID and treatment BMP PDFs would also serve as hydromodification source control PDFs. Parcel-based and community-scale treatment BMPs would provide volume reduction ranging from incidental volume reduction in biotreatment BMPs (via evaporation and infiltration) up to full volume reduction of captured water in infiltration BMPs where soil and hydrogeologic conditions permit. In addition, these facilities would also receive and eliminate dry weather flows through infiltration.
- ***Storage of Excess Runoff Volume for Irrigation Reuse***. Excess flows could be directed to storage tanks or above groundwater features located in parks for irrigation reuse, or alternatively, to blend excess stormwater runoff with reclaimed water from the proposed WWTF for reuse.
- ***Regional Flood Control Sump Basins.*** Hydromodification control can be provided at a community-scale stormwater treatment facility (on a larger, multi-parcel, multi-land use scale) within the project site, potentially integrated with the flood control sumps. Runoff that bypasses distributed BMPs (20%, based on 80% capture) would flow to the downstream community-scale BMPs where it would be retained assuming capacity is available. Such basins could also provide flow-duration control, if needed.

Sediment Management Measures (PDF #4a)

Similar to hydrologic management measures, sediment management measures include both non-structural and structural controls. Reductions in bed sediment supply will be managed in the following ways:

- ***Avoid Significant Bed Material Supply Sources in Site Design***. The most effective approach to ensuring stability of receiving streams is to avoid changes in bed sediment supply by avoiding development on areas and channels that are significant contributors of bed material load. Where possible, development within a project should be located preferentially outside of natural channels and on existing soils that have a low potential to contribute bed material to the receiving stream.
- ***Pass Through Sediments from Natural Open Spaces.*** Where possible, drainage pathways for open spaces upstream of developments should be designed to pass coarse bed sediments from natural areas and channels to the receiving streams that are susceptible to hydromodification. Maintaining natural bed sediment supplies to streams helps to reduce the potential for excess erosion in alluvial channels. Additional analysis or maintenance protocols may be required to ensure downstream flood and sedimentation protection from large magnitude storm events, particularly given the Project's geomorphic setting on the depositional alluvial fan.
- ***Replace Significant Bed Material Sources that are Eliminated.*** If, after implementing non-structural sediment management measures, it is not feasible to obtain a less than significant potential for adverse response, then bed sediment can be added to the receiving stream by placing coarse sediment downgradient of debris basins or the outfalls' energy dissipation system. The caliber of this sediment shall be of the same grain size distribution as the receiving stream, and it shall not contain a significant amount of fine sediment associated with the suspended wash-load. It is anticipated that natural bed sediment deposited in existing and proposed debris basins will be utilized as source material for the replacement of bed material.

  The annual replenishment of this supplemented bed sediment, in tons, shall be equal to the estimated annual bed-load deficit caused by project development, as calculated in a bed sediment supply evaluation. This rate of replenishment can be modified as part of an adaptive management and monitoring plan. Prior to project construction, the stockpile should initially be stocked with more than the annual bed-load deficit in the event that the first wet season has higher than normal precipitation and runoff. Added bed sediment material should be placed such that it can be readily transported by fluvial forces exiting debris basin outlets, in-stream culverts that enter the Project, and the outfalls' energy dissipation system. Prior to placing this material at an outfall, it must undergo a sieve treatment to mimic the grain size distribution of the receiving stream of interest and remove fine particles.

- ***Additional Detention and Retention in Site Runoff.*** One option for managing for bed sediment supply reductions is to provide additional detention and retention in site runoff to compensate for the reduction of bed material. This measure would require increasing flow attenuation by adding storage volume in hydrologic management measures (PDF #3) beyond the level needed to meet a target Ep that accounts for changes in hydrology, channel geometry, and bed/bank material, but not sediment supply. For example, if there is a 30% reduction in bed-load due to proposed urbanization, then the sediment supply potential (Sp) equals 0.7 and the target Ep becomes 0.7 +/- the appropriate range. Assuming the appropriate range is +/- 5%, hydromodification controls can be sized and situated such that the post-development effective work in-stream is lowered to within 67% to 74% of the baseline pre-project condition.

Channel Geometry Management Measures (PDF# 4b)

Changes in channel geometry, primarily the narrowing of floodplain width, will be managed by the following measures:

- ***Establish Riparian Buffer Zones.*** Establishing riparian buffer zones, where no development is allowed, prevents direct impacts to riparian habitat in multiple ways. Benefits of riparian buffer zones include: helping prevent changes to channel geometry (i.e., narrowing of the floodplain width) or bed and bank materials that can contribute to increase erosion independent of upstream flow changes; sustainably supporting the flora and fauna that existed prior to development; maintaining the degree of native wood and leaf debris input into the creek system; filtering stormwater runoff before it enters the receiving stream; and maintaining the hydrologic connectivity between streams and floodplains. If runoff can be routed through the buffer, it can provide attenuation and infiltration to reduce the volume of runoff entering the creek. Existing riparian corridor widths will be conserved while avoiding in-stream constrictions (i.e., culverts, bridges, and at-grade crossings) to the extent possible;
- ***Reinforce Stream Banks to Withstand Channel Avulsion.*** Historically the receiving streams of concern within the Grapevine project have avulsed and found new flow paths as a result of the high level of sediment production from the Tehachapi Mountains and the subsequent deposition of that sediment on the alluvial fan. Because the project limits the ability for the alluvial receiving streams (specifically Grapevine Creek) to migrate and avulse within the alluvial fan as it has done historically, if necessary, buried bank stabilization will be provided along the edges of the proposed stream corridor that are adjacent to development. This bank stabilization would act as a barrier to withstand

redirection of the active channel into proposed development areas and its associated infrastructure.

- ***Design for Stream Constrictions.*** In-stream hydraulic constrictions, such as culverts and bridge crossings, may be unavoidable in certain situations due to site constraints. This in-stream infrastructure could potentially create backwater effects upstream and higher shear stresses near the piers and abutments. The energy associated with concentrating channel flow through smaller cross-sectional area creates the potential for localized scour within receiving streams. These are considered localized effects and will be managed with: proper in-stream energy dissipation; design of in-stream structures for anticipated toe down scour without undermining infrastructure; and stream crossings with higher and longer spans that limit reductions in cross-sectional flow area. Energy dissipation and toe scour calculations should be performed consistent with the Kern County Development Standards.

Bed and Bank Material Management Measures (PDF #4c)

Changes to bed and bank material will be managed by the following measures:

- ***Prohibit Cattle within Riparian Corridors.*** The primary concern related to bed and bank material is the presence of cattle within the active stream channels. Under proposed project there will be less land available for grazing, which could concentrate cattle into some of the riparian corridors which will be left as open space. One necessary management practice is to prohibit cattle from accessing the riparian corridor (e.g., with fencing) because grazing on bank vegetation and stepping on the banks causes in-stream erosion. It also decreases the resistance of the banks, thus making the channel more susceptible to in-stream erosion when water is flowing.
- ***Dissipate Flow Energy at Outfalls.*** Energy dissipation at the project's outfalls will minimize localized scour in the receiving streams of concern. Proper energy dissipation per the Kern County Development Standards will also reduce the potential for in-stream knickpoint migration resulting from the formation of these scour holes resulting from concentrated flow.

Differences between Hydromodification Control and Flood Control

Flood control and hydromodification control are inherently different in their objectives as well as methods of analysis. The objective of flood control is to prevent flood inundation and scour of property from high magnitude and rare storm events (e.g., between the 10-year and 100-year event). The objective of hydromodification management is to prevent excessive long-term erosion and deposition in natural channels for a range of channel flows that are typically much lower than flood design flow rates (e.g., from a fraction of the 2-year discharge to the 10-year discharge).

While hydrologic analyses for flood control, such as those contained in the Kern County Hydrology Manual (Hromadka, 1992), are based on evaluating the magnitude of one or a few large discrete events (on the order of hours to days), hydromodification analysis focuses on continuous simulations (spanning over several decades) which take into account both flow magnitude and duration. Because hydromodification analysis looks at both magnitude and duration of the long-term record, the large but rare flowrates that are crucial to flood control can be relatively insignificant when considering sediment transport and changes in channel form. The most important range of flows from the perspective of affecting channel form are the relatively frequent flows that are contained primarily within the active channel and not the rare, high magnitude flows which exceed the rate of flow that can be contained in the normally wetter perimeter of the channel.

Flows which create high enough shear stresses to initiate sediment transport within the channel and which occur frequently enough to have influence over long-term stream morphology are considered “geomorphically-significant” flows. To provide perspective on the timescales of interest, a peak storm discharge may contribute to a bed scour hole, which slowly fills in with sediment over days to months after the event takes place. But if the time scale considered for stream stability is on the order of several decades, then the contribution of the short duration peak discharge to that scour hole may be a negligible perturbation on the overall record of channel form.

Flood control standards for hydrograph attenuation and in-stream erosion and sedimentation associated with peak storm events, including protection against localized scour velocities at outfalls and in-stream culverts, are provided in the Kern County Development Standards (2010). Although these flood control considerations are related to hydromodification control, they are inherently different in their objectives as well as methods of analysis, and are therefore distinguished from one another.

1.2.4 Project Construction Scenario

The project site is divided into six planning areas ranging in size from approximately 450 to 1,400 acres. Development of the planning areas would be phased over a period of 19+ years. Buildout of each phase is projected to take approximately 2 to 4 years (Phase 1: 2 years; Phase 2: 4 years; Phase 3: 3 years; Phase 4: 4 years; Phase 5: 4 years; Phase 6: 2 years), with the first phase commencing in 2016. The portions of the site that are proposed to remain in exclusive agriculture/open space are primarily located along the southern edge of the California Aqueduct, along the southern portion of the project site at the foothills of the Tehachapi Mountains, and along Grapevine and Cattle Creeks.

Erosion and sediment controls to be implemented during the construction phase are described in PDF#1 above, which would apply to all phases regardless of order implemented.

1.2.5 Project Operation Scenario

The project operations are described in the Grapevine Specific and Community Plan, and land uses associated with operations are described in the Grapevine Special Plan.

As described above, PDFs #2, #3, and #4 would be implemented during project operation scenario.

2 SETTING

2.1 Environmental Setting

2.1.1 Topography

The project site ranges in elevation from 898–2,186 feet above mean sea level (AMSL). The majority of the site is at the lower to mid-elevation range of approximately 1,000–1,400 feet amsl. The slopes in the southern portion of the site are steepest. Slopes become less steep from the southwestern corner of the site to the northeast corner. The majority of the site is relatively flat. The slopes along the southern boundary generally face north, but exhibit a range of aspects. Monroe and Aliso Canyons trend north to south in the southern portion of the site (Figure 2-1).

The lowest elevations in the study area occur in the northwestern part of the site and along the northern boundary of the site to the northeastern corner. Elevations generally rise in the southwesterly direction. The entire length of the aqueduct through the center of the site is approximately 1,250 feet amsl. Aspects vary considerably more in the southern portion of the site where the steepness increases. The highest point on the study area is located at the southern edge of the site east of I-5.

2.1.2 Climate

The Tejon Rancho National Oceanic and Atmospheric Administration (NOAA) Cooperative Station is approximately 6 miles to the northeast of the Grapevine project at an elevation of 1,420 feet amsl. Given the proximity to the area and the elevation of the station, which is close to the mid-point of the study area elevation (i.e., 1,542 feet amsl), the approximate climate of the Grapevine study area is characterized herein using the data collected at this station (Figure 2-2).

As mentioned previously, the project is located at the base of the Tehachapi Mountains on the extreme southern end of the San Joaquin Valley floor. However, the majority of the project site is located in the San Joaquin Valley, which has a semi-arid climate characterized by long, hot, dry summers and damp, short winters that have a heavy fog layer for weeks at a time. The average high temperature during the summer approaches 96 degrees Fahrenheit (°F) with an annual average of 75.9°F. Low temperatures range from approximately 37–68°F, with an annual average low temperature of 51.2°F. The average annual precipitation is 11.68 inches. The majority of the rainfall (precipitation over 1 inch/month) during the year occurs between November and April, the typical rainy season for this region. The summer months are virtually rainless with average monthly rainfalls ranging from 0.1–0.02 inch/month (Western Regional Climate Center [WRCC], 2013).

2.1.3 Geology

The project site is located at the base of the Tehachapis. The hydrogeological history is summarized as follows: "at the base of the granitic basement rock of the Tehachapis are deep layers of sediments that have been eroded from the mountains and deposited in the adjacent valleys. Groundwater formed via the infiltration of rain, and snowmelt travels down-slope and accumulates in these alluvial groundwater basins. The faulting prevalent in the region produces fractures through which groundwater moves to the surface rather than continuing down-gradient, expressing as springs or seeps of water" (Tejon Ranch Conservancy 2013) (Figure 2-3). Generally, groundwater in the southern San Joaquin Valley lies between 150 and 500 feet below ground surface (Faunt 2009, as cited in Tejon Ranch Conservancy 2013).

2.1.5 Soils

Soils within the project site are comprised of Natural Resources Conservation Service (NRCS) hydrologic soil Groups A, B, C, and D (Figure 2-4). A tabular summary of hydrologic soil group areas is presented in Table 1.

Table 1
Hydrologic Soil Groups within the Grapevine Project Area

Hydrologic Soil Group	Description (NRCS, 2009)	Area (Acre)	Percent of Project Area
A	Low runoff potential when wet allowing water to transmit freely through the soil layer into the subsurface; generally composed of less than 10 percent clay and more than 90 percent sand or gravel.	5,668	70.8%
B	Low runoff potential when wet and unimpeded water transmission; generally composed of 10 to 20 percent clay and 50 to 90 percent sand.	1,754	21.9%
C	Moderately high runoff potential when wet and somewhat restricted water transmission; generally composed of 20 to 40 percent clay, less than 50 percent of sand, and some loam, silt loam, sandy clay loam, clay loam, or silty clay loam.	522	6.5%
D	High runoff potential when wet and restricted to very restricted water transmission; generally composed of greater than 40 percent clay and less than 50 percent sand. .	36	0.4%
Not Classified	N/A	29	0.4%
Total		8,010	100%

In order to further characterize the infiltration characteristics of subgrade soils within the Grapevine project area, with the intent of assessing the feasibility of including infiltration BMPs in the operational condition, in January of 2014 a site investigation was conducted in each of the accessible special plan areas (SPAs) (Geosyntec, 2014). The investigation found that on-site soils are expected to support infiltration BMPs with infiltration rates of approximately 2 inches/hour for most of the project site and groundwater and clay layers are unlikely to inhibit infiltration. The summary report is attached as Appendix B.

2.1.7 Land Use

The existing project site is primarily agricultural land use (7,869 acres, or 98%), which is primarily used for cattle grazing (Figure 2-5). Other existing uses include general commercial (135 acres, or 1.7%) and floodplain (6 acres, or 0.1%) (Table 2). Impervious cover and impervious areas are provided in Table 3.

Table 2
Existing Condition Land Uses (acres)

Special Plan Area	Exclusive Agriculture (acres)	Floodplain Primary (acres)	General Commercial (acres)	Total (acres)
1	973	4	64	1041
2	939	0	0	939
3	1012	0	70	1082
4	820	0	0	820
5a	1631	0	0	1631
5b	975	0	0	975
6a	620	0	0	620
6b	322	0	0	322
6c	193	0	0	193
6d	194	0	0	194
6e	194	0	0	194
Total	7873	4	134	8011

Table 3
Existing Condition Impervious Cover and Impervious Area

Existing Land Use	Acreage	Estimated Impervious Cover (%)[1]	Estimated Impervious Area (ac)
Exclusive Agriculture[2]	7873	2%	157
General Commercial	134	90%	121
Floodplain - Primary	4	0%	0
Total	8011	3.5% (area weighted)	278

[1]Imperviousness values were estimated as the median imperviousness from the range provided in the Kern County Hydrology Manual (Kern County, 1992).

[2]Agriculture is specified as 0% imperviousness in the Kern County Manual; however, an imperviousness of 2% was conservatively used to account for dirt roadways, some soil compaction, loading areas, and pads associated with agriculture within the development areas.

2.1.8 Watershed Description

The project is located in the San Joaquin Valley at the base of the Tehachapi Mountains. Grapevine Creek and its tributaries; Pastoria Creek and its tributaries (including Live Oak Creek and Cattle Creek); and one unnamed tributary flow through the project (Figure 2-6).

Additionally, there are a few isolated, unnamed drainages and seeps within the project site. As previously determined by the U.S. Army Corps of Engineers (ACOE), Grapevine Creek ends in a playa in the San Joaquin Valley and has no connectivity to other waters of the United States; there is no hydrologic connection between Grapevine Creek and the California Aqueduct (ACOE 2008b; Appendix A-2).

Also as previously determined by the ACOE, Pastoria Creek either dissipates into agricultural lands north of the project or flows into an unnamed drainage at the very northeast corner of the study area, which flows off site into a detention basin referred to as Tejon Reservoir No. 1. Tejon Reservoir No. 1 is not publicly accessible, has no boating opportunities, was created by excavating uplands, and is used exclusively for agricultural purposes. Tejon Reservoir No. 1 is an isolated, non-navigable water body that does not support substantial interstate commerce. Tejon Ranch diverts seasonal surface flows into Tejon Reservoir No. 1 and pumps water into the Wheeler Ridge–Maricopa Water District's 850 Canal (Appendix A-2, ACOE 2008b). Both Live Oak Creek and Cattle Creek are tributaries to Pastoria Creek. Live Oak Creek connects to Cattle Creek via an artificially created agricultural irrigation ditch and Cattle Creek flows into Pastoria Creek, which, as noted above, does not have a hydrologic connection to any navigable water.

In 2013 Dudek produced the *Supplemental Jurisdictional Delineation Report for Tejon Ranch, Grapevine Study Area* and specified that the portions of Grapevine Creek, and on-site tributaries to Grapevine Creek, within the Grapevine study area are isolated, non-jurisdictional streams (Appendix C). The on-site portions of, and tributaries to, Pastoria Creek and the unnamed tributary it flows into, as well as Cattle and Live Oak Creeks (tributaries to Pastoria Creek) and their tributaries, are also not considered waters of the United States. The few isolated, unnamed drainages and seeps within the study area that do not flow into navigable waters of the United States were also determined to be non-ACOE jurisdictional.

The receiving streams of concern for hydromodification impacts are the California Department of Fish and Wildlife (CDFW) and Central Valley Regional Water Board (CVWB) jurisdictional waters within the project (Figure 2-7) and downstream of the project. These watercourses include (from west to east) Tecuya Creek, Grapevine Creek, Cattle Creek 2, Live Oak Creek, Cattle Creek 1, and Pastoria Creek. Engineered canal systems are not considered to be susceptible to hydromodification impacts. Watershed areas tributary to each of the six receiving streams susceptible to hydromodification impacts (Figure 2-8) are summarized in Table 4.

Table 4
Watershed Tributary Areas

Receiving Stream	Point of Interest ID	Tributary Watershed Acreage	Point of Interest Description
Tecuya Creek	B	13,032	At crossing of the California Aqueduct
	A	33,677	Just downstream of northern-most project development (weigh station) that drains to Tecuya Creek.
Grapevine Creek	C	16,165	Just upstream of confluence with eastern tributary channel
	B	19,329	At crossing of the California Aqueduct
	A	19,823	At transition from natural channel to engineered canal. Just downstream of northern-most project development that drains to Grapevine Creek (Special Plan Area 6e, Sump Tributary Area HH).
Cattle Creek 2	--	856	At crossing of the California Aqueduct and project boundary.
Live Oak Creek	--	5,576	At crossing of the California Aqueduct. Just north of the project boundary.
Cattle Creek 1	--	766	At crossing of the California Aqueduct and project boundary.
Pastoria Creek	--	20,134	At crossing of the California Aqueduct. Just north of the project boundary.

In 2006 TRC was issued eleven Permits in response to a series of water rights applications. A total of 21 points of diversion (POD) are currently operated by TRC under various methods of measurements. TRC have has the appropriative water rights for 2,194.5 acre feet in the 2013 water year. Diversion monitoring may be of use in efforts to calibrate hydrologic models developed in subsequent analyses. The locations of PODs in proximity to the project site are presented in Figure 2-9.

2.1.8.1 Beneficial Uses - Surface Water

The Tulare Lake Basin Plan (Central Valley *Regional* Water *Quality Control* Board [CVWB], 2004) shows that the Grapevine project site is located within the Grapevine and South Valley Floor Hydrologic Units (HUs), 556 and 557, respectively, in the Central Valley Region. Grapevine Creek flows in a northerly direction and terminates in the San Joaquin Valley approximately 1000 feet northeast of the study area if not first captured and used for irrigation. Cattle Creek enters the project area in two locations, it is diverted from Grapevine Creek near POD #10 at the southern edge of the project, east of I-5, and also through the southeastern panhandle of the project. Cattle Creek enters an irrigation ditch on the northern side of the

California Aqueduct before merging together and entering Pastoria Creek. Live Oak Creek also joins Cattle Creek within the irrigation drainage ditch (Dudek 2013). Local streams are depicted in Figure 2-6. None of the creeks are shown as impaired in the 2010 Clean Water Act (CWA) Section 303(d) list. Additionally, none of the features delineated within the jurisdictional study area are under the jurisdiction of the ACOE (Dudek 2013).

The majority of the Grapevine project (7,143 ac) is located within the South Valley Floor HU 557, specifically, the Arvin-Wheeler Ridge hydrologic area (HU 557.30). The remainder of the project is located within the Grapevine HU 556, specifically 544 acres within the San Emigdio hydrologic area (HU 556.30) and 20 acres of the southeastern end within the Tejon Creek hydrologic area (HU 556.20) (Figure 2-6) (Dudek 2013). Streams within HU 556 and HU 557 are listed in the Basin Plan as “West Side Streams” and “Valley Floor Waters”, respectively. Both HUs have the same beneficial uses as follows:

- Agricultural Supply (AGR) - Agricultural supply waters used for farming, horticulture, or ranching
- Industrial Service Supply (IND) - Use of water for industrial activities that do not depend primarily on water quality
- Industrial Process Supply (PRO) - Use of water for industrial activities that depend primarily on water quality
- Water Contact Recreation (REC-1) - Water contact recreation involving body contact with water and ingestion is reasonably possible
- Non-Contact Water Recreation (REC-2) - Non-contact water recreation for activities in proximity to water, but not involving body contact
- Warm Freshwater Habitat (WARM) - Use of water that support warm water ecosystems
- Wildlife Habitat (WILD) - Wildlife habitat waters that support wildlife habitats
- Rare, Threatened, or Endangered Species (RARE) - Waters that support rare, threatened, or endangered species and associated habitats
- Groundwater Recharge (GWR) - Groundwater recharge for natural or artificial recharge of groundwater

Generally narrative criteria require that degradation of water quality does not occur due to increases in pollutant loads that would adversely impact the designated beneficial uses of a water body. For example, the Tulare Lake Basin Plan requires that surface waters shall not contain suspended or settleable solids in amounts which “cause nuisance or adversely affect the water for beneficial uses." Numeric criteria are also specified in the Basin Plan for specific beneficial uses.

Water quality criteria apply within receiving waters as opposed to applying directly to runoff; therefore, water quality criteria from the Basin Plans are utilized as conservative benchmarks to evaluate potential water quality impacts of project runoff on the receiving waters.

2.1.8.2 Existing Condition - Surface Water

Existing surface water quality and quantity data allowing for the characterization of the project site have not been identified at this time. Additionally, there are no 303(d) listed surface water bodies within the project site. The nearest 303(d) listed water body is Piru Creek to the south, which is located on the opposite side of the watershed divide from the project. The Lower Kern River is listed to the north, however, runoff from the project site does not flow to that water body.

2.1.8.3 Beneficial Uses - Groundwater

The Tulare Lake Basin Plan indicates that the project site overlays two groundwater basins that have been assigned various beneficial uses (Figure 2-10). The beneficial uses listed for each groundwater basin are shown in Table 5 below. The project also lies within the White Wolf Subbasin, which is defined in the Basin Plan as lying between the White Wolf Fault on the north, the Tehachapi Mountains on the east, the San Emigdio Mountains on the west, and the southern tip of the Tulare Lake Basin.

Table 5
Beneficial Uses by Groundwater Basin

Detailed Analysis Unit	Special Plan Areas	Beneficial Uses
Kern River Basin 258	3, 4, 5a, 5b, 6a, 6b, 6c, 6d, and 6e	MUN, AGR, IND, PRO
Kern River Basin 261	1 and 2	MUN, AGR, IND

The definition of each beneficial use listed in Table 5 above are:

- Municipal and Domestic Supply (MUN) - Water used for military, community, or individual water supply systems
- Agricultural Supply (AGR) - Agricultural supply waters used for farming, horticulture, or ranching
- Industrial Service Supply (IND) - Use of water for industrial activities that do not depend primarily on water quality

- Industrial Process Supply (PRO) - Use of water for industrial activities that depend primarily on water quality

The Basin Plan contains water quality criteria for groundwater basins. For example, the Basin Plan requires that "all groundwaters shall be maintained as close to natural concentrations of dissolved matter as is reasonable considering careful use and management of water resources." For groundwaters designated for municipal water supply, at a minimum, concentrations shall not exceed California Maximum Contaminant Levels (MCLs) specified in Title 22 of the CCR.

2.1.8.4 Existing Condition - Groundwater

Background

Groundwaters, unlike surface waters, have little assimilative capacity as a result of their slow migration rate, lack of aeration, lower rates of biological activity and laminar flow patterns. The Tulare Lake Basin Plan identifies a number of potential sources of water quality impacts to groundwater within the Basin, relevant discussions are discussed in further detail below.

Salinity. One of the greatest problems for groundwater quality identified in the Basin Plan is the increase of salinity which has accelerated due to anthropogenic activities. According to the Basin Plan, currently, the most feasible and practical short-term management approach is controlled groundwater degradation, and limitations on this are described in the Basin Plan.

There are several sources of increasing salinity in the Basin, though the primary source is irrigated agriculture. Irrigated agriculture accounts for most of the water used in the Tulare Lake Basin. Irrigation water can contain salts, nutrients, pesticides, trace elements, sediments, and other constituents, which may be transported to underlying groundwater. Salts from irrigation water and leached out of soils are of particular concern. Evaporation and crop transpiration remove water from soils, resulting in an accumulation of salts near the root zone. Additional water is often applied to leach these salts below the root zone to prevent them from inhibiting plant growth.

Disposal of this subsurface drainage must be done in such a way that salts are kept out of usable groundwater bodies. Evaporation basins are used in some parts of the Tulare Lake Basin to concentrate drainage water and contain salts, but due to potential impacts on wildlife, particularly shorebirds, and the costs associated with salt disposal, these systems are likely not a permanent solution.

Oil and Gas Activities. Oil and gas bearing geological strata are located beneath the project site, in the Tejon Oil Field and Tejon North Oil Field. These strata are located 2000 to 2600-feet below ground surface, well below the groundwater aquifers that are potentially suitable for drinking water purposes. Groundwater in the area of the Tejon Oil Field and Tejon North Oil Field is obtained from the Quaternary Kern River Formation at a depth of approximately 800 to 1000 feet below ground surface. The water quality of this zone is approximately 1400 ppm TDS. The shallowest oil producing zones are the lowermost portion of the Mio-Pliocene Chanac and the Transition-Santa Margarita Formations at depths of approximately 2000 to 2600 feet. The water quality in these zones is approximately 2200 ppm TDS. Injection for purposes of water disposal and enhanced oil production (water flooding) has occurred within the Santa Margarita within the oil field. Water produced during oil and gas production activities (Produced Water) is injected utilizing Class II disposal wells permitted through the DOGGR. Additional oil production is obtained from other Miocene sands at greater depths and in general, based on DOGGR published data, the water quality of the producing zones is less than 10,000 ppm TDS.

Agricultural and Industrial Chemicals. Agricultural and industrial chemicals may also pose a threat to groundwater resources. Agricultural chemicals, particularly pesticides and nutrients, may be found in agricultural drainage, but may also be released due to accidental spills or improper containment and disposal of equipment wash water. One of the biggest chemical issues facing municipal water providers in the Tulare Lake Basin is the presence of dibromochloropropane (DBCP), a fumigant used to control nematodes in vineyards in water supply wells (CVWB, 2004).

Potential industrial sources of groundwater contamination in the Basin may result from a number of different industrial processes occurring in the region, including oil production, as well as underground storage tanks. Inventories of underground storage tanks in the region indicate a high number of leaking tanks (CVWB, 2004). Groundwater contamination can also occur through illegal or inappropriate discharge of process materials, fluids, or waste.

Waste Disposal Practices. Hazardous and non-hazardous waste disposal to waste management units (i.e. landfills, waste piles, surface impoundments, etc.) is also identified in the Basin Plan as a potential threat to groundwater resources. Requirements for these discharges are established by the Regional Water Board, and discharges of municipal solid wastes to land are closely regulated and monitored. Water quality problems issuing from these activities have been detected and are being addressed. Monitoring efforts have shown that disposal of municipal solid wastes to unlined landfills have resulted in groundwater degradation and pollution by volatile organic constituents and other waste constituents. The Basin Plan also describes effluent limits and other requirements for WWTFs that discharge to land in such a way that waste may reach groundwater.

Local Water Quality Summary

Two groundwater monitoring wells are present within the project area, the TA well and the Rose well.

A pump test and video survey were performed on the TA well (200) (Lat: 34°35'30.3", Long: 118°33'57.2") in March of 2010. A standing water level of 878 feet was recorded during the pump test. Groundwater samples were collected three years prior, on November 5, 2007 for a broad suite of analytes (Gerow, 2010). A comparison of analytical results from the November 2007 event shows MCL exceedances for sulfate, conductivity, and TDS (Table 6).

A technical memorandum drafted by the California Water Service Company on March 9, 2012 (Hearn, 2012) summarizing analytical results from an unknown sampling date states that water quality "meets all mineral, inorganic, and organic primary MCLs." The report goes on to state that some analyte concentrations exceed upper limits of secondary MCLs. Analytes exceeding both the recommended and upper limits include manganese, TDS, and sulfate. A comparison of analytical results from the March, 2012 sampling shows MCL exceedances for sulfate, conductivity, manganese, and TDS (Table 7). Complete analytical results for the November, 2007 sampling and relevant standards are presented in Appendix D, Table D-1.

Table 6
Analytical results for TA Well (200) sampling on November 5, 2007

Parameter	Result	Standard Exceeded
Sulfate	780 mg/L	Secondary MCL, Recommended limit: 250 mg/L, Upper limit: 500 mg/L
Conductivity	1670 µS/cm	Secondary MCL, Recommended limit: 900 µS/cm, Upper limit: 1600 µS/cm
TDS	1400 mg/L	Secondary MCL, Recommended limit: 500 mg/L, Upper limit: 1000 mg/L

Table 7
Analytical results for TA Well (200) on an unknown sampling date, as summarized by the California Water Service Company on March 9, 2012

Parameter	Result	Standard Exceeded
Sulfate	670 mg/L	Secondary MCL, Recommended limit: 250 mg/L, Upper limit: 500 mg/L
Manganese	67 ug/L	Secondary MCL: 50 ug/L
Conductivity	1610 µS/cm	Secondary MCL, Recommended limit: 900 µS/cm, Upper limit: 1600 µS/cm
TDS	1300 umhos/cm[1]	Secondary MCL, Recommended limit: 500 mg/L, Upper limit: 1000 mg/L

[1] Units were reported as umhos/cm, although this is likely incorrect. Correct units could not be confirmed, although it has been assumed that units should be mg/L

Sampling of the Rose Well (201) was carried out on January 31, 2012 for analytes including a broad panel of organic parameters and radioactivity. A comparison of analytical results to MCLs showed an exceedance for gross alpha with an activity of 22.2 pCl/L above the upper MCL of 15 pCl/L (Table 8). Parameters exceeding the recommended secondary MCLs, but not the upper limits, include sulfate, conductivity, and TDS. A tabular summary of all laboratory results for the Rose Well are presented in Appendix C, Table C-2.

Table 8
Analytical results for Rose Well (201) sampling on January 31, 2012

Parameter	Result	Standard Exceeded
Sulfate	290 mg/L	Secondary MCL, Recommended limit: 250 mg/L, Upper limit: 500 mg/L
Conductivity	1180 µS/cm	Secondary MCL, Recommended limit: 900 µS/cm, Upper limit: 1600 µS/cm
TDS	780 mg/L	Secondary MCL, Recommended limit: 500 mg/L, Upper limit: 1000 mg/L
Gross Alpha	22.2 pCi/L	Secondary MCL, Upper limit: 15 pCi/L

2.1.9 Geomorphic Setting

The geomorphic setting of receiving streams running through the project area is within the depositional alluvial fan entering the Valley Floor just downstream of the transition from high sediment production in the steep and seismically active Tehachapi and San Emigdio Mountains. Historically, the creeks situated on this alluvial fan have avulsed as stream channels have filled up with deposited sediment during large magnitude sedimentation events (i.e., wildfire and/or heavy storm s) and then found new flow paths. The longitudinal gradients of the receiving streams of concern within the project boundary range between approximately 2 to 3 percent. For example, Grapevine Creek, which is the primary watercourse running through the project has a 2.8 percent slope for its 9,700-foot flow path between Edmonston Pumping Plant Road and the California Aqueduct, and a 2.1 percent slope for the 15,800-foot flow path between the California Aqueduct and where the natural channel transitions to an engineered canal.

In their existing condition, it is apparent that the alluvial streams within the project area have experienced past hydromodification impacts due to altered land use. For example, Grapevine Creek has become more incised and entrenched in its current alignment. This geomorphic impact to Grapevine Creek is likely due to the following:

- Bed sediment supply rates have decreased due to trapping of sediment in upstream debris basins along the Interstate 5 freeway corridor and potentially from in-stream culvert constrictions that may have partially trapped bed sediment;
- The in-stream culverts crossing Edmonston Pumping Plant Road have concentrated flow velocities without proper energy dissipation at the outlet of the culverts, which has resulted in localized bed scour downstream; and

- Cattle have been grazing on bank vegetation and stepping on the banks and bed, thus reducing the strength of the channel lining materials and making it more susceptible to in-stream erosion when water flows in the streams.

2.2 Regulatory Setting

The following section presents an overview of the federal, state, regional, and local setting as they relate to potential water quality and hydromodification impacts.

2.2.1 Federal

Applicable Federal regulations described below include the Clean Water Act (CWA).

2.2.1.1 Clean Water Act

In 1972, the Federal Water Pollution Control Act (later referred to as the Clean Water Act) was amended to require National Pollutant Discharge Elimination System (NPDES) permits for the discharge of pollutants to waters of the United States from any point source. In 1987, the CWA was amended to require that the United States Environmental Protection Agency (USEPA) establish regulations for permitting of municipal and industrial stormwater discharges under the NPDES permit program. The USEPA published final regulations regarding stormwater discharges on November 16, 1990. The regulations require that Municipal Separate Storm Sewer Systems (MS4s) discharging to surface waters is regulated by a NPDES permit.

The CWA also requires States to adopt water quality standards for receiving water bodies and to have those standards approved by the USEPA. Water quality standards consist of designated beneficial uses for a particular receiving water body (e.g. wildlife habitat, agricultural supply, fishing etc.), along with water quality criteria necessary to support those uses. Water quality criteria are prescribed concentrations or levels of constituents – such as lead, suspended sediment, and fecal coliform bacteria – or narrative statements which represent the quality of water that support a particular use. Because California had not established a complete list of acceptable water quality criteria, USEPA established numeric water quality criteria for certain toxic constituents in receiving waters with human health or aquatic life designated uses in the form of the California Toxics Rule (“CTR”) (40 CFR 131.38).

2.2.1.2 California Toxics Rule

The CTR is a Federal regulation issued by the USEPA providing water quality criteria for potentially toxic constituents in receiving waters with human health or aquatic life designated uses in the State of California. CTR criteria are applicable to the receiving water body and therefore must be calculated based upon the probable hardness values of the receiving waters for evaluation of acute (and chronic) toxicity criteria. At higher hardness values for the receiving water, copper, lead, and zinc are more likely to be bound with components in the water column. This in turn reduces the bioavailability and resulting potential toxicity of these metals.

Due to the intermittent nature of stormwater runoff, the acute criteria are considered to be more applicable to stormwater conditions than chronic criteria and therefore are used in assessing project impacts. Acute criteria represent the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time (one hour) without deleterious effects; chronic criteria equal the highest concentration to which aquatic life can be exposed for an extended period of time (four days) without deleterious effects.

CTR criteria will be used as one type of benchmark to evaluate the potential ecological impacts of project runoff on the receiving waters.

2.2.2 State

Applicable State regulations discussed below include the California Porter-Cologne Act, CWA Section 303(d) and Total Maximum Daily Loads (TMDLs), CTR, Recycled Water Policy, Municipal Recycled Water Landscape Irrigation Use Permit, California Green Building Standards Code, Construction Stormwater Permit, Lake or Streambed Alteration Agreement, the Caltrans MS4 Permit, and the 2014 Emergency Proclamation.

2.2.2.1 California Porter-Cologne Act

The Federal CWA places the primary responsibility for the control of surface water pollution and for planning the development and use of water resources with the States, although it does establish certain guidelines for the States to follow in developing their programs and allows USEPA to take control from States with inadequate implementation mechanisms.

California‘s primary statute governing water quality and water pollution issues with respect to both surface waters and groundwater is the Porter-Cologne Water Quality Control Act of 1970 (Porter-Cologne Act). The Porter-Cologne Act grants the State Water Resource Control Board (State Water Board) and the Regional Water Quality Control Boards (Regional Water Boards) power to protect water quality and is the primary vehicle for implementation of California’s responsibilities under the Federal CWA. The Porter-Cologne Act grants the State Water Board and the Regional Water Boards authority and responsibility to adopt plans and policies, to regulate discharges of waste to surface and groundwater, to regulate waste disposal sites and to require cleanup of discharges of hazardous materials and other pollutants. The Porter-Cologne Act also establishes reporting requirements for unintended discharges of any hazardous substance, sewage, or oil or petroleum product.

Each Regional Water Board must formulate and adopt a water quality control plan (Basin Plan) for its region. The Basin Plan must conform to the policies set forth in the Porter-Cologne Act and established by the State Water Board in its State water policy. To implement State and Federal law, the Basin Plan establishes beneficial uses for surface and groundwaters in the region, and sets forth narrative and numeric water quality standards to protect those beneficial uses. The Porter-Cologne Act also provides that a Regional Water Board may include within its regional plan water discharge prohibitions applicable to particular conditions, areas, or types of waste. The relevant CVWB publication for the project site is the Tulare Lake Basin Plan.

2.2.2.2 CWA Section 303(d) – TMDLs

When designated beneficial uses of a particular receiving water body are being compromised by water quality, Section 303(d) of the CWA requires identifying and listing that water body as "impaired". Once a water body has been deemed impaired, a TMDL must be developed for the impairing pollutant(s). A TMDL is an estimate of the total load of pollutants from point, non-point, and natural sources that a water body may receive without exceeding applicable water quality standards (with a "factor of safety" included). Once established, the TMDL allocates the loads among current and future pollutant sources to the water body.

The CWA requires that the State Water Resources Control Board and Regional Water Boards conduct a Water Quality Assessment that addresses the condition of its surface waters (required in Section 305(b) of the CWA) and provides a list of impaired waters (required in CWA Section 303(d)) that is then submitted to the USEPA for review and approval. The report integrates the requirements of these two CWA sections and is referred to as the Integrated Report. The 2010 Integrated Report and updated 303(d) list were approved by the State Water Resources Control Board on August 4, 2010 and by the USEPA on October 11, 2011.

No receiving waters in proximity to the project site are 303(d) listed at this time.

2.2.2.3 Regionalization, Reclamation, Recycling and Conservation for Wastewater Treatment Plants

Resolution No. R5-2009-0028 was adopted by the CVWB on April 23, 2009 in support of regionalization, reclamation, recycling and conservation for new and existing WWTFs. The Resolution is consistent with State Water Board's Resolution No. 77-1, "Policy with Respect to

Water Reclamation in California", and the Recycled Water Policy. The resolution states that the CVWB would facilitate dischargers in these efforts and would consider innovative permitting options to facilitate the implementation of regionalization, recycling, reclamation, or conservation programs. Wastewater treatment plant operators must document all current and planned efforts to promote new or expand recycling and reclamation opportunities in Reports of Waste Discharge. Additionally, as required by the Basin Plan, wastewater reclamation and land disposal must be evaluated as alternative disposal methods when requesting an NPDES permit. Per the Resolution, WWTFs planned as part of the project would need to consider and implement wastewater recycling and reclamation opportunities and programs, water conservation measures, and regional wastewater management opportunities and solutions.

2.2.2.4 Recycled Water Policy

The project would generate approximately 2,014 acre-ft per year of recycled water to help meet non-residential, roadway, and selected common area landscape irrigation demands (EKI, 2014d).

On February 3, 2009, by its Resolution No. 2009-0011, the State Water Board adopted a Recycled Water Policy in an effort to move towards a sustainable water future. In this Policy, the State Water Board stated "we declare our independence from relying on the vagaries of annual precipitation and move towards sustainable management of surface waters and groundwater, together with enhanced water conservation, water reuse and the use of stormwater."

The following goals were included in this Policy:

- Increase use of recycled water over 2002 levels by at least one million acre-feet per year by 2020 and at least two million acre-feet per year by 2030.
- Increase the use of stormwater over use in 2007 by at least 500,000 acre-feet per year by 2020 and at least one million acre-feet per year by 2030.
- Increase the amount of water conserved in urban and industrial areas by comparison to 2007 by at least 20 percent by 2020.
- Included in these goals is the substitution of as much recycled water for potable water as possible by 2030.

The State Water Board also stated in this Policy that they expect to develop additional policies to encourage the use of stormwater, encourage water conservation, encourage the conjunctive use of surface and groundwater, and improve the use of local water supplies.

The Recycled Water Policy provides direction to the Regional Water Quality Control Boards regarding appropriate criteria in issuing permits for recycled water projects intended to streamline permitting of the vast majority of recycled water projects, while also reserving sufficient authority and flexibility to address site-specific conditions. The Policy also addresses the benefits of recycled water and encourages other public agencies to use this presumption in evaluating the impacts of recycled water projects on the environment as required by CEQA. The Policy addresses a mandate for use of recycled water and indicates the State Water Board will exercise their authority to the fullest extent possible to encourage the use of recycled water, consistent with State and Federal water quality laws and indicates that the water industry and environmental community have agreed jointly to advocate for $1 billion in State and Federal funds over the next five years to fund projects needed to meet the goals and mandates established in this Policy.

The Policy indicates that some groundwater basins contain salts and nutrients that exceed or threaten to exceed water quality objectives established in Basin Plans and states that it is the intent of this Policy that all salts and nutrients be managed on a basin-wide or watershed-wide basis through development of regional or sub-regional management plans. The Policy describes the components of these salt and nutrient management plans.

Finally, the Policy addresses the control of incidental runoff from landscape irrigation projects, recycled water groundwater recharge projects, antidegradation, control of emerging constituents and chemicals of emerging concern and incentives for use of recycled water.

In accordance with the provisions of the Recycled Water Policy, a CEC Advisory Panel was established to address questions about regulating CECs with respect to the use of recycled water. The Panel's primary charge was to provide guidance for developing monitoring programs that assess potential CEC threats from various water recycling practices, including groundwater recharge/reuse and urban landscape irrigation. On June 25, 2010, the CEC Advisory Panel provided recommendations to the State Water Board and CDPH in their Final Report *"Monitoring Strategies for Chemicals of Emerging Concern in Recycled Water – Recommendations of a Scientific Advisory Panel"* (Southern California Coastal Water Research Project [SCCWRP], 2012a). The State Water Board used those recommendations to amend the Recycled Water Policy (SWRCB Resolution No. 2013-003).

The amendment, which became effective on April 25, 2013, provides direction to the Regional Water Boards on monitoring requirements for CECs in recycled water. The monitoring requirements pertain to the production and use of recycled water for groundwater recharge reuse by surface and subsurface application methods[12], and for landscape irrigation. The amendment identifies three classes of constituents to monitor:

- Human health-based CECs: CECs of toxicological relevance to human health
- Performance indicator CECs: An individual CEC used for evaluating removal through treatment of a family of CECs with similar physicochemical or biodegradable characteristics.
- Surrogates: A measurable physical or chemical property, such as chlorine residual or electrical conductivity, that provides a direct correlation with the concentration of an indicator compound. Surrogates are used to monitor the efficiency of CEC treatment.

Tables indicating the specific CECs and surrogates are listed in the policy amendment, but are subject to change on a case-by-case basis and shall be appropriate for the treatment process or processes.

Only groundwater recharge reuse facilities would be required to monitor for CECs and surrogates. Surface application and subsurface application facilities would have different mandatory CECs and a different monitoring schedule. Monitoring is not required for recycled water used for landscape irrigation projects that qualify for streamlined permitting unless monitoring is required under the adopted salt and nutrient management plan. Streamlined permitting projects must meet the criteria specified in the Policy including: compliance with Title 22, application at agronomic rates, compliance with any applicable salt and nutrient management plan, and appropriate use of fertilizers.

2.2.2.5 Municipal Recycled Water Landscape Irrigation Use Permit

The General WDRs for Landscape Irrigation Uses of Municipal Recycled Water (Water Quality Order No. 2009-0006-DWQ) (Landscape Irrigation General Permit) regulates landscape irrigation with recycled water. Specified uses of recycled water considered to be “landscape irrigation” include any of the following: (i) parks, greenbelts, and playgrounds; (ii) school yards; (iii) athletic fields; (iv) golf courses; (v) cemeteries; (vi) residential landscaping and common areas (not including individually owned residential areas); (vii) commercial landscaping, except eating areas; (viii) industrial landscaping, except eating areas; and (ix) freeway, highway, and

[12] Use of recycled water for groundwater recharge reuse has the same meaning as indirect potable reuse for groundwater recharge as defined in Water Code section 13561(c), where it is defined as the planned use of recycled water for replenishment of a groundwater basin or an aquifer that has been designated as a source of water supply for a public water system. Groundwater recharge by surface application is the controlled application of water to a spreading area for infiltration resulting in the recharge of a groundwater basin. Subsurface application is the controlled application of water to a groundwater basin or aquifer by a means other than surface application, such as direct injection through a well.

street landscaping. Producers or distributors of recycled water must submit a Notice of Intent for coverage under the Landscape Irrigation General Permit. This permit is not required for individual recycled water users and does not cover use of harvested stormwater for irrigation.

Producer and Distributor Responsibilities

Producers must deliver disinfected tertiary recycled water as defined by CCR Title 22, sections 60301.230 and 60301.320, which address disinfection requirements and "filtered wastewater" requirements, respectively. Producers are responsible for ensuring that recycled water meets the quality standards for disinfected tertiary recycled water as described in Title 22 and any associated WDR order for the water reclamation plant. Distributors are responsible for drafting and submitting an O&M Plan to the State Water Board. The plan contents are contained in the permit, and include O&M/management of transport facilities and associated infrastructure necessary to convey and distribute recycled water from the point of production to the point of use. Additionally, distributors must designate a Recycled Water Use Supervisor for each use area. The permit also addresses BMPs, including general operations and maintenance, which producers and distributors must apply to manage recycled water and prevent water quality impacts.

Usage

The permit establishes terms and conditions of discharge to ensure that the discharge does not unreasonably affect beneficial uses of groundwater and surface water. This includes minimum setback distances, signage, application control, and use restrictions, along with other preventative measures, such as backflow prevention and cross-contamination programs.

2.2.2.6 California Green Building Standards Code (CALGreen Code)

In August of 2009, the State of California enacted The California Green Building Standards Code (CALGreen Code) as part 11 of The California Building Standards Code (Title 24). The 2013 Code became effective on January 1, 2014. CALGreen measures are designed to improve public health, safety, and general welfare by utilizing design and construction methods that reduce the negative environmental impact of development and encourage sustainable construction practices.

CALGreen provides mandatory direction to developers of all new construction and renovations of residential and non-residential structures with regard to all aspects of design and construction, including but not limited to site drainage design, stormwater management, and water use efficiency. Required measures are accompanied by a set of voluntary standards that are designed to encourage developers and cities to aim for a higher standard of development.

Under CALGreen, all residential and non-residential sites are required to be planned and developed to keep surface water from entering buildings and to incorporate efficient outdoor water use measures. Construction plans are required to show appropriate grading and surface water management methods such as swales, water collection and disposal systems, french drains, and rain gardens. Plans should also include outdoor water use plans that utilize weather or soil moisture controlled irrigation systems. In addition to the above mentioned requirements, non-residential structures are also required to develop:

- A Storm Water Pollution Prevention Plan (SWPPP),
- Irrigation water budget for landscapes greater than 2,500 square feet, and
- Quantified plan to reduce waste water by 20 percent through utilizing water efficient fixtures or non-potable water systems such as use of harvested rainwater, grey water, and/or recycled water.

CALGreen also offers a tiered set of voluntary measures to encourage residential and non-residential development that goes beyond the mandatory standards for reduced soil erosion, rainwater capture and infiltration, and use of recycled and/or grey water systems. Nonresidential developers are further encouraged to integrate treatment BMPs that result in zero net increase in runoff due to development and can treat runoff from the 85^{th} percentile storms. Furthermore, by meeting overall environmental performance goals for the specified categories (e.g., planning and design, energy efficiency, water efficiency and conservation, etc.), buildings can be designated as CalGreen Tier 1 or Tier 2, with the Tier 2 designation having more stringent goals than the Tier 1 designation.

2.2.2.7 Rainwater Capture Act of 2012

California Assembly Bill 1750 (AB1750), or the Rainwater Capture Act of 2012, allows residential, commercial, and government land owners to install, operate, and maintain rainwater collection systems (RCS) for rainwater (precipitation on any public or private parcel that has not entered an off-site storm drain system or channel, a flood control channel, or any other stream channel, and has not previously been put to beneficial use) that would not otherwise directly enter a saltwater body through a constructed conveyance and treatment system. AB 1750 permits the following uses for rooftop runoff: rain barrel system for outdoor non-potable use, RCS for outdoor non-potable use or infiltration into groundwater, RCS for indoor non-potable use. Additional requirements are included for indoor non-potable use. Compliance with any local rainwater or stormwater capture programs would still be required.

2.2.2.8 Construction Stormwater Permit

Pursuant to the CWA Section 402(p), requiring regulations for permitting certain stormwater discharges, the State Water Board adopted the statewide Construction General Permit for discharges from construction sites on September 2, 2009 (NPDES No. CAS000002, Order 2009-0009-DWQ, as amended by 2010-0014-DWQ and 2012-006-DWQ).

Under this Construction General Permit, discharges of stormwater from construction sites with a disturbed area of one or more acres are required to either obtain individual NPDES permits for stormwater discharges or to be covered by the Construction General Permit. Coverage under the Construction General Permit is accomplished by completing a construction site risk assessment to determine appropriate coverage level; preparing a SWPPP, including site maps, a CSMP, and sediment basin design calculations; for projects located outside of a Phase I or Phase II permit area, completing a post-construction water balance calculation for hydromodification controls; and completing a Notice of Intent. All of these documents must be electronically submitted to the State Water Board for General Permit coverage. The primary objective of the SWPPP is to identify and apply proper construction, implementation, and maintenance of BMPs to reduce or eliminate pollutants in stormwater discharges and authorized non-stormwater discharges from the construction site during construction. The SWPPP also outlines the monitoring and sampling program.

2.2.2.9 Lake or Streambed Alteration Agreement

The California Department of Fish and Wildlife (CDFW) is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. To meet this responsibility, the law requires the proponent of a project that may impact a river, stream, or lake to notify the CDFW before beginning the project. This includes rivers or streams that flow at least periodically or permanently through a bed or channel with banks that support fish or other aquatic life and watercourses having a surface or subsurface flow that support or have supported riparian vegetation.

Section 1602 of the Fish and Game Code requires any person who proposes a project that would substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake or use materials from a streambed to notify the CDFW before beginning the project. Similarly, under section 1602 of the Fish and Game Code, before any State or local governmental agency or public utility begins a construction project that would: 1) divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake; 2) use materials from a streambed; or 3) result in the disposal or deposition of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake, it must first notify the CDFW of the project. If the CDFW determines that the project may adversely affect existing fish and wildlife resources, a Lake or Streambed Alteration Agreement is required.

2.2.2.10 Caltrans MS4 Permit

Stormwater discharges from the associated off-site state highway improvement projects would be regulated under the Statewide Caltrans NPDES Permit, Order No. 2012-0011-DWQ, effective July 1, 2013. The permit regulates stormwater discharges from all Caltrans-owned MS4s and maintenance facilities but does not regulate discharges from Caltrans construction activities (which are regulated under the Construction General Permit). The permit contains specific requirements for new development and redevelopment projects within the Caltrans right-of-way implemented by both Caltrans and outside, "Non-Department," parties.

2.2.2.11 2014 Emergency Proclamation and Surface Rights Curtailment

On January 14, 2014, the Governor of California issued a proclamation declaring that the current drought had created a state of emergency and identifying several measures that would be implemented in response (Emergency Proclamation). The Emergency Proclamation states that "The [State] Board will put water right holders throughout the state on notice that they may be directed to cease or reduce water diversions based on water shortages."

On January 14, 2014, the State Board issued a notice of curtailment (Curtailment Notice) stating that "… if dry weather conditions persist, the State Water Board will notify water right holders in critically dry watersheds of the requirement to limit or stop diversions of water under their water right, based on their priority. The right to divert surface water in California is based on the type of right being claimed and when the right was initiated. In times of drought and limited supply, the most recent ("junior") right holder must be the first to discontinue use. Some riparian and pre-1914 water right holders may also receive a notice to stop diverting water if their diversions are downstream of reservoirs releasing stored water and there is no natural flow available for diversion." However, the Water Supply Assessment (Tejon-Castac Water District, 2014) states that the availability of Nickel Water for Grapevine project use under the 2013 Agreement between DMB Pacific LLC and Tejon Ranchcorp is not affected by Emergency Proclamation or the Curtailment Notice.

2.2.3 Regional

Applicable regional regulations discussed below include the Tulare Lake Basin Plan and the Dewatering General Permit.

2.2.3.1 Basin Plan

The Tulare Lake Basin Plan (CVWB, 2004) provides quantitative and narrative criteria for a range of water quality constituents applicable to certain receiving water bodies and groundwater basins within the Central Valley's Tulare Lake Basin. Specific water quality objectives are provided for the larger, designated water bodies within the region, and more general narrative water quality objectives are provided for all inland surface waters and groundwaters. In general, the narrative objectives require that degradation of water quality does not occur due to increases in pollutant loads that would adversely impact the designated beneficial uses of a water body. For example, the narrative objective for inland surface waters for sediment states, "the suspended sediment load and suspended sediment discharge rate of waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses." Water quality criteria apply within receiving waters as opposed to applying directly to runoff; therefore, water quality criteria from the Basin Plan are utilized as benchmarks as one method to evaluate the potential ecological impacts of project runoff on the receiving waters of the project.

Waterbodies with a municipal and domestic supply designated beneficial use (MUN) shall not have concentrations that exceed MCLs. MCLs for TDS are discussed in this section because this information is relevant for the groundwater quality impacts assessment. Federal MCLs are established by USEPA and California MCLs are established by the CDPH (California MCLs are in Title 22 of the CCR). The MCLs consist of (1) primary MCLs, which are enforceable standards for contaminants that present a risk to human health, and (2) secondary MCLs, which are non-mandatory standards established to assist public water systems in managing drinking water for aesthetic considerations, such as taste, color, and odor, but do not relate to a health risk. Impacts related to elevated TDS concentrations include water taste and potential corrosion (which may impart a metallic taste to the water and reduce water flow due to pipe corrosion), staining of household fixtures, and scaling (pipes, boilers and heat exchangers) and sedimentation (deposits in the water distribution system).[13]

USEPA sets the secondary MCL for TDS at 500 mg/L. The CDPH sets a recommended MCL of 500 mg/L, and upper concentration of 1,000 mg/L and a short-term upper limit of 1,500 mg/L.

2.2.3.2 Dewatering General Permit

The CVWB issued a General Order for Dewatering and Other Low Threat Discharges to Surface Waters (NPDES No. CAG995001, Order No. R5-2013-0074). The General Order covers discharges such as construction dewatering and pipeline/tank pressure testing/flushing, which are

[13] USEPA, Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals, http://water.epa.gov/drink/contaminants/secondarystandards.cfm, accessed August 24, 2012.

either four months or less in duration or have an average dry weather flow of less than 0.25 million gallons per day.

To obtain coverage under the General Order, the applicant must demonstrate that the proposed discharge meets the following criteria:

- Pollutant concentrations in the discharge do not cause, have a reasonable potential to cause, or contribute to an excursion above any applicable Federal water quality criterion established by USEPA pursuant to CWA section 303;
- Pollutant concentrations in the discharge do not cause, have a reasonable potential to cause, or contribute to an excursion above any water quality objective adopted by the CVWB or State Water Board, including prohibitions of discharge for the receiving waters; and
- The discharge does not cause acute or chronic toxicity in the receiving water.

The discharge must meet effluent limitations in the General Order for biochemical oxygen demand (BOD), total suspended solids (TSS), settleable solids, residual chlorine, and pH for the Tulare Lake Basin. Dischargers must comply with the General Order monitoring and reporting requirements, which include effluent and receiving water monitoring for constituents specified in the Order. A post-discharge report must be submitted after each discharge to the CVWB, as well as self-monitoring reports (per the schedule in the General Order) that summarize the effluent and receiving water monitoring data.

2.2.4 Local

Applicable local regulations discussed below include the Kern County Development Standards (2010).

2.2.4.1 Kern County Development Standards

The following are sections from Kern County's Development standards which are considered to be relevant to the present analysis.

Off-Site Capital Storm Design Discharge Mitigation/Off-Site Intermediate Storm Design Discharge Mitigation

The Kern County Hydrology Manual (Hromadka, 1992) specifies a methodology for calculating the off-site capital storm design discharge (CSDD) and off-site intermediate storm design discharge (ISDD) flows. Development standards require all structures within developments to be protected to one foot above the water surface elevation associated with the CSDD where tributary areas account for complete on and off-site drainage areas. Flows associated with a site's ISDD, based upon flows from an uncontrolled developed watershed "proximate" to the development must be managed in a manner consistent with flows generated on-site.

County Master Drainage Plans

Kern County administers master drainage plans (MDP) that lay out design hydrology methodology requirements in some areas of the County. Developments that change MDP assumed land uses may require the construction of facilities to mitigate increases in runoff. If MDP planned facilities have not been constructed at the time of site development, the Developer would be required to construct temporary facilities that can be abandoned after MDP planned facilities are constructed to serve the site.

Subdivision

Development Standards state that storm runoff mitigation measures for a subdivision are expected to be constructed as part of a comprehensive drainage plan, each phase of the development is required to be designed to function independently or in conjunction with completed development phases.

Alluvial Fan Development

Planned developments on alluvial fan material are required to mitigate the effects of the design flow at the development site. The design flow is defined as the event which has a one-percent risk of being equaled or exceeded in any given year. Mitigation measures are required to ensure that the flow associated with the one-percent exceedance risk would not cause more than one foot of water surface rise resulting from encroachment at the development site. Discharge of the flow associated with the one-percent exceedance risk should be carried out in a manner matching flows prior to development of the site to the extent feasible.

Flood Control Facility Requirements on Alluvial Fans

The design of structural flood control measures on alluvial fans are required to effectively eliminate alluvial fan flood hazards from the area protected using the following measures and associated analyses:

- Engineering analyses quantifying the discharges and volumes of water, debris, and sediment movement associated with the flood that has a one percent probability of being exceeded in any year at the apex of the alluvial fan under current watershed conditions and under potential adverse conditions (e.g., deforestation of the watershed by fire). The potential for debris flow and sediment movement must be assessed using an engineering method acceptable to the Director and Federal Emergency Management Agency (FEMA). The assessment should consider the characteristics and availability of sediment in the drainage basin above the apex and on the alluvial fan.

- Engineering analyses showing that the measures will accommodate the estimated peak discharges and volumes of water, debris, and sediment, as determined in accordance with Section 404-2.01, and will withstand the associated hydrodynamic and hydrostatic forces.
- Engineering analyses showing that control measures have been designed to withstand the potential erosion and scour associated with estimated discharges.
- Engineering analyses or evidence showing that control measures will provide protection from hazards associated with the possible relocation of flow paths from other parts of the fan.
- Engineering analyses that assess the effect of the project on flood hazards, including depth and velocity of floodwaters and scour and sediment deposition, on other areas of the fan.
- Engineering analyses demonstrating that flooding from sources other than the fan apex, including local runoff, is either insignificant or has been accounted for in the design.

Street Drainage

Street drainage for urban uses will be designed consistent with Type A Subdivision Improvements in accordance with the Kern County Land Division Ordinance. Non-intensive areas of the Specific Plan will be designed consistent with Type B Subdivision Improvements following further discussions with the affected County Departments.

In areas suspected of significant sediment yield from an ISDD, the following applies:

- The developer's engineer must quantify any sediment yield from on-site or off-site properties based upon the ISDD.
- Sediment yield must be independent of the runoff event and is to be mitigated separate from the design discharge.
- Sediment must not be deposited on the roadway
- Higher levels of mitigation may be required in mudslide-mudflow areas.

Erosion protection measures based on the ISDD must be established upstream, downstream and through the project by the developer's engineer subject to approval by the Director.

Culverts, Bridges, and At-Grade Crossings

All publicly maintained crossings of natural channels shall be bridged or culverted. The minimum length of any culvert shall be from toe-of slope to toe-of-slope. Additional right-of-way may be required for maintenance of these facilities. Roadways shall be required to bridge a floodway where encroachment of the floodway is prohibited. Energy losses for bridge piers, interior walls for multiple box culverts, or other obstructions within the channel shall be predicated upon the obstruction width plus two (2) feet of debris allowance for each obstruction.

Culverts. The ISDD for the total upstream watershed under existing conditions shall not exceed soffit of culvert. The CSDD for the total upstream watershed under existing conditions will be allowed to overtop the roadway until 2.0 feet of specific energy is obtained, at which point additional culverts will be required to meet these minimum requirements. The 2.0 feet of specific energy shall be calculated at the crown or high point of the traveled roadway. The minimum size of any culvert under a publicly maintained roadway shall be 18 inches. For private roads or public access, which are privately maintained, this requirement may be waived. Culverts shall be designed to have a minimum useful life of 50 years.

Bridges. The lowest portion of the bridge span shall be one foot or 0.2 times the specific energy (whichever is greater) above the water surface elevation when the normal depth of flow for the CSDD is subcritical. The lowest portion of the bridge span shall be one foot or 0.2 times the specific energy (whichever is greater) above the sequent flow depth when the normal depth of flow for the CSDD is supercritical. When levee conditions exist, the lowest portion of the bridge span shall also meet the minimum freeboard requirements of the levee.

At-Grade-Crossings. At-grade-crossings shall not be permitted on a publicly maintained roadway and shall not encroach upon a floodway.

Closed Conduit Systems, Catch Basins

The Kern County Development Standards include requirements for closed conduit systems with respect to design, location, freeboard, manholes, losses, erosion, catch basins, and right-of-way/easements. Specifically, the erosion standards are as follows:

- Velocities within the closed conduit system should not exceed 20 feet per second with standard wall RCP, or 10 feet per second for plastic pipe. Where velocities exceed 20 feet per second for RCP, or 10 feet per second for plastic pipe, a special pipe shall be installed as approved by the Director of the Engineering, Surveying, and Permitting Services Department and/or the Road Commissioner.

- Erosion protection against scour velocities shall be provided at the inlet and outlet of the closed conduit system. The engineer shall supply all data and reference material supporting his/her design, subject to approval by the Director.

Retention Basin Design

The design volume of stormwater retention basins must be based upon the runoff from the ISDD five-day storm event and a volume of nuisance water determined by the engineer. No runoff generated on site from the design storm or from nuisance flows would be allowed to leave the site unless downstream drainage disposal facilities exist to handle the flow. The retention of upstream off-site flows shall not be considered to reduce the size of the required on-site retention facilities or mitigate the runoff from the development. An evaluation of the runoff volumes associated with the site in its existing condition may not reduce the size of the required drainage facilities. The runoff volume from the ISDD five-day storm shall be calculated using the formula:

$$\text{Runoff Volume (cu.ft.)} = [(D_{10yr\text{-}5day})/12](a_i)(\text{Area})$$

Where:

$D_{10\text{-}5day}$ = 10 yr 5-day depth of rainfall (in.) obtained from NOAA Atlas 14, Vol 6, Ver 2.0

a_i = average percentage of impervious area

Area = Drainage area of total development (sq.ft)

In the absence of a hydrologic volume routing analysis, the storm drain hydraulic grade line calculations must assume that 50% of the design storm volume and 100% of the nuisance volume is in the basin when the peak flow rates occur.

Freeboard is required for all retention basins having a design water depth exceeding 18 inches. Six inches of freeboard will be required when the design ponding depth within the basin is four feet or less. For basins with a design ponding depth greater than four feet the amount of freeboard required shall be one foot. Freeboard shall be measured from the lowest gutter inlet or top of bank, whichever is lower.

Detention Basin Design

The design flow into the basin shall be the ISDD five-day runoff hydrograph. Hydrograph design and mass ratios shall be in accordance with the Kern County Hydrology Manual. The out flow hydrograph shall not extend beyond five days from the end of the inflow hydrograph. Infiltration effects from the detention facility shall not be included in the calculation of the outflow hydrograph.

Constructed Channel Design

Constructed channels shall be designed to carry the CSDD plus freeboard. The minimum freeboard between the design water surface, and the top of bank of the channel shall be 0.50 feet or 0.20 of the specific energy, whichever is greater.

Hydraulic Design. Channels shall be designed with proper allowance for hydraulic losses for all planned and projected future crossings or other obstructions to maintain clearance and freeboard as required. The water surface and the energy grade line profile shall be computed and plotted for all constructed channels and at locations where natural channels modifications are proposed. Constructed channels shall not be designed with a slope in the range of ± 20% of critical slope unless freeboard equal to the height for instability waves is added. A minimum velocity of two feet per second shall be maintained for lined channels to prevent sedimentation.

Structural Design. The minimum bottom width of constructed channels shall be ten (10) feet. A triangular channel may be permitted when the channel side slopes are four (4) to one (1) or flatter. The minimum centerline radii for curves in constructed channels shall be three (3) times the top width of the design water surface. Design of slopes shall be predicated upon results of an investigation by a Soil Engineer, subject to the approval of the Director. Adequate bank protection and drop structures shall be provided where the slopes in the channel are steep and high velocities are present. Bank protection shall be provided based on the design engineer's recommendations, subject to the approval of the Director. Stress area protection shall extend downstream from the end of the stress area a distance equal to ten (10) times the design water depth, unless the engineer can show that the erosion potential is not excessive. At drop structures or in other locations where a hydraulic jump may occur, bank protection shall be provided through the hydraulic jump for a minimum distance of six (6) times the sum of the sequent depth and the depth of freeboard. This protection shall cover the invert and extend to the height of the sequent depth plus the height of the freeboard. The protection material may be either concrete, concreted-rock slope protection, sacked concrete, air-blown mortar or other approved alternative. All channel lining materials and methods shall be specified by the engineer and approved by the Director. All appurtenant drainage facilities shall be constructed and areas adjacent to channels graded so that erosion will be prevented within the channel right-of-way. Waterways shall enter the main channel at an angle not exceeding 25 degrees.

Erosion. The engineer shall provide recommendations on all necessary mitigation measures for erosion including bank protection and bottom stabilization of the channel, subject to the approval of the Director.

Sedimentation. The determination of sediment yield and proposed mitigation measures of such shall be prepared and recommended by a qualified registered civil engineer, subject to the approval of the Director.

Natural Channels

All natural channels shall be identified and clearly delineated on the plans with the appropriate floodplain designation. For defined natural channels, the Floodplain and Floodway Boundaries shall be delineated, subject to the approval of the Director. The minimum setback from the top of bank of a natural channel with side slopes steeper than two (2) horizontal to one (1) vertical, shall be a two (2) to one (1) slope plus a 10 foot wide buffer strip. The setback shall be measured from the toe of the slope. Where the slopes are flatter than two (2) to one (1), the required setback shall be a minimum of 10 feet from the Floodway limit. Where natural channels merge into constructed channels, the tie-ins shall be designed in a manner to dissipate energy and protect against erosion. The design for such tie-ins shall be in accordance with acceptable engineering practices and approved by the Director. Should an existing natural channel be relocated, the channel shall be designed in accordance with the criteria specified herein for constructed channels. All applicable Federal and State permits and requirements shall be required for any operation that would discharge dredged or fill material in any waters of the United States (normally channels identified with blue lines on the U.S.G.S. maps).

3 POLLUTANTS AND PARAMETERS OF CONCERN

Pollutants and parameters of concern for surface waters and groundwaters as they relate to the project are discussed below. Rationale and significance criteria are also detailed in Appendix E.

3.1 Surface Water Quality

The discussion in subsections below focuses exclusively on changes in water quality during wet weather. While potential dry weather impacts are notable in many developments, dry weather flows are expected to be mitigated by wet weather features in the Grapevine project. Dry weather flows from the project could be generated primarily from excess irrigation. To reduce the potential generation of dry weather flows, landscape watering is expected to be controlled by utilizing advanced metering systems designed to minimize or eliminate excess watering. Moreover any dry weather flows that did occur would be routed to BMPs sized for wet weather treatment. Incidentally, dry weather flows would be completely captured by these BMPs, preventing dry weather discharges from the project.

3.1.1 Pollutants and Parameters of Concern for Surface Waters

PPOCs are typically selected based upon the 303(d) listing of constituents that are determined by the CVWB to be impacting the beneficial uses of receiving waters and constituents that are anticipated or potentially could be generated by the project at concentrations or loads that could cause impairment of beneficial uses. In the absence of 303(d) listed receiving waters in close proximity to the project footprint, PPOCs are limited to pollutants associated with the projects proposed development land uses.

The following constituents, although not contained in the 303(d) list as impairing beneficial uses of project receiving waters, are considered PPOCs because they are commonly found in urban runoff associated with the proposed land uses and have the potential to cause impairment to beneficial uses.

- ***Pathogens (Bacteria, Viruses, and Protozoa)***. Pathogens are agents or organisms that can cause diseases or illnesses, such as bacteria, viruses, and protozoa. Routine monitoring of these organisms was historically not practical because they are usually present in small quantities and required fairly complicated and expensive sampling and analyses. Although these conditions have changed with the introduction of new technologies, current regulations continue to rely on fecal coliform and other bacteria as indicator organisms for pathogens. The presence of fecal coliform bacteria indicates the presence of fecal contamination, but it does not necessarily correlate with pathogen presence and therefore human health risk. Two complicating factors are that there are multiple sources of coliform bacteria, including fecal wastes from humans, domesticated animals, and wildlife, and indicator bacteria can regenerate under some natural conditions.
- ***Trace Metals (Copper, Lead, and Zinc)***. The primary sources of trace metals in stormwater are typically commercially available metals used in transportation, buildings, and infrastructure. Metals are also found in fuels, adhesives, paints, and other coatings. Copper, lead, and zinc are the most prevalent metals typically found in urban runoff. Other trace metals, such as cadmium, chromium, nickel, and mercury, are typically not detected in urban runoff or are detected at very low levels (Los Angeles County

Department of Public Works [LACDPW], 2000[14]). Metals are of concern because of toxic effects on aquatic life. High metal concentrations can bioaccumulate in fish and shellfish and affect beneficial uses of a waterbody. With respect to numeric criteria, the Basin Plan states, "At a minimum, water designated MUN shall not contain lead in excess of 0.015 mg/L." The Basin Plan also specifies that, "At a minimum, water designated MUN shall not contain concentrations of chemical constituents in excess if the MCLs…". There are also CTR criteria for certain metals, which are calculated based on the hardness of the receiving waters.

- ***Nutrients (Nitrogen and Phosphorus)***. Nutrients are inorganic forms of nitrogen and phosphorus. There are several sources of nutrients in runoff from urban areas, mainly fertilizers in runoff from lawns, pet wastes, atmospheric deposition from industry, and automobile emissions. Eutrophication due to excessive nutrient input can lead to changes in water quality, temperature, and aquatic plant and animal communities. Decomposition of algae can result in depressed dissolved oxygen levels that can threaten aquatic species and also change the benthic chemistry thereby resulting in release of metals and nutrients from bottom sediments. With respect to ammonia, the Basin Plan states, "Waters shall not contain un-ionized ammonia (NH3) in amounts which adversely affect beneficial uses. In no case shall the discharge of wastes cause concentrations of NH3 to exceed 0.025 mg/L (as N) in receiving waters." With respect to biostimulatory substances, the Basin Plan states, "Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses."
- ***Pesticides.*** Pesticides (including herbicides, insecticides, and fungicides) are chemical compounds commonly used to control insects, rodents, plant diseases, and weeds. Excessive application of a pesticide may result in runoff containing toxic levels of its active component. Pesticide formulations have evolved over time in response to regulatory concerns that have led to outright banning or restrictions on certain uses. This historical evolution has included organochlorine pesticides, organophosphate pesticides, and pyrethroid pesticides. The Basin Plan states: "Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the limiting concentrations specified in … Title 22 of the California Code of Regulations."
- ***Petroleum Hydrocarbons (Oil and Grease and PAHs)***. Potential sources of oil, grease, and other petroleum hydrocarbons in urban areas include spillage of fuels and lubricants, discharge of domestic and industrial wastes, atmospheric deposition, and runoff. Runoff

[14] In lieu of urban runoff data from Kern County, data from Los Angeles County have been referenced as the most robust locally available dataset.

can be contaminated by leaching hydrocarbons from asphalt roads, tire wear, and deposition from automobile exhaust. Also, do-it-yourself auto mechanics may dump used oil and other automobile-related fluids directly into storm drains. Petroleum hydrocarbons, such as PAHs, can bioaccumulate in aquatic organisms from contaminated water, sediments, and food and are toxic to aquatic life at low concentrations. Hydrocarbons can persist in sediments for long periods of time and result in adverse impacts on the diversity and abundance of benthic communities. Hydrocarbons can be measured as total petroleum hydrocarbons (TPH), oil and grease, or as individual groups of hydrocarbons, such as PAHs. The Basin Plan states, "Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses."

- ***Sediments (TSS and Turbidity)***. Excessive erosion, transport, and deposition of sediment in surface waters can impair designated uses. Excessive sediment can impair aquatic life by filling interstitial spaces of spawning gravels, impairing fish food sources, filling rearing pools, and reducing beneficial habitat structure in stream channels. Sediment can also transport other pollutants including nutrients, bacteria, trace metals, and hydrocarbons. The Basin Plan states the following with respect to sediments, "Waters shall not contain suspended material in concentrations that cause nuisance or adversely affects beneficial uses…waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses [maximum increases are specified based on natural turbidity levels]…"
- ***Trash & Debris***. Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic debris (such as leaves, grass cuttings, and food waste) are general waste products on the landscape that can be entrained in urban runoff. The presence of trash and debris may have a significant impact on the recreational value of a water body and aquatic habitat. Excess organic matter such as food wastes in urban trash can create a high BOD in a stream and thereby lower its water quality. Also, in areas where stagnant water exists, the presence of excess organic matter can promote septic conditions resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds such as hydrogen sulfide. With regard to trash and debris, the Basin Plan states, "Waters shall not contain floating material, including but not limited to solids [such as trash or debris], liquids, foams, and scum, in concentrations that cause a nuisance or adversely affect beneficial uses."
- ***Temperature.*** Increases in receiving water temperatures can lower dissolved oxygen concentrations and impair beneficial uses of receiving waters. Elevated temperatures in

receiving waters may result from discharges of process wastewaters or non-contact cooling waters; the project would not include these types of discharges. However, urban runoff can also elevate receiving water temperatures, due to increases in imperviousness and decreases in tree canopy resulting from urbanization. Studies conducted in Prince George's County Maryland by Galli (1990) found that most cold water organisms are severely stressed at temperatures above 21°C (70°F), and a 2°C to 3°C change in temperature is enough to eliminate sensitive insect species. Galli's studies (1990) demonstrated (1) higher stream temperatures directly related to increasing levels of impervious surface in the watershed, and increases in stream temperatures by between 5°F and 12°F resulting from development; and (2) increased runoff temperatures through open channels. In addition, BMPs that rely on detention are not thermally neutral. Galli's studies indicated higher outflow temperatures from in-line stormwater detention structures compared to the inflow temperatures. Generally, BMPs with permanent pools have a greater potential to affect downstream temperatures than detention BMPs without permanent pools. But even basins without permanent pools that lack shade and have detention times longer than 12 hours may contribute to stream warming (Galli, 1990).

The Basin Plan states "elevated temperature wastes shall not cause the temperature of waters designated COLD or WARM to increase by more than 5°F above natural receiving water temperature." Unmitigated discharges from the project could adversely affect warm water habitat in close proximity to the project, if the discharges resulted in increasing receiving water temperatures by more than 5°F.

- ***Constituents of Emerging Concern (CECs).*** Although thousands of substances may be detected in the environment, only a small percentage of known chemicals are currently regulated and/or routinely monitored in California receiving waters. The much larger group of chemicals that remain largely unregulated and/or unmonitored in the aquatic environment, known as CECs, may originate from a wide range of point and non-point sources (SCCWRP, 2012a). The largest class of CECs is industrial chemicals, followed by ingredients in personal care products, food additives, pharmaceuticals, and pesticides (SCCWRP, 2012b). CECs may be present in stormwater runoff.

  Once discharged into receiving waters, CECs are subject to physical, chemical and biological processes that may result in attenuation (lower concentrations), enrichment, or magnification (higher concentrations) in a given environment. CECs that are readily soluble in water will remain in the dissolved phase and provide a route of exposure to aquatic life. A smaller subset of CECs that are hydrophobic will associate with particles, where they may remain suspended in the water column or accumulate in sediments and ultimately in tissues of aquatic and terrestrial biota. Most CECs do not have approved measurement methods, and few studies have examined the environmental fate and potential harmful effects of CECs on organisms (including humans). Preliminary research has found some effects on wildlife at the individual organism level, but not larger population effects. CEC effects on humans are not evident, although biological effects research is still in its early stages (SCCWRP, 2012a).

In response to the lack of knowledge about the effects CECs on aquatic resources, the State Water Board in conjunction with the David and Lucile Packard Foundation and a group of stakeholder advisors tasked a group of leading scientists (the Panel) to address the issues associated with CECs in California's aquatic systems that receive discharge of treated municipal wastewater effluent and stormwater.

The Panel also designed a study to determine the occurrence and concentrations of CECs in stormwater and rain water. Surface grab samples were collected in March 2010, and February and May of 2011 from urban streams in southern California and the San Francisco Bay margins during storm events. A single rainwater sample was collected using a stainless steel funnel and bucket from the roof of the SCCWRP building in Costa Mesa during the March 2010 storm event. Twenty four CECs were detected in urban runoff, with fewer detected in the rainwater sample (SCCWRP, 2012a).

3.1.2 Pollutants and Parameters that are not of Concern for Surface Waters

This section discusses other constituents that are listed in the Basin Plan, but for reasons explained in this section, are not PPOCs for the project.

- ***BOD and Dissolved Oxygen.*** Adequate levels of dissolved oxygen are necessary to support aquatic life. High levels of oxygen demanding substances discharged to receiving waters can depress oxygen levels to levels of concern. Oxygen demanding substances are compounds that can be biologically degraded through aerobic processes. The presence of oxygen demanding substances can deplete oxygen supplies in waters and can contribute to algae growth. Nutrients in fertilizers and organic food wastes in trash are examples of likely oxygen demanding compounds to be present on the project site. Ammonia is also typically detected at very low levels in urban runoff, likely due to the oxidation of ammonia to nitrate by nitrifying bacteria in water and soil (nitrates are typically detected at higher concentrations than ammonia in urban runoff and do not exert an oxygen demand). Oxygen demand can be measured as "five-day biochemical oxygen demand" (BOD_5). This test involves the measurement of the dissolved oxygen used by microorganisms in the biochemical oxidation of organic matter. The mean BOD_5 reported in the Los Angeles County database[15] in runoff from open space and high density single

[15] In lieu of urban runoff data from Kern County, data from Los Angeles County have been referenced as the most robust locally available dataset.

family residential land uses was 12 mg/L and 16 mg/L, respectively (LACDPW, 2000). In contrast, the typical BOD_5 concentration in untreated domestic wastewater is 185 mg/L and, after secondary treatment, is 13 mg/L (Metcalf and Eddy, 2003). Thus oxygen demand in typical runoff from new development is likely to be relatively low. Moreover, nutrients or trash that could pose an oxygen demand, are identified as pollutants of concern.

- ***Biostimulatory Substances.*** Biostimulatory substances are substances that promote growth of algae and nuisance vegetation. These include nutrients from fertilizers and organic wastes. The Basin Plan states that these substances shall not be present in concentrations that "promote aquatic growths to the extent that such growths cause nuisance of adversely affect beneficial uses." Nutrients, which are PPOCs, will be used as an indicator of biostimulatory substances.
- ***Chemical Constituents***. Chemical constituents in excessive amounts in drinking water are harmful to human health. The Basin Plan objective for chemical constituents states: "At a minimum, water designated MUN shall not contain concentrations of chemical constituents in excess of the MCLs specified in…Title 22 of the California Code of Regulations." However, the streams that flow through the Grapevine project are not listed in the Basin Plan as having 'MUN' beneficial uses.
- ***Color, Taste, and Odor***. The Basin Plan contains narrative objectives for color, taste, or odor that causes a nuisance or adversely affects beneficial uses. Undesirable tastes and odors in water may be a nuisance and may indicate the presence of a pollutant(s), which would be subsumed by way of the PPOCs. Odor associated with water can result from decomposition of organic matter or the reduction of inorganic compounds, such as sulfate. Color in water may arise naturally, such as from minerals, plant matter, or algae, or may be caused by industrial pollutants. Therefore, color-, taste-, or odor-producing substances are not parameters of concern for the project.
- ***Mineral Quality: EC, Chloride, and Boron.*** Mineral quality in natural waters is largely determined by the mineral assemblage of soils and rocks near the land surface. Elevated mineral concentrations could impact beneficial uses; however, the minerals listed in the Basin Plan are not believed to be constituents of concern due to the absence of river impairments and/or, as with TDS (as a surrogate for EC), chloride, and boron, anticipated post-development runoff concentrations well below the Basin Plan objectives (Table 9). Therefore, these constituents are not considered PPOCs for the project.

Table 9
Comparison of Basin Plan Mineral Objectives with Mean Measured Values in Los Angeles County

Mineral	Tulare Lake Basin Plan objectives for discharges within the White Wolf subarea	Range of Mean Concentration in Urban Runoff[1]
TDS	2,000 mg/L	53 – 226 mg/L
EC	2,000 umhos/cm	N/A
Sodium	75% base constituents	N/A
Chloride	350 mg/L	5.4 – 78 mg/L
Boron	2 mg/L	0.16 – 0.25 mg/L

Source: LACDPW, 2000 and Ventura County, 2003. Land uses include single-family residential, multi-family residential, commercial, education, transportation, light industrial, agriculture, and mixed residential. In lieu of urban runoff data from Kern County, data from Los Angeles County and Ventura County have been referenced as the most robust locally available dataset.

- ***Salinity***. Salinity and TDS measure the concentration of dissolved minerals in the form of cations and anions that include the primary cations calcium (Ca^{2+}), magnesium (Mg^{2+}), sodium (Na^{+}), and potassium (K^{+}); and the primary anions chloride (Cl^{-}), sulfate (SO_4^{2-}), carbonate (CO_3^{2-}), bicarbonate (HCO_3^{-}), fluoride (F^{-}) and nitrate (NO_3^{-}). The concentration of dissolved minerals can be high in groundwater where minerals in the soils come in contact with pore water, but typically urban stormwater runoff is low in TDS (<200 mg/L) and is therefore not a significant source of salinity that would contribute to impairment of beneficial uses. The Basin Plan includes the following narrative for salinity: "Waters shall be maintained as close to natural concentrations of dissolved matter as is reasonable considering careful use of the water resources." However, specific objectives for salinity, as specified in the Basin Plan to be measured via EC, are not listed for the streams within the project site. Therefore, salinity is not considered a pollutant of concern for the project.
- ***Toxicity.*** Toxicity can result from chemical, biological, or physical toxicants in water. The Basin Plan states, "All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life." The constituents associated with the project that may cause toxicity include trace metals (e.g., copper, lead, and zinc), pesticides, and PAHs, all of which are listed as pollutants of concern. Therefore toxicity, being an indicator of other water quality pollutants, is not itself considered a pollutant of concern for the project.
- ***pH.*** The hydrogen ion activity of water (pH) is measured on a logarithmic scale, ranging from 0 to 14. While the pH of "pure" water at 25 ºC is 7.0, the pH of natural waters is usually slightly basic due to the solubility of carbon dioxide from the atmosphere. The Basin Plan objective for pH states that "the pH of waters shall not be depressed below

6.5, raised above 8.3, or changed at any time more than 0.3 units from normal ambient pH." Mean runoff concentrations in the Los Angeles County[16] stormwater monitoring data ranged from 6.5 for mixed- and single-family residential land uses to 7.0 for commercial land use. Therefore, pH in Grapevine Creek is not expected to be affected by runoff discharges from the project.

- ***Radioactive Substances***. Radioactive substances typically occur at very low concentrations in natural waters. Some activities such as mining or certain industrial activities (e.g., energy production, fuel reprocessing) can increase the amount of radioactive substances impairing beneficial uses. The Basin Plan states that "at a minimum, waters designated MUN shall not contain concentrations of chemical constituents in excess of the MCLs specified in the following provisions of…Title 22 of the California Code of Regulations." The streams that flow through the Grapevine project are not listed in the Basin Plan as having 'MUN' uses. Therefore, radioactive substances are not considered a pollutant of concern for the project.

3.2 Groundwater Quality

The project will allow for infiltration of urban runoff to groundwater after receiving treatment in the BMPs, as well as incidental infiltration of irrigation water. Research conducted on the effects on groundwater from stormwater infiltration by Pitt et al. (1994) indicate that the potential for contamination is dependent on a number of factors including the local hydrogeology and the chemical characteristics of the pollutants of concern. Site-specific factors may include precipitation, irrigation, dry weather runoff, and temperature patterns; soil properties such as texture; clay mineral, organic matter and microbial content; presence of structural voids; and depth to the groundwater table. Pollutant characteristics that influence the potential for groundwater impacts include high mobility (low absorption potential), high solubility fractions, and abundance in runoff, including dry weather flows. Pollutants of concern for groundwaters are discussed below.

3.2.1 Pollutants of Concern for Groundwater

The pollutants of concern for the groundwater quality analysis are those that are anticipated or potentially could be generated by the project at concentrations, based on water quality data collected in Los Angeles County[17] from land uses that are the same as those included in the project, that exhibit these characteristics. The Basin Plan contains numeric objectives for

[16] In lieu of urban runoff data from Kern County, data from Los Angeles County have been referenced as the most robust locally available dataset.
[17] EMC data in Kern County are not available

bacteria, lead, electrical conductivity, and various toxic chemical compounds with MCLs, and contains qualitative objectives for pesticides, radionuclides, dissolved matter, taste and odor, and toxic substances.

- ***Nitrate.*** Of the surface water pollutants of concern discussed above, nitrate-N is the most mobile and was therefore selected as the PPOC for groundwater impacts from infiltration of urban runoff. High nitrate levels in drinking water can cause health problems in humans. The primary health concern is with the consumption of water with elevated nitrate which is the condition known as methemoglobinemia, or "blue baby syndrome".
- ***Contaminants of Emerging Concern (CECs).*** The project's recycled water (tertiary-treated effluent) could be sources of CECs that could impact groundwater quality. CECs in wastewater include pharmaceuticals and personal care products, industrial and household chemicals, and nanomaterials.
- ***Total Dissolved Solids (TDS).*** The Basin Plan identifies salts as a crucial problem in the Tulare Lake Basin "due to evaporation and crop transpiration removing water from soils, resulting in an accumulation of salts in the root zone of the soils at levels that retard or inhibit plant growth. Additional amounts of water often are applied to leach the salts below the root zone. The leached salts eventually enter ground or surface water."

3.2.2 Pollutants that are not of Concern for Groundwater

This section discusses other pollutants that are listed in the Basin Plan, but for reasons explained in this section, are not groundwater pollutants of concern for the project.

- ***Bacteria.*** The Basin plan states that "in groundwaters designated MUN, the concentration of total coliform organisms over any 7-day period shall be less than 2.2/100 mL". Bacteria are removed through straining in soils (for example, as with septic tank discharges).

  Although there are limited data on the effectiveness of different types of stormwater treatment to manage bacteria, treatment processes that help reduce pathogen indicators include sunlight (ultraviolet light) degradation, sedimentation, and filtration; processes that will be at work in the proposed treatment BMPs. A summary of BMP performance data for fecal coliform from six infiltration basins indicated a geometric mean of 1,971 most probable number (MPN)/100 mL for the influent and a geometric mean for the effluent of 133 MPN/100mL with a 95% confidence about the median that ranged from 35 to 411 MPN/100mL (Wright Water Engineers, Inc. and Geosyntec Consultants, 2010). This difference is statistically significant, and corresponds to treatment effectiveness, based on geometric means, of 93%. These data clearly indicate that infiltration BMPs are effective in treating bacteria. Furthermore, bacteria would be removed through straining in soils below the infiltration BMPs.

Reclaimed wastewater to be used for irrigation would be disinfected tertiary recycled water, per Title 22. Per this standard, total coliform bacteria cannot exceed a 7-day median of 2.2 MPN/100 mL, consistent with the Basin Plan objective (Erler & Kalinowski, Inc. [EKI], 2014a). Therefore application of reclaimed water for irrigation would not cause bacteria impacts to groundwater. For the reasons detailed above, bacteria is not a pollutant of concern for groundwater.

- ***Chemical Constituents.*** The Basin Plan states that "groundwaters shall not contain chemical constituents in concentrations that adversely affect beneficial uses...At a minimum, waters designated as MUN shall not contain concentrations of chemical constituents in excess of the MCLs…At a minimum, water designated MUN shall not contain lead in excess of 0.015 mg/L". Groundwaters could be impacted by application of potable drinking water, irrigation by tertiary treated reclaimed wastewater, or stormwater runoff via infiltration-type BMPs. Drinking water limits for inorganic and organic chemicals that can be toxic to human health in excessive amounts are contained in Title 22 of the CCR. Lead, in particular, has an action level requiring a specified treatment technique of 15 ug/L, or 0.015 mg/L (EKI, 2014b). The WWTF will also meet the minimum water quality requirements for disinfected tertiary recycled water for unrestricted use per Title 22 (EKI, 2014a). Due to compliance with these criteria, chemical constituents are not expected to occur in drinking or reclaimed wastewater in amounts that would impact groundwater.

  In 2007 a total recoverable lead result of 0.087 µg/L (or 0.000087 mg/L) was measured in the TA Well, and in 2012 total recoverable lead was not detected (practical quantification limit = 1.0 µg/L), both of which are below the Basin Plan limit of 0.015 mg/L. Regardless, metals tend to associate with particulate matter and, if metals are not in the dissolved form, their potential for infiltrating to groundwater is reduced. When metals do exist in the dissolved form in runoff, they often adsorb to soil particles and are filtered out by the soils; removal in the soil column prevents infiltration to groundwater. This behavior has been confirmed by data collected beneath stormwater detention/retention ponds in Fresno (conducted as part of the Nationwide Urban Runoff Program), which showed that trace metals tended to be adsorbed in the upper few feet in the bottom sediments (Brown and Caldwell, 1984). For the reasons detailed above, chemical constituents, aside from the previously identified PPOC, are not considered PPOCs for groundwater.

- ***Pesticides.*** The Basin Plan states "no individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses", and "at a minimum, waters designated and MUN shall not contain concentrations of pesticide constituents in excess of the MCLs…". Pesticides have been detected in urban runoff from residential areas, especially in dry weather flows associated with landscape irrigation runoff (Pitt et. al, 1994). In addition to the chemical characteristics listed above, the potential for leaching to groundwater is also a function of the pesticide formulation. A pesticide leaches to groundwater when its residence time in the soil is less than the time required to remove it, or transform it to an innocuous form by chemical or biological processes. USGS National Water Quality Assessment Program data from agricultural areas across the US indicate that pesticides with greater persistence in soil are more likely to be detected in shallow groundwater than compounds that are less persistent (USGS, 2007). For example, within areas of relatively equal use, atrazine (soil half-life of 146 days) was detected in shallow groundwater much more frequently than the less persistent metolachlor (soil half-life of 26 days). Generally, pesticides with low water solubilities, high octanol-water partitioning coefficients, and high carbon partitioning coefficients are less mobile. The greatest pesticide mobility occurs in areas with coarse-grained or sandy soils without a hardpan layer, with low clay and organic matter content, and high permeability. Thus, heavy repetitive use of mobile pesticides on irrigated and sandy soils likely contaminates groundwater (Pitt et. al, 1994).

  However, Pitt et al.'s research (1994) shows that for a variety of pesticides found in stormwater, the potential for groundwater contamination is low when sedimentation or filtration pretreatment is used (as opposed to, for example, using an infiltration trench). This includes the types of treatment mitigation measures proposed for this project (for example, bioretention areas, and swales), which promote sedimentation and/or filtration. In addition, bioretention areas would be amended with organic matter, which further enhances their ability to sorb and immobilize pesticides.

  Pesticides associated with either legacy use in the project area, or introduced with the new development through urban runoff are expected to be adequately treated in the project treatment BMPs via sedimentation and/or filtration, and immobilized by soils/amendments within and beneath the BMPs. This renders pesticides relatively immobile to groundwater migration, and therefore pesticides are not included as groundwater pollutants of concern.

- ***Radioactivity.*** The Basin Plan states "radionuclides shall not be present in groundwaters in concentrations that are deleterious to human, plant, animal, or aquatic life, or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life…at a minimum groundwaters shall not contain concentrations of radionuclides in excess of the MCLs…" Although a gross alpha result of 22.2 pCi/L was measured to be greater than the upper limit Secondary MCL of 15 pCi/L, radionuclides are not expected to occur in the project's runoff since radionuclides behave similarly to other heavy metals, in that their mobility in soils is retarded by adsorption onto the soil mineral and organic matter (Staunton et al., 2008). Additionally, Title 22 specifies the water quality criteria which the municipal water must meet. Due to compliance with these criteria, radionuclides are not expected to occur in municipal supply water in amounts that would impact groundwater.

- ***Salinity.*** The Basin Plan states, "All groundwaters shall be maintained as close to natural concentrations of dissolved matter as is reasonable considering careful use and management of water resources." The Kern River Hydrographic Unit, in which the project site is located, is limited to a maximum average annual increase in salinity, as measured by electrical conductivity, of 5 µmhos/cm.
- ***Tastes and Odors***. The Basin Plan contains narrative objectives for taste- or odor-producing substances in concentrations that cause nuisance or adversely affects beneficial uses of groundwaters. Undesirable tastes and odors in water may be a nuisance and may indicate the presence of a pollutant(s). Odor associated with water can result from decomposition of organic matter or the reduction of inorganic compounds, such as sulfate. Other potential sources of odor-causing substances, such as heavy industrial processes, would not occur as part of the project. Therefore, taste-, or odor-producing substances are not pollutants of concern for the project.
- ***Toxicity***. The Basin Plan states that "groundwaters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life associates with designated beneficial use(s)". Toxicity is not addressed as a unique PPOC for groundwater, but addressed through an evaluation of the most mobile potentially toxic constituents in urban runoff and reclaimed water.

4 GEOMORPHIC CONDITIONS OF CONCERN (HYDROMODIFICATION)

Geomorphic conditions of concern for receiving streams that are susceptible to hydromodification impacts as they relate to the project are discussed below.

The alteration of the hydrologic characteristics of a watershed due to development, which in turn causes degradation of receiving waters, is termed hydromodification. Hydromodification due to land development changes bed sediment supply, channel geometry, and bed and bank material. It can additionally cause excessive erosion and/or sedimentation rates, which can result in excessive turbidity, channel aggradation, and/or degradation. Hydromodification can also increase dry weather flows (irrigation return flows) that alter habitat.

Development project can create many compounding effects which have the potential to impact downstream channels and habitat integrity, including increased runoff due to impervious surfaces, narrowed channel width, weakened bed and bank material, and trapped sediment from upland watershed sources. Increased flow magnitudes and durations associated with urbanization often leads to stream channel enlargement and loss of habitat and associated riparian species (SCCWRP 2005; Bledsoe & Watson 2001; MacRae 1992; Booth 1990). Under certain circumstances, development can also cause a reduction in the amount of sediment supplied to the stream system, which can lead to stream channel incision and widening.

A change to the project site's geomorphic regime would be considered a condition of concern if the change could have a significant impact on downstream natural channels and habitat integrity, alone or in conjunction with the impacts of other projects. Urbanization alters hydrologic processes in that it changes the natural relative proportions of overland flow, interflow, and groundwater flow to stream channels (Booth et al., 1997). When large areas are rendered impervious with asphalt, concrete, and roofs, and runoff is conveyed directly to streams via conventional storm drain systems, both natural water storage in vegetation and soil infiltration are reduced, and overland flow is increased. As a result of these altered runoff conveyance and interception processes, the magnitude and duration of flow rates entering receiving streams increase, intensifying the erosive energy within the channel. It is important to note that total impervious cover is not a direct indication of downstream instability. If managed correctly, impervious surfaces can be routed through pervious surfaces and/or specially designed detention structures, thus minimizing the hydrologic effects of urbanization.

The following sections discuss how changes in geomorphic conditions were characterized as they relate to changes in the four key factors that affect stream stability due to project development – hydrology, bed sediment supply, channel geometry, and bed and bank material.

4.1 Hydrology

Hydrologic changes to the jurisdictional receiving streams were characterized semi-quantitatively for the project in two ways. First, a comparison was made of the average annual runoff volume calculated for the existing and proposed conditions (with PDFs) from the surface water quality model. A comparison was then made of the proposed project drainage areas tributary to each stream to the respective total watershed area.

4.2 Bed Sediment Supply

Introducing impervious surface reduces the open space areas where natural erosion processes can occur, thus decreasing the amount of sediment supplied to streams. This effect is typically more pronounced in arid areas with naturally exposed soils and less pronounced in forested areas. Urbanized areas are often designed to trap sediment that is generated upstream of a development in debris basins to prevent storm drain system clogging and preserve capacity and/or prevent damage. These reductions in sediment load, if severe enough, can starve downstream reaches of naturally transported bed load. Thus, the water flowing in the channel becomes “hungry water,” that is more prone to eroding in-stream bed and bank material (Kondolf, 1997). Hungry water is more erosive because, due to the reduced or eliminated supply of sediment in stream flow, the only source of sediment available for transport is from the material that forms the channel itself. To minimize the impacts of hungry water, drainage pathways for open spaces upstream of developments can be designed to pass coarse sediments from natural areas to the stream channels. Additionally, denser cluster development preserves more open space and sediment supply.

Bed sediment supply changes were characterized semi-quantitatively for each receiving stream based on screening-level GIS calculations of area and stream length that would be eliminated by the project and other planned development in the watersheds. These reductions in area and stream length were then compared to the existing totals by watershed. The screening-level sediment supply source calculations do not account for the higher sediment supply rates associated with steep terrain (i.e., sources in the upstream Tehachapi and San Emigdio Mountains) compared to the relatively low sediment supply rates on flat terrain (i.e., the Valley Floor alluvial fan). Considering that the project is situated on the alluvial fan, the calculated reductions in sediment supply sources for the project are considered conservative.

4.3 Channel Geometry

Channel shape is an integral factor of stream stability because it serves as the basis of key hydraulic properties (specifically flow stage, velocity, and shear stress) that drive the conveyance of water and sediment. For example, given a set discharge and longitudinal slope, a cross-sectional geometry that is deep and narrow has a higher flow stage, shear stress, and overall transport capacity than one that is shallow and wide. Longitudinal slope, when increased, also results in greater flow velocities and stresses giving the stream more capacity to transport sediment. Urbanization has historically affected channel geometry by narrowing stream corridors (e.g., with constructed levees) so that the floodplain can be developed for residential, commercial, industrial, or agricultural uses. This confinement potentially impacts sensitive floodplain ecosystems, eliminates sediment deposition in overbanks, reduces in-stream infiltration, and creates a more energetic stream system that is more prone to in-stream erosion.

Changes to channel geometry were characterized qualitatively by comparing the currently mapped FEMA 100-year floodplain to the project's development area. Areas where the existing floodplain overlaps with the project development footprint are indicative of where the channel width is anticipated to be narrowed. Such reductions in channel width will also restrict the corridor in which channel avulsion and/or migration can occur within its alluvial fan setting.

4.4 Bed and Bank Material

Bed and bank material properties (as well as vegetation type and density) define the channel's susceptibility to the forces of flowing water. The characteristic of bed and bank material that is most important to channel form is its resistance to movement (often expressed as critical shear stress or velocity). As the size and weight of non-consolidated bed material increases, or the cohesive strength of consolidated bank and bed material increases, the channel form becomes more resistant to erosive forces and thus more stable. Urbanization can impact bed and bank material strength if natural channels are physically modified or replaced with constructed channels. Constructing a new channel in place of a natural one causes a significant geomorphic impact in and of itself, eliminates the native riparian habitat, and impacts the longitudinal riparian connectivity of a stream system.

Changes to bed and bank material were characterized qualitatively by evaluating 1) which riparian corridors would have concentrated cattle due to a reduction in the surrounding land available for grazing and 2) which streams would receive discharge from project outfalls. It is important to note that these considerations are not a direct indication of downstream instability; prohibiting cattle within riparian corridors and dissipating flow energy at project outfalls can minimize alteration to bed and bank material.

5 SURFACE WATER QUALITY AND GROUNDWATER RECHARGE ANALYSIS METHODOLOGY

5.1 Surface Water Quality Modeling Methodology

A load-based water quality model was used to estimate pollutant loads and concentrations in project stormwater runoff for certain pollutants of concern for pre-development conditions and post-development conditions. The water quality model is one of the few models that takes into account the observed variability in stormwater hydrology and water quality. This is accomplished by characterizing the probability distribution of observed rainfall event depths, the probability distribution of EMCs, and the probability distribution of the number of storm events per year. These distributions are then sampled randomly using a Monte Carlo approach to develop estimates of mean annual loads and concentrations in the existing condition, the project condition without PDFs, and the project condition with PDFs. A detailed description of the water quality model methodology and inputs is presented in Appendix E and Figure 5-1 illustrates how BMPs in each planning area were modeled.

5.1.1 Model Description

The following summarizes major features of the water quality model:

- ***Rainfall Data*****:** The water quality model estimates the volume of runoff from storm events. The storm events were determined from 61 years (water years 1949 - 2010) of hourly rainfall data measured at the National Climatic Data Center (NCDC) Bakersfield Airport rain gauge that was scaled by the WRDD Tejon Rancho weather station to represent the weather patterns and average annual rainfall totals characteristic of the project. The rainfall data that are incorporated into the water quality model require the rainfall record to have rainfall measurements at one hour intervals and a period of record that is at least 20 to 30 years in length.
- ***Land Use Runoff Water Quality*****:** The water quality model estimates the concentration of pollutants in runoff from storm events based on existing and proposed land uses. The pollutant concentrations for various land uses, in the form of EMCs, were estimated from data collected in Los Angeles County and Ventura County (LACDPW, 2000 and Ventura County, 2011). In lieu of urban runoff data from Kern County, data from Los Angeles County have been referenced as the most robust locally available dataset. The Los Angeles County database was chosen for use in the model because: (1) it is an extensive database that is quite comprehensive, (2) it contains monitoring data from land use-specific urban drainage areas, and (3) the data are representative of the semi-arid conditions in southern California. The Ventura County data were chosen to supplement the Los Angeles County database for agricultural land uses, as the Los Angeles County data were representative of urban development and did not include a representative agricultural land use parcel.
- ***Pollutant Load*****:** The pollutant load associated with each storm event is estimated as the product of the storm event runoff and the EMCs. For each year in the simulation, the individual storm event loads are summed to estimate the annual load. The mean annual load is then the average of all the annual loads.
- ***BMPs Modeled*****:** The modeling only considers the distributed treatment BMPs and community-scale infiltration facilities and does not take into account source control

BMPs (e.g., street sweeping and catch basin inserts) that would also improve water quality. In this respect, the modeling results are conservative (i.e., tend to overestimate pollutant loads and concentrations).

- ***Treatment Effectiveness*:** The water quality model estimates mean pollutant concentrations and loads in stormwater following routing and infiltration in the BMPs. The amount of stormwater runoff that is captured by the LID and treatment BMPs was calculated for each storm event, taking into consideration the intensity of rainfall, duration of the storm, and duration between storm events. All distributed BMPs and community-scale treatment facilities were modeled as infiltrating BMPs, so there is no treated effluent from the BMPs simulated. The majority of the captured stormwater is infiltrated into the subsoils; any outflows from the facilities are only to achieve target draw down times and are assumed to have the same effluent concentrations as the influent.
- ***Bypass Flows*:** The water quality model takes into account conditions when the BMPs are full and flows are bypassed.
- ***Volume Reduction*:** The water quality model accounts for volume reductions from the BMPs due to infiltration and evaporation.
- ***Representativeness to Local Conditions*:** The water quality model utilizes runoff water quality data obtained from tributary areas that have a predominant land use, and are measured prior to discharge into a receiving water body. Currently, such data are available from stormwater programs in Los Angeles County and Ventura County. Such data are often referred to as "end-of-pipe" data to distinguish it from data obtained in urban streams, for example.
- ***Infiltration*:** Existing conditions infiltration parameters were assumed based on soil texture class and the NRCS Soil Survey of the project area as shown in Figure 3 of the Initial Infiltration Testing Evaluations Report (Geosyntec, 2014) (also attached as Appendix B to this WQTR). The majority of the development area would be impacted by cut/fill operations; therefore, post-development soil compaction impacts were modeled for post-development open space and landscaped areas assuming a 25 percent reduction in saturated hydraulic conductivity, or infiltration rate, from the pre-developed to post-developed condition. Impervious surfaces were modeled assuming no infiltration.

5.1.2 BMPs Incorporated into the Water Quality Model

Parcel-based (distributed) and community-scale facility treatment BMPs were incorporated into the water quality model based on the project land use type.

Table 10 summarizes the treatment types modeled for each land use type. Discharges from land uses that drain to distributed treatment BMPs and are also located within community-scale infiltration facility boundaries are subsequently routed to the community-scale facilities following treatment in the treatment BMPs. As the distributed treatment BMPs are infiltration facilities, flows discharging to one of the 35 community-scale facilities are the flows that bypass the distributed treatment BMPs.

Table 10
Treatment Facility Types

Treatment Type	Land Uses Treated
Distributed Treatment BMPs (Bioretention)	Village Commercial, Village Residential, Commercial, Residential, Parks, Schools, Light Industrial, Roadways
Regional Infiltration Facilities	Agriculture[1]
No Treatment	Vacant (e.g., riverwash, open space, etc.), Freeway Ramps (managed by Caltrans)

[1] Agriculture within developed areas is treated within community-scale infiltration facilities and is estimated to be 20% of the exclusive agriculture zoning category.

Distributed BMPs

The modeled distributed BMPs were analyzed to ensure that they meet the required volume-based sizing criteria (80% watershed capture and the 85^{th} percentile, 24-hour storm volume). In this analysis, a representative 1-acre catchment was used (calculated composite imperviousness and soil distribution of the proposed total drainage area, and parameterized per the modeling assumptions in Table 11). A standard distributed bioretention BMP configuration was developed to represent the approximate characteristics of facilities that are anticipated to be employed within the project. The infiltration rate beneath the representative BMP was set at the most conservative infiltration rate tested for each of the SPAs where distributed BMPs are to be utilized. The total storage depth within the distributed BMPs was set at 2.3 feet to ensure that the BMP draws down within 48 hours with the conservative infiltration rate of 0.57 in/hr. The water quality basins were conservatively sized to achieve 80% capture, as sizing for the 85^{th} percentile, 24-hour storm could potentially overestimate the retention in the watershed and underestimate the runoff reaching the community-scale infiltration facilities. All of the discharge or bypass from the distributed BMPs, with the exception of the off-site areas, was modeled as being routed to downgradient community-scale facilities. The model representation for the distributed BMPs in the project is presented in Table 11.

Table 11
SWMM Hydrologic Model Representation and Design Assumptions of Distributed BMPs

SWMM Runoff Parameters	Units	Distributed Treatment BMP Representation
Depression Storage, pervious	inches	29
Depression Storage, impervious	inches	NA
Imperviousness	%	0
Infiltration Rate	in/hr	0.57[1]
Hydrologic Distributed BMP Surface Area (as a % of tributary impervious area)	%	2.4
Average Annual Reduction in Runoff Volume from Hydrologic Representation	%	80%
Average Annual Reduction in Runoff Volume from Hydraulic Representation	%	80%

[1] An infiltration rate of 0.57 in/hr was used as it is the most conservative measured infiltration rate located within the SPAs that contain distributed BMPs. If actual measured infiltration rates are greater, the facility dimensions may be adjusted as long as the facility achieves 80% capture and draws down in less than 48 hours.

Community-Scale BMPs

Two separate representations of the community-scale BMPs were modeled to assess the smallest and largest facility sizes that would be designed as part of the development condition:

- **Community-Scale BMP Scenario #1** includes community-scale BMPs that are sized according to the Kern County Hydrology Manual flood control sizing procedure and does not allow for direct consideration of distributed bioretention BMP features up gradient of the community-scale BMPs.
- **Community-Scale BMP Scenario #2** includes community-scale BMPs that are sized using a simplified parameter adjustment for impervious cover (reduction of 48.8%) in the Kern County Hydrology Manual flood control sizing procedure. This method incorporates the effects of distributed bioretention BMPs and downspout disconnections (both of which reduce effective impervious area).This approach is based on the findings of the memorandums submitted to Kern County entitled, *Task 1: Test Catchment Selection of Pilot Analysis of Potential Flood Control Calculation Parameter Adjustments*, and *Task 2: Results of Test Catchment for Assessment of Parameter Adjustments* (Geosyntec, 2014a and b), attached as Appendix G.

The two community-scale BMP representations provide a range of anticipated sump sizes for the project, inclusive of scenarios in which only distributed bioretention BMPs are implemented or where all rooftop areas are not routed to pervious surfaces. A summary of the modeling assumptions for the two sets of community-scale facility representations is provided in Table 12, with details in Appendices E and F.

Table 12
Design Assumptions for Distributed and Community-Scale BMPs

BMP Parameter	Distributed BMPs[1]	Community-Scale BMP Scenario #1	Community-Scale BMP Scenario #2
Storage Volume	Sized for 80% Watershed Capture	Equivalent to project Flood Control Sumps (Geosyntec, 2015)[2]	Equivalent to Adjusted Flood Control Sumps (Geosyntec, 2015)[2]
BMP Functionality	Infiltration	Infiltration	Infiltration
Planning Level BMP Configuration	No underdrain; all discharge to infiltration	No underdrain for facilities; all discharge to infiltration	No underdrain for facilities; all discharge to infiltration
BMP Drain Time	< 48 hours	< 7 days[3]	< 7 days[3]

[1]Generic modeling assumptions were used to develop planning level performance estimates that are considered to be representative of infiltrating distributed BMPs that will draw down in 48 hours.
[2] Facilities checked to ensure that they meet sizing criteria (80% capture and runoff from the 85th percentile, 24-hour storm event)
[3]The community-scale infiltration basins are held to the flood control sizing draw down criteria of 7-days based on the Kern County Development Standards.

5.1.3 Modeled Pollutants of Concern

The appropriate form of stormwater runoff data used to address water quality is flow-weighted composite samples, which are a measure of the average water quality during the event. To obtain such data usually requires automatic samplers that collect data at a frequency that is proportionate to flow rate. The pollutants of concern for which there are sufficient flow composite sampling data in the Los Angeles County and Ventura County databases[18] are:

- Total Suspended Solids (sediment)
- Total Phosphorus
- Total Nitrogen, Nitrate-Nitrogen, Nitrite-Nitrogen, and Ammonia-Nitrogen
- Total Copper
- Dissolved Copper
- Total Lead
- Total Zinc
- Dissolved Zinc

[18] In lieu of urban runoff data from Kern County, data from Los Angeles County and Ventura County have been referenced as the most robust locally available datasets.

5.1.4 Qualitative Impact Analysis

Post development stormwater runoff water quality impacts associated with the following pollutants and parameters of concern were addressed based on literature information and professional judgment because available data were not deemed sufficient for modeling:

- Pesticides
- Pathogens (Bacteria, Viruses, and Protozoa)
- Petroleum Hydrocarbons (Oil and Grease, PAHs)
- Trash and Debris
- Emerging Contaminants
- Temperature
- Turbidity

Pesticides in urban runoff are often present at concentrations below analytical detection limits for most commercial laboratories and therefore there are limited statistically reliable data available on pesticides in urban runoff. Pesticides were not detected in Los Angeles County monitoring data[19] for land use-based samples, except for diazinon and glyphosate which were detected in less than 15 percent and 7 percent of samples, respectively (LACDPW, 2000).

Human pathogens are usually not directly measured in stormwater monitoring programs because of the difficulty and expense involved; rather, indicator bacteria such as fecal coliform or certain strains of *E. Coli* are measured. Because maximum allowable holding times for bacterial samples are necessarily short, most stormwater programs do not collect flow-weighted composite samples that potentially could produce more reliable statistical estimates of indicator concentrations. Fecal coliform or *E. Coli* are typically measured with grab samples, making it difficult to develop reliable EMCs. Total coliform and fecal bacteria (fecal coliform, fecal streptococcus, and fecal enterococci) were detected in stormwater samples tested in Los Angeles County[20] at highly variable densities (or most probable number, MPN) ranging between several hundred to several million cells per 100 ml (LACDPW, 2000).

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[19] In lieu of urban runoff data from Kern County, data from Los Angeles County have been referenced as the most robust locally available dataset.

[20] In lieu of urban runoff data from Kern County, data from Los Angeles County have been referenced as the most robust locally available dataset.

Petroleum hydrocarbons are difficult to measure because of laboratory interference effects and sample collection issues (hydrocarbons tend to coat sample bottles). Grab samples are typically used to collect samples, making it difficult to develop reliable EMCs.

Trash and debris and emerging contaminants are not typically included in routine urban stormwater monitoring programs. Several studies conducted in the Los Angeles River basin[21] have attempted to quantify trash generated from discrete areas, but the data represent relatively small areas or relatively short periods, or both.

Emerging contaminants were not included in the Los Angeles County land use-based monitoring program, and many emerging contaminants do not yet have reliable analytical methods for quantification.

Temperature and turbidity are site-specific in nature and would be expected to vary widely by land use.

Also addressed qualitatively are potential construction impacts, water quality impacts from dry weather sources, hydromodification impacts, and groundwater quality impacts.

5.1.5 Summary of Conservative Assumptions Used for the Water Quality Model

A number of conservative assumptions were included in the water quality model, the results of which may be considered a worst case scenario for project-related water quality impacts. The primary conservative assumptions are as follows:

- The water quality model only accounts for the benefits of treatment BMPs. It does not account for reductions in concentrations or pollutant loadings that are the result of site design LID or source control BMPs. Therefore, any modeled increases in concentrations associated with the project have a high bias because only the effect of treatment BMPs can be modeled.
- Distributed BMP sizing assumptions used for capture efficiency calculations are based on sizing to achieve 80% capture. It is possible that some of the BMPs may ultimately be sized to be larger and would tend to result in a higher capture performance. Additionally, the infiltration rate assumed for all project distributed BMPs was the lowest, or most conservative, of those measured in the special planning areas where distributed BMPs are anticipated (Geosyntec, 2014). A factor of safety of 2.5 was also applied (see Appendix E

[21] Similar studies are not available in Kern County.

for discussion of methodology). It is probable that the site-specific infiltration rates would be higher and may also result in a higher capture performance.

- Safety factors were incorporated into the determination of the runoff coefficients and the infiltration rates underlying the treatment BMPs. It is likely that treatment BMPs would be sited on highly infiltrating soils following a site-specific BMP design feasibility assessment and that the actual infiltration capabilities of the treatment BMPs would be enhanced.

5.2 Groundwater Recharge Assessment Methodology

The project overlies four groundwater basins, two of which have designated beneficial uses, including MUN. Groundwater recharge impacts were addressed in two ways:

1) A comparison of pre-project to post-project stormwater runoff volumes will inform the change in runoff retained on-site, which would have the potential to infiltrate and potentially recharge the underlying groundwater basins.

2) A comparison of pre-project to post-project approximate irrigation demands will inform the change in volume of reclaimed or potable water that could contribute to groundwater recharge. A detailed analysis of water supply and demand related to the project is included in the Water Supply Assessment (WSA) (TCWD, 2014).

6 IMPACT ANALYSIS

6.1 Thresholds of Significance

Significance criteria and thresholds for significance are based on Appendix G of the CEQA Guidelines (Environmental Checklist Form) (California Resources Agency, 2009) and the Kern County Guide for the Preparation of Environmental Impact Reports (County of Kern, 2006), as summarized below:

- WQ-1: Violate any water quality standards or WDRs;
- WQ-2: Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);

- WQ-3: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;
- WQ-4: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
- WQ-5: Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
- WQ-6: Otherwise substantially degrade water quality.

The criteria that will be used for evaluating the significance of a potential impact for each PPOC based on the thresholds for significance are summarized below. The application of the criteria discussed below to a decision regarding significance requires an integrated or "weight of evidence" approach, rather than a decision based on any one of the individual criterion.

CEQA Standard: In order to determine significance under CEQA, potentially substantial increases to pollutant concentrations and/or loads resulting from development will be evaluated for significant adverse impacts to receiving water quality by comparing pre-development and post-development water quality concentrations and loads. Analysis of potential significant impacts will be based on the results of water quality modeling and qualitative analysis that takes into account selected treatment BMPs.

If post-development pollutant loads and concentrations, with capture in BMPs, are predicted to remain the same or to be reduced compared to existing conditions, then it will be concluded that the project would not cause a significant adverse impact to the ambient water quality of the receiving waters for that constituent. If post-development pollutant loads or concentrations are predicted to increase compared to existing conditions, the potential impacts will be assessed by evaluating the effect of the potential increase in pollutant concentration on water quality criteria.

Water Quality Criteria: Comparison of post-development water quality concentrations in the runoff discharge with benchmark receiving water quality criteria as provided in the Basin Plan and the CTR will facilitate analysis of the potential for runoff to cause or contribute to exceedances of receiving water quality standards or adversely affect beneficial uses. The water quality criteria will be considered benchmarks for comparison purposes only; as such criteria apply within receiving waters as opposed to directly to runoff discharges.

Narrative and numeric water quality objectives contained in the Basin Plan apply to the project's receiving waters. Water quality criteria contained in the CTR provide concentrations that are not to be exceeded in receiving waters more than once in a three year period for those waters designated with aquatic life or human health related beneficial uses. Projections of runoff water quality will be compared to acute CTR criteria, as stormwater runoff is associated with episodic events of limited duration, whereas chronic criteria apply to 4-day exposures.

Because water quality criteria are established to protect beneficial uses of receiving waters, analyses that result in no violations of water quality criteria support a finding of less than significant impact.

Construction General Permit Requirements: All development projects which disturb one or more acres are required to obtain coverage under the State Water Quality Control Board's General Permit for Discharges of Stormwater Associated with Construction Activity (Construction General Permit 2012-0006-DWQ). The Construction General Permit requires the development and implementation of a SWPPP that describes erosion and sediment control BMPs, as well as material management/non-stormwater BMPs that would be used during the construction phase of development. Compliance with these requirements during the construction phase of a project, including implementation of BMPs consistent with BAT/BCT, as required by the Construction General Permit, will be assessed as part of the impact determination.

BAT/BCT refers to CWA technology-based standards that are applicable to construction site stormwater discharges. Federal law specifies factors relating to the assessment of BAT including: age of the equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; the cost of achieving effluent reduction; non-water quality environmental impacts (including energy requirements); and other factors as the Administrator deems appropriate (CWA §304(b)(2)(B)). Factors relating to the assessment of BCT include: reasonableness of the relationship between the costs of attaining a reduction in effluent and the effluent reduction benefits derived; comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources; the age of the equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; non-water quality environmental impact (including energy requirements); and other factors as the Administrator deems appropriate (CWA §304(b)(4)(B)). USEPA has not issued regulations specifying BAT or BCT for construction site discharges.

In addition, the project must also comply with the requirements in the General Order for construction site dewatering (CVWB Order No. R5-2013-0074).

Hydromodification Control Performance Standard: The state of the current science for hydromodification control is to use the Erosion Potential metric to: predict the likelihood of channel adjustment given watershed and stream hydrologic and geomorphic variables; and size and situate hydromodification controls to manage potential geomorphic impacts. Erosion Potential (Ep) is defined as the ratio of long-term effective work or sediment transport capacity done on the channel boundary for the post- and pre-project conditions (i.e., post/pre).

The project will be designed to the following hydromodification control performance standard:

> *The erosion potential (Ep) of susceptible watercourses associated with the Project shall be maintained within an appropriate range of the target value. The target Ep shall be 1.0 unless a more appropriate value is derived based on best available science. The target Ep shall account for changes in sediment supply at the point of analysis. If the Project does not significantly alter the hydrology, bed sediment supply, channel geometry, and bed/bank material of a receiving stream, then the Project is in compliance with the Ep management objective for this watercourse.*

The hydromodification control performance standard applies to susceptible watercourses associated with the Project. These susceptible watercourses correspond to the jurisdictional receiving streams within and downstream of the project, which includes (from west to east) Tecuya Creek, Grapevine Creek, Cattle Creek 2, Live Oak Creek, Cattle Creek 1, and Pastoria Creek. Engineered canal systems are not considered to be susceptible to hydromodification impacts.

6.2 Project Design Features

The Project Design Features for the Grapevine project, described in detail in Section 1.2.3, are listed below:

- **PDF#1: Erosion and Sediment Control BMPs to be implemented during Construction.** The project will comply with the requirements of the Construction General Permit, including determination of the project risk level, development of a SWPPP, BMP selection and implementation, and required monitoring activities.
- **PDF#2: Source Control Features.** The Grapevine project will implement source control BMPs including, but not limited to, maintaining records of BMP maintenance, proper design of outdoor material storage and other pollutant areas, education of property owners, tenants, and occupants, landscape management planning, etc.
- **PDF#3: Low Impact Development and Treatment Features.** The Grapevine project will implement site design measures to minimize impervious areas, minimize directly

connected impervious areas, conserve natural areas, select appropriate building materials, and protect slopes and channels. The project will also implement a combination of distributed and community-scale treatment BMPs to meet the performance standard, or treating stormwater runoff from the 85th percentile, 24-hour event, also meeting the 80% capture criteria.

- **PDF#4: Hydromodification Controls.** The Grapevine project will implement hydromodification controls to prevent and control hydromodification impacts to Grapevine Creek and other local streams. The site will, to the extent possible, preserve natural hydrologic and geomorphic conditions and protect sensitive hydrologic features, sediment sources, and sensitive habitats. The project will also minimize the effects of development though site design practices and implementation of stormwater volume-reducing LID PDFs (PDF#3).

6.3 Study Assumptions

The Grapevine project area includes approximately 8,010 acres, of which approximately 40% would be designated as exclusive agriculture with grazing and open space as the predominant land uses and approximately 60% would be developed as a residential community and employment center. The community would leverage and build upon the economic expansion and job growth that has occurred at Tejon Ranch Commerce Center, and would feature a series of compact neighborhoods linked by bicycle and pedestrian trails that provide convenient access to grocery and drugstores, professional services, schools, and parks. The project site is located along I-5, at the gateway to the Central Valley, and is immediately adjacent to the extensive open space that was conserved in the Tejon Ranch Land Use and Conservation Agreement.

All reclaimed wastewater from the WWTF would be used onsite for irrigation; therefore there would be no wastewater discharges to the project's surface receiving waters.

A tabular summary of proposed development land uses by special planning area is presented in Table 13. Estimated impervious cover by land use and estimated total impervious cover are presented in Table 14. Table 15 summarizes the modeled land uses and associated BMPs that were simulated in the project condition. The table also lists "Mitigation Menu" treatment BMPs that may be implemented by private property owners or other mechanisms, but are not a planned part of the project at this time. If implemented, they would be expected to improve water quality and runoff capture beyond the projected amounts since they are not included in the model.

Table 13
Project Condition Land Uses[a]

Special Plan Area	Exclusive Agriculture	Residential		Commercial				Schools	Parks	Arterial Streets	Collector Streets
		Res.	Village Center Res.	Village Center	Office / R&D	Freeway-Oriented	Light Industrial / Warehouse				
	ac	ac	ac	ac	ac	ac	ac	ac	ac	ac	ac
1	578	284	23	8	68	0	41	0	0	13	19
2	19	475	98	30	46	22	95	30	58	24	31
3	363	303	73	20	70	106	58	5	5	47	8
4	126	489	57	15	0	0	0	30	58	24	21
5a	1090	448	33	5	0	0	0	5	5	5	39
5b	872	93	0	0	0	0	0	0	0	1	10
6a	109	149	75	20	21	0	207	5	5	2	27
6b	0	0	0	0	0	0	322	0	0	0	0
6c	0	0	0	0	0	0	190	0	0	0	3
6d	17	0	0	0	0	0	173	0	0	0	4
6e	23	0	0	0	0	0	171	0	0	0	0
Off-site Road	0	0	0	0	0	0	0	0	0	0	57
Off-site Drainage[b]	138	0	0	0	0	0	0	0	0	0	0
Total	3335	2241	359	98	205	128	1257	75	131	116	219

[a]Land use program summary based on GIS shapefile 'Grapevine_ConceptualLandUsePlan_20140707' provided by Dudek, dated 07-07-2014.
[b]Off-site disturbed areas include multipurpose trails and their surrounding drainage areas, as well as off-site slopes that will drain into the project area.

Table 14
Project Condition Impervious Cover and Impervious Area

Land Use	Subcategory	Acreage	Estimated Impervious Cover (%)[1]	Estimated Impervious Area (ac)
Residential	Residential (7.2 DU/AC)	2,241	45%	1,008
	Village Center Residential (15.5 DU/AC)	359	78%	280
Commercial	Village Center	98	90%	88
	Office/R&D	205	90%	184
	Freeway-Oriented	128	90%	115
	Light Industrial/Warehouse	1,257	90%	1,131
Exclusive Agriculture[2]		3,335	0%	0
Schools		75	40%	30
Parks		132	18%	24
Arterial Streets		116	100%	116
Collector Streets		218	100%	218
Total		8,164	41% (area weighted)	3,194

[1]Imperviousness values were estimated using the Kern County Hydrology Manual (Kern County, 1992), adjusted based on site-specific factors consistent with assumptions used in sizing the flood control sumps.
[2]Areas assigned as exclusive agriculture are assumed to be 20% agriculture and 80% vacant as specified by the maximum disturbed percentage of exclusive agriculture in the Land Use Program Summary (KenKay, 2014).

Table 15
Project Treatment and Mitigation Menu BMP Concepts

Land Use	Treatment BMP Concepts (Model Assumptions)	Mitigation Menu BMP Concepts (Not Modeled)
Single-family residential	• Bioretention in landscaping for runoff from roofs and local impervious areas (requires 5-ft building setback) • Infiltration trenches in landscaping for runoff from roofs and local impervious area (requires 5-ft building setback) • Stormwater planter boxes for rooftop runoff when landscape area is limited • Community-scale system (see below) • Combinations of the above, potentially with "neighborhood-scale" combinations (i.e., shared common area locations for bioretention for example)	• Permeable pavement for driveways, surface parking, and walkways • Flow dispersion of roof and driveway runoff into landscaped areas (no formal bioretention) (requires 5-ft building setback)[22]
Village (multi-family) residential	• Same options as for single-family residential (but advantage of landscaped areas being in common areas for O&M)	• Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing
Commercial, schools, and parks	• Bioretention in courtyards and stormwater planter boxes for roof top runoff • Bioretention or infiltration trenches in landscaped areas for local impervious areas • Community-scale system (see below) • Combinations of the above	• Permeable pavement for walkways and courtyards • Permeable asphalt for parking lots • Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing
Industrial	• Community-scale system (see below) • Infiltration trenches in landscaping for runoff from roofs and local impervious area (requires 5-ft building setback) • Stormwater planter boxes for rooftop runoff when landscape area is limited • Combinations of the above	

[22] Rooftop flow dispersion (or disconnected downspouts) are included as a "Mitigation Menu" item, but would need to be implemented as a "Planned BMP Concept" to achieve the water quality performance of CS BMP Scenario #2

Land Use	Treatment BMP Concepts (Model Assumptions)	Mitigation Menu BMP Concepts (Not Modeled)
Local streets and public access ways	• Bioretention in roadway bulbouts, or in place of some parking spaces (standing water must drain within 48 hours) • Community-scale system (see below) • Combinations of the above	• Permeable pavement for walkways and bikeways • Drain low gradient trails directly to edge for sheet flow dispersion
Relocated interchange	• Caltrans managed community-scale system (see below)	• Vegetated swale in roadways for treatment/infiltration of roadway runoff and adjacent development where feasible • Vegetated swale adjacent to roadway • Bioretention/infiltration basin island in traffic turnabout
Community-scale systems	• Infiltration facilities • Community-scale vegetated detention basin(s) where infiltration rates are limiting	• Vegetated swales route runoff to community-scale infiltration basin(s) • Infiltration trenches or bioretention along riverbanks

6.4 Construction Impacts

The analysis of potential impacts of construction activities, construction materials, and non-stormwater runoff on water quality during the construction phase focuses primarily on sediment (TSS and turbidity) and certain non-sediment-related pollutants. Construction-related activities that are primarily responsible for sediment releases are related to exposing previously stabilized soils to potential mobilization by rainfall/runoff and wind. Such activities include removal of vegetation from the site, grading, and trenching for infrastructure improvements. Environmental factors that affect erosion include topographic, soil, and rainfall characteristics. Non sediment-related pollutants that are also of concern include construction materials (e.g., paint); chemicals, liquid products, petroleum products used in building construction or the maintenance of heavy equipment, and concrete-related products.

Construction impacts resulting from the Project would be minimized through compliance with the Construction General Permit. The permit requires the discharger to perform a risk assessment for the proposed development (with different requirements based upon the determined risk level) and to prepare and implement a SWPPP, which must include erosion and sediment control BMPs that would meet or exceed measures required by the determined risk level of the Construction

General Permit, as well as BMPs that control the other potential construction-related pollutants to the BAT/BCT standard. A CSMP that identifies monitoring and sampling requirements during construction is also a required component of the SWPPP. Most construction projects in the state are categorized as a Risk Level 2. BMPs required by the Construction General Permit will be incorporated assuming this level of risk; if final design analysis indicates that the project will fall under Risk Level 3, the additional Level 3 permit requirements will be implemented as necessary. The types of PDFs that will be implemented as needed during construction are listed in Section 1.2.3.

In accordance with the Dewatering General Permit, the discharger would be required to screen the effluent for priority pollutants to ensure there are no pollutants present that would preclude coverage under the General Order; comply with numeric effluent limitations, conduct effluent and receiving water monitoring during the discharge, and submit a discharge report to the CVWB for every discharge.

Discharges of turbid runoff are primarily of concern during the construction phase of development. The Construction SWPPP must contain sediment and erosion control BMPs pursuant to the Construction General Permit, and those BMPs must effectively control erosion and discharge of sediment, along with other pollutants, per the BAT/BCT standards. Additionally, fertilizer control and non-visible pollutant monitoring and trash control BMPs in the SWPPP would combine to help control turbidity during the construction phase.

During the construction phase there is potential for an increase in trash and debris loads due to poor contractor practices. However, through compliance with the Construction General Permit, the SWPPP for the site will include PDFs for trash control (catch basin inserts, good housekeeping practices such as sweeping and trash bins, etc.). Compliance with the permit requirements and inclusion of these PDFs in the SWPPP that meet the BAT/BCT performance standard would reduce impacts from trash and debris to a less-than-significant level.

Transport of legacy pesticides adsorbed to existing site sediments may be a concern during the construction phase of development. The Construction SWPPP must contain sediment and erosion control BMPs pursuant to the Construction General Permit, and those BMPs must effectively control erosion and the discharge of sediment along with other pollutants per the BAT/BCT standards.

During the construction phase of the project, petroleum hydrocarbons in site runoff could result from construction equipment/vehicle fueling or spills. However, pursuant to the Construction General Permit, the Construction SWPPP must include BMPs that address proper handling of petroleum products on the construction site, such as proper petroleum product storage and spill response practices, and those BMPs must effectively prevent the release of petroleum hydrocarbons to runoff per the BAT/BCT standards. PAH that are adsorbed to sediment during the construction phase would be effectively controlled via the erosion and sediment control BMPs.

Based on these factors, the impact of construction-related runoff from the project would be less than significant with respect to WQ-1 through WQ-6, with no mitigation required.

6.5 Operational Impacts

6.5.1 Stormwater Runoff Impacts for Modeled Pollutants and Parameters of Concern

In this section, model results for each pollutant are evaluated in relation to the following significance criteria: (1) comparison of post-development versus pre-development stormwater quality concentrations and loads; and (2) receiving water benchmarks which are the water quality criteria provided in the Basin Plan and the CTR. Specifically, the predicted runoff pollutant concentrations in the post-development condition with PDFs are compared with the receiving water benchmarks. The water quality criteria are considered benchmarks for comparison purposes only because they are in-stream criteria and therefore do not apply directly to project runoff. However, the comparison provides useful information to evaluate potential impacts. A weight of evidence approach is employed in this analysis when considering the various significance criteria. Significant adverse surface water impacts are presumed to occur if the project would:

> *WQ-1: Violate any water quality standards or waste discharge requirements;*
>
> *WQ-5: Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or*
>
> *WQ-6: Otherwise substantially degrade water quality.*

Results from the water quality model for the community-scale BMP #1 Scenario (Kern County Method) are reported in Tables 16 and 17. Results from the water quality model for the community-scale BMP #2 Scenario (Impervious Cover Adjustment Method) are reported in Tables 18 and 19. All results are reported for the total Grapevine project area, including the off-site disturbed areas associated with the proposed SPAs. The tables are organized by constituent, showing predicted mean annual pollutant loads (lbs/yr) and mean annual concentrations. Results are provided for the existing condition, the project condition without treatment PDFs (or BMPs), and the project condition with treatment PDFs (or BMPs). Table 16 and 18 show the predicted changes in the average annual stormwater runoff volume and pollutant loadings for each scenario. Table 17 and 19 show predicted changes in average annual pollutant concentrations in stormwater runoff for each scenario.

Table 16
Average Annual Runoff Volume and Pollutant Loads for the Grapevine Project and Off-Site Roads (CS BMP Scenario #1 Results from Water Quality Model), 1949-2010[a]

Parameter	Units	Existing	Project w/o PDFs			Project with PDFs		
		Result	*Result*	*Difference from Existing*	*Percent Difference from Existing*	*Result*	*Difference from Existing*	*Percent Difference from Existing*
Runoff Volume	acre-ft	106	2,979	+2,873	+2,706%	20	-86	-82%
TSS	tons/yr	25.1	496.6	+471.5	+1,882%	2.5	-22.6	-90%
Total Phosphorus	lbs/yr	357	2,984	+2,627	+736%	28	-329	-92%
Nitrate-N	lbs/yr	787	6,119	+5,332	+677%	40	-747	-95%
Nitrite-N	lbs/yr	51.2	734.2	+683.0	+1,333%	5.2	-46.0	-90%
Ammonia-N	lbs/yr	359	4,375	+4,016	+1,119%	25	-334	-93%
Total Nitrogen	lbs/yr	1,929	26,773	+24,844	+1,288%	160	-1769	-92%
Total Copper	lbs/yr	11.6	208.6	+197.0	+1,703%	2.1	-9.5	-82%
Dissolved Copper	lbs/yr	3.9	102.7	+98.8	+2,547%	1.2	-2.7	-69%
Total Zinc	lbs/yr	60	2,037	+1,977	+3,273%	14	-46	-77%
Dissolved Zinc	lbs/yr	40	1,487	+1,447	+3,641%	10	-30	-74%
Total Lead	lbs/yr	4.3	88.1	+83.8	+1,955%	0.5	-3.8	-88%

[a] The 1949-2010 period of record was sampled randomly using a Monte Carlo approach to predict average annual runoff volumes and pollutant loads in each project condition.

Table 17
Average Annual Pollutant Concentrations for the Grapevine Project and Off-Site Roads (CS BMP Scenario #1 Results from Water Quality Model), 1949-2010[a]

Parameter	Units	Existing	Project w/o PDFs			Project with PDFs		
		Result	*Result*	*Difference from Existing*	*Percent Difference from Existing*	*Result*	*Difference from Existing*	*Percent Difference from Existing*
TSS	mg/L	174	123	-51	-29%	93	-81	-46%
Total Phosphorus	mg/L	1.24	0.37	-0.87	-70%	0.52	-0.72	-58%
Nitrate-N	mg/L	2.73	0.76	-1.97	-72%	0.75	-1.98	-72%
Nitrite-N	mg/L	0.18	0.09	-0.09	-49%	0.10	-0.08	-45%
Ammonia-N	mg/L	1.24	0.54	-0.70	-57%	0.48	-0.76	-62%
Total Nitrogen	mg/L	6.7	3.3	-3.4	-51%	3.0	-3.7	-55%
Total Copper	µg/L	40	26	-14	-36%	39	-1	-3%
Dissolved Copper	µg/L	13	13	0	-6%	23	+10	+68%
Total Zinc	µg/L	209	251	+42	+20%	264	+55	+26%
Dissolved Zinc	µg/L	138	184	+46	+33%	195	+57	+42%
Total Lead	µg/L	15	11	-4	-27%	10	-5	-32%

[a] The 1949-2010 period of record was sampled randomly using a Monte Carlo approach to predict average annual pollutant concentrations in each project condition.

Table 18
Average Annual Runoff Volume and Pollutant Loads for the Grapevine Project and Off-Site Roads (CS BMP Scenario #2 Results from Water Quality Model), 1949-2010[a]

Parameter	Units	Existing	Project w/o PDFs			Project with PDFs		
		Result	*Result*	*Difference from Existing*	*Percent Difference from Existing*	*Result*	*Difference from Existing*	*Percent Difference from Existing*
Runoff Volume	acre-ft	106	2,979	+2,873	+2,706%	40	-66	-62%
TSS	tons/yr	25.1	496.6	+471.5	+1,882%	6.5	-18.6	-74%
Total Phosphorus	lbs/yr	357	2,984	+2,627	+736%	50	-307	-86%
Nitrate-N	lbs/yr	787	6,119	+5,332	+677%	80	-707	-90%
Nitrite-N	lbs/yr	51.2	734.2	+683.0	+1,333%	9.7	-41.5	-81%
Ammonia-N	lbs/yr	359	4,375	+4,016	+1,119%	54	-305	-85%
Total Nitrogen	lbs/yr	1,929	26,773	+24,844	+1,288%	346	-1,583	-82%
Total Copper	lbs/yr	11.6	208.6	+197.0	+1,703%	3.5	-8.1	-70%
Dissolved Copper	lbs/yr	3.9	102.7	+98.8	+2,547%	1.9	-2.0	-52%
Total Zinc	lbs/yr	60	2,037	+1,977	+3,273%	28	-32	-53%
Dissolved Zinc	lbs/yr	40	1,487	+1,447	+3,641%	22	-18	-44%
Total Lead	lbs/yr	4.3	88.1	+83.8	+1,955%	1.1	-3.2	-74%

[a] The 1949-2010 period of record was sampled randomly using a Monte Carlo approach to predict average annual runoff volumes and pollutant loads in each project condition.

Table 19
Average Annual Pollutant Concentrations for the Grapevine Project and Off-Site Roads (CS BMP Scenario #2 Results from Water Quality Model), 1949-2010[a]

Parameter	Units	Existing	Project w/o PDFs			Project with PDFs		
		Result	*Result*	*Difference from Existing*	*Percent Difference from Existing*	*Result*	*Difference from Existing*	*Percent Difference from Existing*
TSS	mg/L	174	123	-51	-29%	119	-55	-31%
Total Phosphorus	mg/L	1.24	0.37	-0.87	-70%	0.45	-0.79	-63%
Nitrate-N	mg/L	2.73	0.76	-1.97	-72%	0.73	-2.00	-73%
Nitrite-N	mg/L	0.18	0.09	-0.09	-49%	0.09	-0.09	-50%
Ammonia-N	mg/L	1.24	0.54	-0.70	-57%	0.49	-0.75	-61%
Total Nitrogen	mg/L	6.7	3.3	-3.4	-51%	3.1	-3.6	-53%
Total Copper	µg/L	40	26	-14	-36%	32	-8	-21%
Dissolved Copper	µg/L	13	13	0	-6%	17	+4	+26%
Total Zinc	µg/L	209	251	+42	+20%	256	+47	+23%
Dissolved Zinc	µg/L	138	184	+46	+33%	203	+65	+47%
Total Lead	µg/L	15	11	-4	-27%	10	-5	-32%

[a] The 1949-2010 period of record was sampled randomly using a Monte Carlo approach to predict average annual pollutant concentrations in each project condition.

Stormwater Runoff Volumes

For modeling purposes, the existing site conditions were represented as vacant with the exception of a small portion of existing commercial development. The overall imperviousness in the existing condition was estimated at 3.5%. In contrast, project developed land uses were assumed to have imperviousness values ranging from 0% for vacant areas to 100% for roadways, with an overall imperiousness of 43%. (See Appendix F, Tables F-10 and F-11, for a summary of modeled zones, assumed land uses and assumed imperviousness for the project).

As summarized in Tables 16 and 18, average annual runoff volumes are expected to decrease in the project (w/PDFs) condition for both CS BMP Scenarios #1 and #2, even with the increase in percent imperviousness and the decrease in infiltration capacity of the existing site soils due to compaction during construction. The decrease in volume can be attributed to the routing of stormwater runoff to highly infiltrating BMPs, including those distributed in the watershed as well as the regional treatment facilities.

Grapevine project BMPs include site design, source control, and treatment BMPs. Site design BMPs, especially the minimization of impervious area and the preservation of approximately 3,196 acres of exclusive agriculture within the project, contribute to the reduction of impacts associated with increases in stormwater runoff volume. The treatment BMPs would provide substantial runoff volume reduction via infiltration and evapotranspiration, in compliance with the Project LID Performance Standard. The reduction in stormwater runoff volume is not anticipated to have significant impacts on downstream water users due to the ephemeral nature of the project creek tributaries that results in dry periods between storm events. The project is also located at the top of the watershed for Grapevine and Live Oak Creeks, where lesser tributary flows are anticipated (Figure 2-6).

Therefore, with project BMPs in place, the overall stormwater runoff volumes are predicted to decrease in the developed condition, and the impacts would not be significant, or require mitigation.

Total Suspended Solids (TSS)

In the proposed (with PDFs) condition, the average annual TSS load is predicted to decrease (from 25 to 3 tons/year for the CS BMP #1 scenario and from 25 to 7 tons/year for the CS BMP #2 scenario) and the average annual TSS concentration is predicted to decrease (from 174 to 93 mg/L for the CS BMP #1 scenario and from 174 to 119 mg/L for the CS BMP #2 scenario). The decrease in loading is indicative of the conversion from agriculture/open space to urban land-uses (with infiltrating treatment BMPs incorporated). The Tulare Lake Basin Plan states:

"*The suspended sediment load and suspended sediment discharge rate of waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses*."

The concentration of TSS in project discharge, the total runoff volume containing TSS, and the associated loading are all predicted to decrease. Additionally, the model results are conservative because they do not include source control BMPs targeting TSS, which would further decrease the runoff concentrations and loading. Based on the comprehensive site design, source control, and LID treatment control strategy, TSS concentrations in stormwater runoff from the project would comply with the Basin Plan water quality objectives, and project and off-site road impacts associated with TSS would be less than significant, with no mitigation required.

Total Phosphorus

Total phosphorus loads are anticipated to decrease (from 357 to 28 tons/year for the CS BMP #1 scenario and from 357 to 50 tons/year for the CS BMP #2 scenario) and the concentrations are also predicted to decrease in the project condition (with PDFs) (from 1.2 to 0.52 mg/L for the CS BMP #1 scenario and from 1.2 to 0.45 mg/L for the CS BMP #2 scenario). It should be noted that the total phosphorus load in the developed without PDFs condition (2,984 tons/year) is nearly eight times higher than the existing condition.

Several factors can affect phosphorus concentrations and loads. For example, urbanization would tend to reduce natural sources; however pet wastes, landscape fertilization, and other human activities can increase phosphorus loadings. Analysis of land use runoff data from Los Angeles County[23] indicates that total phosphorus concentrations are higher in untreated runoff from village residential areas (mean of 0.23 mg/L) than from open space (mean of 0.12 mg/L) (see Appendix F, Table F-16).

The modeling results are conservative because they do not include source control BMPs that target nutrients, which would further reduce concentrations and loads of total phosphorus. Source control BMPs include distribution of educational materials on the proper handling of fertilizers and pet waste management, common area landscape management, implementation of an Integrated Pest Management Program for common landscaped areas, and the use of efficient irrigation systems in common areas.

While the Basin Plan does not contain a specific water quality objective for total phosphorus, there is a narrative objective for biostimulatory substances, which states:

[23] In lieu of urban runoff data from Kern County, data from Los Angeles County have been referenced as the most robust locally available dataset. This is discussed in further detail in Appendix F.

> *"Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance of adversely affects beneficial uses."*

The project would directly discharge stormwater runoff (beyond the design storm) to receiving waters in the Grapevine and South Valley Floor watersheds, which do not support algal growth because the ephemeral receiving waters dry out in between storms. Additionally, the proposed site design, source control, and LID treatment control strategies are predicted to contribute to further reduced phosphorus loads, so the impacts are considered less than significant, with no mitigation required.

Nitrogen

Total nitrogen, nitrate, nitrite, and ammonia loads are predicted to decrease in the project condition (with PDFs) for both the CS BMP #1 and CS BMP #2 scenarios. For both CS BMP scenarios, nitrate, nitrite, ammonia and total nitrogen concentrations are predicted to decrease in the project condition (with PDFs).

Site design BMPs that would further reduce nitrate concentrations and loadings include the use of native or other appropriate plants in development area plant palettes (reduced fertilizer usage). Source control BMPs would also target nutrients include educational materials on the proper handling of fertilizer and pet waste management, the use of IPM for common area landscape management, and the use of efficient irrigation systems in common areas.

The numeric Basin Plan water quality objective for ammonia, which is for the unionized form, states:

> *"Waters shall not contain un-ionized ammonia in amounts which adversely affect beneficial uses. In no case shall the discharge of wastes cause concentrations of un-ionized ammonia (NH3) to exceed 0.025 mg/L (as N) in receiving waters."*

The percentage of total ammonia (which is the form of ammonia modeled for this WQTR) present in the un-ionized form may be calculated based on temperature and pH (Florida Department of Environmental Protection, 2001). Un-ionized ammonia predominates when pH is high. Assuming a pH for project runoff of 8.0[24] and a temperature of 20°C, 3.8 percent of the total ammonia would be in the un-ionized form. The predicted ammonia concentration in runoff from the project and off-site roads is 0.48 mg/L for the CS BMP #1 scenario and is 0.49 mg/L

[24] This assumption is consistent with stormwater quality measurements made in 2007 for Tejon Ranch, upstream of the project site.

for the CS BMP #2 scenario. This translates to an un-ionized ammonia concentration of 0.02 mg/L for both scenarios, which is below the Basin Plan objective. The Basin Plan also has a narrative objective for biostimulatory substances, as summarized above for total phosphorus.

The decrease in total nitrogen in discharge from the project, including off-site roads, is anticipated to not result in significant adverse impacts.

The nitrate load is predicted to decrease from 787 lbs/year to 40 lbs/year for the CS BMP #1 scenario and from 787 lbs/year to 80 lbs/year for the CS BMP #2 scenario, and the nitrate concentration is also predicted to decrease from 2.7 mg/L to 0.75 mg/L for the CS BMP #1 scenario and from 2.7 mg/L to 0.73 mg/L for the CS BMP #2 scenario. However, there is no numeric objective for nitrate in the Basin Plan. Also, the total nitrogen concentration is predicted to decrease and non-modeled source controls would be expected to further reduce nutrient concentrations. Therefore, the project would comply with the Basin Plan objectives and potential impacts associated with nitrogen discharges to receiving waters would be less than significant, with no mitigation required.

Metals

Projected loads for all total and dissolved metals that were modeled are predicted to decrease in the project condition (with PDFs) for both the CS BMP #1 and CS BMP #2 scenarios. Projected concentrations of dissolved copper and total and dissolved zinc are projected to increase. Concentrations of total copper and total lead are anticipated to decrease with project development. The increase in concentrations can be attributed to the overall runoff volume being reduced within the infiltrating BMPs and through ET at a higher proportion than the overall load of the pollutants for the project. This is because any bypassed flows are assumed to be untreated and any additional runoff volume lost to ET within the project is not assumed to remove any pollutants, resulting in an overall lower load but a higher concentration for dissolved copper and total and dissolved zinc.

These model projections do not take into account source control and site design BMPs that would be implemented including the selection of building materials for roof gutters and downspouts that do not include copper or zinc and street sweeping on private streets and parking lots, which would further reduce pollutant concentrations. Source control BMPs that target metals include education for property owners, BMP maintenance, and street sweeping private streets and parking lots. The LID and treatment control BMPs would also reduce trace metals in the runoff from the project. Only the effects of the LID and treatment control BMPs are reflected in the model results.

A narrative objective for toxic substances in the Tulare Lake Basin Plan states: "all waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life".

Comparison of the predicted runoff metal concentrations and the acute CTR criteria for dissolved copper, total lead, and dissolved zinc are shown in Table 20. The CTR criteria are the applicable water quality objectives for protection of aquatic life. The CTR criteria are presented for dissolved copper and zinc because the dissolved form is more bioavailable and potentially toxic to aquatic species than the total fraction (only total lead was modeled due to the low occurrence of dissolved lead data). The acute CTR criteria are considered to be applicable for stormwater discharges because the duration of stormwater discharge is consistently less than 4 days. The CTR criteria are calculated on the basis of the hardness of the receiving waters. Lower hardness concentrations result in lower, more stringent CTR criteria. Because there are no wet weather hardness data for the project, the CTR criteria were calculated assuming a hardness concentration of 100 mg/L, which is the default concentration used by USEPA to calculate hardness-specific metals criteria.

The comparison of the predicted trace metal concentrations in runoff in the project (with PDFs) condition to the benchmark CTR values shows that the total lead concentrations are well below the benchmark water quality criteria, but that the dissolved copper and dissolved zinc concentrations are above the CTR criteria. However, the predicted existing condition average annual concentrations are also above the CTR criteria for dissolved zinc and equal to the CTR criteria for dissolved copper. The increase in concentration in the developed condition can be attributed to the modeled reduction in dilution in the stormwater runoff due to high levels of infiltration (i.e., the model does not account for metal removal via infiltration). Additionally, the overall loading from the project is significantly less in the developed condition and the model does not account for the removal of trace metals via source control and site design BMPs, which would be expected to further reduce metals loads and concentrations.

Based on the comprehensive site design, source control, LID, and treatment control BMP strategy and the comparison between existing and project condition results with benchmark water quality criteria, the project would have less than significant impacts resulting from trace metals, with no mitigation required.

Table 20
Comparison of Predicted Average Annual Trace Metals Concentrations with Water Quality Criteria

Metal	Existing Condition Concentration[1] (µg/L)	Project Condition Concentration (µg/L)		California Toxics Rule Criteria[4] (µg/L)
		CS BMP #1 PDFs[2]	*CS BMP #2 PDFs*[3]	
Dissolved Copper	13	23	17	13
Total Lead	15	10	10	82
Dissolved Zinc	138	195	203	120

[1]Modeled concentration for existing condition without development or BMPs
[2]Modeled concentration for developed conditions with BMPs for the CS BMP #1 Scenario
[3]Modeled concentration for developed conditions with BMPs for the CS BMP #2 Scenario
[4]Acute CTR criteria were calculated assuming a hardness concentration of 100 mg/L, which is the default concentration used by USEPA to calculate hardness-based metals criteria. This hardness concentration of 100 mg/L was used in lieu of wet weather hardness data for project receiving waters.

6.5.2 Stormwater Runoff Impacts for Pollutants and Parameters of Concern Addressed without Modeling

6.5.2.1 Pathogens (Bacteria, Viruses, and Protozoa)

Pathogens are viruses, bacteria, and protozoa that can cause gastrointestinal and other illnesses in humans through body contact exposure. Traditionally, regulators have used fecal indicator bacteria (FIB), such as total and fecal coliform, enterococci, and E. coli, as indirect measures of the presence of pathogens, and by association, human illness risk. Representative sources of fecal indicator bacteria include sanitary sewer overflows (SSOs), stormwater discharges from MS4s, illicit connections to storm sewer systems (dry weather discharges), inappropriate discharges to storm sewer systems (e.g., power washing), failing or improperly located onsite wastewater treatment systems (septic systems), WWTFs, wildlife, domestic pets, and agriculture. There are various factors that affect the reliability of FIB as pathogen indicators, including non-anthropogenic (natural) sources posing potentially less human health risk, growth of organisms within stormwater drainage infrastructure, and different persistence characteristics of real pathogens in the environment compared to FIB.

USEPA updated its recreational water quality criteria in 2012 (last published in 1986), which recommends using FIB enterococci and E. coli as indicators of fecal contamination in fresh water. Scientific advancements in microbiological, statistical, and epidemiological methods have demonstrated that culturable enterococci and E. coli are better indicators of fecal contamination than the previously used general indicators total coliform and fecal coliform. Water quality criteria consist of a geometric mean and statistical threshold value. USEPA recommends that states make a risk management decision about illness rate that will determine which set of criteria is most appropriate for the receiving waters.

Until recently, few epidemiological studies have tested the health effects related to exposure to the receiving waters receiving direct discharges of stormwater runoff, and these studies have found it difficult to link illness with stormwater sources of FIB. For instance, the Mission Bay epidemiological study (Colford et al., 2005) found that “only skin rash and diarrhea were consistently elevated in swimmers versus non swimmers, the risk of illness was uncorrelated with levels of traditional water quality indicators, and State water quality thresholds were not predictive of swimming-related illnesses.”

The primary sources of pathogen indicators from the project would likely be sediment, pet wastes, wildlife, and regrowth in the stormwater drainage system. Other sources of pathogens and FIB, such as cross connections between sanitary and storm sewers, are unlikely given that the sanitary sewer would be brand new and designed using modern sanitary sewer installation, inspection, and maintenance practices. Runoff concentrations from residential development are highly variable from site to site and from event to event, with a coefficient of variation (equal to the standard deviation divided by the mean) of approximately five according to a compilation of urban runoff water quality data contained in the National Stormwater Quality Database (Pitt et al., 2004). The National Stormwater Quality Database also indicates that runoff from residential areas has a median fecal coliform concentration of 8,345 MPN/100mL compared to a median concentration of 7,200 MPN/100mL for open space land use.

The concentrations and loads of bacteria in runoff from the project would be reduced by source controls and the LID PDFs. The most effective means of controlling specific bacteria sources, such as pet and other animal wastes, is through source control, specifically education of pet owners, education regarding feeding (and therefore attracting) of waterfowl near waterbodies, and providing products and disposal containers that encourage and facilitate cleaning up after pets. These PDFs are specified as project source controls.

Although there are limited data on the effectiveness of various stormwater treatment controls to reduce FIB concentrations, treatment processes that may reduce FIB concentrations include degradation by ultraviolet light (sunlight), sedimentation, and filtration. Manufactured devices that include disinfection are also effective in reducing FIB. A recent summary of the data from the International Stormwater BMP Database (Geosyntec Consultants and Wright Water Engineers, 2012) showed that median BMP effluent concentrations for enterococcus ranged from 10 MPN/100mL to 6,890 MPN/100mL. Statistically significant reductions in enterococcus were observed for bioretention, retention/wetland basins, and disinfection BMPs, with the greatest reduction observed following disinfection. Median enterococcus effluent concentrations actually increased when storm drain inlet insert filter BMPs were implemented (likely because the filter acts as a substrate for growth).

Median effluent concentrations in the BMP Database for fecal coliform bacteria ranged from 12 MPN/100mL to 11,200 MPN/100mL. Statistically significant reductions were observed for media filters and retention ponds. The lowest overall effluent median concentration was observed following disinfection, but too few samples were analyzed to evaluate the statistical difference between the median influent and effluent. Physical settling/straining devices appear to be the least effective BMP as the median effluent concentration was slightly higher than the median influent concentration.

In summary, stormwater discharges from the project could potentially exceed the Basin Plan fecal coliform objective for REC-1 beneficial use and therefore impacts from FIB may be significant without PDFs. However, the FIB concentrations in runoff from the project would be reduced through the implementation of source control and LID PDFs. The project will incorporate a number of source controls specific to managing FIB, including education of pet owners, education regarding feeding (and therefore attracting) of waterfowl near waterbodies, and providing products and disposal containers that encourage and facilitate cleaning up after pets. The project's sewer system will be designed to current standards which would minimize the potential for leaks. The project includes LID PDFs (e.g., infiltration and biotreatment controls), selected to manage pollutants of concern, including pathogen indicators. With these PDFs, the project would not result in substantial changes in pathogen levels compared to the existing condition that would cause a violation of the water quality objectives or WDRs, would not create runoff that would provide substantial additional sources of bacteria, or otherwise substantially degrade water quality in the receiving waters. Project water quality impacts related to pathogens would be less than significant, with no mitigation required.

6.5.2.2 Trash and Debris

Urban development can generate trash and debris. Trash refers to any human-derived materials including paper, plastics, metals, glass and cloth, while debris is typically associated with the natural condition (e.g., organic material transported by stormwater, including but not limited to, leaves, twigs, and grass clippings). Trash and debris can be characterized as material retained on a 5-mm mesh screen. In developed areas during rain events, trash and debris deposited on paved surfaces can be transported to un-screened storm drains, where it eventually can be discharged to receiving waters. Trash and debris can also be mobilized by wind and transported directly into waterways. The discharge of trash and debris can contribute to the degradation of receiving waters by imposing an oxygen demand during decomposition, attracting pests, disturbing physical habitats, clogging storm drains and conveyance culverts, and carrying nutrients, pathogens, metals, and other pollutants that may be attached to the surfaces.

Urbanization could significantly increase trash and debris loads, if controls are not implemented. However, project PDFs, including site design, source control, and LID measures would significantly reduce the amount of trash and debris in runoff. Based on these considerations, post-development trash and debris would be less than significant to the receiving waters of the project, with no mitigation required.

6.5.2.3 Temperature

The Basin Plan states "elevated temperature wastes shall not cause the temperature of waters designated COLD or WARM to increase by more than 5°F above natural receiving water temperature." Runoff from the project, from storm events larger than the design storm, would discharge directly to Grapevine Creek, Live Oak Creek, Cattle Creek or Pastoria Creek, which together as "West Side Streams" and "Valley Floor Waters" have a WARM beneficial use.

The project would minimize temperature impacts to receiving waters by implementing the following PDFs:

- The project would use LID PDFs that promote infiltration where feasible, thus reducing the total volume of runoff that is discharged.
- Runoff from roads (typically high temperature surfaces) would be treated by distributed infiltration BMPs, where not routed to a community-scale basin. Regional basins would be designed to infiltrate runoff discharged into the basin, up to the design storm.
- The community-scale basins would not include permanent pools, which could contribute to warming, but would incorporate biofiltration which would help to regulate temperature of the project's discharges.

Therefore, because the project's water quality treatment would rely on infiltration, the detention facilities would not include permanent pools, and any discharges from the community-scale facilities would occur during the wet (cooler) season, it is unlikely that project discharges would result in increasing receiving water temperatures by more than 5°F. Therefore, the effect of project discharges on receiving water temperature would be less than significant, with no mitigation required.

6.5.2.4 Constituents of Emerging Concern

CEC concentrations in stormwater runoff can be expected to be reduced via treatment in the project's LID PDFs, which would include unit processes to filter, sorb, and biologically transform CECs present in runoff. However, the expected effluent concentrations from LID PDFs are not known, nor are the effects of these concentrations on the aquatic ecosystem.

Given the thousands of chemicals that are potentially present in the aquatic environment and because information about CECs is rapidly evolving, developing a methodology to assess impacts from CECs in stormwater runoff (and wastewater) is being addressed at the State level. The Panel selected to study the effects of CECs in California's receiving waters made recommendations for implementation of a phased monitoring approach to evaluate the impacts of CECs in stormwater and WWTF discharges in the report "*Monitoring Strategies for Chemicals of Emerging Concern (CECs) in California's Aquatic Ecosystems*" (SCCWRP, 2012). The targeted CECs were selected using application of a risk-based screening framework. The Panel recommends that the State conduct the monitoring through a program such as the Surface Water Ambient Monitoring Program (SWAMP).

Use of a phased monitoring approach at the state level approach allows for a logical, sequential course of action to develop new information utilizing state-of-the-art monitoring and modeling tools, which include:

- Non-targeted analyses using advanced bioanalytical and chemical methods;
- Confirmatory biological investigations linking chemical and bioassay screening data with higher order effects (i.e., at the organism and population level);
- Environmental fate models and screening-level mass-based models that can assist in estimating the predicted environmental concentrations in effluents coupled with structure-based toxicity assessments to determine the source, occurrence, fate and effects of CECs; and
- Baseline monitoring for antibiotic resistance in WWTF effluents.

The Panel recommends that after two to three years of implementation, the Panel or a similar entity reconvene to evaluate the results of the initial monitoring and to assess the effectiveness of the monitoring approach including an update of the risk-based screening process and the CEC monitoring lists. After this interval there will undoubtedly be new tools to assess toxicity and occurrence; it will also be important to fully assess the effectiveness of control actions (if any) that have been undertaken by the state at periodic intervals.

Implementation of a state-level program to evaluate the occurrence and effects of CECs in stormwater will result in the development of control measures that would ultimately reduce water quality impacts to a less than significant level, with no mitigation required.

6.5.2.5 Turbidity

Turbidity is a measure of suspended matter that interferes with the passage of light through the water or in which visual depth is restricted (Sawyer et al, 1994). Turbidity may be caused by a variety of suspended materials, which range in size from colloidal to coarse dispersions, depending upon the degree of turbulence. In lakes or other waters existing under relatively quiescent conditions, most of the turbidity will be due to colloidal and extremely fine dispersions. In rivers under flood conditions, most of the turbidity will be due to relatively coarse dispersions. Erosion of clay and silt soils may contribute to in-stream turbidity (see discussion of hydromodification impacts in Section 6.5.3 below). Organic materials reaching rivers serve as food for bacteria, and the resulting bacterial growth and other microorganisms that feed upon the bacteria produce additional turbidity. Nutrients in runoff may stimulate the growth of algae, which also contribute to turbidity.

In the post-development condition, placement of impervious surfaces will serve to stabilize soils and to reduce the amount of erosion that may occur from the project during storm events, and would therefore decrease turbidity in the runoff (see also hydromodification impacts discussed in Section 6.5.3 below). Project PDFs, including source controls (such as common area landscape management and common area litter control) and treatment control BMPs in compliance with the SUSMP requirements and the LID Performance Standard, would prevent or reduce the release of organic materials and nutrients (which might contribute to algal blooms) to receiving waters thereby reducing turbidity. As shown above, post-development nutrients in runoff are not expected to cause significant water quality impacts. Based on implementation of the project PDFs and the construction-related controls outlined in Section 1.2.3, runoff discharges from the project would not cause increases in turbidity which would result in adverse effects to beneficial uses in the receiving waters. Based on these considerations, the water quality impacts of the project on turbidity are considered less than significant, with no mitigation required.

6.5.2.6 Pesticides

Pesticides can be of concern where past farming practices involved the application of persistent organochlorine pesticides. Historical pesticides should no longer be discharged in the watershed except in association with erosion of sediments to which these pollutants may have adhered in the past. Site development involves remedial grading which would stabilize soils and prevent their transport from the project site, actually reducing the potential for discharge of sediments to which historical pesticides may have adsorbed in pre-development conditions.

In the post-developed condition, pesticides would likely be applied to common landscaped areas and residential lawns and gardens. Pesticides that have been commonly found in urban streams include the organophosphate pesticides chlorpyrifos and diazinon (Katznelson and Mumley, 1997). However, as an example, only 0 to 13% of the samples in the Los Angeles County database[25] had detectable levels of diazinon (depending on the land use) while levels of chlorpyrifos were below detection limits for all land uses in all samples taken between 1994 and 2000 (LACDPW, 2000). Other pesticides presented in the database were seldom measured above detection limits. Furthermore, these data represent flows from areas without treatment controls, unlike the project, which would incorporate source control and treatment BMP PDFs.

Diazinon and chlorpyrifos are two pesticides of concern due to their potential toxicity in receiving waters. The EPA has banned all indoor uses of diazinon in 2002 and stopped all sales for all outdoor non-agricultural use in 2003 (EPA, June, 2002)[26]. The EPA is has also phased out most indoor and outdoor residential uses of chlorpyrifos and has stopped all non-residential uses where children may be exposed. Use of chlorpyrifos in the project area is not expected, with the possible exception of emergency fire ant eradications until such time as reasonable alternative products are available and only with appropriate application practices in accordance with the landscape pesticide management program.

Diazinon had long been one of the most commonly used pesticides on the market (SFBRWQCB, 2005) before its use was phased-out. Although the USEPA’s actions eliminated most urban diazinon uses by the end of 2004, phasing out diazinon likely has increased post-2004 reliance on alternative pesticides and encouraged new pesticides to enter the marketplace.

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[25] In lieu of urban runoff data from Kern County, data from Los Angeles County have been referenced as the most robust locally available dataset.

[26] Changes to the use of chlorpyrifos include reductions in the residue tolerances for agricultural use, phase out of nearly all indoor and outdoor residential uses, and disallowal of non-residential uses where children may be exposed. Retail sales of chlorpyrifos were stopped by December 31, 2001, and structural (e.g. construction) uses were phased out by December 31, 2005. Some continued uses will be allowed, for example public health use for fire ant eradication and mosquito control is permitted by professionals.

Permissible uses of diazinon are also restricted. All indoor uses are prohibited (as of 12/2002) and retailers were required to end sales for indoor use on December 2002. All outdoor non-agricultural uses were phased out by December 31, 2004. Therefore it is likely that the EPA ban will eliminate most of the use of diazinon within the Project area. The use of diazinon for many agricultural crops has been eliminated (EPA 2001), while some use of this chemical would continue to be permitted for some agricultural activities.

The San Francisco Regional Water Quality Control Board commissioned a study, *Insecticide Market Trends and Potential Water Quality Implications*, to evaluate pesticide use trends as they relate to water quality. In 2003, on the basis of current and projected pesticide use and possible water quality risks, the report considered the pesticide alternatives of potential concern for water quality to be pyrethrums; parathyroid's (bifenthrin, cyfluthrin, cypermethrin, deltamethrin, esfenvalerate, and permethrin); carbaryl; malathion; and imidacloprid (SFBRWQCB, 2003). A more recent study also identified lambda cyhalothrin (a pyrethroid) and fipronil among pesticides of interest (SFEP, 2005).

The water quality risks posed by a pesticide relate to the quantity of the pesticide used, its breakdown rate or degradable rate, its runoff characteristics, and its relative toxicity in water and sediment. As urban diazinon applications are phased out, the use of some alternatives may inadvertently pose new water quality risks. Given what is known about alternative pesticide use trends, pyrethroids may be the alternatives that pose the greatest concerns for water quality (SFBRWQCB, 2005). Although pyrethroids tend to be toxic to Ceriodaphnia dubia test organisms at concentrations in water comparable to diazinon, pyrethroids do not dissolve well in water but instead adhere well to surfaces, including particles in the environment (SFBRWQCB, 2005). At equilibrium, pyrethroid concentrations in sediment are reported to be about 3,000 times greater than dissolved concentrations in water (SFBRWQCB, 2005). Thus, BMPs targeting reductions and removal of sediment loads would be effective to reduce and remove pyrethroids as well.

Source control measures such as education programs for owners, occupants, and employees in the proper application, storage, and disposal of pesticides are the most promising strategies for controlling the pesticides that would be used post-development. Structural treatment controls are less practical because of the variety of pesticides and wide range of chemical properties that affect their treatability. However, most pesticides, including historical pesticides that may be present at the site, are relatively insoluble in water and therefore tend to adsorb to the surfaces of sediment, which would be stabilized with development, or if eroded, would be settled or filtered out of the water column in the treatment BMP and treatment control PDFs. In addition, bioinfiltration media contains sorption sites that would promote the removal of pesticides. Thus, treatment in the treatment BMPs should achieve some removal of pesticides from stormwater as TSS is reduced and stormwater is biofiltered.

For common area landscaping in commercial areas, multi-family residential areas, and parks, an IPM Program will be incorporated. The goal of an IPM is to keep pest levels at or below threshold levels, reducing risk and damage from pest presence, while eliminating the risk from the pest control methods used. IPM programs achieve these goals through the use of low risk management options by emphasizing use of natural biological methods and the appropriate use of selective pesticides. IPM programs also incorporate environmental consideration by implementing procedures that minimize intrusion and alteration of biodiversity in ecosystems.

While pesticides are subject to degradation, they vary in how long they maintain their ability to eradicate pests. Some break down almost immediately into nontoxic byproducts, while others can remain active for longer periods of time. While pesticides that degrade rapidly are less likely to adversely affect non-targeted organisms, in some instances it may be more advantageous to apply longer-lasting pesticides if it results in fewer applications or smaller amounts of pesticide use. As part of the IPM program, careful consideration will be made as to the appropriate type of pesticides for use on the project site. While pesticide use is likely to occur due to maintenance of landscaped areas, particularly in the residential portions of the development, careful selection, storage and application of these chemicals for use in common areas per the IPM Program will help prevent adverse water quality impacts from occurring. Additionally, as discussed above, removal of sediments in the LID and treatment control PDFs will also remove sediment-adsorbed pesticides.

Based on the incorporation of site design, source control, LID, and treatment control BMPs pursuant to LID Performance Standard, potential post-development impacts associated with pesticides would be less than significant, with no mitigation required.

6.5.2.7 Petroleum Hydrocarbons (Oil and Grease, Polycyclic Aromatic Hydrocarbons)

Various forms of petroleum hydrocarbons (oil and grease) are common constituents associated with urban runoff; however, these constituents are difficult to measure and are typically measured with grab samples, making it difficult to develop reliable EMCs for modeling. Based on this consideration, petroleum hydrocarbons were not modeled but are addressed qualitatively.

Petroleum hydrocarbons are a broad class of compounds, most of which are non-toxic. Petroleum hydrocarbons are hydrophobic (low solubility in water), have the potential to volatilize, and most forms are biodegradable. A subset of petroleum hydrocarbons, PAHs can be toxic depending on the concentration levels, exposure history, and sensitivity of the receptor organisms. Of particular concern are those PAH compounds associated with transportation-related sources.

Although the concentration of petroleum hydrocarbons in runoff is expected to increase under post-development conditions due to the increase in roadways, driveways, parking areas, and vehicle use, the PDFs are expected to prevent appreciable increases in hydrocarbon concentrations from leaving the project site. Source control PDFs that address petroleum hydrocarbons include educational materials on used oil programs, carpooling, and public transportation alternatives to driving; BMP maintenance; and street sweeping. Additionally, the parking treatment BMP PDFs will adsorb the low levels of emulsified oils in stormwater runoff, preventing discharge of petroleum hydrocarbons and visible film in the discharge or the coating of objects in the receiving water.

The majority of PAHs in stormwater adsorb to the organic carbon fraction of particulates in the runoff, including soot carbon generated from vehicle exhaust (Ribes et al, 2003). For example, a stormwater runoff study by Marsalek et. al. (1997) found that the dissolved-phase PAHs represented less than 11 percent of the total concentration of PAHs. Consequently, the treatment BMPs, which are designed to treat particulate pollutants through settling, filtration, and infiltration, will be effective at treating PAHs.

Los Angeles County[27] conducted PAH analyses on 27 stormwater samples from a variety of land uses in the period 1994-2000 (LACDPW, 2000). For those land uses where sufficient samples were taken and were above detection levels to estimate statistics, the mean concentrations of individual PAH compounds ranged from 0.04 to 0.83 µg/L. The reported means were less than acute toxicity criteria available from the literature (Suter and Tsao, 1996). Moreover, the Los Angeles County data do not account for any treatment, whereas the treatment in the PDFs should result in a reduction in petroleum hydrocarbon concentrations inclusive of PAHs. This makes it very unlikely that impacts would occur to the receiving water due to hydrocarbon loads or concentrations. On this basis, the effect of the project on petroleum hydrocarbon levels in the receiving waters post-development would be less than significant, with no mitigation required.

6.5.3 Hydromodification Impacts

In this section, changes in the four key geomorphic conditions that affect stream stability (i.e., hydrology, bed sediment supply, channel geometry, and bed and bank material) are evaluated in relation to the following hydromodification control performance standard:

> *The erosion potential (Ep) of susceptible watercourses associated with the Project shall be maintained within an appropriate range of the target value. The target Ep shall be 1.0 unless a more appropriate value is derived based on best available science. The target Ep shall account for changes in sediment supply at the point of analysis. If the Project does not significantly alter the hydrology, bed sediment supply, channel geometry, and*

[27] In lieu of urban runoff data from Kern County, data from Los Angeles County have been referenced as the most robust locally available dataset.

bed/bank material of a receiving stream, then the Project is in compliance with the Ep management objective for this watercourse.

Significant adverse hydromodification impacts are presumed to occur if the project would:

WQ-3: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site.

For the purposes of this report, the project's hydromodification impacts have been qualitatively and semi-quantitatively evaluated to assess if the project causes significant changes to the four key geomorphic conditions, as detailed in the following sections. Quantification of Ep and bed sediment supply reductions, as required by the performance standard, will be performed in the next stage of modeling and design. These geomorphic conditions were evaluated for each of the six jurisdictional receiving streams associated with the project: Tecuya Creek; Grapevine Creek, Cattle Creek-2 (CC-2), Live Oak Creek, Cattle Creek-1 (CC-1), and Pastoria Creek. The severity of concern for each geomorphic condition within each jurisdictional receiving stream was determined as either "none", "negligible", "low", "medium", or "high" (Table 21). Geomorphic conditions of concern include those identified as low, medium, or high severity. Note that none of the factors evaluated for the project have been identified as having a "high" severity of concern.

Table 21
Severity of Concern for Changes in Geomorphic Conditions

Receiving Stream	Change in Hydrology	Change in Bed Sediment Supply	Change in Channel Geometry	Change in Bed and Bank Material
Tecuya Creek	None	Negligible	Negligible	None
Grapevine Creek	Negligible[2]	Low[1]	Medium[1]	Negligible
Cattle Creek 2	Negligible[2]	Medium to Low[1]	Negligible	Negligible
Live Oak Creek	None	None	None	None
Cattle Creek 1	None	None	None	None
Pastoria Creek	None	None	None	None

[1]Geomorphic condition of concern.

[2]Changes in hydrology in Grapevine Creek and Cattle Creek 2 are associated with project runoff reductions. These reductions result in a small net positive impact with regard to long-term stream stability.

6.5.3.1 Hydrologic Impacts

The project would include PDF#3, as described in Section 1.2.3, including both distributed infiltration BMPs (designed for the highest, or most conservative, of 80% capture and the 85th

percentile, 24-hour runoff volume) as well as community-scale flood control basins (designed to capture the 10-year, 5-day storm event), which would also infiltrate captured stormwater and urban runoff form the developed portions of the site. Site drainage patterns would also be graded such that dry weather runoff would be routed to either the distributed BMPs or community-scale basins prior to discharging to Grapevine or other local creeks (in most cases basins would not discharge at all since they are designed to infiltrate captured runoff). The water quality model, described in Section 5.1, demonstrates that these BMPs are predicted to reduce the average annual runoff volume from approximately 117 acre-ft/year in the existing condition to 20 acre-ft/year in the proposed (with PDFs) condition for the CS BMP #1 scenario or to 40 acre-ft/year in the proposed (with PDFs) condition for the CS BMP #2 scenario. These reductions correspond to an overall decrease in average annual runoff volume of 83% and 65%, respectively.

As shown in Table 22, a comparison was made of the proposed project drainage areas tributary to each jurisdictional receiving stream to the respective existing total watershed area.

Table 22
Project Contributions to Watershed Area

Receiving Stream	Proposed Tributary Project Drainage Area (acres)	Existing Tributary Watershed Area (acres)	Relative Project Contribution to Watershed (Proposed/Existing) (%)
Tecuya Creek[1]	34	33,677	0.1%
Grapevine Creek	1,883	19,823	9.5%
Cattle Creek 2	400	856	46.7%
Live Oak Creek	-	5,576	0.0%
Cattle Creek 1	-	766	0.0%
Pastoria Creek	-	20,134	0.0%
Canals (to Pastoria)[2]	267	N/A	N/A
Canal 850[3]	2,632	N/A	N/A

[1] Proposed tributary project drainage area includes 34 acres for the off-site weigh station.
[2] Canals that eventually discharge to Pastoria Creek are engineered canals that are not susceptible to hydromodification impacts. Pastoria Creek, however, is considered susceptible to hydromodification impacts.
[3] Canal 850 is an engineered canal that does not discharge to a jurisdictional receiving stream. Canal 850 is not considered susceptible to hydromodification impacts.

As shown, only Cattle Creek 2 and Grapevine Creek have appreciable project area contributions to their watersheds. However, because of the significant reduction of the average annual runoff volume post-development, concern over changes in hydrology for Cattle Creek 2 and Grapevine Creek are negligible. Concerns for changes in hydrology were not identified for Tecuya Creek, Live Oak Creek, Cattle Creek 1, and Pastoria Creek. Additionally, project BMPs will provide hydrologic controls, including peak flow reduction due to the holding capacity of the planned stormwater BMPs, mitigation of flooding by the flood control basins, and on-site infiltration of captured runoff rather than discharge to a local water body will reduce Thus, the impacts associated with changes in hydrology would not be significant nor require mitigation.

6.5.3.2 Bed Sediment Supply Impacts

Bed sediment supply changes were characterized semi-quantitatively for each receiving stream based on screening-level GIS calculations of area and stream length that would be eliminated by the project and other planned development in the watersheds. These reductions in area and stream length were then compared to the totals by watershed.

Tables 23 and 24 provide the results of the bed sediment source reduction calculation. The map of these sediment source reductions are provided in Figure 6-1. The screening-level calculations below do not account for the higher sediment supply rates associated with steep terrain (i.e., sources in the upstream Tehachapi and San Emigdio Mountains) compared to the relatively low sediment supply rates on flat terrain (i.e., the Valley Floor alluvial fan). The calculations also do not account for sediment supplies reduced by debris basins or partial trapping of sediment behind stream constrictions (e.g., in-stream culverts). For Grapevine Creek, this could affect results for the existing and cumulative ultimate buildout conditions due to the presence of debris basins within the Interstate 5 freeway corridor. Taking these debris basin sediment reductions into account, it was estimated that Grapevine Creek sediment sources may be reduced by up to 75 to 99 percent in the existing condition (compared to 7 to 17 percent without accounting for debris basins) and up to 80 to 100 percent in the cumulative ultimate buildout condition (compared to 18 to 26 percent without accounting for debris basins). The sediment source reduction calculations for Grapevine Creek do not change for the “Grapevine project only” condition when debris basin sediment capture is considered. It should be noted that bed sediment supply measurements and calculations are inherently inexact and the screening-level analysis will be expanded in a more detailed fashion in the next stage of modeling and design.

Table 23
Area Not Contributing to Sediment Supply

Point of Interest	Tributary Area (acres)	Area Not Contributing to Sediment Supply (acres)			% of Area Not Contributing to Sediment Supply		
			Ultimate Condition			*Ultimate Condition*	
		Existing Condition	*Grapevine Project only*	*Cumulative (Grapevine Project + Existing + TMV)*	*Existing Condition*	*Grapevine Project only*	*Cumulative (Grapevine Project + Existing + TMV)*
Tecuya B	13,032	329	66	394	2.5%	0.5%	3.0%
Tecuya A	33,677	1,059	100	1,140	3.1%	0.3%	3.4%
Grapevine C	16,165	1,255	57	2,892	7.8%	0.4%	17.9%
Grapevine B	19,329	1,428	1,365	4,285	7.4%	7.1%	22.2%
Grapevine A	19,823	1,473	1,537	4,490	7.4%	7.8%	22.7%
CC-2	856	30	384	403	3.5%	44.9%	47.1%
Live Oak	5,576	44	1	1,151	0.8%	0.0%	20.6%
CC-1	766	12	-	12	1.5%	0.0%	1.5%
Pastoria	20,134	405	-	2,085	2.0%	0.0%	10.4%

Table 24
Stream Length Not Contributing to Sediment Supply

Point of Interest	Tributary Stream Length (miles)	Stream Length Not Contributing to Sediment Supply (miles)			% of Stream Length Not Contributing to Sediment Supply		
			Ultimate Condition			*Ultimate Condition*	
		Existing Condition	*Grapevine Project only*	*Cumulative (Grapevine Project + Existing + TMV)*	*Existing Condition*	*Grapevine Project only*	*Cumulative (Grapevine Project + Existing + TMV)*
Tecuya B	65.0	2.9	-	2.9	4.4%	0.0%	4.4%
Tecuya A	146.4	7.3	-	7.3	5.0%	0.0%	5.0%
Grapevine C	67.8	11.4	0.4	16.4	16.8%	0.5%	24.2%
Grapevine B	86.8	12.6	5.8	22.2	14.5%	6.7%	25.6%
Grapevine A	91.7	13.4	5.8	23.1	14.6%	6.4%	25.2%
CC-2	6.4	0.4	1.5	1.8	6.2%	23.6%	28.0%
Live Oak	23.5	0.4	0.0	3.3	1.9%	0.2%	13.9%
CC-1	4.7	-	-	-	0.0%	0.0%	0.0%
Pastoria	84.5	3.1	-	6.1	3.6%	0.0%	7.2%

In identifying bed sediment reductions of concern associated with the Grapevine project, Soar and Thorne (2001) indicate that a greater than 10% reduction in sediment supply can have potentially significant effects on stream stability. On this basis, reductions less than 10% were used as a preliminary significance threshold. In Cattle Creek 2 reductions in bed sediment supply is of medium concern for the "Grapevine project only" condition due to the proportion of sediment sources being reduced by Project development (24 to 45 percent). However, given that the screening-level sediment supply source calculations do not account for the higher sediment supply rates associated with steep terrain (i.e., sources in the upstream Tehachapi Mountains) compared to the relatively low sediment supply rates on flat terrain (i.e., the Valley Floor alluvial fan), and that project development in the Cattle Creek 2 watershed is located on the alluvial fan and not in steep terrain, then there is justification to consider this condition of concern to have low severity. Bed sediment supply reductions are of low concern in Grapevine Creek because source reductions are anticipated up to just below the 10 percent significance threshold, but are relatively minor (1 to 8 percent). Concern for changes in bed sediment supply are negligible for Tecuya Creek and do not exist for Live Oak Creek, Cattle Creek 1, and Pastoria Creek.

Compensation for these bed sediment reductions will be through the implementation of sediment management measures (PDF #4a) to meet the hydromodification control performance standard. PDF #4a includes: avoiding significant bed material supply sources in site design; passing through sediments from natural open spaces; replacement of significant bed material sources that are eliminated; and additional detention and retention in site runoff.

Therefore, impacts associated with changes in bed sediment supply are found to be less than significant, with no mitigation required.

6.5.3.3 Channel Geometry Impacts

Changes to channel geometry are characterized qualitatively by comparing the FEMA 100-year floodplain to the project's development area (Figure 6-2). It should be noted, however, that although this analysis uses the FEMA 100-year floodplain as currently mapped, the floodplain and floodway are currently under review and may be revised based on site-specific topographic contours. If the mapped floodplain is ultimately reduced, this analysis would remain conservative, as it is based on a wider floodplain.

As currently mapped, the 100-year floodplain width is estimated to be reduced by up to 70 percent (from approximately 6,300 feet to 1,800 feet at the widest cross-section), as a result of development. While this reduction is considerable, the severity of this concern is considered medium, and not high, because the project does conserve the existing active riparian corridor of Grapevine Creek, which appears to be incising over time into a more entrenched morphology due to bed sediment supply reductions and localized channel constrictions associated with existing development (i.e., Interstate-5 debris basins and culverts crossing Edmonston Pumping Plant Road). Due to this entrenchment, is it anticipated that Grapevine Creek overbank flow conditions do not occur as often as they once did naturally. Additionally, a more entrenched channel that has most of its bed sediment supply cut off is less likely to avulse than it did naturally. Concern for changes in channel geometry is negligible for Tecuya Creek and Cattle Creek 2 because floodplain disturbance will be minimal. Concerns for changes in channel geometry due to the project were not identified for Live Oak Creek, Cattle Creek 1, and Pastoria Creek.

Therefore, changes in channel geometry will occur due to the project, but this narrowing of channel width is not anticipated to create a significant impact. Reductions in channel width are not significant for five of the six jurisdictional receiving streams including Tecuya Creek, Cattle Creek 2, Live Oak Creek, Cattle Creek 1, and Pastoria Creek. Compensation for narrowing of the Grapevine Creek channel will through the implementation of channel geometry management measures (PDF #4b) to meet the hydromodification control performance standard. PDF #4b includes: establishing riparian buffer zones around the active channel; reinforcing stream banks to withstand channel avulsion with buried bank stabilization along the edges of the proposed stream corridor; and properly designing for stream constrictions.

Therefore, impacts associated with changes in channel geometry are found to be less than significant, with no mitigation required.

6.5.3.4 Bed and Bank Material Impacts

Changes in bed and bank material are not anticipated to be significantly impacted. No modifications of bed and bank material are anticipated in the active riparian corridors of Tecuya Creek, Live Oak Creek, Cattle Creek, and Pastoria Creek. Alteration of bed and bank material within Cattle Creek 2 and Grapevine Creek due to potential grazing on riparian vegetation and localized scour at outfall discharge locations will be controlled through the implementation of bed and bank material management measures (PDF #4c). PDF #4c includes prohibiting cattle within the riparian corridors and dissipating flow energy at outfalls that discharge onto the bed and banks.

Therefore, impacts associated with changes in bed and bank material are found to be less than significant, with no mitigation required.

6.5.4 Flooding Impacts

Significant adverse hydrologic impacts are presumed to occur if the project would:

> *WQ-4: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the*

rate or amount of surface runoff in a manner which would result in flooding on- or off-site.

The project is designed to retain on-site the 10-year, 5-day design storm per the Kern County Development Standards for both the original site imperviousness (CS BMP scenario #1) and a modified site imperviousness to account for upstream BMPs (CS BMP scenario #2) (Geosyntec, 2015). The County requirements for alluvial fan development and flood control facilities on alluvial fans will also be followed. Additionally, buffers have been proposed along Grapevine Creek between the water body and the development and, due to the proposed BMPs, the average annual runoff volume is decreased in the project condition with PDFs than in the existing condition. Therefore, impacts associated with drainage pattern modifications resulting in on-site flooding are found to be less than significant.

6.5.5 Groundwater Quality Impacts

Significant adverse groundwater quality impacts are presumed to occur if the project would:

WQ-1: Violate any water quality standards or waste discharge requirements; or

WQ-6: Otherwise substantially degrade water quality.

Groundwater quality, if impacted, would most likely be impacted by the infiltration of retained stormwater and urban runoff or surface infiltration of recycled wastewater from the WWTF used for landscape irrigation. Nitrate, CECs, and TDS have been identified as the pollutants of concern for groundwater.

6.5.5.1 Nitrate

Nitrate has been identified as a pollutant of concern for groundwater. The Kern County groundwater basin has a groundwater quality objective that is equal to the nitrate-N drinking water MCL (10 mg/L [as nitrogen]). The predicted nitrate-N concentration in runoff from the project with PDFs for the CS BMP #1 scenario is 0.75 mg/L and is 0.73 mg/L for the CS BMP #2 scenario (sees Tables 17 and 19) . These predicted concentrations are significantly below the nitrate-N MCL of 10 mg/L (EMCs range from 0.61 to 1.5 mg/L, excluding agriculture). On this basis, the potential for infiltrated stormwater runoff to adversely affect nitrate-N levels in groundwater would be less than significant.

While the concentrations of other parameters are predicted to increase in the project condition, as discussed previously, they are not anticipated to impact the underlying groundwater basin due to uptake by vegetation, sorption to soils, etc. This is supported by a study conducted in Fresno to assess the water quality impacts beneath urban runoff management basins. The two-year study found that while inorganic and organic pollutants were present in the runoff water sent to the basins, no significant contamination of the soils or underlying groundwater was measured (Nightingale, 1987). On this basis, the potential for infiltrated stormwater runoff to adversely affect groundwater quality would be less than significant.

Wastewater generated by the project would be treated in the proposed WWTF. Implementation and construction of the WWTF would require the acquisition of numerous permits and the approval of several agencies, including the CVWB, CDPH, and Kern County. The WWTF's water quality will comply with WDRs that would be obtained from the Regional Water Board. As required by the Porter-Cologne Act and the Basin Plan, the WDRs will include effluent limitations that will be protective of groundwater quality and designated beneficial uses. Additionally, an Engineering Report for the production, distribution, and use of reclaimed water, focused on protecting public health, will be submitted to both the Regional Water Board and the CDPH. On this basis, the potential for infiltration of recycled irrigation water to adversely affect groundwater quality for nitrate-N would be less than significant.

6.5.5.2 Constituents of Emerging Concern

CEC concentrations in stormwater runoff can be expected to be reduced via treatment in the project's LID PDFs, which would include until processes to filter, sorb, and biologically transform CECs present in runoff. However, the expected effluent concentrations from LID PDFs are not known nor are the effects of these concentrations on the aquatic ecosystem.

Given the thousands of chemicals that are potentially present in the aquatic environment and because information about CECs is rapidly evolving, developing a methodology to assess impacts from CECs in stormwater runoff (and wastewater) is being addressed at the state level. The Panel selected to study the effects of CECs in California's receiving waters made recommendations for implementation of a phased monitoring approach to evaluate the impacts of CECs in stormwater and WWTF discharges in the report "*Monitoring Strategies for Chemicals of Emerging Concern (CECs) in California's Aquatic Ecosystems*" (SCCWRP, 2012). The targeted CECs were selected using application of a risk-based screening framework. The Panel recommends that the state conduct the monitoring through a program such as SWAMP and the San Francisco Bay Regional Monitoring Program.

Use of a phased monitoring approach at the state level allows for a logical, sequential course of action to develop new information utilizing state-of-the-art monitoring and modeling tools, which include:

- Non-targeted analyses using advanced bioanalytical and chemical methods;
- Confirmatory biological investigations linking chemical and bioassay screening data with higher order effects (i.e., at the organism and population level);
- Environmental fate models and screening-level mass-based models that can assist in estimating the predicted environmental concentrations in effluents coupled with structure-based toxicity assessments to determine the source, occurrence, fate and effects of CECs; and
- Baseline monitoring for antibiotic resistance in WWTF effluents.

The Panel recommended that after two to three years of implementation, the Panel or a similar entity reconvene to evaluate the results of the initial monitoring and to assess the effectiveness of the monitoring approach including an update of the risk-based screening process and the CEC monitoring lists. After this interval there will undoubtedly be new tools to assess toxicity and occurrence; it will also be important to fully assess the effectiveness of control actions (if any) that have been undertaken by the state at periodic intervals.

Implementation of a state-level program to evaluate the occurrence and effects of CECs in stormwater will result in the development and implementation of state-level control measures that would ultimately reduce groundwater quality impacts from the project to a less than significant level.

6.5.5.3 Total Dissolved Solids (TDS)

The Basin Plan identifies salts as a crucial problem in the Tulare Lake Basin "due to evaporation and crop transpiration removing water from soils, resulting in an accumulation of salts in the root zone of the soils at levels that retard or inhibit plant growth. Additional amounts of water often are applied to leach the salts below the root zone. The leached salts eventually enter ground or surface water." The Basin Plan also states, "All ground waters shall be maintained as close to natural concentrations of dissolved matter as is reasonable considering careful use and management of water resources." The Kern River Hydrographic Unit, in which the project site is located, is limited to a maximum average annual increase in salinity in groundwater, as measured by electrical conductivity, of 5 μmhos/cm. The applicable water quality objective for TDS is the secondary Federal MCL (taste and odor or welfare based), which is 500 mg/L; in California, the CDPH has set a recommended MCL of 500 mg/L, and upper concentration of 1,000 mg/L.

Reclaimed water that would be used for the project would meet CCR Title 22 standards for tertiary treatment as appropriate for unrestricted use. This requires a specific effluent quality for BOD, TSS, total coliform, and turbidity, but the salinity of reclaimed water is often elevated compared to the salinity of potable water sources, unless salinity removal process is incorporated into the wastewater treatment process. The *Wastewater Treatment Facilities Engineering Report* (EKI, 2014b) states that "the TDS concentration added by domestic use is assumed to be at or below 275 mg/L, in compliance with the Basin Plan objectives [for discharge to the White Wolf Subbasin]. To limit the salinity addition by indoor uses, the project will implement a pretreatment program for commercial and industrial properties and a salinity education and minimization program." The project would obtain its potable water from the Kern County Water Agency via the California Aqueduct. The highest reported concentration of TDS between January 2010 and October 2013 was 352 mg/L, and TDS concentrations added by domestic water use have been measured between 150 mg/L and 380 mg/L above the TDS levels in the source water supply (EKI, 2014b). Therefore, TDS concentration in project wastewater influent could be approximately 625 mg/L. The conceptual wastewater treatment system design includes disinfection with UV light. Therefore, in the absence of chlorination, the wastewater effluent and wastewater influent can be assumed to have the same approximate concentration of TDS.

The TDS concentrations for groundwater in the project area range from 655-1,200 mg/L from nearby drinking water wells (reported as 1,180 and 1,670 µmhos/cm converted to mg/L using 1 mg/L equal to between 1.4 and 1.8 µmhos/cm) (MWH, 2013). WZI has also reported TDS concentrations in groundwater between 2,200 and 32,000 mg/L in the project area (WZI, 2013). Therefore, TDS concentrations in recycled water are expected to be on the low end of the range of existing groundwater quality, and are unlikely to adversely affect groundwater quality. In addition, the expected recycled water TDS concentration is well below the recommended upper concentration of the California MCL.

To manage salts and nutrients, the Recycled Water Policy requires every groundwater basin or sub-basin in California to have a consistent salt/nutrient management plan. Each salt/nutrient plan must include a monitoring plan, which includes monitoring of CECs consistent with CDPH recommendations; be protective of water sources; and encourage recycling to meet the Policy's reuse goals.

The application of recycled water for landscape irrigation would be regulated under site-specific WDRs or the June 2014 General WDRs for Recycled Water Use. The permit requires implementation of BMPs, such as implementation of an Irrigation Management Plan to ensure the use of recycled water occurs at an agronomic rate while employing practices to ensure irrigation efficiency necessary to minimize application of salinity constituents.

Lastly, oil and gas bearing geological strata are located beneath the project site, in the Tejon Oil Field and Tejon North Oil Field. These strata are located 2000 to 2600-feet below ground surface, well below the groundwater aquifers that are potentially suitable for drinking water purposes. Groundwater in the area of the Tejon Oil Field and Tejon North Oil Field is obtained from the Quaternary Kern River Formation at a depth of approximately 800 to 1000 feet below ground surface. The water quality of this zone is approximately 1400 ppm TDS. The shallowest oil producing zones are the lowermost portion of the Mio-Pliocene Chanac and the Transition-Santa Margarita Formations at depths of approximately 2000 to 2600 feet. The water quality in these zones is approximately 2200 ppm TDS. Injection for purposes of water disposal and enhanced oil production (water flooding) has occurred within the Santa Margarita within the oil field. Water produced during oil and gas production activities (Produced Water) is injected utilizing Class II disposal wells permitted through the DOGGR.

Therefore, given the expected TDS concentration in recycled water, existing TDS concentrations, BMPs that would be implemented per the landscape irrigation General Permit, and the fact that oil and gas producing strata (including Phase II injection wells) are well below groundwater producing strata, impacts to groundwater quality (WQ-1 and WQ-6) are considered less than significant, with no mitigation required.

6.5.5.4 WWTF Impacts

The SWRCB Resolution No. 68-16 “Statement of Policy with Respect to Maintaining High Quality Water of the State” (Antidegradation Policy) requires that high quality waters of the State of California be maintained consistent with their beneficial uses and water quality objectives as defined in the Basin Plan. Resolution No. 68-16 prohibits degradation of groundwater by waste discharges unless it has been shown that:

a) The degradation does not result in water quality less than that prescribed in state and regional policies, including violation of one or more water quality objectives;

b) The degradation would not unreasonably affect present and anticipated future beneficial uses;

c) The discharger employs best practicable treatment or control (BPTC) to minimize degradation; and

d) The degradation is consistent with the maximum benefit to the people of California.

The Basin Plan designates beneficial uses and establishes narrative and numerical water quality objectives for all waters of the Basin. The WWTFs and the recycled water use areas are in Detailed Analysis Units (DAUs) No. 258 and No. 261. As discussed in Section 2.1.6.3, the Basin Plan identifies the beneficial uses of groundwater in both DAUs as municipal and domestic supply, agricultural supply, and industrial service supply. The Basin Plan also identifies DAU No. 258 as having industrial process supply beneficial uses.

The Basin Plan requires that concentrations of chemical constituents in waters designated as domestic or municipal supply meet the MCLs specified in CCR Title 22. The Basin Plan also establishes narrative water quality objectives for chemical constituents, taste and odors, and toxicity, and includes salt management requirements.

Antidegradation Analysis

Salts and nutrients are the constituents of concern in WWTF effluent that have the potential to degrade groundwater quality. However, use of the treated effluent generated at the Grapevine project WWTFs for irrigation use would not unreasonably affect present and anticipated future beneficial uses of groundwater.

a) For salts, the Basin Plan specifies that the incremental EC of a discharge cannot exceed the EC of the source water plus 500 μmhos/cm. The Basin Plan considers groundwater in the White Wolf Subarea to be class II irrigation waters, and discharges to the White Wolf Subarea cannot exceed an EC limit of 2,000 μmhos/cm (see Section 3.4.4).

   The measured maximum EC of source water was 630 μmhos/cm between 2010 and 2013. Based on the assumption that the EC addition from domestic use is 500 μmhos/cm or less, the EC in WWTF effluent would be no higher than 1,130 μmhos/cm, which meets both the Basin Plan limit for EC of source water plus 500 μmhos/cm and the Basin Plan discharge limit for EC of 2,000 μmhos/cm in the White Wolf Subarea. Underlying groundwater has an EC that ranges from 1,500 μmhos/cm to 2,300 μmhos/cm. Therefore, the EC of the WWTF effluent meets the water quality objectives for the White Wolf Subarea and the EC of underlying groundwater.

b) Nutrients in water are measured as total nitrogen, which is the sum of nitrate, nitrite, organic nitrogen, and ammonia (all expressed as nitrogen). The WWTFs constructed and operated as part of the Grapevine project will be designed to remove total nitrogen to an effluent limit of 10 mg/L or less. Application of WWTF effluent (i.e., recycled water) at agronomic rates for irrigation purposes will preclude degradation of groundwater by nitrogen.

c) Monitoring specified by WDRs will verify that recycled water use does not violate water quality objectives or impair beneficial uses.

The SWRCB concludes in the General WDRs that recycled water used for irrigation and applied at agronomic rates complies with the Antidegradation Policy. The General WDRs find that use of recycled water in place of both raw and potable water supplies for non-potable uses, such as irrigation, improves water supply availability and helps to ensure that higher quality water would continue to be available for human uses and for in-stream uses for fish and wildlife. The SWRCB establishes that the limited degradation of groundwater that may occur as a result of recycling provides maximum benefit to the people of California.

With respect to the Grapevine project, it is anticipated that approximately 13,000 new jobs (Stanley R. Homan Assoc. 2014) and 12,000 new housing units would be created at full build out of the Grapevine project. The project would also support the local economy by purchasing construction materials from local merchants and by hiring local contractors. As such, the economic benefits associated with the development of the Grapevine project, and the associated use of recycled water, is of maximum benefit to the people of California, provided water quality objectives are met and beneficial uses are preserved.

The existing WWTFs utilized and the proposed WWTFs constructed and operated as part of the Grapevine project would provide treatment and control of the discharge that includes the following:

- Nitrate reduction to less than the MCL of 10 mg/L (as nitrogen);
- Total coliform treatment to less than 2.2 most probable number per 100 mL;
- UV disinfection;
- Application of recycled water at rates that would not exceed reasonable agronomic demand in areas where recycled water would be used for irrigation;
- Sludge handling and hauling off-site;
- Certified operators to ensure proper O&M;
- Source water and discharge monitoring; and
- Salinity minimization.

Employment of these measures represents BPTC, which is included as PDF #2[28] in the Wastewater Treatment Facilities Engineering Report (EKI, 2014a).

[28] "The wastewater treatment facility operator shall ensure that the Grapevine project wastewater treatment facilities employ BPTCs to minimize degradation of groundwater. BTCPs will include nitrate reduction, UV disinfection to Title 22 standards, application of recycled water not to exceed reasonable agronomic demand in areas where the

6.5.6 Groundwater Recharge Impacts

Groundwater recharge is a process whereby direct precipitation, runoff, and applied water (e.g., irrigation) retained on site percolates to underground aquifers. The length of time this process takes depends on the depth to the aquifer and the subsurface soils/materials. Significant adverse groundwater recharge impacts are presumed to occur if the project would:

> *GW-2: Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level.*

The project site is located in the foothills along the southern boundary of the Central Valley. Generally, groundwater in the southern San Joaquin Valley lies between 150 and 500 feet below ground surface (Faunt 2009, as cited in Tejon Ranch Conservancy 2013). The shallowest depth to the aquifer is located at the eastern extents of the project site, and the greatest depths are located in the northern extents. Subsurface materials consist primarily of alluvial soils, sand and silt. Although the soils on the project are moderately to highly infiltrative (Geosyntec, 2014), interflow or recharge is anticipated to occur over a long time frame given the considerable subsurface distance that infiltrated water must percolate to reach the aquifer.

In its developed condition, the project site would contain more impervious area than in the existing condition (43% compared to 3.5%, respectively). While increased imperviousness would typically result in more runoff, planned treatment BMPs (PDFs) have been sized to capture and infiltrate this additional runoff, up to the design storm depth. As shown in Table 25, a minor increase (1%) in the "losses" of precipitation to infiltration and/or ET is predicted for the project Condition (with PDFs), with a reduction in average annual runoff volume as compared to the existing condition (62 to 82% reduction). Furthermore, in both the existing and proposed conditions nearly all of the precipitation volume (>98%) is retained on-site and "lost" to infiltration and/or ET. On this basis, it is not expected that the project would deplete groundwater supplies or interfere with groundwater recharge as compared to existing conditions.

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project uses recycled water for irrigation, sludge handing and hauling off-site, certified operators, source water and discharge monitoring, and salinity minimization." (EKI, 2014a)

Table 25
Modeled Average Annual Precipitation, Runoff, and Losses

Condition		Precipitation[1]	Runoff	Losses[2]
		ac-ft	*ac-ft*	*ac-ft*
Existing Condition		7916.7	106.2	7810.5
CS BMP #1 Scenario	Project Condition (with PDFs)	7916.7	19.6	7897.1
	% Change	N/A	-82%	+1%
CS BMP #2 Scenario	Project Condition (with PDFs)	7916.7	40.5	7876.2
	% Change	N/A	-62%	+1%

[1] Precipitation volume is computed as average annual rainfall volume (11.8 in) from the scaled Bakersfield Airport rainfall gauge (Station 040442) over the project area plus off-site improvements (8,164acres).
[2] Losses include ET and infiltration

Changes in irrigation practices also have the potential to affect groundwater recharge. In the existing condition, the project site is mostly comprised of undeveloped pervious areas with small portions of irrigated agricultural land uses (approximately 10% of the project area, or 857 acres, based on an aerial review). As a coarse comparison, it is assumed that on-site irrigation in the project condition would include irrigated agricultural land uses on 8% of the project area (this assumes that 20% of the exclusive agriculture land use areas are irrigated, or approximately 640 acres), and in combination, residential outdoor, roadside, and community landscape irrigation would account for 16% of the project area 1260 acres). The irrigation demands for parks, residential, village residential, village commercial, and community areas (roads and windrows) were estimated in the *Water Supply Assessment* report as approximately 2,418 acre-ft per year (EKI, 2014d). This demand for the project would be met by the TCWD's rights to use Nickel Family LLC[29] water and recycled water produced by treating the project's indoor wastewater in the WWTFs. It is assumed that efficient irrigation practices and landscaping design will be incorporated by the project to mitigate dry weather discharges. Evaluating the relative recharge potential by taking into account estimated irrigation efficiency for both the agricultural (assumed 70%) and developed (assumed 80%) land use types in the existing and proposed conditions (Howell, 2003), a higher overall loss fraction is anticipated in the project condition. This is due primarily to the assumption that more area would be irrigated in the project condition. An increase in irrigated area, taking into account applicable loss factors, implies that more water would be available to potentially infiltrate and ultimately recharge the underlying groundwater aquifers in the project condition.

[29] The Tejon Ranchcorp has the right to receive 6,693 AFY of water from the Kern County Water Agency (KCWA) through at least 20179 as the assignee of a Kern River water transfer agreement between KCWA and the Nickel Family LLC. The delivery of Nickel Water is 100 percent reliable on a year-to-year basis and is not subject to hydrological variability, regulatory requirements, or supply constraints that may affect other water sources.

In summary, in the project condition more runoff would be retained (infiltrated and evapotranspirated) on site due to PDFs and potential irrigation losses are anticipated to increase as compared to the existing condition due to an increase in irrigated area. Therefore, since there would be more runoff and irrigation water available for infiltration, the project is not anticipated to deplete groundwater supplies, nor substantially interfere with groundwater recharge. In fact, the project would increase groundwater recharge over existing conditions. Therefore, the project would have a less than significant impact on the groundwater supply.

6.6 Cumulative Impacts

CEQA requires the analysis of cumulative impacts of a project when the project's incremental effects may be significant when assessed along with the effects of past projects, other current projects, and probable future projects. The discussion of cumulative impacts must reflect the potential severity of the impacts and their likelihood of occurrence, but the discussion and analysis need not provide as great a detail as is provided for the direct effects attributable to the project alone.

The cumulative analysis of surface water quality and hydrologic impacts in this report is based on the "Default Study Area" as defined by a memorandum from the Kern County Planning and Community Development Department on July 29, 2014 (Kern County, 2014).

As required by CEQA, the focus of the cumulative impacts analysis for the project will be on the project's incremental contribution to significant adverse water quality and hydrologic impacts to receiving waters, taking into account the reasonably foreseeable water quality and hydrologic impacts of other projects that may develop impervious surfaces and urban land uses within these watersheds. The analysis will also consider whether the project, including PDFs, and future projects would comply with the Basin Plan, the CTR, the Construction General Permit, the General Dewatering Permit, and the Kern County Development Standards, which have been adopted for the purpose of avoiding or substantially lessening the cumulative water quality and hydrologic impact problems within the geographic area in which the project is located.

6.6.1.1 Surface Water Impacts

As discussed above, the anticipated quality of effluent expected from the PDFs would not contribute concentrations of pollutants of concern that would be expected to cause or contribute to a violation of the water quality standards in the project's surface receiving waters at a level beyond the existing condition. In addition, the proposed infiltration PDFs are sized such that average annual runoff volumes are predicted to significantly decrease in the project condition, peak flows would inherently be reduced due to the holding capacity of the planned stormwater

PDFs, flooding would be mitigated by the flood control basins, and captured runoff would be infiltrated on-site rather than being discharged to a local water body. Therefore, the project's incremental effects on surface water quality are not expected to be significant.

The project's surface runoff water quality, with implementation of PDFs, both during construction and post-development, is predicted to comply with adopted regulatory requirements that are designed by the State Water Board and CVWB to assure that regional development does not adversely affect water quality in receiving streams, including the Construction General Permit and General Dewatering Permit requirements; and benchmark Basin Plan water quality objectives, CTR criteria, and CWA 303(d) listings. Any future urban development occurring in the South Valley Floor or Grapevine HUs must also comply with these conditions.

By extrapolating the results of the direct and cumulative impact analysis modeling done for this Water Quality Technical Report, it can be presumed that analysis of other proposed development combined with existing conditions would have similar water quality results.

Therefore, cumulative impacts to surface water quality of receiving waters from the project and future urban development in the South Valley Floor and Grapevine HUs are addressed through compliance with the Construction General Permit and benchmark Basin Plan water quality objectives, CTR criteria, and 303(d) listings, which are intended to be protective of beneficial uses of the receiving waters. Based on compliance with these requirements designed to protect beneficial uses, cumulative water quality impacts would be mitigated to a less-than-significant level.

6.6.1.2 Groundwater Impacts

As discussed above, the anticipated quality of stormwater runoff discharges from the project's developed areas and reclaimed water used for irrigation would not contribute pollutants of concern that would be expected to cause or contribute to a violation of the groundwater quality standards. Project PDFs in the form of LID PDFs would result in no adverse effects on groundwater recharge, and are predicted to increase the potential for recharge as compared to the existing condition due to the proposed infiltration BMPs. The only project identified within the "Default Study Area" to have potential impacts to groundwater is the Wildlands Conservancy in San Emidio; however, by extrapolating the evaluation of Grapevine project groundwater impacts and assuming similar PDF implementation to the additional development, it is concluded that no adverse cumulative effects would occur to groundwaters. Therefore, the project's incremental effects on groundwater quality and recharge, when considered together with the effects of other similar projects in the area, are not expected to be significant.

The project's discharges to groundwater with implementation of PDFs, both during construction and post-development, are predicted to comply with adopted regulatory requirements that are designed by the CVWB and State Water Board to assure that regional development does not adversely affect water quality, including Construction General Permit requirements and Basin Plan groundwater quality objectives. In addition, per the State Water Board's Recycled Water Policy, cumulative groundwater impacts shall be managed under a regional salt/nutrient management plan. Management of potential impacts from CECs would be conducted using a phased approach at the State level. Based on compliance with these requirements designed to protect beneficial uses, cumulative groundwater quality impacts would be less than significant.

6.6.1.3 Hydromodification Impacts

As discussed above, the anticipated changes in hydrology, bed sediment supply, channel geometry, and bed and bank material expected from PDFs #3 and #4 would not contribute geomorphic conditions of concern that would be expected to cause or contribute to hydromodification impacts to the project's jurisdictional receiving waters at a level beyond the existing condition. Therefore, the project's incremental effects on surface water quality are not expected to be significant.

Cumulative impacts to hydromodification resulting from the project and future similar developments in the watersheds tributary to the project's jurisdictional receiving streams would be addressed through implementation of hydromodification control PDFs in compliance with the hydromodification control performance standard, which is intended to be protective of beneficial uses of receiving streams. The only project identified within the watersheds to have potential impacts to hydromodification is the Tejon Mountain Village project due to sediment supply losses[30]. However, it is the intent of the hydromodification control performance standard that, "the target Ep shall account for <u>cumulative</u> changes in bed sediment supply at the point of analysis <u>for the ultimate buildout condition</u>." This clarification is made because if bed sediment supply reductions were accounted for from only the Grapevine project and not the Tejon Mountain Village, then cumulative hydromodification impacts would possibly be significant. However, based on compliance with the hydromodification control performance standard for both Grapevine and Tejon Mountain Village, as it is intended, cumulative hydromodification impacts would be less than significant.

[30] Drainage from Tejon Mountain Village to Castac Lake is excluded from the bed sediment supply evaluation because it is assumed that coarse bed sediment generated upstream is trapped within the lake.

7 CONCLUSIONS

This WQTR for the Grapevine project is intended to assess the following significance criteria, to determine if the project would:

- WQ-1: Violate any water quality standards or waste discharge requirements;
- WQ-2: Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);
- WQ-3: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;
- WQ-4: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
- WQ-5: Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
- WQ-6: Otherwise substantially degrade water quality.

Each of these is discussed below.

7.1 Surface Water Impacts

Construction General Permit, Dewatering General Permit, source controls, and stormwater BMP PDF #1 would be incorporated into the project to target PPOCs for both the construction and post-construction phases. PDFs for off-site roads would comply with the Construction General Permit and the Caltrans stormwater permit, as applicable. Impacts associated with sediments, nutrients, and metals were evaluated using a water quality model and impacts associated with other PPOCs were evaluated qualitatively based on information in technical literature. Impacts discussed below are applicable to both scenarios, CS BMP #1 and #2, unless noted otherwise.

- ***Sediment*:** Construction General Permit-compliant PDFs as well as source control and treatment BMPs will be incorporated into the project to address sediment in both the construction and post-development phases (PDF#1-3). Loads and concentrations of TSS are predicted to decrease with project and off-site road implementation, and **therefore**

sediment-related impacts to surface waters would be less than significant, with no mitigation required.

- ***Nutrients (Phosphorus and Nitrogen Species)***: Total phosphorus loads and concentrations are predicted to decrease for the project, which would directly discharge stormwater runoff (beyond the design storm) to ephemeral drainages in the Grapevine and South Valley Floor watersheds, which do not support algal growth because the ephemeral receiving waters dry out between storms.

  Total nitrogen, nitrate, nitrite, and ammonia loads are predicted to decrease for the project. Nitrite and nitrate concentrations are predicted to decrease for the project. Ammonia concentrations are predicted to decrease for the project and the Basin Plan objective for un-ionized ammonia is predicted to be met in project runoff. Overall, total nitrogen concentrations are predicted to decrease in the project condition, taking into account PDFs.

  Additionally, the water quality model results are conservative because they do not include the benefits of site design and source control PDFs that would be implemented for the project, which would further reduce nutrient concentrations and loads. Therefore, potential **nutrient-related impacts to surface waters would be less than significant, with no mitigation required.**

- ***Trace Metals*: **Loads for all total and dissolved metals are predicted to decrease with implementation of the project (including PDFs). Metals concentrations for the project are predicted to increase, except for total copper and total lead, which are predicted to decrease. These projections are conservative and do not account for source control and site design PDFs that would be implemented. The predicted total lead concentration in runoff from the project is below the CTR water quality criteria (Table 20). The predicted dissolved copper and dissolved zinc concentrations are above the CTR water quality criteria; however the concentrations associated with the undeveloped existing condition is above the CTR criteria for dissolved zinc and equal to the CTR criteria for dissolved copper. Therefore, given that the overall loads decrease in the project condition and the model predictions do not account for source control BMPs, **metals-related impacts to surface waters would be less than significant, with no mitigation required.**

- ***Pathogens*: **Project pathogen sources include both natural and anthropogenic sources. Pet wastes are the primary source of concern in urban runoff. The project PDFs will include source controls and treatment controls which in combination should help to reduce pathogen indicator levels in post-construction stormwater runoff to the maximum extent practicable. Pathogens are not expected to occur at elevated levels during the construction-phase of the project. On this basis, **pathogen-related impacts to surface waters would be less than significant, with no mitigation required.**

- ***Trash and debris*****:** Trash and debris in runoff are likely to increase in post-development if left unchecked. However, the project PDFs including source control and treatment BMPs would minimize the adverse impacts of trash and debris. Source controls such as street sweeping, public education, fines for littering, covered trash receptacles, and storm drain stenciling are effective in reducing the amount of trash and debris that is available for mobilization during wet weather. During the construction phase of the project, PDFs implemented per Construction General Permit and General Dewatering Permit requirements would remove trash and debris through the use of BMPs such as catch basin inserts and general good housekeeping practices. Therefore, due to the implementation of the project PDFs, **trash/debris-related impacts to surface waters would be less than significant, with no mitigation required.**
- ***Temperature.*** Adverse receiving water effects resulting from the discharge of runoff are caused by warming effects in detention-based PDFs as well as warming effects of runoff traveling over hot surfaces (such as roads). The project would discharge to ephemeral streams that do not support cold water habitat. The project would incorporate treatment BMPs that rely on infiltration and community-scale basins. The community-scale basins would not have permanent pools and basin discharges to the project ephemeral drainages during the cool wet season would not adversely affect warm water habitat. On this basis, **temperature-related impacts to surface waters would be less than significant, with no mitigation required.**
- ***CECs.*** Knowledge about impacts associated with CECs in stormwater runoff is still evolving. Treatment of CECs would be expected in the project's LID PDFs, however the level of treatment is unknown as are the effects of residual CECs in treated and discharged stormwater. Implementation of a state level program as recommended by the expert panel on CECs would result in development of control measures (at the state level) that would reduce impacts from CECs. Therefore, **CEC-related impacts to surface waters would be less than significant, with no mitigation required.**
- ***Turbidity.*** In the post-development condition, placement of impervious surfaces would serve to stabilize soils and to reduce the amount of erosion that may occur from the project during storm events, and would therefore decrease turbidity in the runoff. Project PDFs, including source controls (such as common area landscape management and common area litter control) and treatment control BMPs in compliance with the SUSMP requirements and the LID Performance Standard, would prevent or reduce the release of organic materials and nutrients (which might contribute to algal blooms and increased turbidity) to receiving waters. As shown above, post-development nutrients in runoff are

not expected to cause significant water quality impacts. Therefore, **turbidity-related impacts to surface waters would be less than significant, with no mitigation required.**

- ***Pesticides***. A landscape management plan will be developed and implemented for common area landscaping within the project that addresses IPM and pesticide and fertilizer application guidelines. While pesticide use is likely to occur due to maintenance of landscaped areas, particularly in the residential portions of the development, careful selection, storage and application of these chemicals for use in common areas per the IPM Program will help prevent adverse water quality impacts from occurring. Additionally, as discussed above, removal of sediments in the LID and treatment control PDFs would also remove sediment-adsorbed pesticides. Based on the incorporation of site design, source control, LID, and treatment control BMPs pursuant to SUSMP requirements and the LID Performance Standard, **pesticide-related impacts to surface waters would be less than significant, with no mitigation required.**
- ***Petroleum Hydrocarbons.*** Various forms of hydrocarbons (e.g., PAHs and oil and grease) are common constituents associated with urban runoff. Although the concentration of hydrocarbons in runoff is expected to increase slightly under post-development conditions due to the increase in roadways, driveways, parking areas, and vehicle use, the PDFs are expected to prevent appreciable increases in hydrocarbon concentrations from leaving the project site. Source control PDFs that address petroleum hydrocarbons include educational materials on used oil programs, carpooling, and public transportation alternatives to driving; BMP maintenance; and street sweeping. The majority of PAHs in stormwater adsorb to the organic carbon fraction of particulates in the runoff. Consequently, the treatment BMP and treatment control PDFs, which are designed to treat pollutants through settling, filtration, and infiltration, would also be effective at treating PAHs. On this basis, **petroleum hydrocarbon-related impacts to surface waters would less than significant, with no mitigation required.**
- ***Construction Impacts:*** Construction impacts on water quality are generally caused by soil disturbance and subsequent suspended solids discharge. These impacts would be minimized through implementation of construction PDFs that would comply with the Construction General Permit, as well as PDFs that control the other potential construction-related pollutants (e.g., petroleum hydrocarbons and metals). A SWPPP specifying PDFs for the site that meet or exceed BAT/BCT standards will be developed as required by and in compliance with the Construction General. Erosion control PDFs, including but not limited to hydro-mulch, erosion control blankets, stockpile stabilization, and other physical soil stabilization techniques would be implemented to prevent erosion, whereas sediment controls, including but not limited to silt fencing, sedimentation ponds, and secondary containment on stockpiles would be implemented to trap sediment and

prevent discharge. Non-stormwater and construction waste and materials management PDFs, such as vehicle and equipment fueling and washing PDFs; nonvisible pollutant monitoring; and PDFs to manage materials, products, and solid, sanitary, concrete, hazardous, and hydrocarbon wastes would also be deployed to protect construction site runoff quality. Construction dewatering and other low threat discharges would be managed in accordance with the General Order for dewatering. On this basis, **construction-related impacts to surface waters would be less than significant, with no mitigation required.**

- ***Dry Weather Runoff.*** Dry weather flows from the project would be expected to be generated primarily from excess irrigation. In order to reduce the potential generation of dry weather flows, landscape irrigation would be controlled with advanced metering systems designed to minimize or eliminate over-watering. Moreover, any dry weather flows that did occur would be routed to PDFs, where they would be retained, infiltrated, and prevented from discharging to receiving waters. On this basis, **the impact of dry weather flows from the project would be less than significant, with no mitigation required.**

Therefore, with respect to the CEQA significance criteria WQ-1, WQ-5, and WQ-6**, the project's incremental effects on surface water quality would be less than significant, with no mitigation required.**

Additionally, the project is designed to retain on-site the 10-year, 5-day design storm per the Master Drainage Study (Geosyntec, 2015). The County requirements for alluvial fan development and flood control facilities on alluvial fans would also be followed. Additionally, levees have been proposed along Grapevine Creek between the water body and the development and the average annual runoff volume has also been shown to be less in the project condition with PDFs than in the existing condition due to the BMPs. Therefore, with respect to CEQA significance criteria WQ-4, **impacts associated with drainage pattern modifications resulting in on-site flooding are found to be less than significant, with no mitigation required.**

7.2 Groundwater Quality Impacts

Nitrate, CECs, and TDS have been identified as the pollutant of concern for groundwater. The Kern County groundwater basin has a groundwater quality objective that is equal to the nitrate-N drinking water MCL (10 mg/L [as nitrogen]). The predicted nitrate-N concentration in runoff from the project with PDFs for the CS BMP #1 scenario is 0.75 mg/L and is 0.73 mg/L for the CS BMP #2 scenario (see Tables 17 and19). Therefore, both of the predicted concentrations in urban runoff are significantly below the nitrate-N MCL of 10 mg/L (EMCs range from 0.61 to

1.5 mg/L, excluding agriculture). On this basis, the potential for infiltrated stormwater runoff to adversely affect nitrate-N levels in groundwater would be less than significant.

Implementation of a state-level program to evaluate the occurrence and effects of CECs in stormwater would result in the development of control measures that would ultimately reduce groundwater quality impacts to a less than significant level.

Additionally, the oil and gas producing strata, to which permitted Class II injection wells are used to dispose of produced water, is located at depths significantly below the groundwater producing strata.

Finally, increased infiltration of treated stormwater would further improve groundwater quality as stormwater is low in TDS.

Therefore, with respect to the CEQA significance criteria WQ-1 and WQ-6, **the project's incremental effects on groundwater quality are found to be less than significant, with no mitigation required.**

7.3 Groundwater Recharge Impacts

A quantitative analysis of the two sources of groundwater recharge (captured runoff and irrigation) demonstrates that both would have the potential to contribute to increased recharge compared to existing conditions. With respect to the CEQA significance criterion WQ-2, **the project would not substantially interfere with groundwater recharge, and therefore the impacts would be less than significant, with no mitigation required.**

7.4 Hydromodification Impacts

The proposed hydromodification control PDFs #3 and #4 will be sized in compliance with the hydromodification control performance standard, as defined herein. Therefore, with respect to the following CEQA significance criteria WQ-3, **the project's incremental effects on hydromodification including drainage pattern modification resulting in erosion are not expected to be significant, with no mitigation required.**

7.5 Cumulative Impacts

Cumulative impacts to surface water quality and stream channel hydromodification resulting from the project and future similar development in the Grapevine and South Valley Floor HUs are addressed through compliance with the Construction General Permit and benchmark Basin Plan water quality objectives, CTR criteria, and CWA 303(d) listings, which are intended to be protective of beneficial uses of the receiving waters. Based on compliance with these requirements, **cumulative surface water quality impacts would be less than significant, with no mitigation required.**

Per the State Water Board's Recycled Water Policy, cumulative groundwater impacts shall be managed under a regional salt and nutrient management plan. Management of potential impacts from CECs would be conducted using a phased approach at the state level. Based on compliance with these requirements designed to protect beneficial uses, **cumulative groundwater quality impacts would be less than significant, with no mitigation required.**

Cumulative impacts to hydromodification resulting from the project and future similar development in the watersheds tributary to the project's jurisdictional receiving streams are addressed through compliance with the hydromodification control performance standard, which is intended to be protective of beneficial uses of receiving streams. Based on compliance with these requirements, **cumulative hydromodification impacts would be less than significant, with no mitigation required.**

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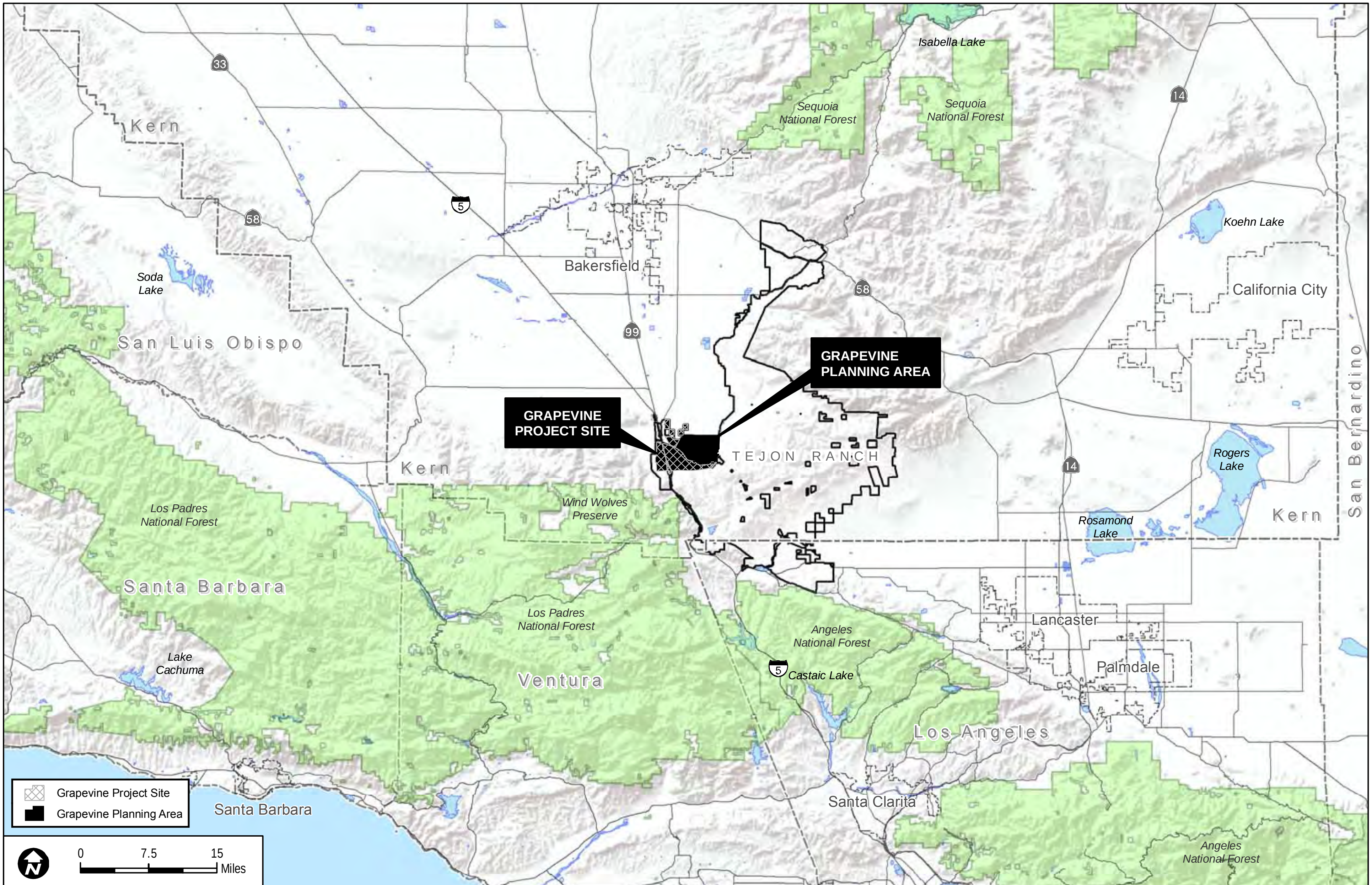
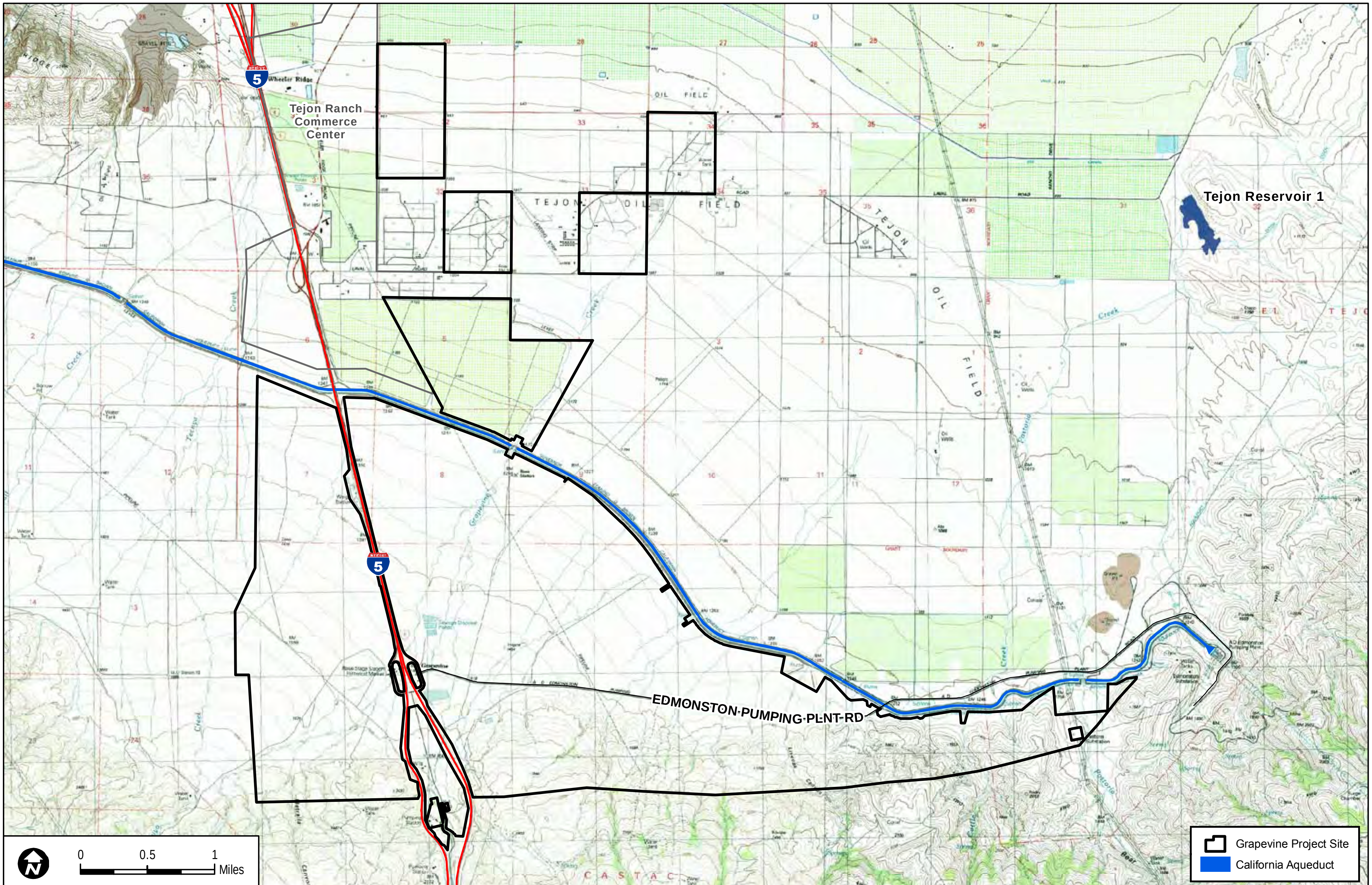


SOURCES: McIntosh & Associates 2013; TRC 2013a

FIGURE 1-1

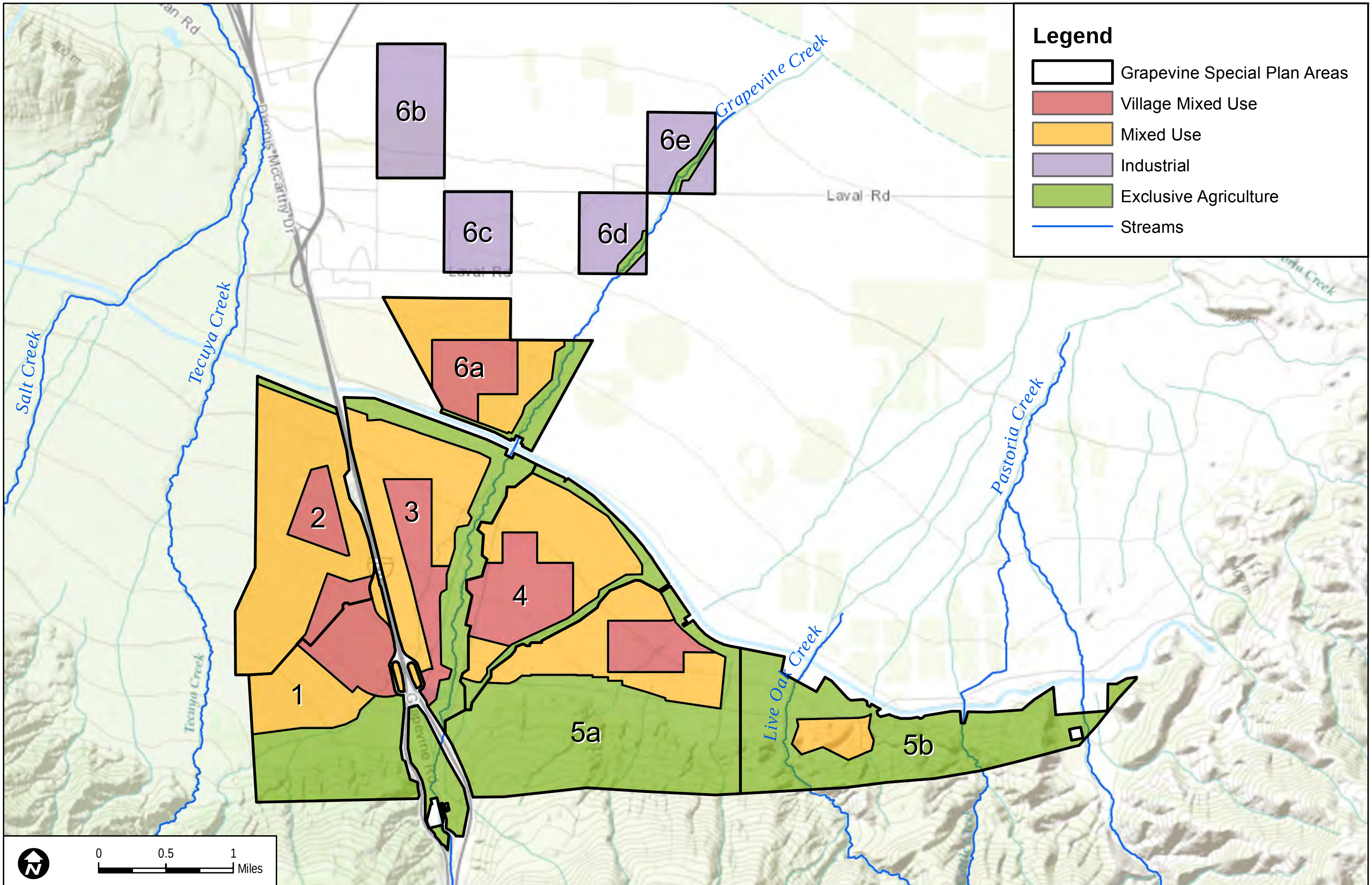
Regional Location



SOURCES: McIntosh & Associates 2013; TRC 2013b

FIGURE 1-2

Vicinity Map

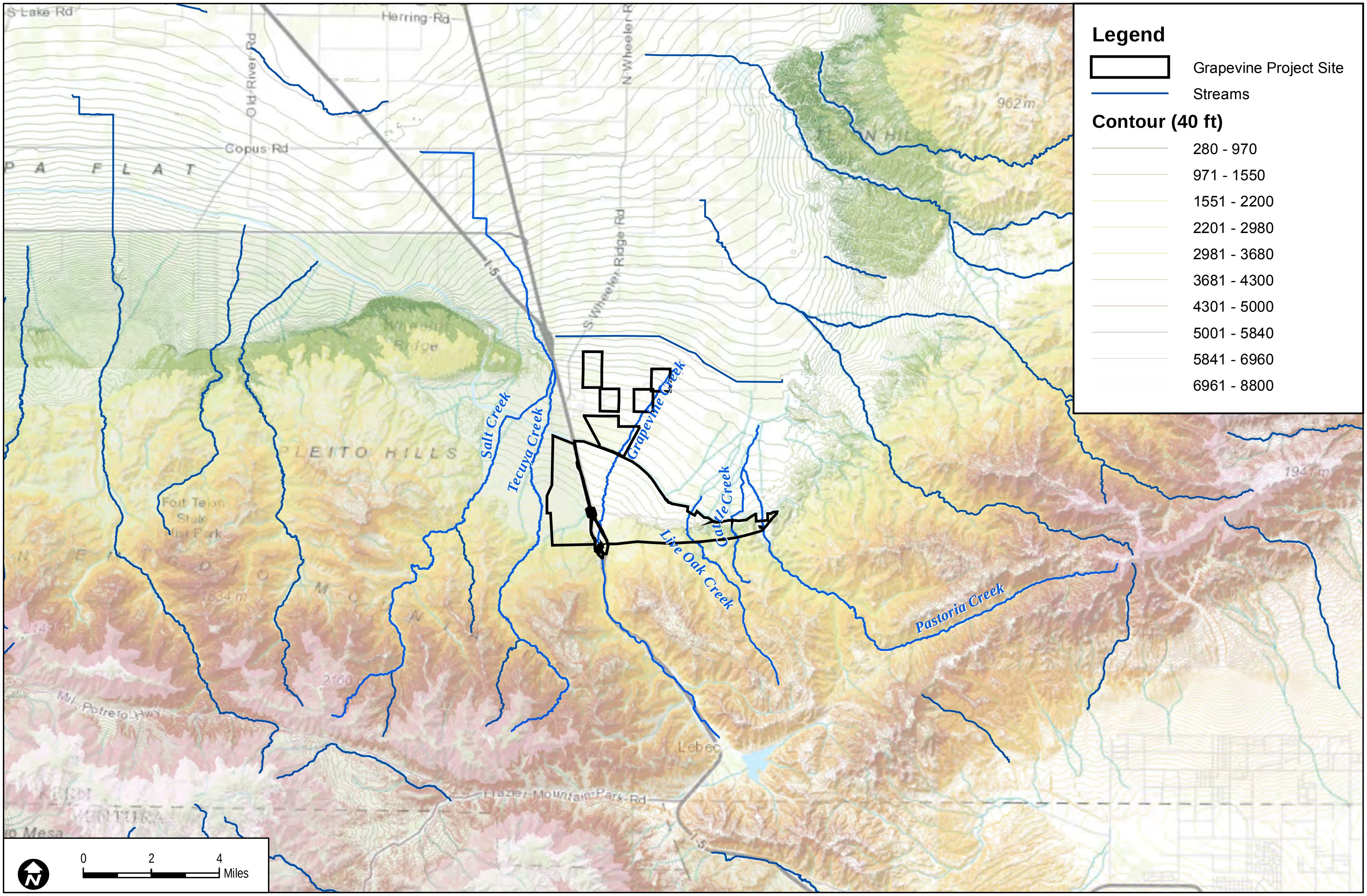


SOURCES: USGS, ESRI

FIGURE 1-3

Proposed Zoning

GRAPEVINE PROJECT



SOURCES: USGS, Dudek

FIGURE 2-1

Topography

GRAPEVINE PROJECT

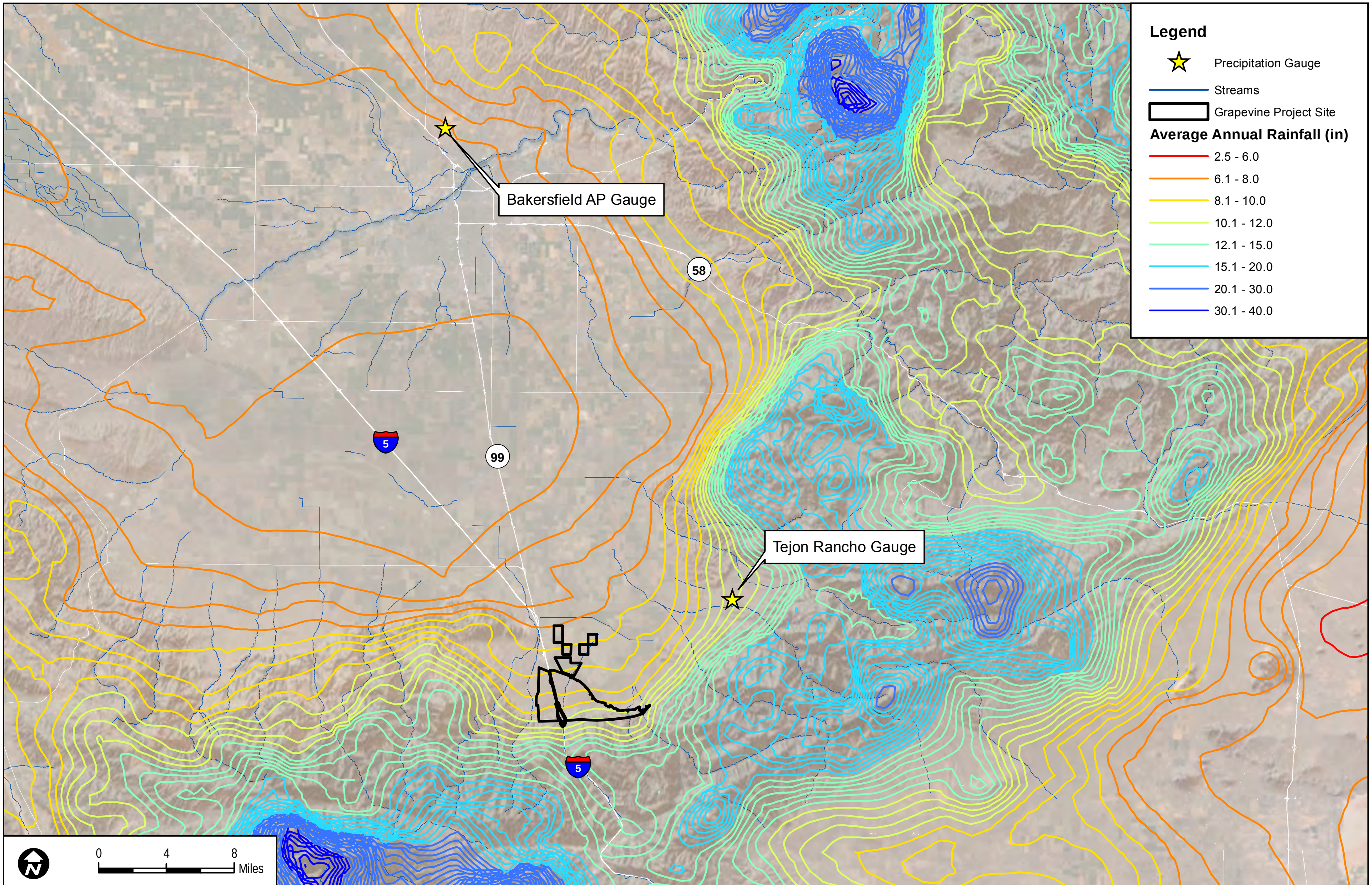


FIGURE 2-2

Isohyetal Contours

SOURCES: USGS, ESRI, PRISM

GRAPEVINE PROJECT

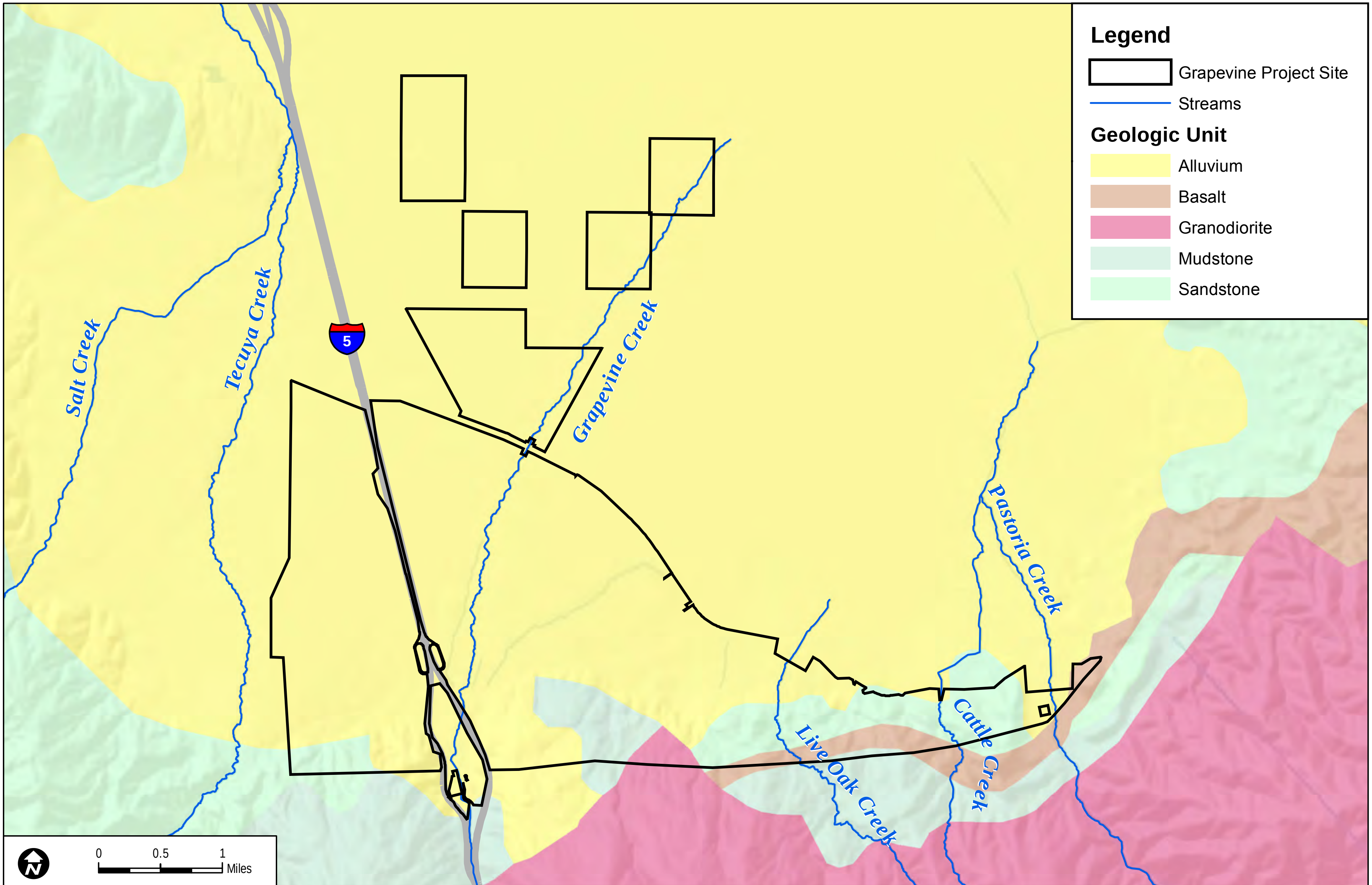
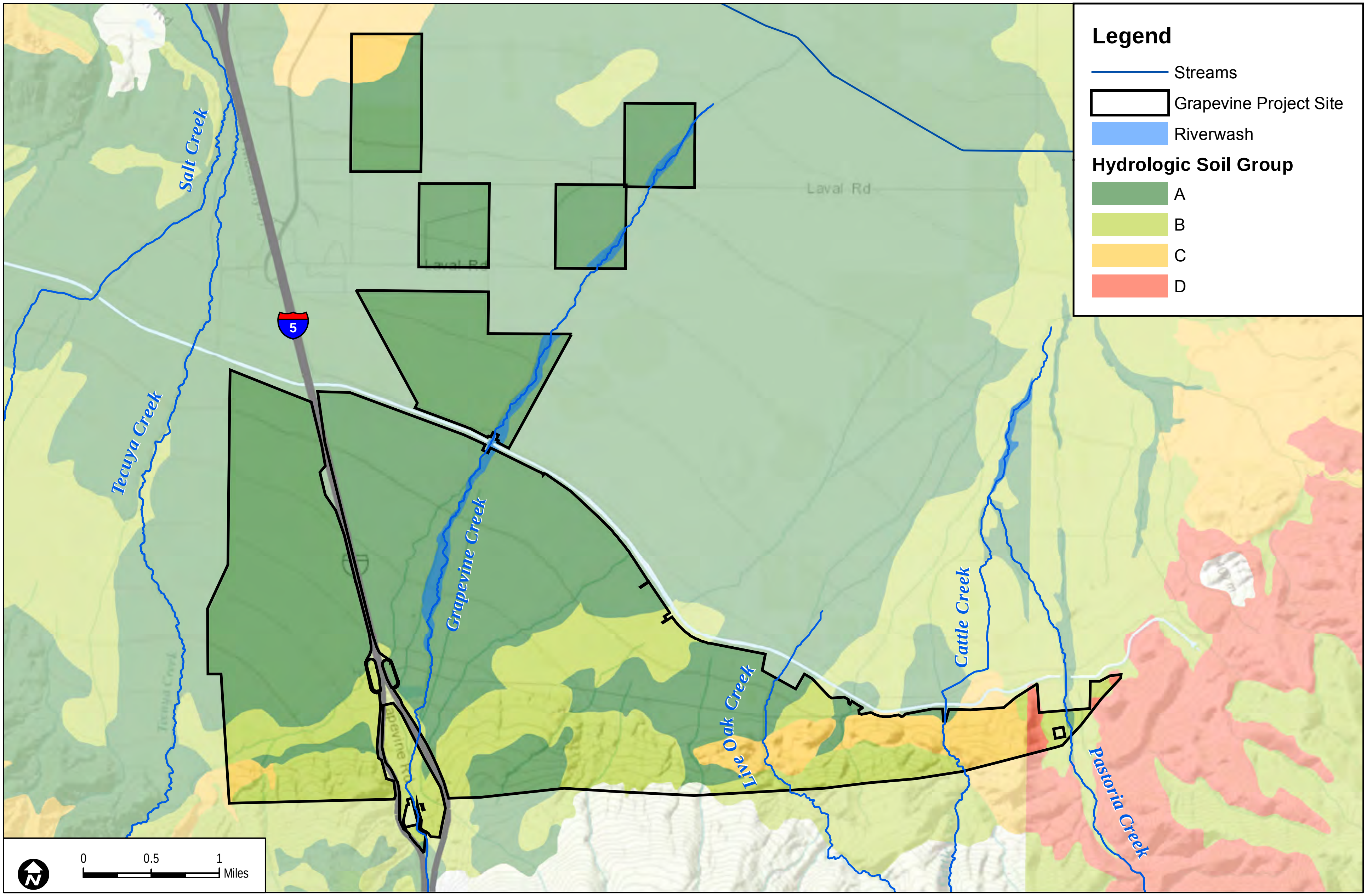


FIGURE 2-3

Geology

SOURCES: USGS, ESRI

GRAPEVINE PROJECT



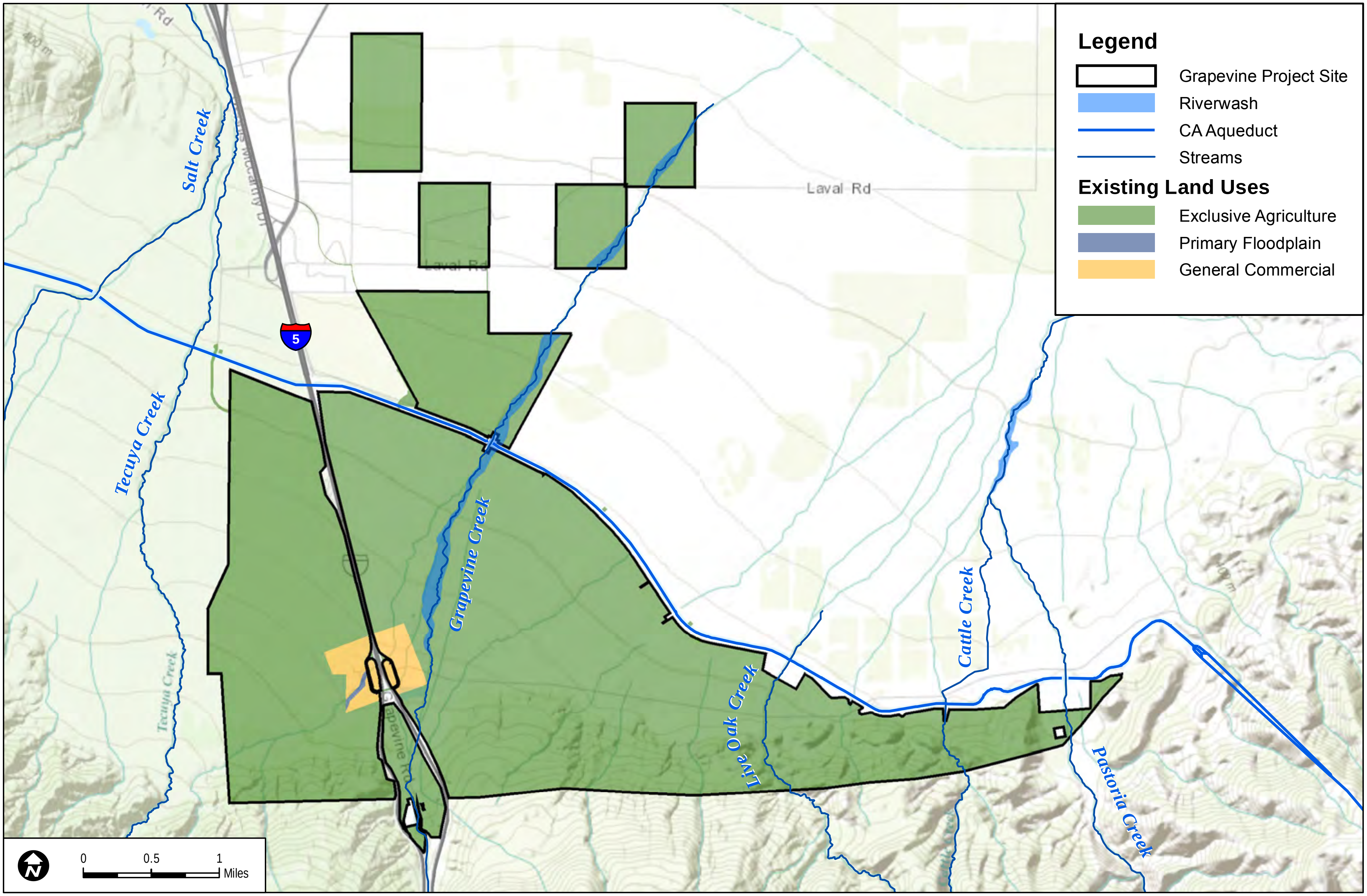
SOURCES: NRCS, ESRI

Note: Hydrologic Soil Group classification from NRCS.

FIGURE 2-4

Hydrologic Soil Groups

GRAPEVINE PROJECT

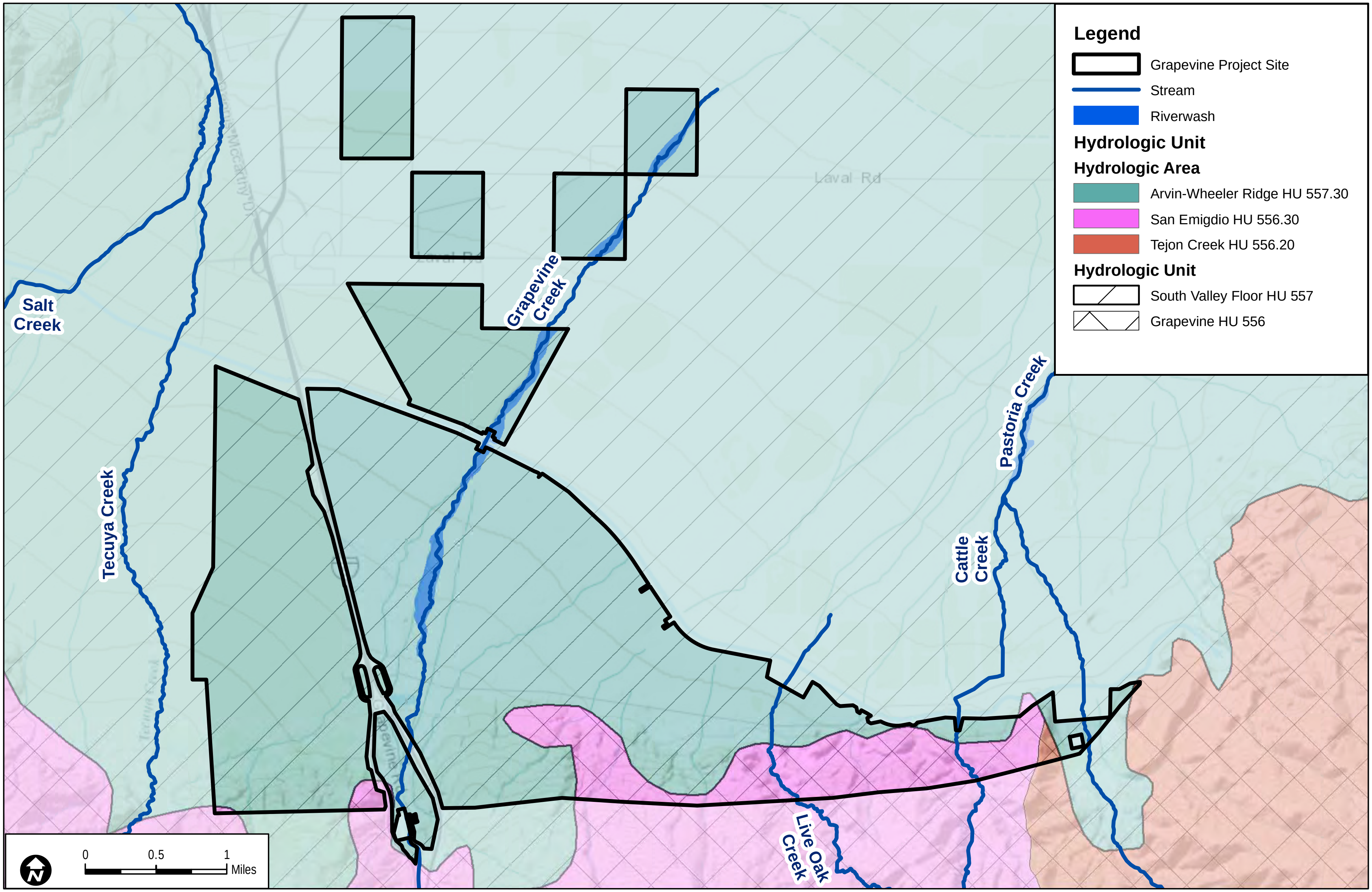


SOURCES: California State Water Resource Control Board, USGS, Dudek

FIGURE 2-5

Existing Land Uses

GRAPEVINE PROJECT

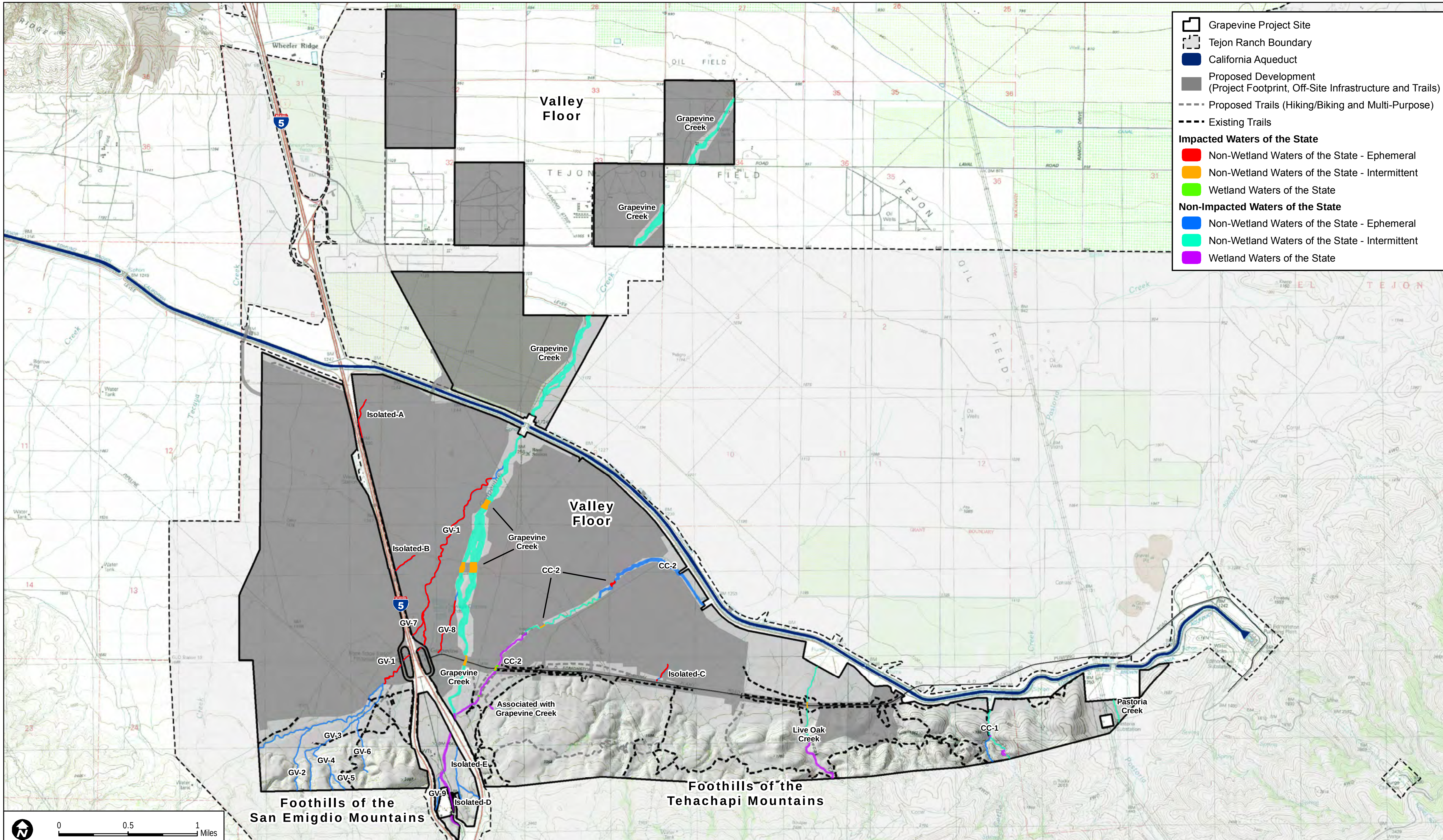


SOURCES: USGS, Dudek

FIGURE 2-6

Hydrologic Setting

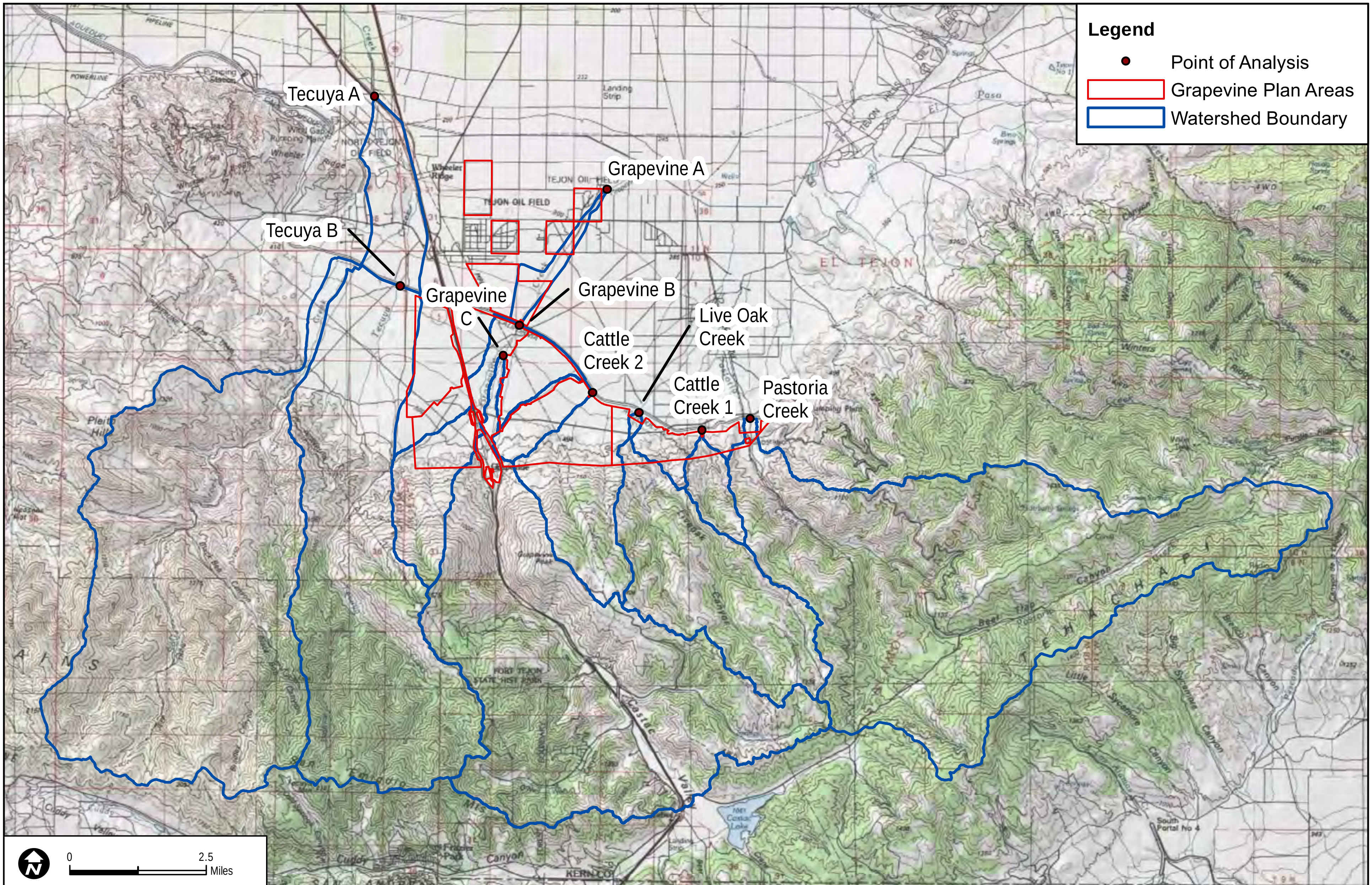
GRAPEVINE PROJECT



SOURCES: McIntosh & Associated 2014a

FIGURE 2-7

Project Footprint and CDFW- and RWQCB- Jurisdictional Areas



SOURCES: USGS, ESRI, NHD

FIGURE 2-8

Watershed Map

GRAPEVINE PROJECT

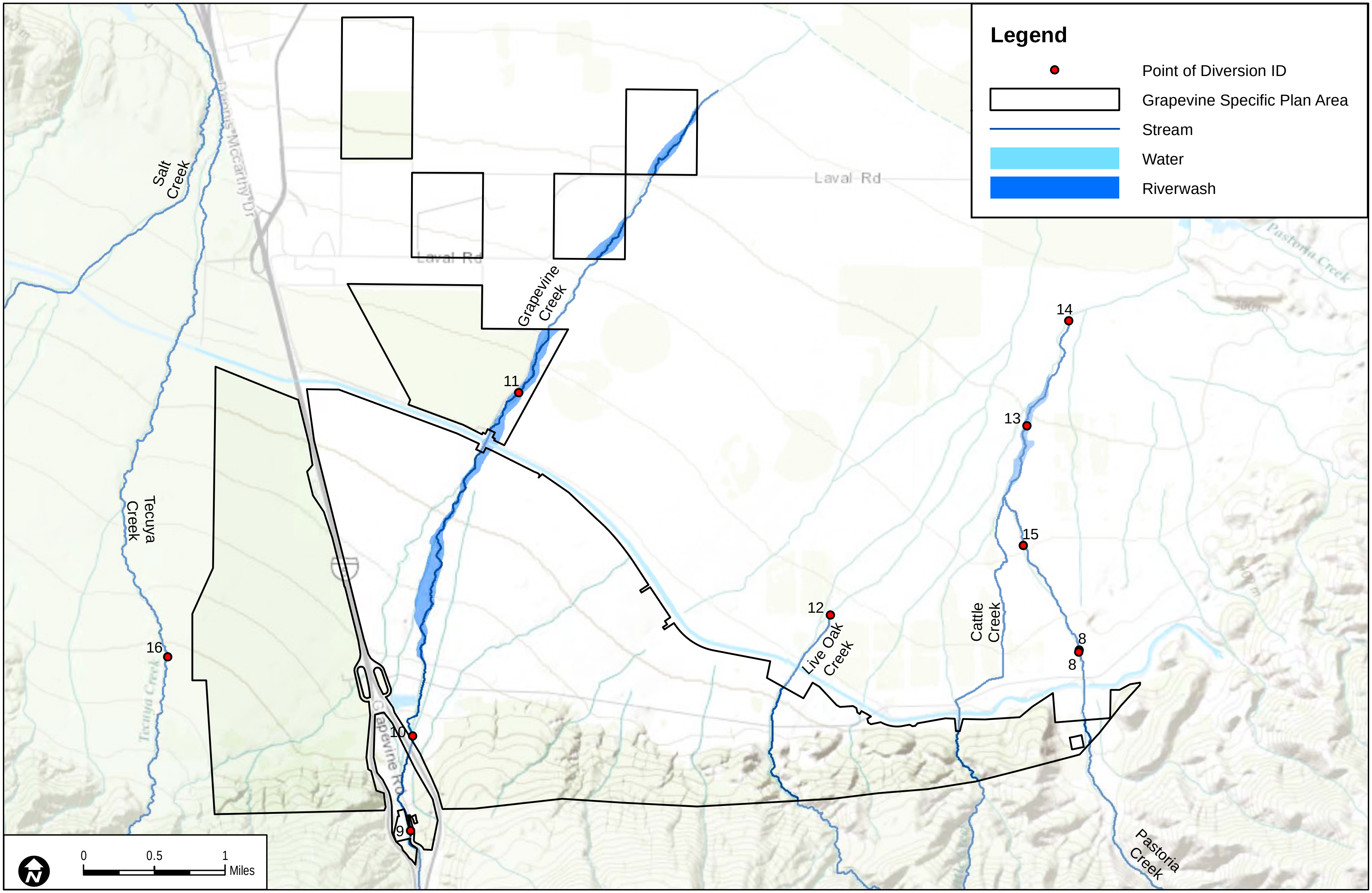


FIGURE 2-9

Surface Water Points of Diversion

SOURCES: USGS, Dudek

GRAPEVINE PROJECT

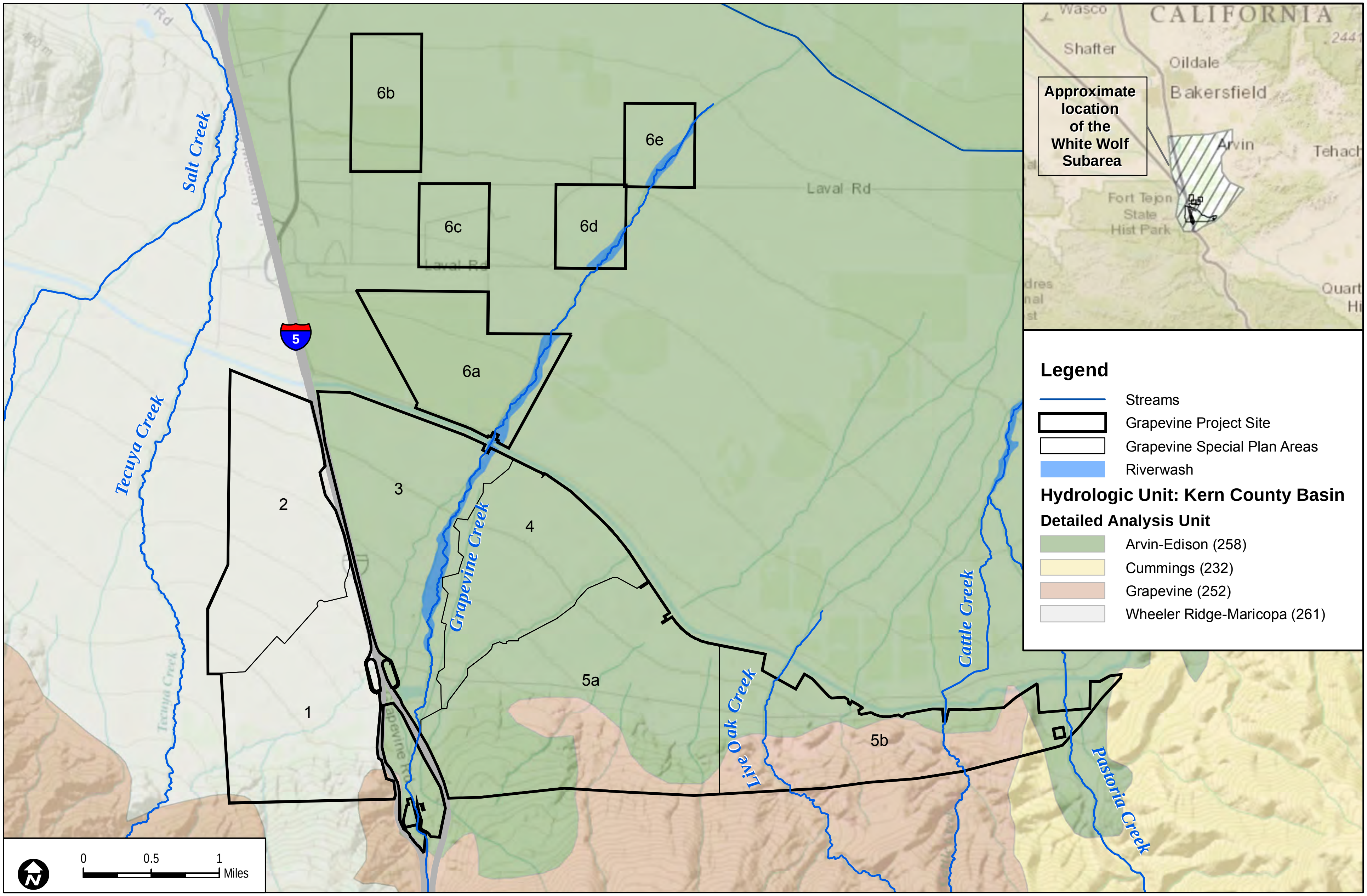
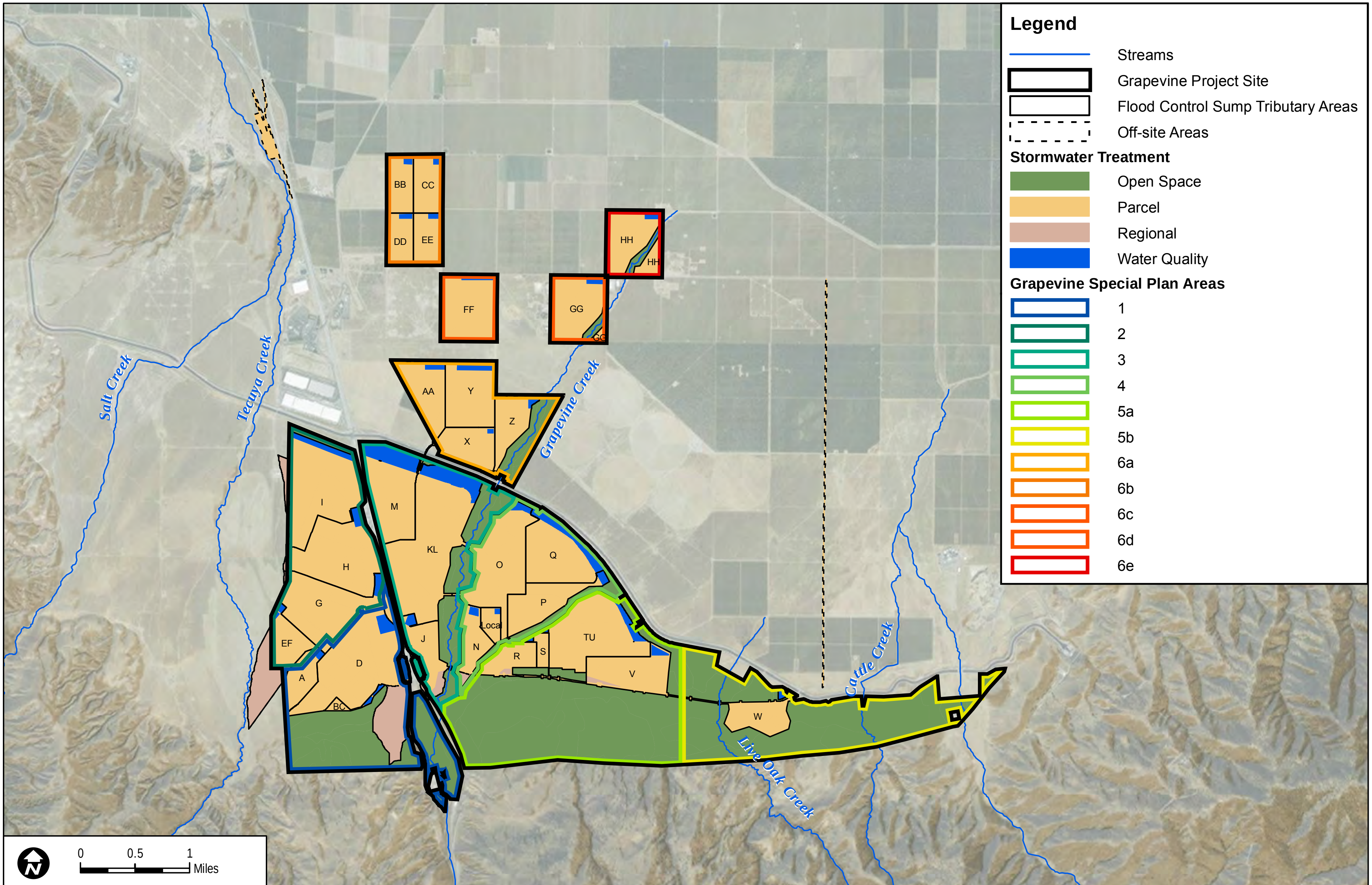


FIGURE 2-10

Groundwater Basins

SOURCES: California State Water Resource Control Board, USGS, Dudek

GRAPEVINE PROJECT

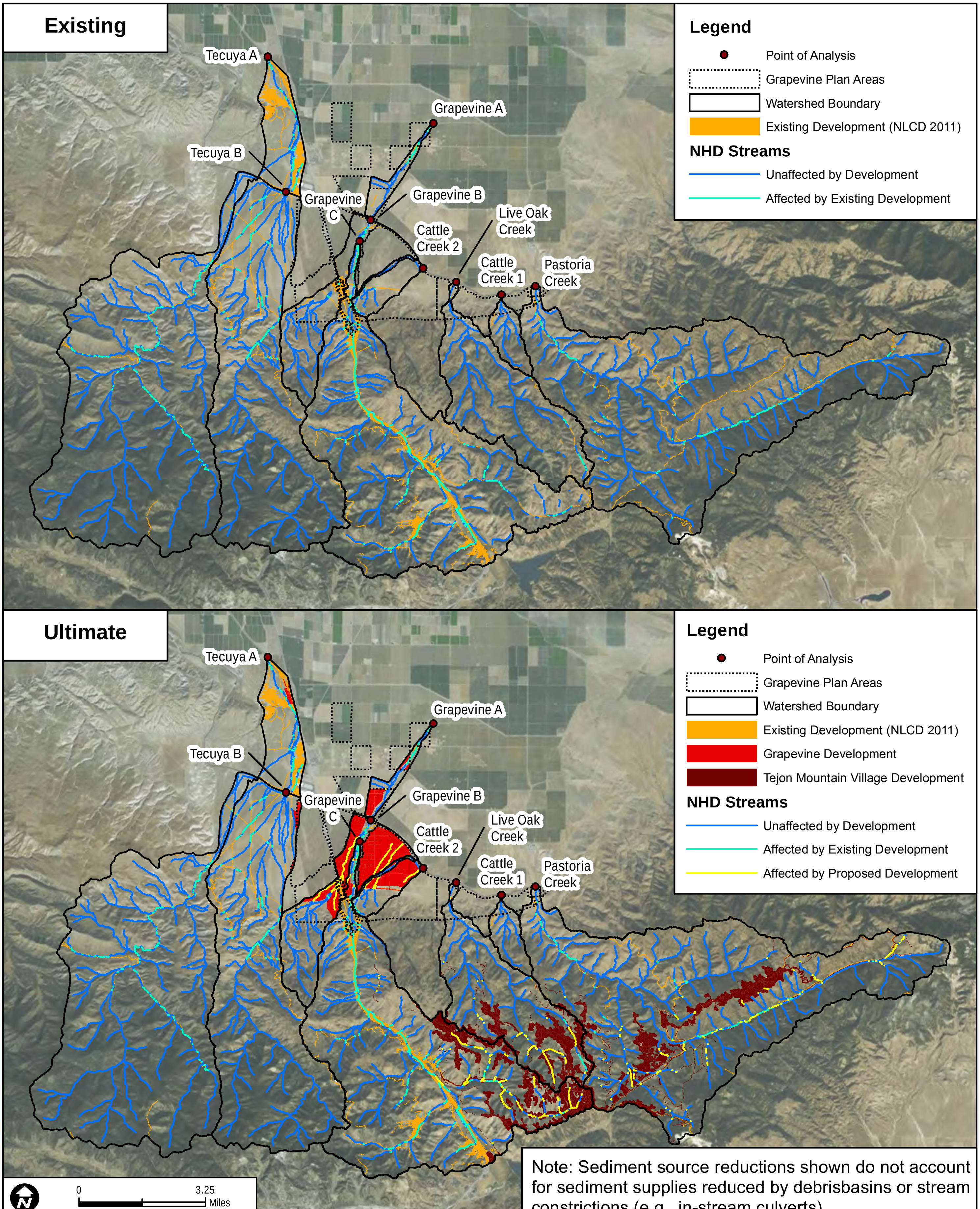


SOURCES: ESRI

FIGURE 5-1

Hydrologic and Water Quality Modeling Areas and PDFs

GRAPEVINE PROJECT



SOURCES: USGS, ESRI, NLCD, NHD

FIGURE 6-1

Sediment Source Reductions Map

GRAPEVINE PROJECT

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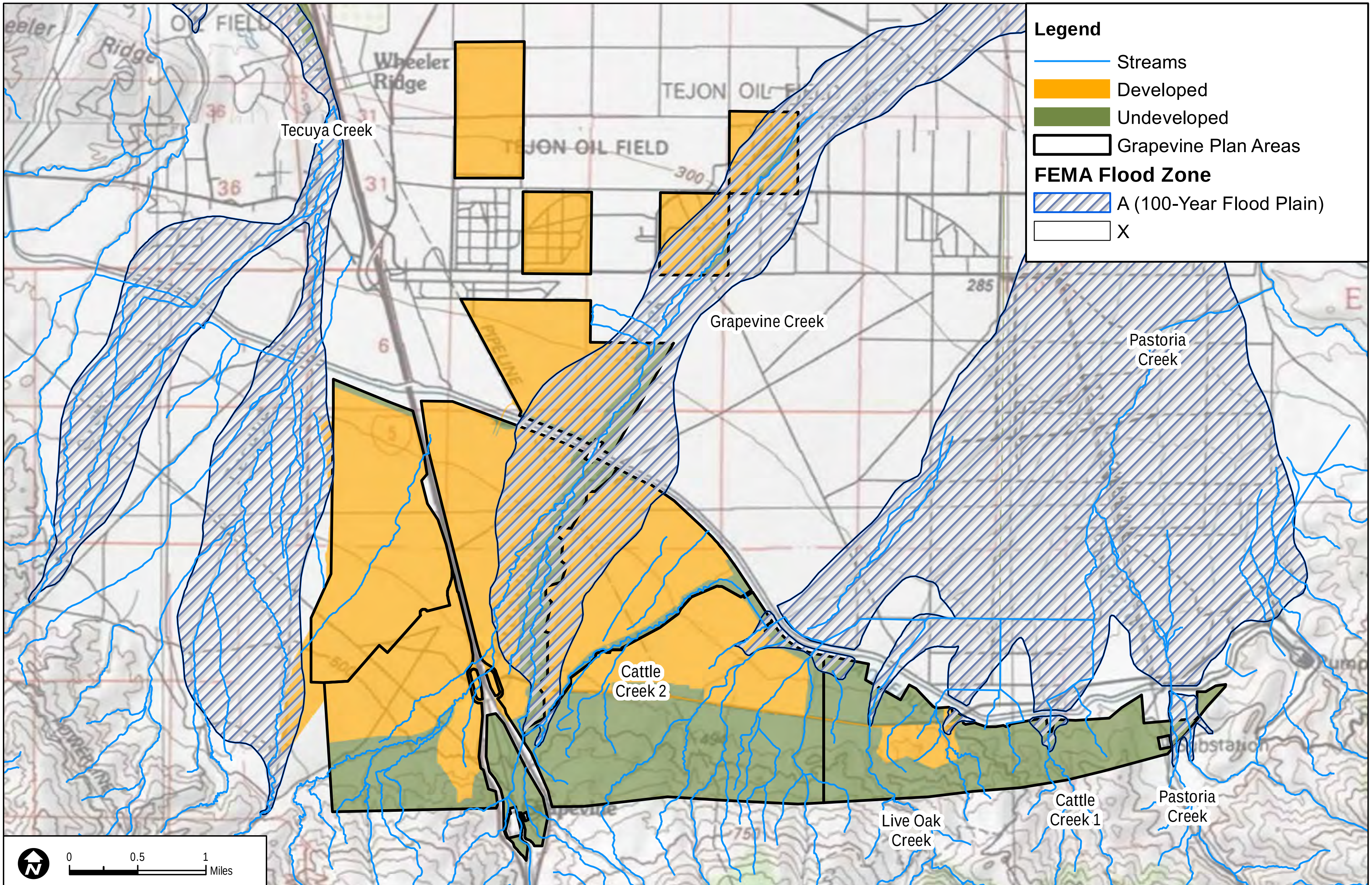

SOURCES: USGS, ESRI

FIGURE 6-2

Floodplain Map

GRAPEVINE PROJECT

APPENDIX A

SOURCE CONTROL AND TREATMENT BMPS

1.0 INTRODUCTION

When stormwater comes in contact with the urban environment, it will potentially travel over many surfaces comprised of varying land uses. These land uses may contribute pollutants that are introduced into the stormwater runoff and conveyed to the receiving water. These pollutants are a result of point sources (i.e., a single, defined location of the pollutant source) or non-point sources (i.e., sources of pollutants without a single, defined location) within the land use areas. To remove or mitigate these pollutants, a variety of best management practices (BMPs) have been developed that reduce pollutant load through overall volume reduction or by treatment processes such as sedimentation, filtration, and adsorption/absorption.

2.0 SOURCE CONTROL AND SITE DESIGN

Source control and site design BMPs target the source of pollutants and thus are among the most effective and efficient ways of controlling and reducing stormwater pollutant loads. Both source control and site design BMPs are proposed. Table A-1 lists potential source control and site design BMPs for the Grapevine Project.

Table A-1
Potential Source Control and Site Design BMPs

Control Type	BMP	Pollutant/Runoff Reduction	Advantages	Disadvantages
Source Control	Inert building materials (e.g. no copper, zinc roofing materials, treated lumber, etc.)	Expected high	Reduces pollution at the source	Limits building materials and potentially building aesthetics and may increase cost
	Education programs	Low	Inexpensive	Not as effective as treatment controls, especially for higher density development
	Covered parking	Moderate	Reduces wash-off of auto-related pollutants	Expensive
	Limit or prohibit pavement washing	Moderate	Reduces dry weather flows	Requires enforcement (e.g., include this limitation in Home Owners Association requirements)
	Smart irrigation systems	High for dry weather	Reduces dry weather runoff and irrigation quantities	Higher capital costs, but saves on water costs

Control Type	BMP	Pollutant/Runoff Reduction	Advantages	Disadvantages
	Native/drought tolerant/low impact vegetation in common areas (medians, etc.)	Moderate and high for wet and dry weather, respectively	Less watering, fertilizers, and pesticides required	Restricts planning schemes (moderate disadvantage)
	Native/low impact vegetation in all open areas (parks, etc.)	Moderate +	Much less (if any) watering, fertilizers, and pesticides required	Restricts planning schemes (more substantial disadvantage)
Site Design	Maximize open space	High	Aesthetically pleasing and may reduce treatment requirements	Restricts planning schemes (more substantial disadvantage)
	Minimize imperviousness – narrow streets, multi-story buildings, alternative paving materials	High	Reduces treatment requirements	Difficult in high density projects
	Minimize directly connected impervious areas	High	May reduce treatment requirements by reducing runoff volumes (or increase capacity in downstream BMPs)	Possible geotechnical concerns and may be difficult in high density projects, but more feasible than minimizing all impervious areas.

3.0 TREATMENT CONTROL BMPS

Treatment BMPs are limited to facilities designed to infiltrate, evaportranspire, and/or harvest and reuse runoff from the 85th percentile, 24-hour storm event for each Drainage Management Area (DMA). Remaining runoff is directed to bioretention facilities designed to infiltrate, evapotranspire, and/or filter the amount of runoff resulting from either the volumetric or flow-based criteria specific in the Permit. There are generally two categories of BMPs selected for design: distributed/onsite and community-scale/regional. Distributed/onsite BMPs include structural treatment that target smaller, individual parcels while community-scale BMPs are centralized stormwater facilities that receive runoff from larger watersheds and subwatersheds. Within these categories, there are various types of BMPs that may be able to meet the required permit criteria: on-site infiltration systems, vegetated treatment systems, local detention, and community-scale treatment. These options are summarized below.

3.1 On-Site Infiltration Systems

Methods to increase on-site infiltration help to reduce the volume of runoff and pollutants that are discharged to receiving waters. Options to increase on-site infiltration include the use of alternative paving materials and infiltration pits. Pre-design considerations include an evaluation of soil types and depth to groundwater; proximity to potentially impacted structures, and BMP maintenance to prevent long-term clogging. Potential examples of on-site infiltration system BMPs are presented and summarized below.

3.1.1 Permeable Paving

Impervious pavement (Figure A-1) on roadways, driveways, parking areas, and walkways are significant contributors to wet weather urban runoff. Permeable or porous pavements are comprised of materials that allow water to pass through a constructed service and into the underlying soil, yet are strong enough to structurally support vehicular or pedestrian traffic. Many types of porous pavements and configurations have been developed for a variety of applications. Most of the systems are supported by a stone base that has large pore spaces that act both as a structural support for the pavement and as a reservoir to store water to be infiltrated, if soil conditions allow, or detained and slowly released to the storm drain system. Some of the available permeable pavements are described below.

3.1.1.1 Pervious Concrete

Pervious concrete contains stable, connected pore spaces that allow water to drain through the structure into the underlying base and soil. The material becomes stronger and more stable when it gets wet, so it does not deteriorate as fast as other paving materials. Pervious concrete use should be restricted to parking lots and local roads since it will not support loads that are typically supported by standard concrete. Pervious concrete is cement based and therefore will not release harmful chemicals into the environment such as oil-based asphalt.

3.1.1.2 Pervious Asphalt

Pervious asphalt mix pavements are typically used in parking lots, private streets, driveways, and pedestrian access areas. Pervious asphalt mix pavements consist of a layer of pervious asphalt paving, underlain with a pervious base rock layer. There may or may not be a layer of geotextile fabric that separates the base rock from the underlying native soils. The base rock layer is typically designed to temporarily store the volume of stormwater generated from a design storm and infiltrate it into underlying soils or into an underdrain system.

3.1.1.3 Pervious Paving Blocks

Pervious paving blocks are also typically used in parking lots, private streets, driveways and pedestrian access ways. They consist of interlocking pre-cast units, typically made of concrete or plastic, with a shape that allows drainage openings that typically comprise approximately 10 percent of the paver surface area. When properly filled with permeable material, the voids allow for movement of stormwater through the pavement surface into the layers below. Interlocking concrete paving blocks are resistant to heavy loads, are easy to repair, and require little maintenance. These systems, however, have higher material and construction costs than gravel or grass pavers (see below).

3.1.1.4 Grass Pavers

Grass pavers offer an alternative to asphalt or concrete for low-traffic areas such as fire lanes, overflow parking, residential driveways, and maintenance and utility access lanes. Plastic rings in a flexible grid system are placed on a base of blended sand, gravel and topsoil, then filled with topsoil such as sandy loam and planted with vegetation. The support base and the rings' walls prevent soil compaction and reduce rutting and erosion by supporting the weight of traffic and concentrated loads, while the large void spaces in the rings allow a strong root network to develop. The end result is a load-bearing surface covered with natural grass, which is typically around 90 percent pervious and allows for stormwater infiltration and treatment. Ancillary benefits include airborne dust capture and reductions in the urban heat island effect. Most manufacturers also produce the paver rings from post-consumer recycled plastic materials. A disadvantage of the natural grass surface is that irrigation is required, potentially increasing potable water demand, and lawn care maintenance requirements.

3.1.2 Infiltration Galleries and Trenches

Infiltration galleries (Figure A-2) are a common means of stormwater management in many areas of the United States. They include subsurface reservoirs made by prefabricated sections or rock and gravel that store runoff directed from the surface (usually by a pipe or percolation) and promote infiltration into the underlying soil. Infiltration galleries are commonly used in locations with significant site constraints. Infiltration trenches (Figure A-3) are similar to infiltration galleries but are constructed as long, narrow, rock-filled trenches that receive stormwater runoff from small drainage areas. These facilities may include a shallow depression at the surface, but the majority of runoff is stored in the void space between the stones and infiltrates through the sides and bottom of the trench. Infiltration galleries and trenches are ideal for hydromodification control because substantial surface runoff volume reductions can be achieved. They are good candidates for the removal of sediment, particulate bound pollutants, and bacteria. Sedimentation of coarse particles should, however, be minimized in infiltration facilities through the use of appropriate pretreatment devices to prevent clogging.

3.2 Vegetated Treatment Systems

Vegetated structural treatment BMP categories include swales, bioretention, flow dispersion, and stormwater planters. When properly designed and maintained, vegetated treatment systems are among the most effective and cost efficient treatment approaches for pollutants in dry and wet-weather runoff. Treatment occurs through sedimentation, filtration, adsorption to organic matter, and/or vegetative uptake. Additionally, vegetated treatment systems can help to reduce runoff volumes through soil soaking, infiltration, and evapotranspiration. A beneficial feature of vegetated treatment systems is that their design and implementation is highly flexible and adaptable. On-site implementation of these systems can be integrated into surface conveyances and on-site landscaping in innovative ways that provide site amenities, are functionally effective for runoff conveyance and water quality treatment, and may be less costly to construct than traditional storm sewers. Potential examples of vegetated treatment system BMPs are presented and summarized below.

3.2.1 Vegetated Swales

Vegetated swales (Figure A-4) are open, shallow channels with low-lying vegetation covering the side slopes and bottom that collect and slowly convey runoff to downstream discharge points. Vegetated swales achieve pollutant removal through settling and filtration in the vegetation (native grasses and small plants) lining the channels, provide the opportunity for volume reduction through infiltration and evapotranspiration, and reduce the flow velocity in addition to conveying stormwater runoff. Swales are most effective when longitudinal slopes are small (two to six percent) and where water depths are less than the vegetation height. An effective vegetated swale achieves uniform sheet flow over and through a densely vegetated area, typically for a minimum hydraulic residence time of ten minutes (LA County DPW, 2009). The effectiveness of vegetated swales can be enhanced by adding check dams at approximately 50 foot increments along their length. These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling.

3.2.2 Bioretention

Bioretention facilities (Figure A-5) are vegetated (i.e., landscaped) shallow depressions that provide storage, infiltration, and evapotranspiration. Bioretention facilities also remove pollutants by filtering stormwater through an engineered soil mix and plants adapted to the local climate and soil moisture conditions. In bioretention facilities, pore spaces, microbes, and organic material in the engineered soils help to retain water in the form of soil moisture and to promote the adsorption of pollutants (e.g., dissolved metals and petroleum hydrocarbons) into the soil matrix. Plants utilize soil moisture and promote the drying of the soil through transpiration. For project areas with low permeability native soils or geotechnical constraints, bioretention facilities can be designed with an underdrain system that routes the treated runoff to the storm drain system. A bioinfiltration facility (Figure A-6) includes the same pollutant removal processes and design components as a bioretention facility, but also incorporates a raised underdrain above a gravel storage area to promote increased infiltration. If no underdrain is provided, deeper percolation of the stored runoff into the underlying soils occurs at a rate dependent on the infiltration rate associated with the underlying soils.

3.2.3 Flow Dispersion

Flow dispersion involves redirecting channeled flow to vegetated areas to maximize the infiltration potential and provide volume reduction. The most common use of flow dispersion involves disconnecting downspouts from buildings that collect roof runoff (Figure A-7). The flow from the downspout is then directed by a channel or other conveyance towards a vegetated area for infiltration into the underlying soil. Additionally, buried rock trenches may be incorporated to promote storage of the dispersed runoff while being infiltrated. In addition to promoting volume reduction through infiltration, flow dispersion also attenuates peak flows that would be entering the storm drain network. Other flow dispersion opportunities, such as directing roadway runoff towards vegetated medians, may be incorporated that also intercept existing drainage patterns and promote infiltration.

3.2.4 Stormwater Planters

A stormwater planter box (Figure A-8) is a structural facility filled with gravel, topsoil, and mulch that is planted with landscape vegetation. The planter receives runoff from rooftops and other impervious surfaces, where it is briefly ponded, filtered, and partly retained in the soil matrix. Planter boxes can be used directly adjacent to buildings beneath downspouts as long as the boxes are properly lined and the overflow outlet discharges away from the building to ensure water does not percolate beneath or into footings or foundations. They can also be placed away from buildings by conveying roof runoff in shallow engineered open conveyances, shallow pipes, or other innovative drainage structures. For example, downspouts could be designed to cross a pathway of a landscaped courtyard by intercepting the vertical downspout and installing a horizontal conveyance on top of an arbor or trellis, or conveying runoff through joints in walkways.

3.3 Local Detention

Local detention BMPs collect runoff from rooftops or smaller impervious areas and detain the water for slow release into the stormdrain system or for reuse as irrigation or other demands such as flushing toilets. The detention of runoff primarily decreases the volume of runoff but also contributes to pollutant load reduction through sedimentation. An important consideration in the design of local detention is the "first flush" or the volume generated by the first storm after a period of dry weather. The "first flush" of water generally includes higher pollutant loads and concentrations compared to subsequent storms due to this initial wash-off of deposited pollutants. Designing for the "first flush" will be more important if the stored water is being reused on-site and must meet specific water quality standards.

3.3.1 Cisterns and Rain Barrels

Cisterns and rain barrels (Figure A-9) are low-cost water conservation devices that collect and store runoff from impervious roof areas. They can be used to reduce runoff volume and, for smaller storm events, delay and reduce the peak runoff flow rates.. This stored runoff could provide a source of chemically untreated 'soft water' for gardens and landscaping, free of most sediment and dissolved salts. Because residential irrigation can account for a significant portion of domestic water consumption, rain barrels or cisterns could be used to reduce the demand on the municipal water system, especially during the hot summer months. Cisterns and rain barrels should have lids and screened inlets to minimize potential for breeding mosquitoes in the stored water.

Individual cisterns and rain barrels can be located above or below-ground and beneath each downspout, or larger community-scale cisterns could be used to collect and store runoff from multiple lots underground. Larger cisterns could potentially be integrated into landscaping designs in commercial areas or within local parks or used to meet other water demands such as flushing toilets.

3.4 Community-Scale Treatment

Community-scale BMPs provide treatment for moderate to large size catchments (greater than 10 acres). These facilities are located at the outlets of catchments and consolidate structural components and maintenance requirements into a limited number of locations. Potential examples of community-scale treatment BMPs are presented and summarized below.

3.4.1 Community-Scale Detention

Community-scale detention facilities (including dry extended detention basins [Figure A-10]) are among the most frequently used structural BMPs for stormwater. Detention facilities are commonly designed to provide detention of a water quality design volume for a period of 24 to 48 hours. Treatment is achieved through sedimentation and/or infiltration; however, pollutant removal can be enhanced by planting vegetation on the bottom and side slopes of the basin. Wetlands or wetland channels can also be constructed in the floor of these facilities to provide treatment of dry-weather flows. Community-scale detention facilities can also be integrated into flood control basins by adding separate water quality pools and water quality outlets to the basin.

3.4.2 Community-Scale Infiltration

Community-scale infiltration basins (Figure A-11) are large, shallow impoundments that are designed to infiltrate runoff through the underlying soil. Infiltration basins store runoff until it gradually percolates into the soil and are highly effective with respect to pollutant removal and runoff volume reduction. These structures can only be used in areas with well-draining soil types and appropriate geology and can be subject to failure or reduced effectiveness due to clogging by fine particulates. Soil conditions in the majority of the Grapevine project area appear to be favorable for community-scale infiltration BMPs (64% of approximate field infiltration rate results > 2 in/hr [Geosyntec, 2014]).

4.0 BMP SELECTION

Treatment BMPs should be selected to suit the development style and planning regime, site characteristics, contaminants of concern, and receiving water characteristics. The following recommendations can guide BMP evaluation and selection:

- Distributed BMPs utilizing vegetated treatment approaches should be employed to the maximum extent given the nature of most of the development (low to medium-density residential and commercial). Distributed BMPs have the capacity to provide a high level of treatment and have the ability to comply with the Phase II MS4 permit. Distributed vegetated treatment systems can easily be integrated into the landscaping of most, if not all, land uses.
- The site soils are predominately well draining hydrologic soil groups A and B, with some areas of poorly draining types to the southeast of the project area. Infiltration BMPs should be used at all locations where undisturbed underlying soil saturated hydraulic conductivities would allow for performance metrics to be met. Vegetated treatment

BMPs should be constructed with underdrains where soil infiltration is deemed infeasible.

- Treatment BMPs that provide runoff volume reduction and directly reduce flows and pollutant loadings to receiving waters for both wet and dry weather conditions are recommended. Runoff volume reducing BMPs include infiltration galleries and trenches, bioretention, vegetated treatment systems, permeable paving, rain barrels and cistern systems, and smart irrigation controllers. Results from initial field visits indicate that runoff volume reduction will be important for controlling hydromodification impacts to receiving streams.

Table A-2 can be used to help select potential treatment BMP types based on removal processes and treatment performance for pollutants of concern. Vegetated treatment systems, such as swales and bioretention are desirable because of their ability to reduce runoff volumes as well as effectively reduce sediment, nutrients, and metals. Catch basin inserts and hydrodynamic separators[1] are recommended for pretreatment of coarse solids and trash, but will not remove bacteria, fine sediment, dissolved nutrients, or dissolved metals. These devices will also not reduce runoff volumes or flow rates.

Table A-2
Removal Processes and Targeted Pollutants for Potential Treatment BMPs

Treatment BMP	Removal Processes	Targeted Pollutants	Suitability Areas
Bioretention	Gravity Settling Filtration Absorption/Adsorption Biological Uptake Evapotranspiration Infiltration	Flow Trash Sediment (and associated pollutants – metals, TPH/PAH, TP) Dissolved Metals Nutrients Bacteria Pesticides	All impervious areas.
Vegetated Swale	Gravity Settling Evapotranspiration Infiltration	Flow Trash Sediment (and associated pollutants – metals, TPH/PAH)	All impervious areas, especially for conveyance and treatment along roadways and for higher density developments.

[1] Catch basin inserts include a filter installed within an existing catch basin to reduce pollutant loads through filtration. Hydrodynamic separators are flow-through BMPs that direct the flow in a circular motion to promote separation and settling of sediments.

Treatment BMP	Removal Processes	Targeted Pollutants	Suitability Areas
Detention Basins / Wet Ponds	Gravity Settling Absorption/Adsorption Biological Uptake/breakdown Evapotranspiration	Flow Trash Sediment (and associated pollutants – metals, TPH/PAH, TP) Dissolved Metals Nutrients Bacteria Pesticides	Centralized treatment for areas with high density of impervious areas. Community-scale treatment for general surface runoff to reduce nutrient and other contaminant loads.
Infiltration pits and trenches	Gravity settling Filtration Absorption/Adsorption Biological breakdown Infiltration	Flow Trash Sediment (and those pollutants associated with fine sediment – metals, TPH/PAH, TP) Dissolved Metals Nutrients Bacteria Pesticides	All areas where distributed BMPs are feasible.
Planter Boxes	Gravity Settling Filtration Evapotranspiration	Flow Trash Sediment (and those pollutants associated with fine sediment – metals, TPH/PAH, TP) Dissolved Metals Nutrients Bacteria	Planter boxes are most commonly used in urban areas adjacent to buildings and along sidewalks.
Flow Dispersion/Disconnected Downspouts	Gravity Settling Filtration Evapotranspiration Infiltration	Flow Dissolved Metals	Pervious areas adjacent to structures with suitable soil conditions, a minimum flow path slope & length across the pervious area.
Porous/Permeable Pavements	Filtration Infiltration	Flow Trash Sediment (and associated pollutants– metals, TPH/PAH, TP) Dissolved Metals Bacteria	Access roads, driveways, walking paths, bike paths, and common courtyards.
Storage/Irrigation Reuse (Rain barrels or cisterns)	Evapotranspiration Potable uses (e.g., toilet flushing)	Flow Dissolved Metals Nutrients Bacteria Pesticides	All areas except roads and parking lots. Need to be located near areas requiring irrigation or other water demands.

Treatment BMPs are recommended based on the selection criteria discussed in previous sections. A heavy reliance on distributed BMPs consisting mainly of infiltration treatment facilities is recommended to comply with the Phase II Small MS4 permit. Specific BMP recommendations for each land use are presented in Table A-3.

Table A-3
Project Treatment and Optional BMP Concepts

Land Use	Treatment BMP Concepts (Model Assumptions)	Optional BMP Concepts
Single-family residential	• Bioretention in landscaping for runoff from roofs and local impervious areas (requires 5-ft building setback) • Flow dispersion of roof and driveway runoff into landscaped areas (no formal bioretention) (requires 5-ft building setback) • Infiltration trenches in landscaping for runoff from roofs and local impervious area (requires 5-ft building setback) • Stormwater planter boxes for rooftop runoff when landscape area is limited • Community-scale system (see below) • Combinations of the above, potentially with "neighborhood-scale" combinations (i.e., shared common area locations for bioretention for example)	• Permeable pavement for driveways, surface parking, and walkways
Village (multi-family) residential	• Same options as for single-family residential (but advantage of landscaped areas being in common areas for O&M)	• Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing
Commercial, schools, and parks	• Bioretention in courtyards and stormwater planter boxes for roof top runoff • Bioretention or infiltration trenches in landscaped areas for local impervious areas • Community-scale system (see below) • Combinations of the above	• Permeable pavement for walkways and courtyards • Permeable asphalt for parking lots • Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing
Industrial	• Community-scale system (see below)	

Land Use	Treatment BMP Concepts (Model Assumptions)	Optional BMP Concepts
Local streets and public access ways	• Infiltration trenches in landscaping for runoff from roofs and local impervious area (requires 5-ft building setback) • Stormwater planter boxes for rooftop runoff when landscape area is limited • Combinations of the above	• Permeable pavement for walkways and bikeways • Drain low gradient trails directly to edge for sheet flow dispersion
Relocated interchange	• Community-scale system (see below)	• Vegetated swale in roadways for treatment/infiltration of roadway runoff and adjacent development where feasible • Vegetated swale adjacent to roadway • Bioretention/infiltration basin island in traffic turnabout
Community-scale systems	• Infiltration facilities • Community-scale vegetated detention basin(s) if infiltration rates are limiting	• Vegetated swales route runoff to community-scale infiltration basin(s) • Infiltration trenches or bioretention along riverbanks

5.0 REFERENCES

County of Los Angeles Department of Public Works (LA County DPW), 2009. Stormwater Best Management Practice Design and Maintenance Manual: For Publicly Maintained Storm Drain Systems. May.

Geosyntec Consultants, 2014. Initial Infiltration Testing Evaluations: Grapevine Specific Plan Area; Kern County, California. March 13.

APPENDIX B

INITIAL INFILTRATION TESTING EVALUATIONS

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Initial Infiltration Testing Evaluations

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1. INTRODUCTION

This report was prepared for Tejon Grapevine, LLC by Geosyntec Consultants (Geosyntec) in support of the Grapevine Specific Plan (Project) in Kern County, California. The work documented in this report focuses on the evaluation of infiltration characteristics of subgrade soils at select locations around the proposed development to assess the potential for use of infiltration to manage stormwater runoff. Figure 1 shows the project vicinity, while Figures 2 and 3 show the project boundaries.

1.1 Project Location

The proposed Grapevine project is located in the west-central portion of Tejon Ranch (the Ranch). The approximately 270,000-acre Ranch is currently held in private ownership by Tejon Ranchcorp. The Ranch includes a large portion of the Tehachapi Mountains as well as smaller portions of the San Joaquin and Antelope Valleys. Generally, the Ranch extends from Interstate 5 (I-5) on the western side to State Route 58 (SR 58) on the northern side and SR 138 on the southern side (Figure 1).

The 8,010-acre Grapevine project site is entirely within unincorporated Kern County, just south of the junction of I-5 and SR 99. Downtown Bakersfield is approximately 25 miles north of the project. The majority of the project is on the east side of I-5, but a portion lies on the west side of I-5. The project site is bisected by the California Aqueduct (Figures 1 and 2).

The Grapevine project site lies mainly in the Grapevine and Pastoria Creek U.S. Geological Survey (USGS) 7.5-minute quadrangles. There is one parcel and a portion of two other parcels in the project site that lie entirely within the Mettler USGS 7.5-minute quadrangles. The latitude and longitude of the approximate center of the site is 34°57′9″ N and 118°55′39″ W. The Universal Transverse Mercator (UTM) coordinates for the approximate center are UTM Easting (meters) 323999 and UTM Northing (meters) 3869472 in Zone 11.

1.2 Project Overview

The 8,010-acre project site is within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement, a landmark agreement reached in 2008 with leading environmental organizations (including the Sierra Club, Natural Resources Defense Council, California Audubon Society, Endangered Habitats League, and Planning and Conservation League) to permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as I-5. The precise boundaries of the 8,010-acre project site may be further adjusted based on the results of the ongoing environmental review and permitting process for the project, but will remain within the Grapevine Planning Area.

The Grapevine project site includes approximately 8,010 acres, of which approximately 3,232 acres (or about 40%) would be designated for agriculture (with grazing and open space as the predominant land uses) and approximately 4,778 acres (about 60%) would be developed as a new residential community and employment center. The community would leverage and build upon the economic expansion and job growth that has occurred at Tejon Ranch Commerce Center, located immediately north of the project on I-5. The Grapevine project would feature a series of compact neighborhoods linked by bicycle and pedestrian trails that provide convenient access to grocery and drugstores, professional services, schools, and parks. The project site is located along I-5, at the gateway to the Central Valley, and is immediately adjacent to the extensive open space that was conserved in the Tejon Ranch Land Use and Conservation Agreement.

The proposed project, which would include up to 12,000 residential units and 10.7 million square feet of commercial land uses, is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Other potential public facilities, including a fire station, sheriff substation, transit facility/park-and-ride, and water and wastewater treatment facilities are proposed throughout the community.

Outside the village cores, the Grapevine project includes a mix of residential uses, office, research and development, regional commercial, freeway-oriented commercial, and light industrial/warehouse uses.

Access to the project site will be from the existing Grapevine interchange (eventually to be relocated slightly to the north) and the Laval Road interchange from I-5. The circulation network is composed of two- and four-lane arterials, collector streets, and local streets organized in a grid pattern. All roads within the project site will be public. Multipurpose trails are proposed along Grapevine Creek, Cattle Creek, the southern foothills, and the open space adjacent to the California Aqueduct and at other locations throughout the project site. Some of these trails would connect to on-street, Class 2 bike lanes. Water and sewer service will be provided by the Tejon–Castac Water District.

1.3 Purpose and Scope

Geosyntec is preparing a stormwater mitigation plan that will be designed to reduce the project's potential runoff impacts to less than significant levels under applicable California Environmental Quality Act (CEQA) criteria. To achieve this objective, the project intends to use infiltration-based low-impact development (LID) techniques that will infiltrate dry weather runoff (including such sources as irrigation return flows which are expected to be minimal), and a portion of wet weather runoff, into subsurface soils. Infiltration-based LID stormwater management avoids discharging runoff into surface waters and utilizes onsite soil and other filtration methods to reduce concentrations of potential constituents of concern in infiltrated water.

This geotechnical investigation evaluates the potential infiltration capacity of the subsurface soils at several locations throughout the project to assess the extent to which onsite soil conditions will facilitate effective infiltration-based LID stormwater and dry weather runoff management. Potential infiltration properties were assessed in a desktop analysis prior to the field work using soil texture type (i.e. sandy loam, silty sandy loam, etc.) and estimated saturated hydraulic conductivity (Ksat) values. The estimated values are shown in Figure 3, and a table summarizing the soil texture and Ksat values is presented in Table A at the end of this report. Field capacity infiltration tests were conducted and the results were compared with the Ksat values estimated from the NRCS data.

Geosyntec's scope of work consisted of the following tasks:

- Development of a geotechnical investigation plan to evaluate infiltration potential;
- Planning\coordinating with Tejon Ranch Company personnel to facilitate field investigation and site access;
- Coordinating with local utility companies for utility clearance;
- Drilling and logging of 11 hollow-stem auger borings and preparing the borings for infiltration testing;
- Performing constant head infiltration testing in the bore holes (vadose zone; 10 feet below the surface) at the locations of the 11 hollow-stem auger borings; and
- Preparing this report outlining our findings and brief interpretations.

1.4 <u>Summary of Conclusions</u>

As discussed below, the field analysis results were generally consistent with the Ksat values estimated for project area soils from the NRCS data. Furthermore, the infiltration rates observed during the field testing indicate that LID infiltration features will support infiltration of storm water and dry weather runoff. This result indicates that

Ksat values derived from NRCS soil information (Table A, attached) are likely to be broadly representative of onsite infiltration conditions. In addition, the field study did not identify substantial impervious clay layers, adverse groundwater conditions or other factors that could significantly reduce the effectiveness of infiltration-based LID stormwater and dry weather runoff management. Subject to a more detailed evaluation that would be conducted prior to the construction of specific runoff management infiltration facilities, the field study results support the use of stormwater and dry weather runoff infiltration-based LID to eliminate or reduce the volume of project-related runoff and achieve applicable runoff water quality and hydromodification objectives.

2. FIELD INVESTIGATION AND INFILTRATION TESTING

2.1 Field Investigation

The field investigation performed by Geosyntec consisted of drilling 11 borings using a hollow-stem auger and logging the soil cuttings. The 11 borings were advanced to a depth of 10 feet below ground surface (bgs). The locations of the 11 borings are shown in Figure 2. The borings are located throughout the project boundary, north and south of the California aqueduct, and in soils that are characteristic of most of the site.

At each boring location, the upper 5 feet of the boring was advanced using a hand auger to check for potential unknown\unmapped utilities in the area. The remaining depth of the borings was advanced using a hollow-stem auger.

Geosyntec's field engineer logged soil cuttings at the 11 borings, and the boring logs are presented in Appendix A of this report.

2.2 Infiltration Testing

Constant head infiltration tests were conducted at 11 boring locations in general accordance with United States Bureau of Reclamation (USBR) (1989) test method USBR 7300-89. At each location, following the completion of hollow-stem auger boring, the annular space was backfilled with 3/8-inch gravel.

At each location, after first saturating a portion of the vadose zone around the borehole, water was added to the borehole from the ground surface at a measured rate using a flow totalizer until the flow rate remained constant. The water level in the boring was kept approximately constant during the test. Using this approach, water was able to enter soil stratum over the entire 10-ft boring (i.e. the bottom of the boring as well as the sides). The infiltration rate of soils was estimated by using the "well permeameter method" described by the United States Bureau of Reclamation (USBR) in publication 7300-89 (USBR 1989). The results of each borehole test are summarized below and in more detail in Appendix B. Appendix C includes an excerpt from the USBR publication 7300-1989 that summarizes the well permeameter test method used in this report.

3. SITE CONDITIONS

3.1 Surface Conditions

Borings B-1 through B-8 were advanced in relatively flat terrain covered with sparse, dry vegetation. Boring B-8 was advanced at the start of the foothills at the southern end of the valley floor where the terrain begins to become rolling. Boring B-9 was advanced in similar flat, dry vegetated terrain as B-1 through B-7, although the vegetation was slightly more dense.

Borings B-11 and B-12 were drilled near Grapevine Creek at Laval Road. The terrain consisted of light vegetation and was relatively flat.

3.2 Subsurface Soils

Borehole logs with brief descriptions of the observed subsurface conditions encountered during the field work are presented in Appendix A. Based on visual field classification, the subsurface conditions within the site, in general, consist of alluvial soils, including significant percentages of sand and fine-grained materials with gravel and cobbles also present in lesser quantities. These observations are consistent with both the more general NRCS characterization and the more specific project geotechnical report characterization of the site.

In all locations except B-8, a sandy silt to silty sand was encountered over the entire 10-ft depth at each boring. In these locations, the gravel content ranged from 0 to 20 percent. Typically the sand content ranged from 20-60% and was primarily very fine to fine grained with lesser amounts of medium and coarse-grained sand present. Fine grained materials made up the remaining 25 to 70%. The fines present in the stratum appeared to be non-plastic and appeared to contain insignificant quantities of clay (i.e., less than 5%). At several locations, the boring location had to be altered due to the presence of boulders beneath the ground surface. The gravel and cobbles present were typically rounded. At the locations near Grapevine Creek (B-11 and B-12), greater percentages of sand (>70%) were present at depths below 5 feet below ground surface (bgs).

Boring B-8, which was located on the south side of Edmonston Pump Plant Road at the base of the foothills primarily consisted of a fine-grained material, field classified as silt with clay. This material was markedly different than material encountered elsewhere on the site. The material contained a trace (<5%) of fine-grained sand.

Detailed descriptions of the subsurface soils are presented on the logs of boreholes in Appendix A of this report.

3.3 Groundwater

Groundwater was not encountered in any of the 11 borings described in this report. Based on a 2013 regional groundwater assessment that included the project site (WZI 2013) and TRC well drilling activity near and within the project area, groundwater depth is documented to be approximately 600 to 800 feet bgs in the northern portion of the project and 200 feet bgs on the east side of the project. Based on the field results and the depth of onsite aquifers, groundwater is not expected to affect infiltration-based LID runoff management measures within the project site.

3.4 Hydraulic Conductivity of Subsurface Soils

Geosyntec performed a total of 11 *in-situ* infiltration tests. The test procedure followed by Geosyntec was substantially similar[1] to the USBR well permeameter test method (USBR 1989) and as described in Appendix C. Results of the *in-situ* infiltration tests are reported in Table 1, and additional detail is provided in Appendix B. Results of the measured *in-situ* hydraulic conductivity testing indicated that *in-situ* hydraulic conductivities of the soils profiled at the tested locations range from approximately 4.5×10^{-4} cm/s to 2.9×10^{-3} cm/s (0.6 in/hr to 4.1 in/hr). Corresponding approximate infiltration rates based upon field measurements are shown in Table 1. Although the soil profile in the borings is generally consistent (except for B-8), the percentage of fines (i.e., silty material) at the specific location may account for some of the observed variability in the *in-situ* hydraulic conductivity.

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[1] The difference between the USBR method and actual field methods was how the water level in the boring was kept constant during testing. The USBR method employs an automatic system and a graduated storage device for measuring the flow, whereas the current field method used a flow meter and manual system for keeping a constant water level in the boring. This deviation from the USBR method is not expected to alter measured infiltration results within the limits of accuracy of the test.

Table 1. Hydraulic Conductivity Measured At Borehole Locations As Estimated From Infiltration Testing Results

Boring	Latitude	Longitude	Special Plan Area	Approximate Field Hydraulic Conductivity (cm/s)	Approximate Field Infiltration Rate[1] (in/hr)	Ksat Value from NRCS Soil Texture (in/hr)[2]
B-1	34.93792	-118.94535	1	1.6×10^{-3}	2.3	2.0-6.0
B-2	34.95355	-118.94701	2	1.6×10^{-3}	2.2	2.0-6.0
B-3	34.95387	-118.93564	2	1.0×10^{-3}	1.4	2.0-6.0
B-4	34.96048	-118.92715	3	1.5×10^{-3}	2.1	2.0-6.0
B-5	34.94480	-118.92088	4	1.8×10^{-3}	2.5	2.0-6.0
B-6	34.94211	-118.91259	5a	1.3×10^{-3}	1.9	0.6-2.0
B-7	34.94606	-118.90072	5a	2.9×10^{-3}	4.1	6.0-20
B-8	34.93622	-118.87476	5b	4.5×10^{-4}	0.6	0.2-0.6
B-9	34.97280	-118.91768	6a	1.2×10^{-3}	1.7	2.0-6.0
B-11	34.98699	-118.90148	6d	2.2×10^{-3}	3.1	6.0-20
B-12	34.99521	-118.89416	6e	2.0×10^{-3}	2.8	2.0-6.0

[1] Assuming a gradient of 1, or that the hydraulic conductivity equals the infiltration rate.

[2] Table A provided at the end of this report provides the source of these values. Figure 3 and Appendix D also provides the boundaries of the NRCS soil textures used to estimate these values. The Ksat values shown in this table provide a range of average values of similar soil types assumed to be present (Based on an NRCS Soil Survey) in the upper 5 feet of the soil stratum.

The field results in Table 1 are also generally consistent with the Ksat values derived from the NRCS surface soil data shown in Figure 3. The field results are also compared with the Ksat values estimated from NRCS data. This comparison shows that, at most borehole locations, infiltration rates based on the field study results fall within the range of Ksat values estimated from corresponding NRCS soil classifications, but generally were at the lower end of the range. The NRCS soil survey generally describes soils within the site as consisting of sandy to gravelly sandy loam up to a depth of 5 feet bgs. Although sand and gravel were observed in all of the borings, the field study indicates that the dominant project area soil type is silty loam, which typically would have lower Ksat values than the sandy to gravelly sandy loam identified in the NRCS survey. The differences between the soil type observed at each boring and the more generalized NRCS characterization of the region that includes the project area likely account for the lower infiltration rates estimated from the field study relative to Ksat values derived from the NRCS survey. Appendix D provides a summary of the NRCS soil characteristics in the project area.

4. CONCLUSIONS

Based on the information presented above, the primary conclusions are:

1. Infiltration rates for most locations, except perhaps in the lower foothills, are likely to be at least 2 inch/hour in most of the site, and particularly in the flatter alluvium areas where most construction would occur;
2. The field infiltration rates are generally consistent with, but at the lower range of, estimates based on NRCS soil boundary and estimated Ksat values, likely due to the greater extent of sandy conditions assumed by the NRCS compared with the more silty conditions observed in most of the borings;
3. Groundwater or clay layers are unlikely to affect project infiltration-based LID runoff measures.

Based on these conclusions, the on-site soils appear to be able to support infiltration based LID features, such as infiltration basins or trenches, and we recommend that these features should be considered for implementation. More detailed design, such as specific infiltration basin/trench locations and dimensions, will be contingent on development planning and proposed land uses, proposed runoff routing and grading, and other site-specific considerations. For purposes of planning-level design, the infiltration rates in Table 1, with an applied safety factor, can be used for initial infiltration BMP design in each of the Special Plan Areas. Where two infiltration rates were estimated for a single Special Plan Area, we recommend that the lower of the two values be used for planning-level design.

5. NEXT STEPS

The in-situ infiltration tests that have been performed and described in this report are intended to provide an initial screening-level assessment of potential feasibility of stormwater and dry weather runoff infiltration for the purposes of the EIR. This study has indicated that infiltration features would be appropriate for the site, although preconstruction design reviews and focused site testing (i.e. at the location of the proposed LID) features will be required when specific basin locations are selected.

For locations where infiltration is proposed at or near existing grade, we recommend using a single ring infiltrometer or large scale open pit test to evaluate site-specific infiltration rates at the planned depth of the facility. For locations where infiltration surfaces are proposed more than 5 to 10 feet below existing grade, we recommend either conducting additional borehole (i.e. tests similar to USBR 7300) tests in these specific locations with targeted depth ranges or conduct single ring infiltrometer or large scale open pit test at the planned depth with appropriate health and safety measures taken. In either case (near surface or deeper facility), we recommend site-specific geologic and groundwater investigations to a depth of at least 15 feet below the bottom elevation of the proposed infiltration feature. Where infiltration is proposed in areas that will be elevated from existing grade via grading and fill or will be subject to remedial over-excavation and recompaction, we recommend collecting samples of potential fill materials and conducting laboratory hydraulic conductivity tests of remolded, compacted samples to evaluate infiltration feasibility in fill areas. Consideration of the use of non-compacted fill materials in the infiltration areas should be evaluated. Compaction of soils in infiltration areas without fill materials should also be limited.

6. LIMITATIONS

The report, borehole logs, and other materials resulting from Geosyntec's efforts were prepared exclusively for use by Tejon Grapevine, LLC. The report is not intended to be suitable for reuse on extensions or modifications of the project or for use on any project other than the currently proposed development, as it may not contain sufficient or appropriate information for such uses. If this report or portions of this report are provided to contractors or included in specifications, it should be understood that they are provided for information purposes only.

Soil deposits may vary in type, strength, and many other important properties between points of exploration due to non-uniformity of the geologic formations or to man-made cut and fill operations. While we cannot evaluate the consistency of the properties of materials in areas not explored, the conclusions drawn in this report are based on the assumption that the data obtained in the field are reasonably representative of field conditions and are conducive to interpolation and extrapolation. Given the similarities of most all of the borings in the flatter areas, we believe that they are reasonably representative. However, there could be localized differences that this study did not find.

Our field investigation and evaluations were performed using generally accepted engineering approaches and principles available at this time and the degree of care and skill ordinarily exercised under similar circumstances by reputable Geotechnical Engineers practicing in this area. No other representation, either expressed or implied, is included or intended in this report.

7. REFERENCES

United States Bureau of Reclamation [USBR 1989]. "Procedure for Performing Field Permeability Testing by the Well Permeameter Method," USBR 7300-89, United States Bureau of Reclamation, United States Department of the Interior.

WZI, Inc. [WZI 2013]. "Tejon Ranch Grapevine Area, Grapevine Regional Groundwater Assessment." November.

ADDITIONAL TABLES

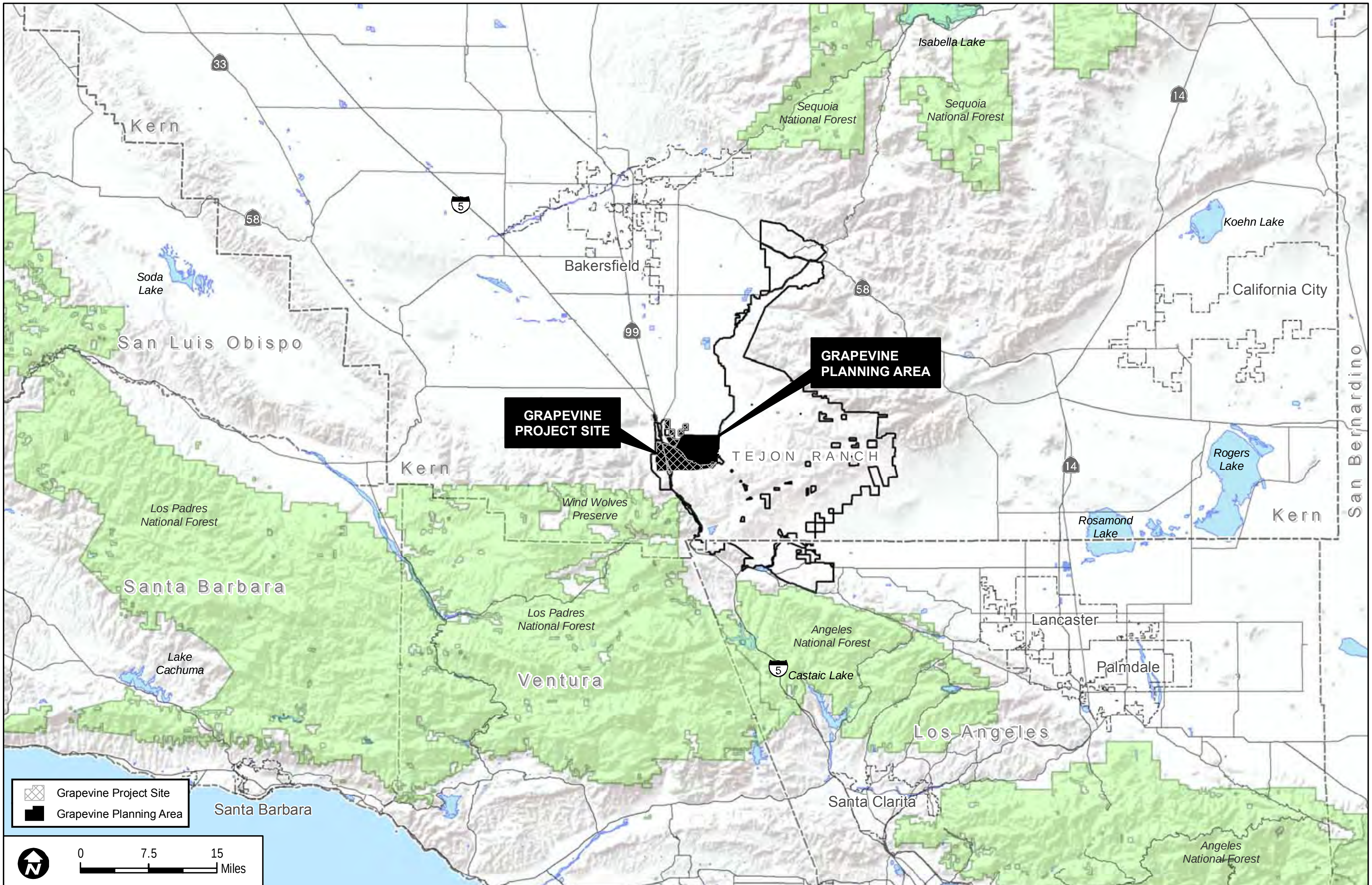
Table A. NRCS-USDA Permeability Rate by Soil Texture

Texture	Textural Class	Permeability Class	Permeability Rate (Ksat) in/hr
Gravel	N/A	Very Rapid	>20.0
Course Sand			
Course Sandy Loam	Moderately Course	Moderately Rapid	2.0-6.0
Sandy Loam			
Loamy Fine Sand			
Fine Sandy Loam			
Very Fine Sandy Loam	Medium	Moderate	0.6-2.0
Loam			
Silt Loam			
Silt			
Clay Loam	Moderate Fine	Moderate Slow	0.2-6.0
Sandy Clay Loam			
Silty Clay Loam			
Sandy Clay Loam	Fine	Slow	0.06-0.2
Silty Clay			
Clay <60%			
Clay >60%	Fine to Very Fine	Very Slow	<0.06
Claypan			

Note: This is a general guide. Bulk Density of the soil may alter the defined rates. The rates provided above are average ranges for the upper 5 feet of the soil stratum.

Source: NRCS-USDA Soil Texture database, Supplemental Guide: Saturated Hydraulic Conductivity in Relation to Soil Texture. [www.nrcs.usda.gov]

FIGURES

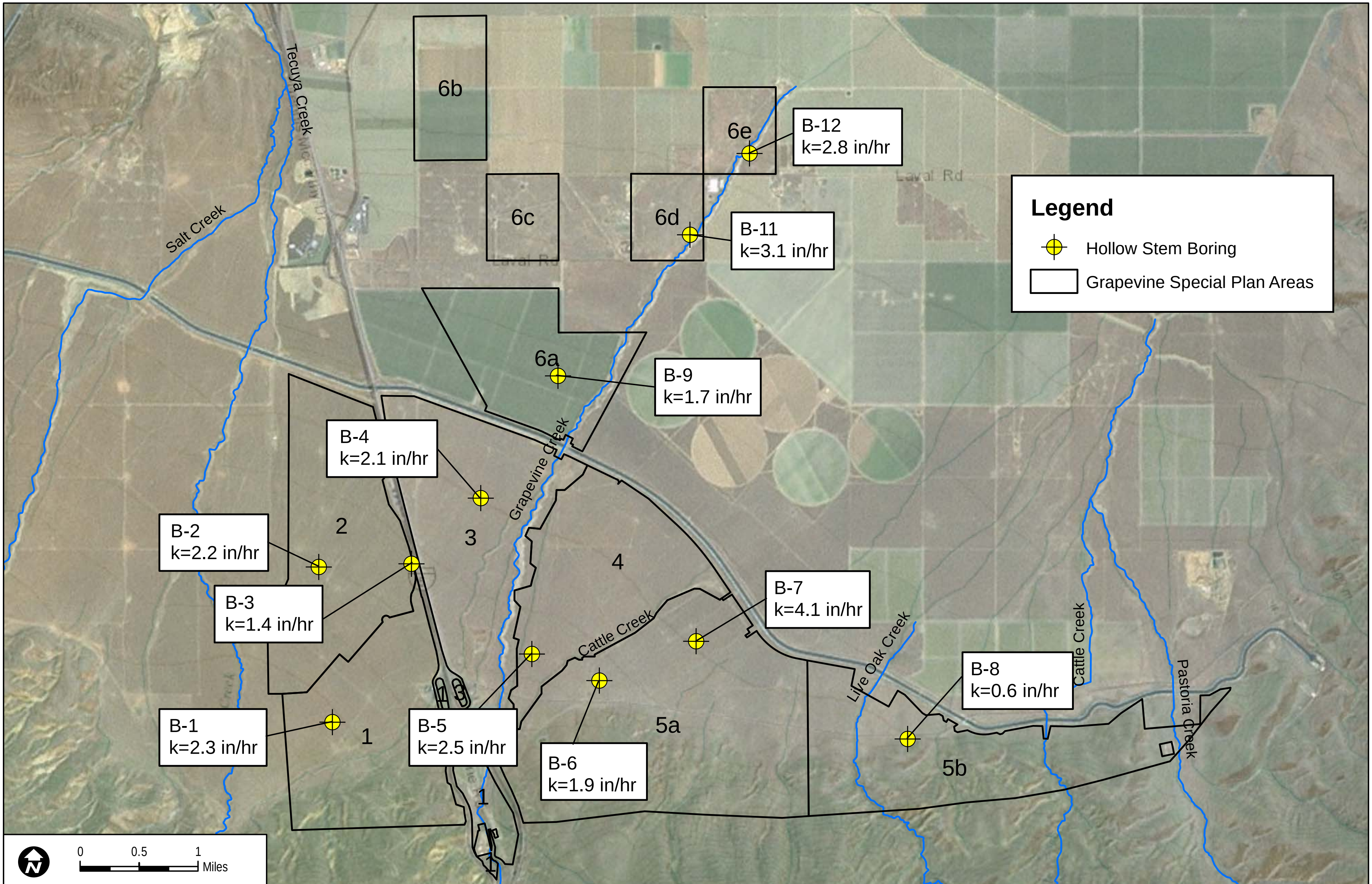


SOURCES: McIntosh & Associates 2013; TRC 2013a

FIGURE 1

Regional Location

GRAPEVINE PROJECT



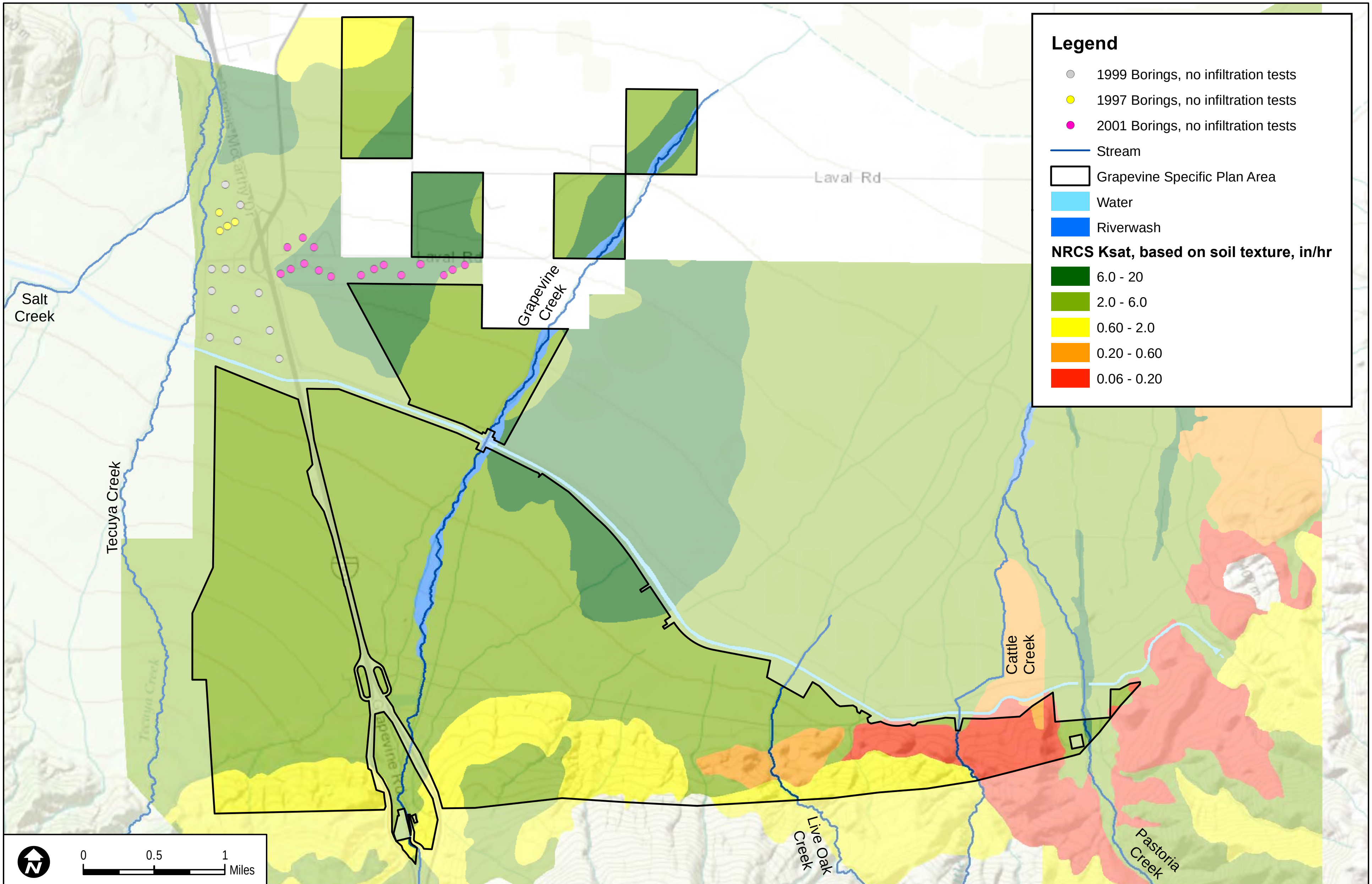
SOURCES: ESRI

NOTE: Infiltration rates shown have been approximated assuming the field infiltration rate equals the hydraulic conductivity for each boring (gradient = 1).

FIGURE 2

Boring Locations, January 2013

GRAPEVINE PROJECT



SOURCES: NRCS, ESRI

Note: Ksat values from NRCS-USDA general soil texture guide. The bulk density of the soil may alter the defined rates.

FIGURE 3

Soil Infiltration Properties

GRAPEVINE PROJECT

APPENDIX A

Borehole Logs

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Fax: (714) 969-0820

GS FORM: GEOTECH1 01/04

BOREHOLE LOG

BORING	B-1	**SHEET** 1 **OF** 1	
START DRILL DATE	Jan 14, 14	**ELEVATION DATA:**	
FINISH DRILL DATE	Jan 14, 14	**GROUND SURF. (Ft)**	
LOCATION	Near Grapevine, CA	**TOP OF CASING (Ft)**	
PROJECT	Grapevine Project	**DATUM**	
NUMBER	PNW0184 02		

DEPTH (ft-bgs)	DESCRIPTION 1) Soil Name (USCS Sym.) 2) Color 3) Moisture 4) Grain Size 5) Percentage (gravel, sand, fines) 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	ELEV. (ft)	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane
0	TOP SOIL, sandy silt (ML), dark brown, dry to moist, fine grain sand, (15,15,70), non-plastic, little gravel.										
	Silty Sand (SM-ML), dark brown, moist, fine grained sand, (10,40,50), non plastic, few gravel.										The upper 5 feet of boring was hand augered.
5											
10	End of Boring at 10' bgs.										
15											
20											
25											
30											

CONTRACTOR	ABC Liovin	**NORTHING**	34.94
EQUIPMENT	CME 75	**EASTING**	-118.95
DRILL MTHD	HSA	**COORDINATE SYSTEM:**	
DIAMETER	7"		
LOGGER	A Stern	**REVIEWER**	Y Zemuy

NOTES: Boring was backfilled with #1 rock in preperation for infiltration testing

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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Fax: (714) 969-0820

GS FORM: GEOTECH1 01/04

BOREHOLE LOG

BORING	B-2	**SHEET** 1 **OF** 1	
START DRILL DATE	Jan 14, 14	**ELEVATION DATA:**	
FINISH DRILL DATE	Jan 14, 14	**GROUND SURF. (Ft)**	
LOCATION	Near Grapevine, CA	**TOP OF CASING (Ft)**	
PROJECT	Grapevine Project	**DATUM**	
NUMBER	PNW0184 02		

DEPTH (ft-bgs)	DESCRIPTION 1) Soil Name (USCS Sym.) 2) Color 3) Moisture 4) Grain Size 5) Percentage (gravel, sand, fines) 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	ELEV. (ft)	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane
0	Silty Sand (SM-ML), dark brown, dry to moist, fine grained sand, (10,40,50), non plastic, few rounded gravel.										The upper 5 feet of boring was hand augered.
5	Becoming slightly lighter brown with an increase in Silt content (5,30,65)										
10	End of Boring at 10' bgs.										
15											
20											
25											
30											

CONTRACTOR	ABC Liovin	**NORTHING**	34.95
EQUIPMENT	CME 75	**EASTING**	-118.95
DRILL MTHD	HSA	**COORDINATE SYSTEM:**	
DIAMETER	7"		
LOGGER	A Stern	**REVIEWER**	Y Zemuy

NOTES: Boring was backfilled with #1 rock in preperation for infiltration testing

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Fax: (714) 969-0820

GS FORM: GEOTECH1 01/04

BOREHOLE LOG

BORING B-3 **SHEET** 1 **OF** 1
START DRILL DATE Jan 14, 14
FINISH DRILL DATE Jan 14, 14
LOCATION Near Grapevine, CA
PROJECT Grapevine Project
NUMBER PNW0184 02

ELEVATION DATA:
GROUND SURF. (Ft)
TOP OF CASING (Ft)
DATUM

DEPTH (ft-bgs)	DESCRIPTION 1) Soil Name (USCS Sym.) 2) Color 3) Moisture 4) Grain Size 5) Percentage (gravel, sand, fines) 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	ELEV. (ft)	SAMPLE: SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane
0	Silt with Sand (ML), light brown, dry to moist, very fine to fine grain sand, (10,30,60), non plastic, few subrounded fine to coarse gravel										The upper 5 feet of boring was hand augered.
5	Decreasing sand content (5,20,75)										
10	End of Boring at 10' bgs.										
15											
20											
25											
30											

CONTRACTOR ABC Liovin
EQUIPMENT CME 75
DRILL MTHD HSA
DIAMETER 7"
LOGGER A Stern **REVIEWER** Y Zemuy

NORTHING 34.95
EASTING -118.94
COORDINATE SYSTEM:

NOTES: Boring was backfilled with #1 rock in preperation for infiltration testing

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM: GEOTECH1 01/04

BOREHOLE LOG

BORING	B-4	**SHEET** 1 **OF** 1	
START DRILL DATE	Jan 14, 14	**ELEVATION DATA:**	
FINISH DRILL DATE	Jan 14, 14	**GROUND SURF. (Ft)**	
LOCATION	Near Grapevine, CA	**TOP OF CASING (Ft)**	
PROJECT	Grapevine Project	**DATUM**	
NUMBER	PNW0184 02		

DEPTH (ft-bgs)	DESCRIPTION: 1) Soil Name (USCS Sym.) 2) Color 3) Moisture 4) Grain Size 5) Percentage (gravel, sand, fines) 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	ELEV. (ft)	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS: 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane
0–5	Sandy Silt (ML), bown, dry to moist, very fine to fine grain sand, (10,20,70), non plastic, few subrounded fine to coarse gravel										The upper 5 feet of boring was hand augered.
5–10	Increasing sand content, becoming an ML-SM, (10,40,50)										
10	End of Boring at 10' bgs.										

Depth scale: 5, 10, 15, 20, 25, 30

CONTRACTOR	ABC Liovin	**NORTHING**	34.96
EQUIPMENT	CME 75	**EASTING**	-118.93
DRILL MTHD	HSA	**COORDINATE SYSTEM:**	
DIAMETER	7"		
LOGGER	A Stern	**REVIEWER**	Y Zemuy

NOTES: Boring was backfilled with #1 rock in preperation for infiltration testing

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

Geosyntec consultants

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Fax: (714) 969-0820

GS FORM: GEOTECH1 01/04

BOREHOLE LOG

BORING B-5 **SHEET** 1 **OF** 1
START DRILL DATE Jan 14, 14
FINISH DRILL DATE Jan 14, 14
LOCATION Near Grapevine, CA
PROJECT Grapevine Project
NUMBER PNW0184 02

ELEVATION DATA:
GROUND SURF. (Ft)
TOP OF CASING (Ft)
DATUM

DEPTH (ft-bgs)	DESCRIPTION 1) Soil Name (USCS Sym.) 2) Color 3) Moisture 4) Grain Size 5) Percentage (gravel, sand, fines) 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	ELEV. (ft)	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane
0	Gravelly Silty with Sand (ML), dark brown, very fine to fine grain sand, fine to coarse gravel, (15,15,70), non plastic										The upper 5 feet of boring was hand augered.
5	Increasing sand and gravel content, becoming an ML-SM, (20,30,50)										
10	End of Boring at 10' bgs.										
15											
20											
25											
30											

CONTRACTOR ABC Liovin
EQUIPMENT CME 75
DRILL MTHD HSA
DIAMETER 7"
LOGGER A Stern
REVIEWER Y Zemuy

NORTHING 34.94
EASTING -118.92
COORDINATE SYSTEM:

NOTES: Boring was backfilled with #1 rock in preperation for infiltration testing

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GS FORM: GEOTECH1 01/04

BOREHOLE LOG

BORING	B-6	**SHEET** 1 **OF** 1	
START DRILL DATE	Jan 14, 14	**ELEVATION DATA:**	
FINISH DRILL DATE	Jan 14, 14	**GROUND SURF. (Ft)**	
LOCATION	Near Grapevine, CA	**TOP OF CASING (Ft)**	
PROJECT	Grapevine Project	**DATUM**	
NUMBER	PNW0184 02		

DEPTH (ft-bgs)	DESCRIPTION 1) Soil Name (USCS Sym.) 2) Color 3) Moisture 4) Grain Size 5) Percentage (gravel, sand, fines) 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	ELEV. (ft)	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane
	Sandy Silt (ML), light brown, dry to moist, fine to medium grain sand, (5,30,65), non plastic to low plasticity, few subrounded fine to coarse gravel										The upper 5 feet of boring was hand augered.
5	Increasing gravel content (20,15,65)										
10	End of Boring at 9.6' bgs due to boulder.										
15											
20											
25											
30											

CONTRACTOR ABC Liovin
EQUIPMENT CME 75
DRILL MTHD HSA
DIAMETER 7"
LOGGER A Stern
REVIEWER Y Zemuy

NORTHING 34.94
EASTING -118.91
COORDINATE SYSTEM:

NOTES: Boring was backfilled with #1 rock in preperation for infiltration testing

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GS FORM: GEOTECH1 01/04

BOREHOLE LOG

BORING B-7 **SHEET** 1 **OF** 1
START DRILL DATE Jan 14, 14
FINISH DRILL DATE Jan 14, 14
LOCATION Near Grapevine, CA
PROJECT Grapevine Project
NUMBER PNW0184 02

ELEVATION DATA:
GROUND SURF. (Ft)
TOP OF CASING (Ft)
DATUM

DEPTH (ft-bgs)	DESCRIPTION: 1) Soil Name (USCS Sym.) 2) Color 3) Moisture 4) Grain Size 5) Percentage (gravel, sand, fines) 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	ELEV. (ft)	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS: 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane
0	Sandy Silt (ML), brown, dry to moist, very fine to fine grain sand, (10,20,70), non plastic, few subrounded fine to coarse gravel										The upper 5 feet of boring was hand augered.
5	Becoming lighter brown with an increase in fine gravel or coarse sand (20,20,60)										
10	End of Boring at 10' bgs.										
15											
20											
25											
30											

CONTRACTOR ABC Liovin
EQUIPMENT CME 75
DRILL MTHD HSA
DIAMETER 7"
LOGGER A Stern
REVIEWER Y Zemuy

NORTHING 34.95
EASTING -118.90
COORDINATE SYSTEM:

NOTES: Boring was backfilled with #1 rock in preperation for infiltration testing

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GS FORM: GEOTECH1 01/04

BOREHOLE LOG

BORING	B-8	**SHEET** 1 **OF** 1	
START DRILL DATE	Jan 14, 14	**ELEVATION DATA:**	
FINISH DRILL DATE	Jan 14, 14	**GROUND SURF. (Ft)**	
LOCATION	Near Grapevine, CA	**TOP OF CASING (Ft)**	
PROJECT	Grapevine Project	**DATUM**	
NUMBER	PNW0184 02		

DEPTH (ft-bgs)	DESCRIPTION 1) Soil Name (USCS Sym.) 2) Color 3) Moisture 4) Grain Size 5) Percentage (gravel, sand, fines) 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	ELEV. (ft)	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane
0	Silt and Clay (ML-CL), very dark brown, dry to moist, (0,5,95), low to moderate plasticity, few fine grain sand										The upper 5 feet of boring was hand augered.
5	Becoming brown										
10	End of Boring at 10' bgs.										
15											
20											
25											
30											

CONTRACTOR ABC Liovin
EQUIPMENT CME 75
DRILL MTHD HSA
DIAMETER 7"
LOGGER A Stern
REVIEWER Y Zemuy
NORTHING 34.94
EASTING -118.87
COORDINATE SYSTEM:

NOTES: Boring was backfilled with #1 rock in preperation for infiltration testing

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM: GEOTECH1 01/04

BOREHOLE LOG

BORING	B-9	**SHEET** 1 **OF** 1	
START DRILL DATE	Jan 14, 14	**ELEVATION DATA:**	
FINISH DRILL DATE	Jan 14, 14	**GROUND SURF. (Ft)**	
LOCATION	Near Grapevine, CA	**TOP OF CASING (Ft)**	
PROJECT	Grapevine Project	**DATUM**	
NUMBER	PNW0184 02		

DEPTH (ft-bgs)	DESCRIPTION 1) Soil Name (USCS Sym.) 2) Color 3) Moisture 4) Grain Size 5) Percentage (gravel, sand, fines) 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	ELEV. (ft)	SAMPLE: SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane
0–5	Sandy Silt (ML), brown, dry to moist, very fine to fine grain sand, (5,25,70), non plastic, few subrounded fine to coarse gravel										The upper 5 feet of boring was hand augered.
5–10	Increasing sand and gravel content, becoming an ML-SM, (10,40,50)										
10	End of Boring at 10' bgs.										
15											
20											
25											
30											

CONTRACTOR	ABC Liovin	**NORTHING**	34.97
EQUIPMENT	CME 75	**EASTING**	-118.92
DRILL MTHD	HSA	**COORDINATE SYSTEM:**	
DIAMETER	7"		
LOGGER	A Stern	**REVIEWER**	Y Zemuy

NOTES: Boring was backfilled with #1 rock in preperation for infiltration testing

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM: GEOTECH1 01/04

BOREHOLE LOG

BORING	B-11	**SHEET** 1 **OF** 1	
START DRILL DATE	Jan 14, 14	**ELEVATION DATA:**	
FINISH DRILL DATE	Jan 14, 14	**GROUND SURF. (Ft)**	
LOCATION	Near Grapevine, CA	**TOP OF CASING (Ft)**	
PROJECT	Grapevine Project	**DATUM**	
NUMBER	PNW0184 02		

DEPTH (ft-bgs)	DESCRIPTION 1) Soil Name (USCS Sym.) 2) Color 3) Moisture 4) Grain Size 5) Percentage (gravel, sand, fines) 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	ELEV. (ft)	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane
0	Silty Sand (SM), light brown, dry to moist, very fine to fine grain sand, (5,60,35), non plastic, trace gravel										The upper 5 feet of boring was hand augered.
5	Increasing sand content (0,75,25)										
10	End of Boring at 10' bgs.										
15											
20											
25											
30											

CONTRACTOR ABC Liovin
EQUIPMENT CME 75
DRILL MTHD HSA
DIAMETER 7"
LOGGER A Stern
REVIEWER Y Zemuy
NORTHING 34.99
EASTING -118.90
COORDINATE SYSTEM:

NOTES: Boring was backfilled with #1 rock in preperation for infiltration testing

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM: GEOTECH1 01/04

BOREHOLE LOG

BORING	B-12	**SHEET** 1 **OF** 1	
START DRILL DATE	Jan 14, 14	**ELEVATION DATA:**	
FINISH DRILL DATE	Jan 14, 14	**GROUND SURF. (Ft)**	
LOCATION	Near Grapevine, CA	**TOP OF CASING (Ft)**	
PROJECT	Grapevine Project	**DATUM**	
NUMBER	PNW0184 02		

DEPTH (ft-bgs)	DESCRIPTION: 1) Soil Name (USCS Sym.) 2) Color 3) Moisture 4) Grain Size 5) Percentage (gravel, sand, fines) 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	ELEV. (ft)	SAMPLE: SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS: 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane
0–5	Sand and Silt (ML-SM); light brown, dry to moist, very fine to fine grain sand, (0,50,50), non plastic, trace gravel										The upper 5 feet of boring was hand augered.
5–10	Silty Sand (SM), light brown, moist, very fine to fine grain sand, (5,70,25), non plastic, trace gravel										
10	End of Boring at 10' bgs.										

Depth scale: 5, 10, 15, 20, 25, 30

CONTRACTOR	ABC Liovin	**NORTHING**	35.00
EQUIPMENT	CME 75	**EASTING**	-118.89
DRILL MTHD	HSA	**COORDINATE SYSTEM:**	
DIAMETER	7"		
LOGGER	A Stern	**REVIEWER**	Y Zemuy

NOTES: Boring was backfilled with #1 rock in preperation for infiltration testing

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

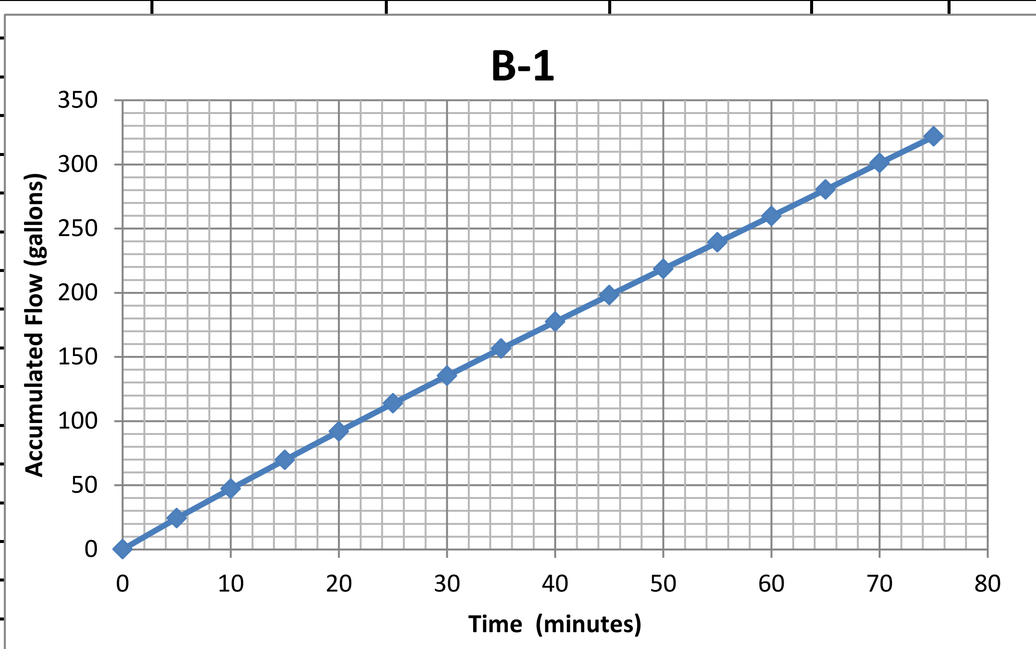
APPENDIX B

Infiltration Test Logs

Well Infiltration Test- Time and Volume Measurements

Project	PNW0184-02	Ground Elv.		Notes:
Boring ID	B-1	GWT Depth bgs	>>10 ft	
Date	15-Jan	Depth to Botttom of Well	10	
Tested By	ANS	Radius of Well	0.29	
Ground Temp		Depth to water surface in well	0.2	
		Height of water in well	9.8	

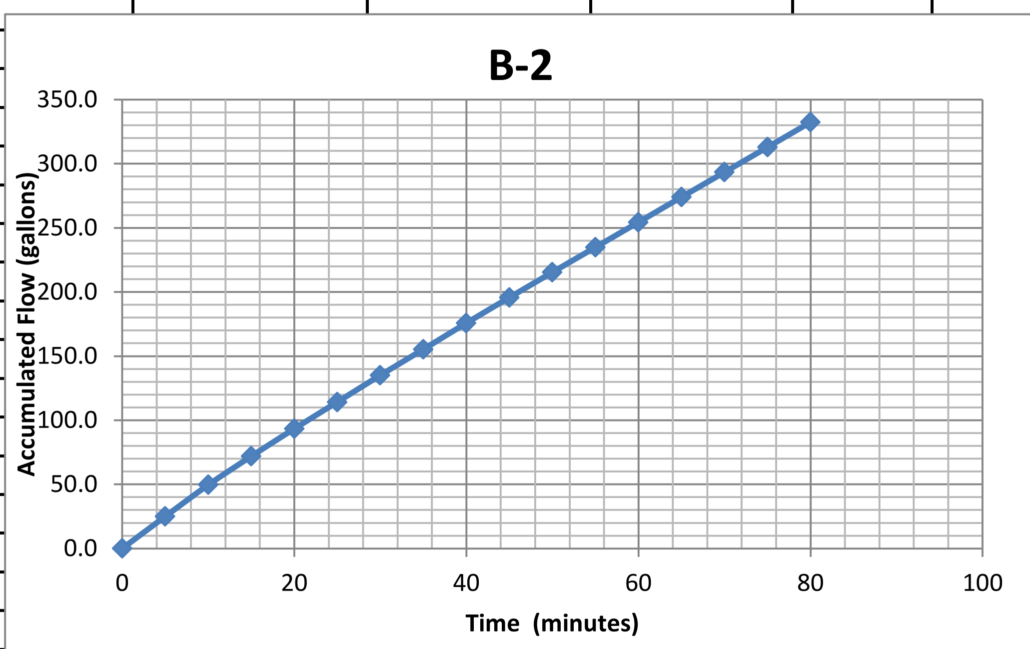
Time		Totalizer Reading	Difference	Accum Flow	Water Temperature	
Clock	Accum (min)				Well	Tank
916	-	3110.6				
	0	3135.1	24.5	0		
	5	3159.3	24.2	24.2		
	10	3182.3	23	47.2		
	15	3204.8	22.5	69.7		
	20	3227	22.2	91.9		
	25	3248.8	21.8	113.7		
	30	3270.3	21.5	135.2		
	35	3291.5	21.2	156.4		
	40	3312.4	20.9	177.3		
	45	3333.1	20.7	198		
	50	3353.7	20.6	218.6		
	55	3374.2	20.5	239.1		
	60	3394.8	20.6	259.7		
	65	3415.4	20.6	280.3		
	70	3436.1	20.7	301		
1032	75	3456.7	20.6	321.6		



Well Infiltration Test- Time and Volume Measurements

Project	PNW0184	Ground Elv.		Notes:
Geoprobe ID	B-2	GWT Depth bgs	>>10	
Date	15-Jan	Depth to Botttom of Well	10	
Tested By	ANS	Radius of Well	0.29	
Ground Temp		Depth to water surface in well	0.2	
		Height of water in well	9.8	

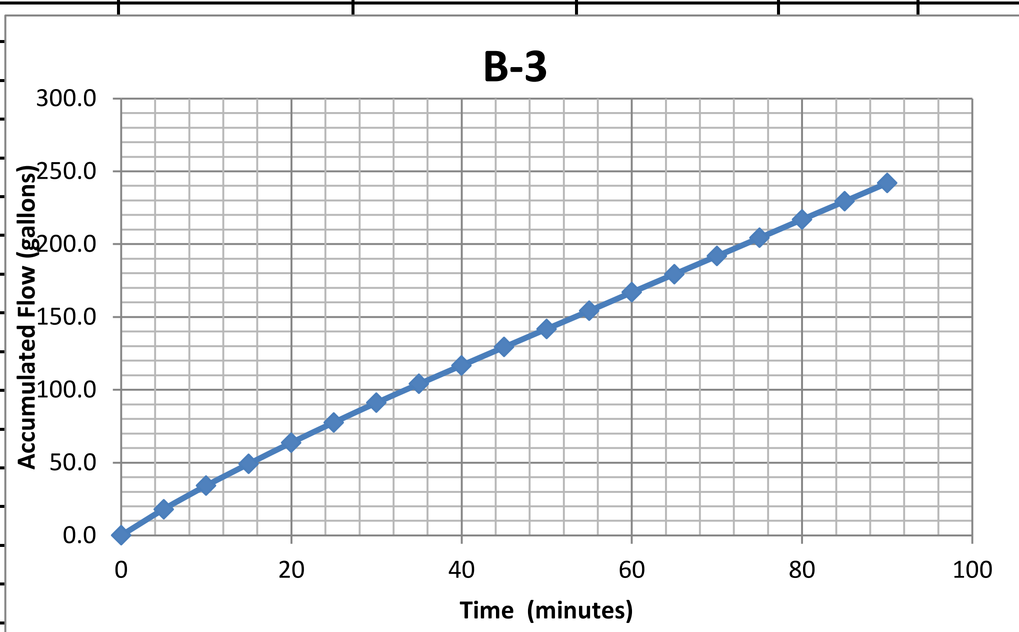
Time		Totalizer Reading	Difference	Accum Flow	Water Temperature	
Clock	Accum (min)				Well	Tank
1112	0	3460.9				
	0	3490.9	30.0	0.0		
	5	3515.9	25.0	25.0		
	10	3540.5	24.6	49.6		
	15	3562.8	22.3	71.9		
	20	3584.3	21.5	93.4		
	25	3605.1	20.8	114.2		
	30	3626.0	20.9	135.1		
	35	3646.2	20.2	155.3		
	40	3666.7	20.5	175.8		
	45	3686.6	19.9	195.7		
	50	3706.3	19.7	215.4		
	55	3725.8	19.5	234.9		
	60	3745.3	19.5	254.4		
	65	3764.9	19.6	274.0		
	70	3784.3	19.4	293.4		
	75	3803.8	19.5	312.9		
	80	3823.3	19.5	332.4		



Well Infilitration Test- Time and Volume Measurements

Project	PNW0184	Ground Elv.		Notes:
Boring ID	B-3	GWT Depth bgs	>>10	
Date	15-Jan	Depth to Botttom of Well (ft)	10	
Tested By	ANS	Radius of Well (ft)	0.29	
Ground Temp		Depth to water surface in well	0.2	
		Height of water in well	9.8	

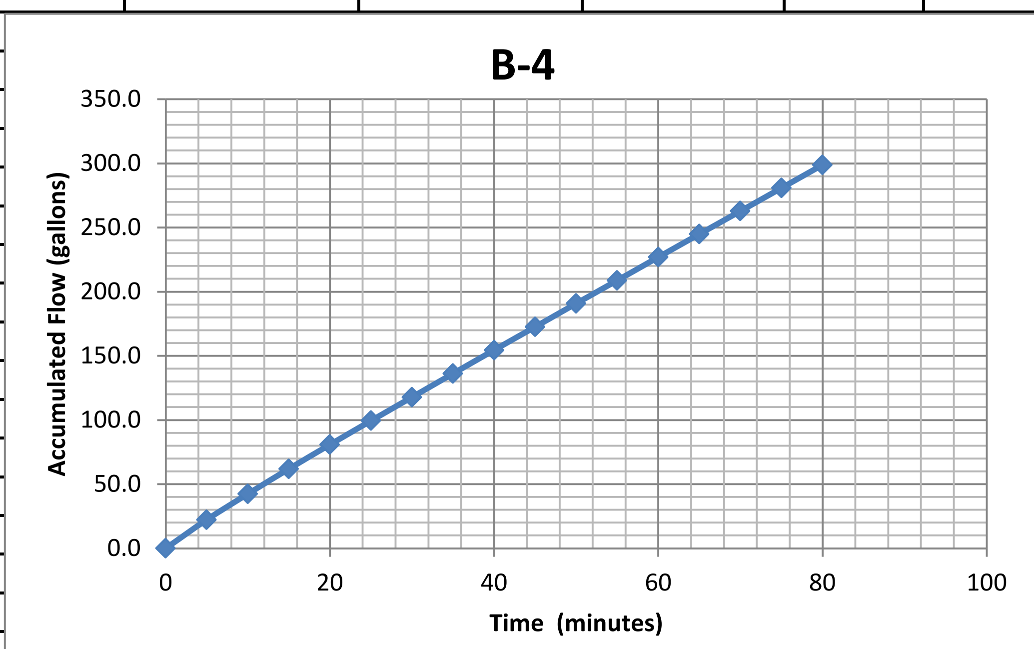
Time		Totalizer Reading	Difference	Accum Flow	Water Temperature	
Clock	Accum (min)				Well	Tank
1256	0	3825.0				
	0	3870.0	45.0	0.0		
	5	3888.0	18.0	18.0		
	10	3904.2	16.2	34.2		
	15	3919.2	15.0	49.2		
	20	3933.7	14.5	63.7		
	25	3947.6	13.9	77.6		
	30	3961.1	13.5	91.1		
	35	3974.0	12.9	104.0		
	40	3986.7	12.7	116.7		
	45	3999.3	12.6	129.3		
	50	4011.8	12.5	141.8		
	55	4024.2	12.4	154.2		
	60	4036.9	12.7	166.9		
	65	4049.4	12.5	179.4		
	70	4061.8	12.4	191.8		
	75	4074.3	12.5	204.3		
	80	4086.9	12.6	216.9		
	85	4099.4	12.5	229.4		
1439	90	4111.9	12.5	241.9		



Well Infiltration Test- Time and Volume Measurements

Project	PNW0184	Ground Elv.		Notes:
Boring ID	B-4	GWT Depth bgs	>>10	
Date	16-Jan	Depth to Botttom of Well	10	
Tested By	ANS	Radius of Well	0.29	
Ground Temp		Depth to water surface in well	0.4	
		Height of water in well	9.6	

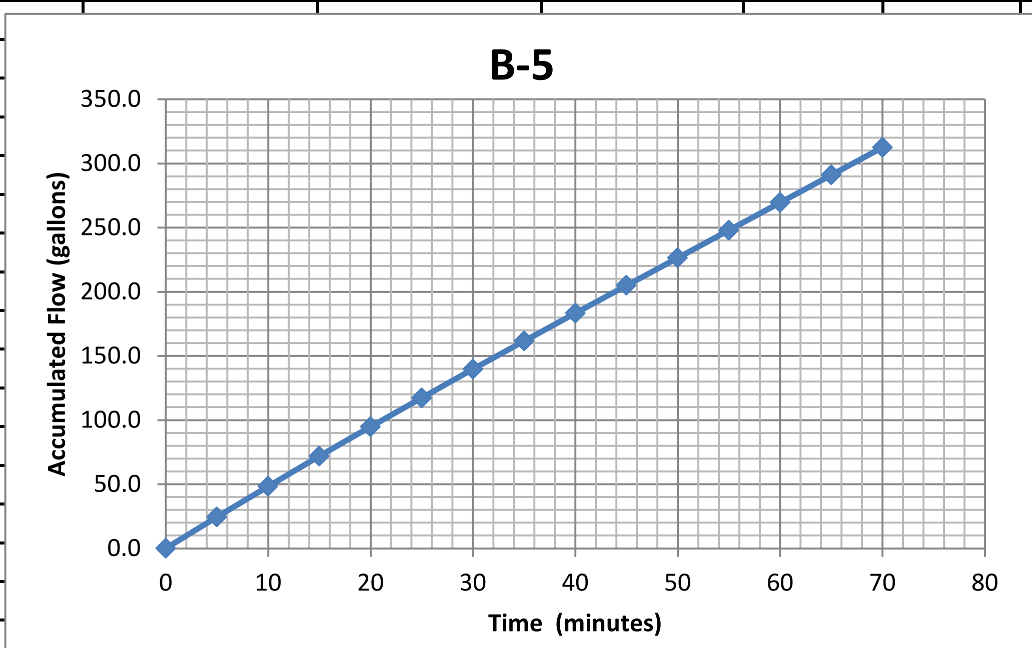
Time		Totalizer Reading	Difference	Accum Flow	Water Temperature	
Clock	Accum (min)				Well	Tank
	0	4115.8				
	0	4151.8	36.0	0.0		
	5	4174.1	22.3	22.3		
	10	4194.2	20.1	42.4		
	15	4213.7	19.5	61.9		
	20	4232.6	18.9	80.8		
	25	4251.2	18.6	99.4		
	30	4269.6	18.4	117.8		
	35	4288.0	18.4	136.2		
	40	4306.3	18.3	154.5		
	45	4324.4	18.1	172.6		
	50	4342.6	18.2	190.8		
	55	4360.6	18.0	208.8		
	60	4378.7	18.1	226.9		
	65	4396.7	18.0	244.9		
	70	4414.6	17.9	262.8		
	75	4432.6	18.0	280.8		
	80	4450.6	18.0	298.8		



Well Infilitration Test- Time and Volume Measurements

				Notes:
Project	PNW0184	Ground Elv.		
Boring ID	B-5	GWT Depth bgs	>>10	
Date	15-Jan	Depth to Botttom of Well	10	
Tested By	ANS	Radius of Well	0.29	
Ground Temp		Depth to water surface in well	0.3	
		Height of water in well	9.7	

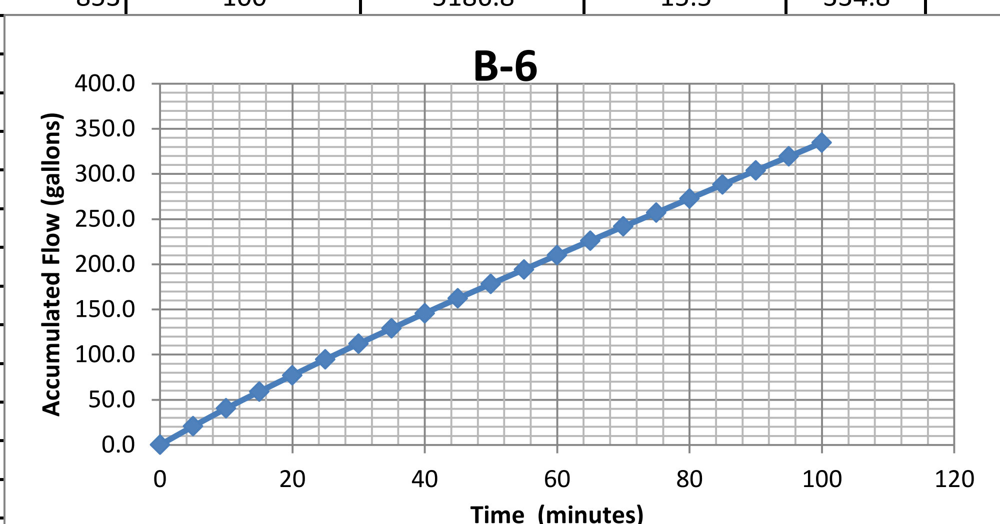
Time		Totalizer Reading	Difference	Accum Flow	Water Temperature	
Clock	Accum (min)				Well	Tank
1505	0	4458.7				
	0	4494.8	36.1	0.0		
	5	4519.3	24.5	24.5		
	10	4543.1	23.8	48.3		
	15	4566.7	23.6	71.9		
	20	4589.6	22.9	94.8		
	25	4612.1	22.5	117.3		
	30	4634.5	22.4	139.7		
	35	4656.4	21.9	161.6		
	40	4678.1	21.7	183.3		
	45	4699.7	21.6	204.9		
	50	4721.2	21.5	226.4		
	55	4742.8	21.6	248.0		
	60	4764.3	21.5	269.5		
	65	4785.8	21.5	291.0		
1642	70	4807.3	21.5	312.5		



Well Infiltration Test- Time and Volume Measurements

Project	PNW0184	Ground Elv.		Notes:
Boring ID	B-6	GWT Depth bgs	>>10	
Date	16-Jan	Depth to Botttom of Well	9.6	
Tested By	ANS	Radius of Well	0.29	
Ground Temp		Depth to water surface in well	0.2	
		Height of water in well	9.4	

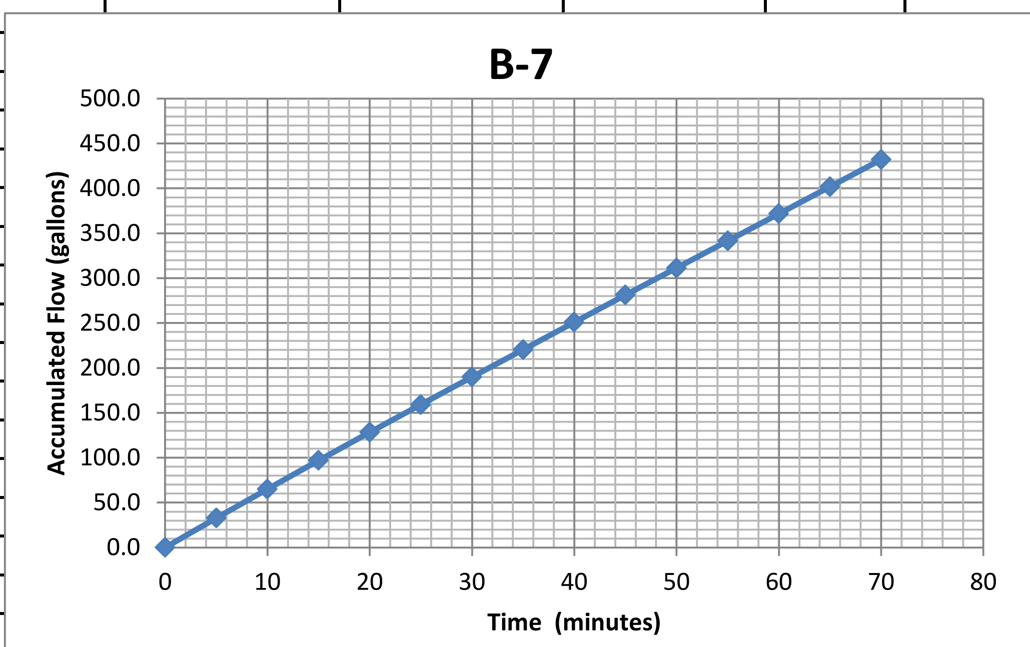
Time		Totalizer Reading	Difference	Accum	Water Temperature	
Clock	Accum (min)			Flow	Well	Tank
703	0	4812.3				
	0	4852.0	39.7	0.0		
	5	4872.6	20.6	20.6		
	10	4892.4	19.8	40.4		
	15	4911.0	18.6	59.0		
	20	4929.0	18.0	77.0		
	25	4946.8	17.8	94.8		
	30	4964.0	17.2	112.0		
	35	4981.0	17.0	129.0		
	40	4997.8	16.8	145.8		
	45	5014.2	16.4	162.2		
	50	5030.3	16.1	178.3		
	55	5046.3	16.0	194.3		
	60	5062.2	15.9	210.2		
	65	5078.1	15.9	226.1		
	70	5093.8	15.7	241.8		
	75	5109.2	15.4	257.2		
	80	5124.7	15.5	272.7		
	85	5140.3	15.6	288.3		
	90	5155.8	15.5	303.8		
	95	5171.3	15.5	319.3		
853	100	5186.8	15.5	334.8		



Well Infilitration Test- Time and Volume Measurements

Project	PNW0184	Ground Elv.		Notes:
Boring ID	B-7	GWT Depth bgs	>>10	
Date	17-Jan	Depth to Botttom of Well	10	
Tested By	ANS	Radius of Well	0.29	
Ground Temp		Depth to water surface in well	0.3	
		Height of water in well	9.7	

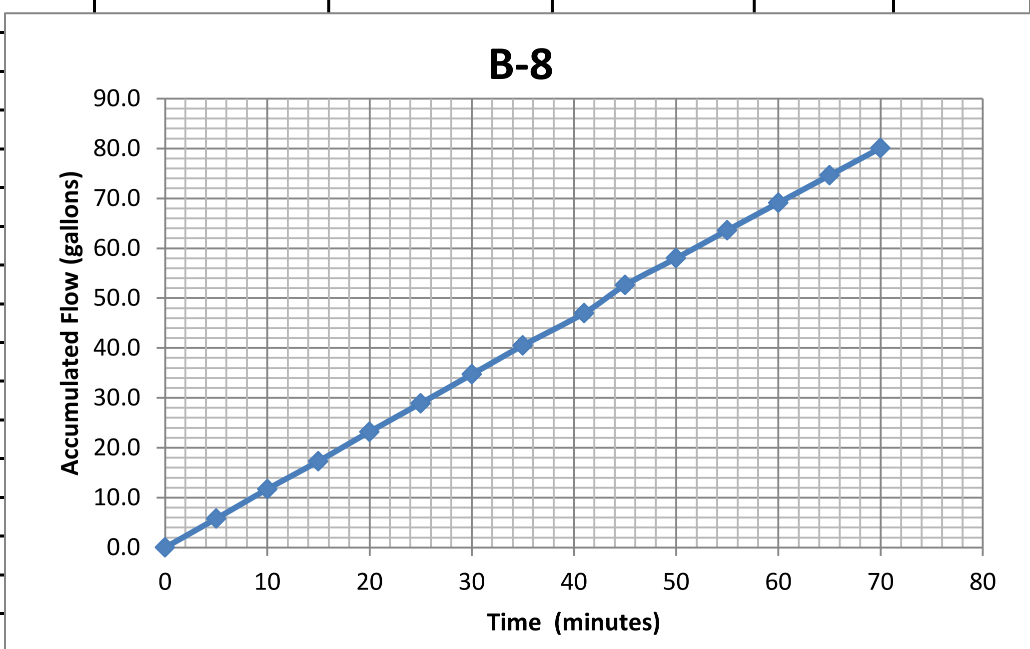
Time		Totalizer Reading	Difference	Accum Flow	Water Temperature	
Clock	Accum (min)				Well	Tank
1600	0	5190.4				
	0	5226.6	36.2	0.0		
	5	5259.4	32.8	32.8		
	10	5291.6	32.2	65.0		
	15	5323.5	31.9	96.9		
	20	5354.9	31.4	128.3		
	25	5385.8	30.9	159.2		
	30	5416.5	30.7	189.9		
	35	5447.0	30.5	220.4		
	40	5477.5	30.5	250.9		
	45	5507.8	30.3	281.2		
	50	5538.0	30.2	311.4		
	55	5568.1	30.1	341.5		
	60	5598.3	30.2	371.7		
	65	5628.5	30.2	401.9		
1716	70	5658.7	30.2	432.1		



Well Infilitration Test- Time and Volume Measurements

Project	PNW0184	Ground Elv.		Notes:
Boring ID	B-8	GWT Depth bgs	>>10	
Date	17-Jan	Depth to Botttom of Well	10	
Tested By	ANS	Radius of Well	0.29	
Ground Temp		Depth to water surface in well	0.3	
		Height of water in well	9.7	

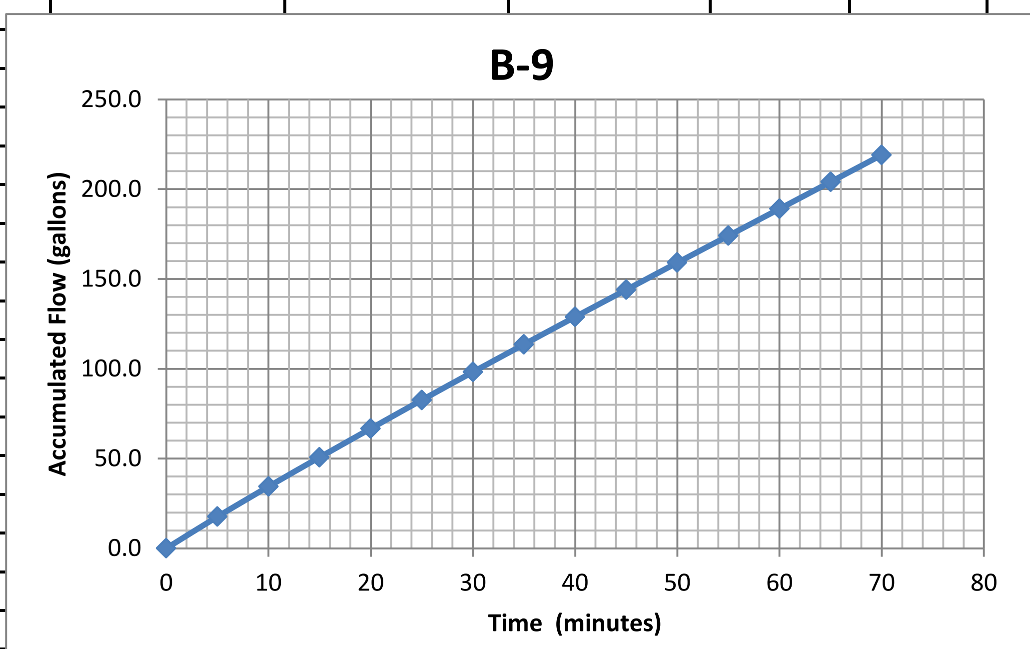
Time		Totalizer Reading	Difference	Accum Flow	Water Temperature	
Clock	Accum (min)				Well	Tank
1200	0	5661.3				
	0	5700.7	39.4	0.0		
	5	5706.5	5.8	5.8		
	10	5712.4	5.9	11.7		
	15	5718.0	5.6	17.3		
	20	5723.9	5.9	23.2		
	25	5729.6	5.7	28.9		
	30	5735.4	5.8	34.7		
	35	5741.2	5.8	40.5		
	41	5747.7	6.5	47.0		
	45	5753.3	5.6	52.6		
	50	5758.7	5.4	58.0		
	55	5764.3	5.6	63.6		
	60	5769.8	5.5	69.1		
	65	5775.3	5.5	74.6		
	70	5780.8	5.5	80.1		



Well Infilitration Test- Time and Volume Measurements

Project	PNW0184	Ground Elv.		Notes:
Boring ID	B-9	GWT Depth bgs	>>10	
Date	18-Jan	Depth to Botttom of Well	10	
Tested By	ANS	Radius of Well	0.29	
Ground Temp		Depth to water surface in well	0.3	
		Height of water in well	9.7	

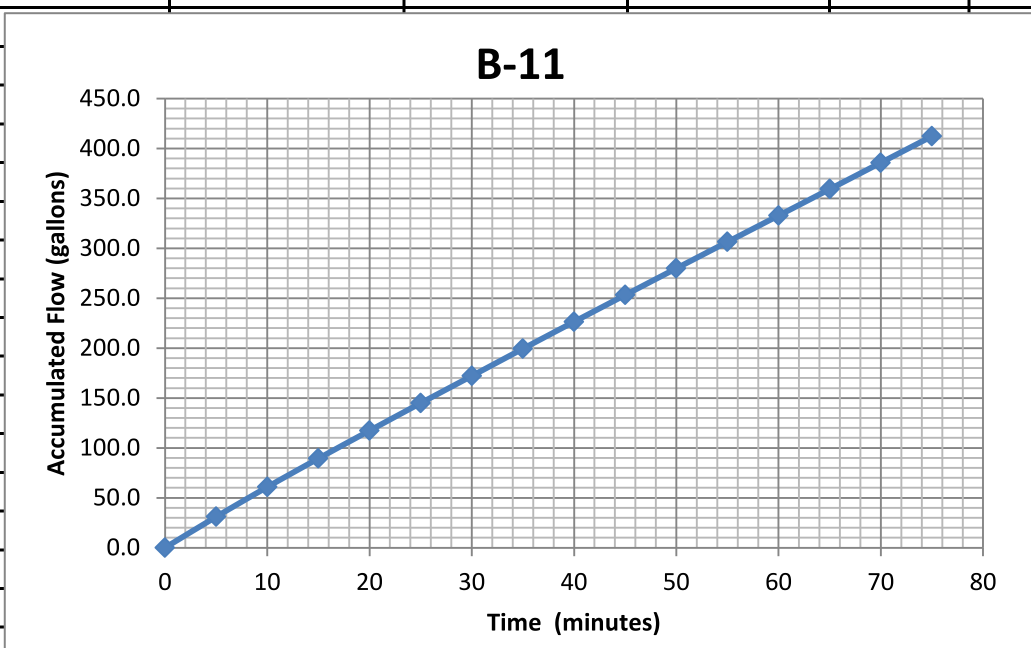
Time		Totalizer Reading	Difference	Accum Flow	Water Temperature	
Clock	Accum (min)				Well	Tank
832	0	5784.2				
	0	5824.4	40.2	0.0		
	5	5842.0	17.6	17.6		
	10	5858.8	16.8	34.4		
	15	5875.1	16.3	50.7		
	20	5891.1	16.0	66.7		
	25	5907.0	15.9	82.6		
	30	5922.6	15.6	98.2		
	35	5938.0	15.4	113.6		
	40	5953.3	15.3	128.9		
	45	5968.4	15.1	144.0		
	50	5983.5	15.1	159.1		
	55	5998.5	15.0	174.1		
	60	6013.5	15.0	189.1		
	65	6028.5	15.0	204.1		
958	70	6043.5	15.0	219.1		



Well Infilitration Test- Time and Volume Measurements

Project	PNW0184	Ground Elv.		Notes:
Boring ID	B-11	GWT Depth bgs	>>10	
Date	18-Jan	Depth to Botttom of Well	10	
Tested By	ANS	Radius of Well	0.29	
Ground Temp		Depth to water surface in well	0.3	
		Height of water in well	9.7	

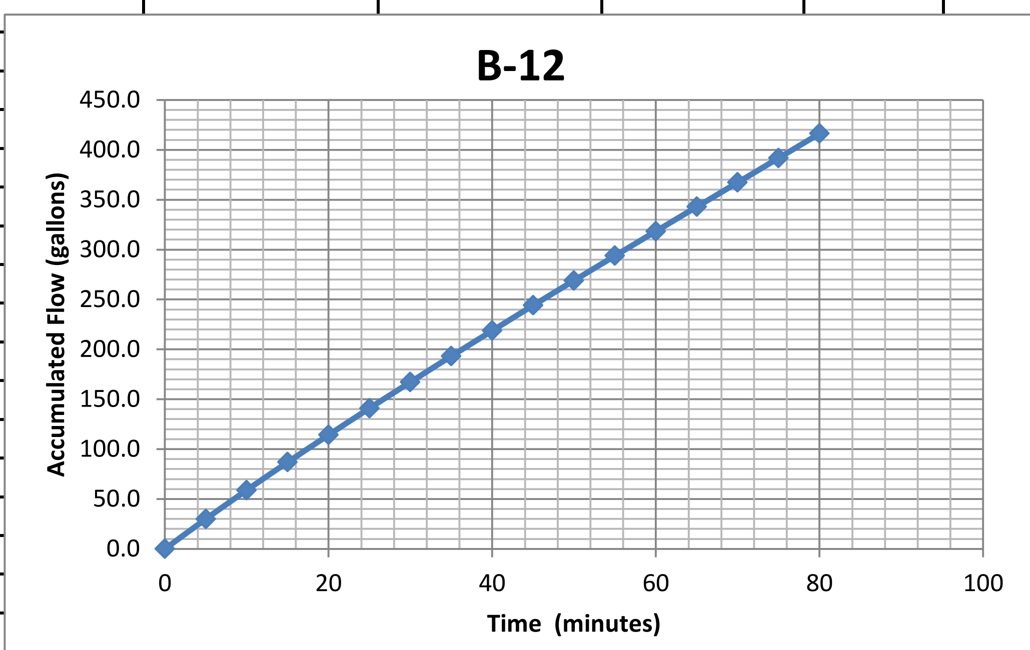
Time		Totalizer Reading	Difference	Accum Flow	Water Temperature	
Clock	Accum (min)				Well	Tank
1200	0	6048.6				
	0	6098.4	49.8	0.0		
	5	6129.4	31.0	31.0		
	10	6159.2	29.8	60.8		
	15	6187.8	28.6	89.4		
	20	6215.7	27.9	117.3		
	25	6243.3	27.6	144.9		
	30	6270.5	27.2	172.1		
	35	6297.8	27.3	199.4		
	40	6324.8	27.0	226.4		
	45	6351.6	26.8	253.2		
	50	6378.3	26.7	279.9		
	55	6404.8	26.5	306.4		
	60	6431.2	26.4	332.8		
	65	6457.7	26.5	359.3		
	70	6484.2	26.5	385.8		
	75	6510.7	26.5	412.3		



Well Infilitration Test- Time and Volume Measurements

Project	PNW0184	Ground Elv.		Notes:
Boring ID	B-12	GWT Depth bgs	>>10	
Date	18-Jan	Depth to Botttom of Well	10	
Tested By	ANS	Radius of Well	0.29	
Ground Temp		Depth to water surface in well	0.2	
		Height of water in well	9.8	

Time		Totalizer Reading	Difference	Accum Flow	Water Temperature	
Clock	Accum (min)				Well	Tank
641	0	6515.6				
	0	3715.2	48.9	0.0		
	5	3723.3	30.0	30.0		
	10	3730.3	28.9	58.9		
	15	3737.7	28.0	86.9		
	20	3745.1	27.3	114.2		
	25	3752.5	26.8	141.0		
	30	3761.2	26.2	167.2		
	35	3767.0	26.0	193.2		
	40	3774.5	25.5	218.7		
	45	3781.7	25.4	244.1		
	50	3789.1	24.9	269.0		
	55	3796.4	24.8	293.8		
	60	3803.6	24.6	318.4		
	65	3810.7	24.5	342.9		
	70	3817.9	24.4	367.3		
	75	3825.1	24.5	391.8		
	80	3832.3	24.5	416.3		



GP ID	flow rate, q q		temp cor. V	head h	well radius r	GWT Depth T_u	Permeability k_{20}			Condition
	gpm	ft^3/hr		ft	ft	ft	ft/hr	cm/s	in/hr	
1	4.1	33.046	1	9.8	0.3	N/A	1.9E-01	1.6E-03	2.3	1
2	3.9	31.281	1	9.8	0.3	N/A	1.8E-01	1.6E-03	2.2	1
3	2.5	20.052	1	9.8	0.3	N/A	1.2E-01	1.0E-03	1.4	1
4	3.6	28.875	1	9.6	0.3	N/A	1.8E-01	1.5E-03	2.1	1
5	4.3	34.490	1	9.7	0.3	N/A	2.1E-01	1.8E-03	2.5	1
6	3.1	24.865	1	9.4	0.3	N/A	1.6E-01	1.3E-03	1.9	1
7	7.1	56.948	1	9.7	0.3	N/A	3.4E-01	2.9E-03	4.1	1
8	1.1	8.823	1	9.7	0.3	N/A	5.3E-02	4.5E-04	0.6	1
9	3	24.063	1	9.7	0.3	N/A	1.4E-01	1.2E-03	1.7	1
11	5.3	42.511	1	9.7	0.3	N/A	2.6E-01	2.2E-03	3.1	1
12	4.9	39.302	1	9.8	0.3	N/A	2.3E-01	2.0E-03	2.8	1

APPENDIX C

Excerpt from USBR 7300

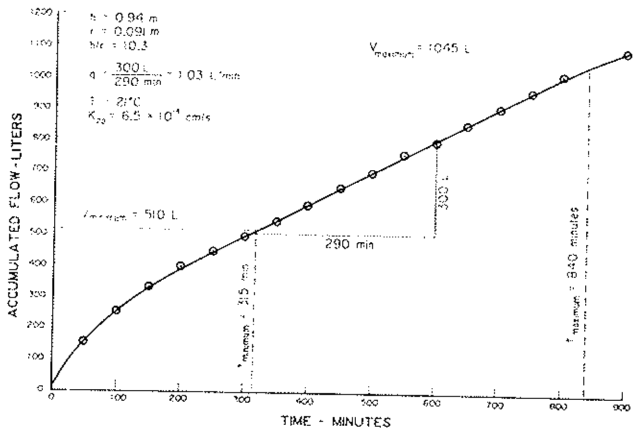


Figure 7. – Time-discharge curve for well permeameter test — low water table example.

with a known or assumed specific yield for the soil and with the dimensions of the well, the minimum volume can be computed and the test discontinued when the minimum volume has been discharged through the well. In pervious soils, it may appear that the volume-time curve has reached a uniform slope after several hours when points are plotted over short time intervals. However, in order to avoid discontinuing a test prematurely, it must be continued for at least 6 hours from the starting time so the slope can be determined over a period of 2 to 3 hours. The first straight portion of the curve should be used for determining the rate of discharge (fig. 7). The test must be conducted continuously without allowing the reservoir to run dry until the test has been completed.

14.2 *Maximum Time.*–If the test is continued for a long period, a water mound may build up around the well and render the test results inaccurate. The maximum time for test duration is the time necessary to discharge through the test well the maximum volume of water as determined using equation (2), substituting 15.0 for 2.09 and in this case, using an assumed minimum value (when the true value is unknown) of 0.1 for specific yield.

$$V_{max} = 2.05 \ V_{min} \tag{3}$$

15. Calculations

15.1 *Computing Coefficient of Permeability.*–Equations (4), (5), or (6) are provided for calculating coefficient of permeability, for the well permeameter test. The presence or absence of a water table or impervious soil layer within a distance of less than three times that of the water depth in the well (measured from the water surface) will enable the water table to be classified as condition I, II, or III, as illustrated on figure 8.

15.1.1 *Low Water Table.*–When the distance from the water surface in the test well to the ground-water table, or to an impervious soil layer which is considered for test purposes to be equivalent to a water table, is greater than three times the depth of water in the well, a low water table condition exists as illustrated by condition I (fig. 8). For determination of the coefficient of permeability under such a condition, equation (4) given in subparagraph 15.2 should be used.

15.1.2 *High Water Table.*–When the distance from the water surface in the test well to the ground-water table, or to an impervious layer, is less than three times the depth of water in the well, a high water table condition exists as illustrated by condition II or III. Condition II shows a high water table with the water table below the well bottom, and for this condition equation (5) should be used. Condition III shows a high water table with the water table above the well bottom. For this condition, equation (6) should be used.

15.2 *Equations:*

Condition I:

$$k_{20} = \frac{qV}{2\pi h^2} \left\{ \ln\left[\frac{h}{r} + \sqrt{\left(\frac{h}{r}\right)^2 + 1} \right] - \frac{\sqrt{1 + \left(\frac{h}{r}\right)^2}}{\frac{h}{r}} + \frac{1}{\frac{h}{r}} \right\} \tag{4}$$

Condition II:

$$k_{20} = \frac{qV}{2\pi h^2} \left[\frac{\ln\left(\frac{h}{r}\right)}{\frac{1}{6} + \frac{1}{3}\left(\frac{h}{T_u}\right)^{-1}} \right] \tag{5}$$

Condition III:

$$k_{20} = \frac{qV}{2\pi h^2} \left[\frac{\ln\left(\frac{h}{r}\right)}{\left(\frac{h}{T_u}\right)^{-1} + \frac{1}{2}\left(\frac{h}{T_u}\right)^{-2}} \right] \tag{6}$$

where:

k_{20} = coefficient of permeability at 20 °C
h = height of water in the well
r = radius of well
q = discharge rate of water from the well for steady-state condition (determined experimentally, see example, fig. 7)
$V = \dfrac{\mu_T, \text{ viscosity of water at temp. } T \text{ (see fig. 9)}}{\mu_{20}, \text{ viscosity of water at 20 °C}}$
T_u = unsaturated distance between the water surface in the well and the water table

15.3 The preferred metric unit for coefficient of permeability is cm/s (centimeters per second). The value of 1×10^{-6} centimeters per second is approximately the same as the inch-pound unit of 1 foot per year.

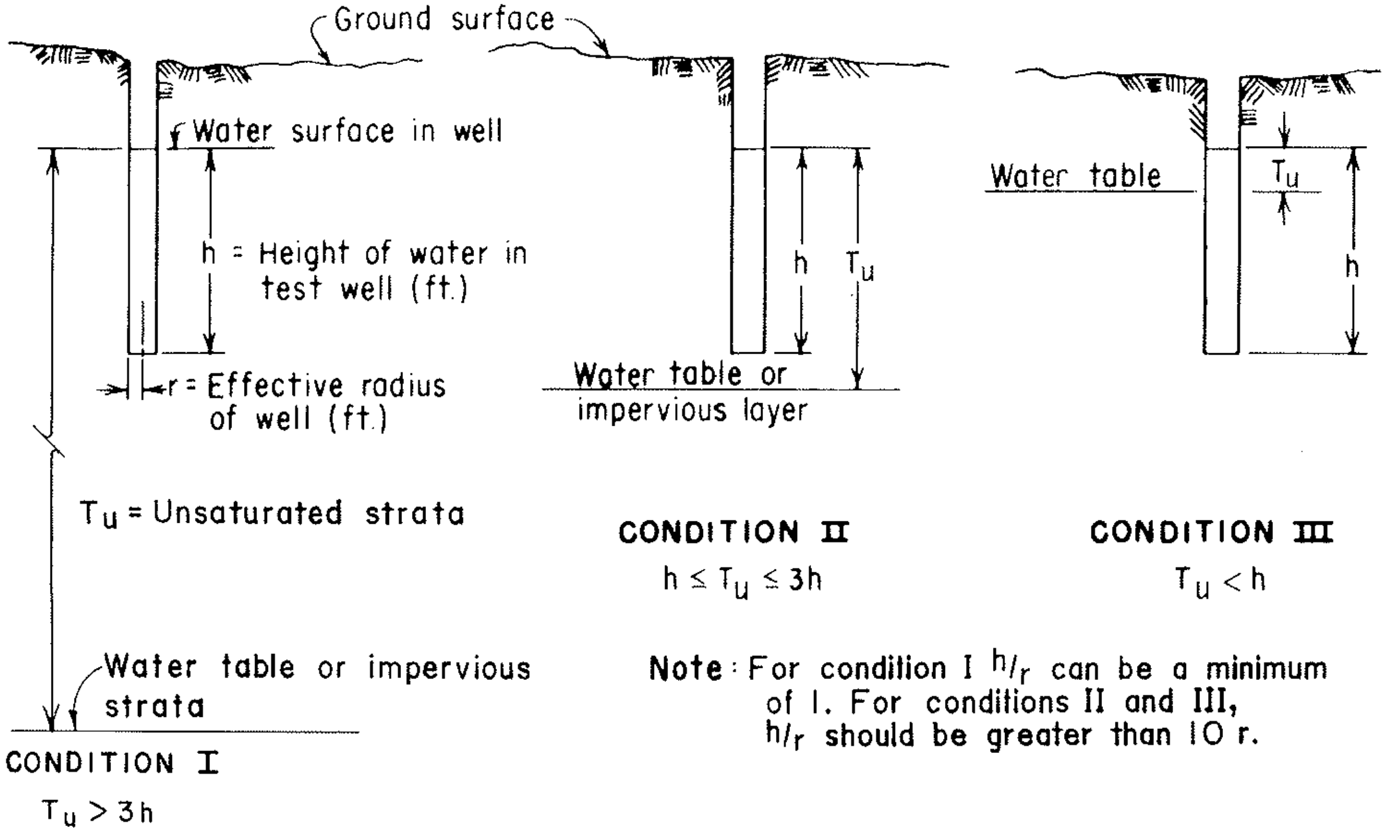


Figure 8. – Relationship between depth of water in test well and distance to water table in well permeameter test.

16. Report

16.1 The report is to consist of the following completed and checked forms:

"Well Permeameter Method (Soil Classifications and Well Dimensions)" (fig. 4).

"Well Permeameter Method (Time and Volume Measurements)" (fig. 6).

Time–Discharge Curve (example on fig. 7).

Calculation of coefficient of permeability from equations (4), (5), or (6).

16.2 All calculations are to show a checkmark and all plotting must be checked.

17. References

[1] *Drainage Manual,* 1st ed., Bureau of Reclamation, U.S. Government Printing Office, Washington, D.C., 1984.

[2] Zanger, Carl Z., *Theory and Problems of Water Percolation,* Engineering Monograph No. 8, (app. B "Flow from a Test Hole Located Above Groundwater Level," development by R. E. Glover) Bureau of Reclamation, Denver, Colorado, April 1953.

[3] Ribbens, R. W. "Exact Solution for Flow From a Test Hole Located Above the Water Table," (unpublished technical memorandum), Bureau of Reclamation, Denver, Colorado, 1981.

APPENDIX D

NRCS Soil Texture Report

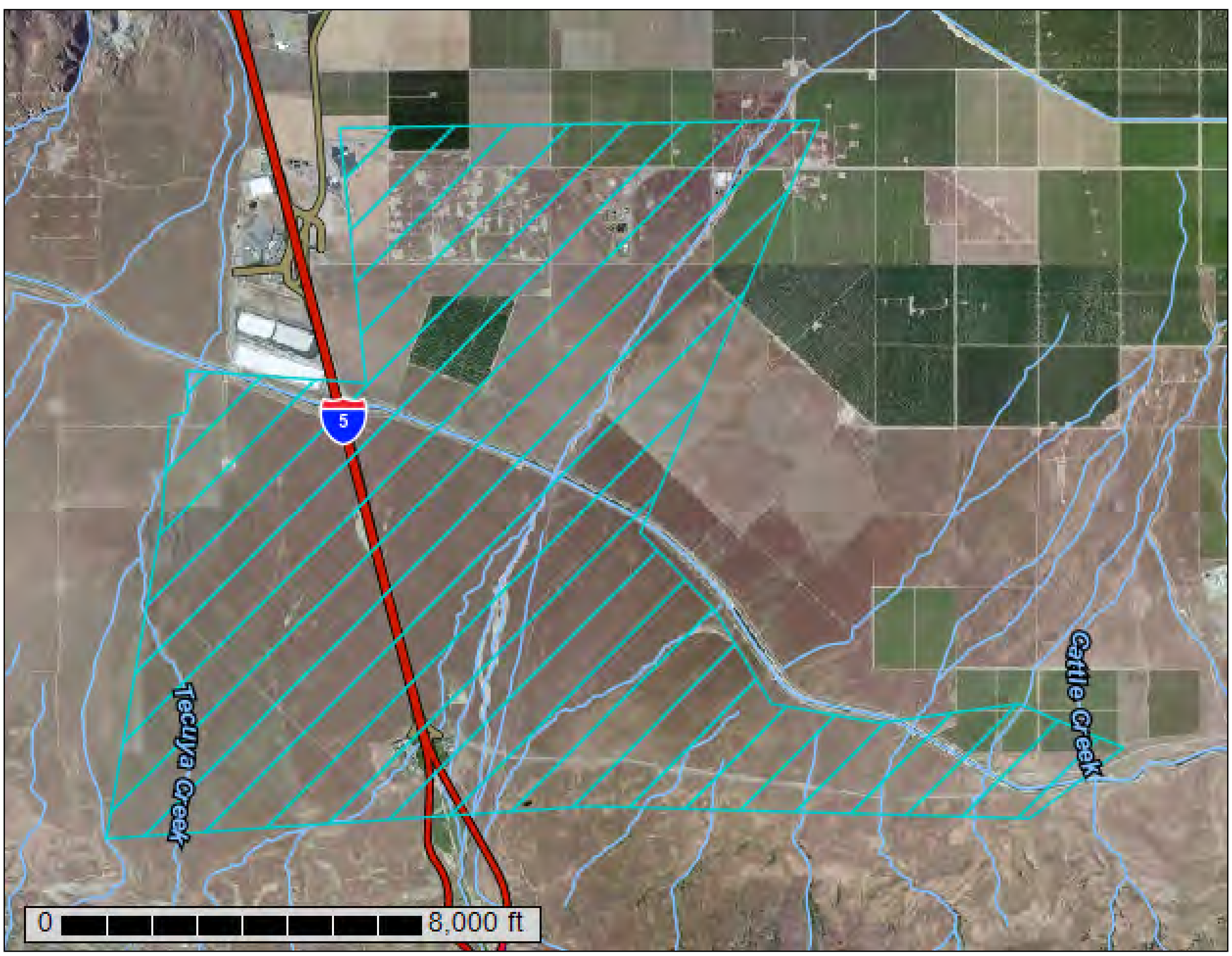
United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Kern County, California, Southwest Part



January 31, 2014

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

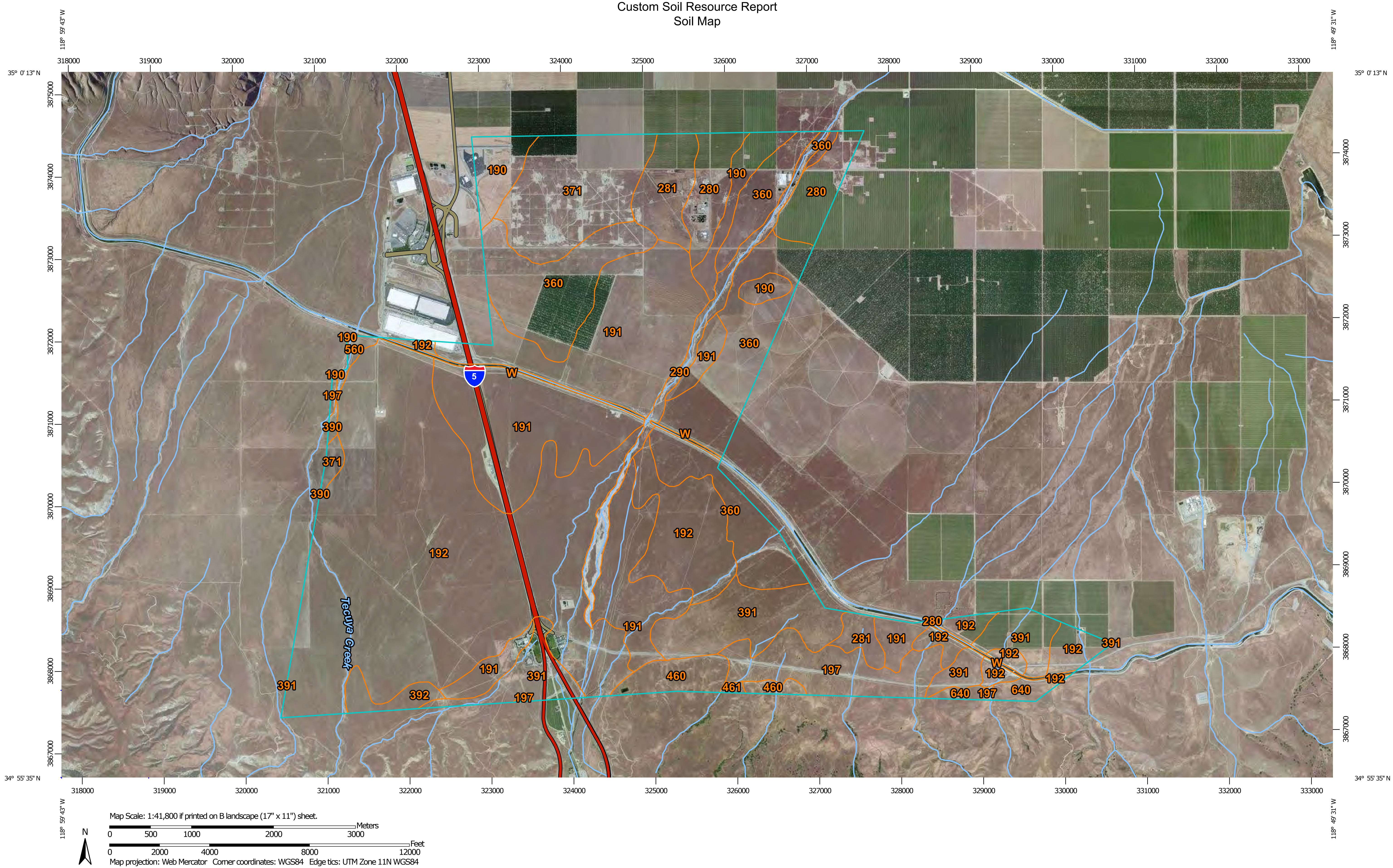
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



118° 59' 43" W
118° 49' 31" W
35° 0' 13" N
34° 55' 35" N
318000
319000
320000
321000
322000
323000
324000
325000
326000
327000
328000
329000
330000
331000
332000
333000
3875000
3874000
3873000
3872000
3871000
3870000
3869000
3868000
3867000
190
371
281
280
360
191
192
560
197
390
290
W
5
391
392
460
461
640
Tecuya Creek
Map Scale: 1:41,800 if printed on B landscape (17" x 11") sheet.
Meters
0
500
1000
2000
3000
Feet
0
2000
4000
8000
12000
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kern County, California, Southwest Part
Survey Area Data: Version 4, Dec 16, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 5, 2010—Aug 31, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Kern County, California, Southwest Part (CA691)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
190	Guijarral sandy loam, 0 to 2 percent slopes	287.1	3.0%
191	Guijarral sandy loam, 2 to 9 percent slopes	1,863.4	19.7%
192	Guijarral-Klipstein complex, 2 to 5 percent slopes	3,292.1	34.8%
197	Klipstein-Guijarral complex, 5 to 15 percent slopes	335.6	3.5%
280	Premier sandy loam, 0 to 2 percent slopes	326.5	3.4%
281	Premier sandy loam, 2 to 5 percent slopes	254.4	2.7%
290	Riverwash	200.9	2.1%
360	Wheelridge gravelly loamy sand, 0 to 2 percent slopes	1,301.0	13.7%
371	Whitewolf loamy sand, 2 to 5 percent slopes	534.8	5.7%
390	Pleito sandy clay loam, 0 to 2 percent slopes	10.1	0.1%
391	Pleito sandy clay loam, 2 to 5 percent slopes	687.6	7.3%
392	Pleito sandy clay loam, 5 to 9 percent slopes	74.9	0.8%
460	Geghus-Tecuya association, 9 to 30 percent slopes	151.5	1.6%
461	Geghus-Tecuya association, 30 to 75 percent slopes	8.5	0.1%
560	Laval-Pleitito complex, 1 to 5 percent slopes	24.8	0.3%
640	Bitcreek-Dibble-Eaglerest complex, 15 to 50 percent slopes	62.0	0.7%
W	Water	50.5	0.5%
Totals for Area of Interest		**9,465.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Kern County, California, Southwest Part

190—Guijarral sandy loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 560 to 1,330 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Guijarral and similar soils: 85 percent
Minor components: 15 percent

Description of Guijarral

Setting

Landform: Fan remnants
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from calcareous sedimentary rock

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 8 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline (0.3 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B

Typical profile

0 to 1 inches: Sandy loam
1 to 4 inches: Sandy loam
4 to 16 inches: Sandy loam
16 to 29 inches: Gravelly sandy loam
29 to 40 inches: Gravelly sandy loam
40 to 46 inches: Gravelly sandy loam
46 to 51 inches: Very gravelly sandy loam
51 to 60 inches: Very gravelly sandy loam

Minor Components

Cerini

Percent of map unit: 5 percent
Landform: Alluvial fans

Excelsior

Percent of map unit: 4 percent
Landform: Alluvial fans

Pentland

Percent of map unit: 3 percent
Landform: Alluvial fans, fan piedmonts

Tupman

Percent of map unit: 2 percent
Landform: Stream terraces, fan remnants
Landform position (three-dimensional): Talf

Unnamed

Percent of map unit: 1 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear

191—Guijarral sandy loam, 2 to 9 percent slopes

Map Unit Setting

Elevation: 460 to 1,830 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Guijarral and similar soils: 85 percent
Minor components: 15 percent

Description of Guijarral

Setting

Landform: Fan remnants
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from calcareous sedimentary rock

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 8 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline (0.3 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups
Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B

Typical profile
0 to 1 inches: Sandy loam
1 to 4 inches: Sandy loam
4 to 16 inches: Sandy loam
16 to 29 inches: Gravelly sandy loam
29 to 40 inches: Gravelly sandy loam
40 to 46 inches: Gravelly sandy loam
46 to 51 inches: Very gravelly sandy loam
51 to 60 inches: Very gravelly sandy loam

Minor Components

Cerini
Percent of map unit: 4 percent
Landform: Alluvial fans

Pentland
Percent of map unit: 4 percent
Landform: Alluvial fans, fan piedmonts

Excelsior
Percent of map unit: 3 percent
Landform: Alluvial fans

Tupman
Percent of map unit: 3 percent
Landform: Stream terraces, fan remnants
Landform position (three-dimensional): Talf

Unnamed
Percent of map unit: 1 percent
Landform: Alluvial fans, flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear

192—Guijarral-Klipstein complex, 2 to 5 percent slopes

Map Unit Setting

Elevation: 510 to 1,900 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Klipstein and similar soils: 45 percent
Guijarral and similar soils: 45 percent
Minor components: 10 percent

Description of Guijarral

Setting

Landform: Fan remnants
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from calcareous sedimentary rock

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 8 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline (0.3 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B

Typical profile

0 to 1 inches: Sandy loam
1 to 4 inches: Sandy loam
4 to 16 inches: Sandy loam
16 to 29 inches: Gravelly sandy loam
29 to 40 inches: Gravelly sandy loam
40 to 46 inches: Gravelly sandy loam

46 to 51 inches: Very gravelly sandy loam
51 to 60 inches: Very gravelly sandy loam

Description of Klipstein

Setting

Landform: Alluvial fans, fan remnants
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear, convex
Parent material: Alluvium derived from granitoid and/or sedimentary rock

Properties and qualities

Slope: 2 to 5 percent
Surface area covered with cobbles, stones or boulders: 2.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 20.12 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 4 percent
Maximum salinity: Nonsaline (0.3 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Very low (about 2.8 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 7e
Hydrologic Soil Group: A

Typical profile

0 to 5 inches: Sandy loam
5 to 23 inches: Extremely gravelly sandy loam
23 to 30 inches: Very gravelly sandy loam
30 to 36 inches: Loamy sand
36 to 60 inches: Extremely gravelly sandy loam

Minor Components

Cerini

Percent of map unit: 4 percent
Landform: Alluvial fans

Excelsior

Percent of map unit: 3 percent
Landform: Alluvial fans

Tupman

Percent of map unit: 2 percent
Landform: Stream terraces, fan remnants
Landform position (three-dimensional): Talf

Unnamed

Percent of map unit: 1 percent
Landform: Alluvial fans, flood plains

Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear

197—Klipstein-Guijarral complex, 5 to 15 percent slopes

Map Unit Setting

Elevation: 590 to 2,070 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Klipstein and similar soils: 60 percent
Guijarral and similar soils: 25 percent
Minor components: 15 percent

Description of Klipstein

Setting

Landform: Alluvial fans, fan remnants
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear, convex
Parent material: Alluvium derived from granitoid and/or sedimentary rock

Properties and qualities

Slope: 5 to 15 percent
Surface area covered with cobbles, stones or boulders: 8.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 20.12 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 4 percent
Maximum salinity: Nonsaline (0.3 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Very low (about 2.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4e
Land capability (nonirrigated): 7e
Hydrologic Soil Group: A

Typical profile

0 to 5 inches: Sandy loam
5 to 23 inches: Extremely gravelly sandy loam

23 to 30 inches: Very gravelly sandy loam
30 to 36 inches: Loamy sand
36 to 60 inches: Extremely gravelly sandy loam

Description of Guijarral

Setting

Landform: Fan remnants
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from calcareous sedimentary rock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 8 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline to slightly saline (2.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Low (about 5.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B

Typical profile

0 to 1 inches: Gravelly sandy loam
1 to 4 inches: Gravelly sandy loam
4 to 16 inches: Gravelly sandy loam
16 to 29 inches: Gravelly sandy loam
29 to 40 inches: Gravelly sandy loam
40 to 46 inches: Very gravelly sandy loam
46 to 51 inches: Very gravelly sandy loam
51 to 60 inches: Very gravelly sandy loam

Minor Components

Cerini

Percent of map unit: 4 percent
Landform: Alluvial fans

Guijarral

Percent of map unit: 4 percent
Landform: Fan remnants

Excelsior

Percent of map unit: 3 percent
Landform: Alluvial fans

Tupman

Percent of map unit: 3 percent
Landform: Stream terraces, fan remnants
Landform position (three-dimensional): Talf

Pleito

Percent of map unit: 1 percent
Landform: Flood plains, fan remnants, channels
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear

280—Premier sandy loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 450 to 1,240 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Premier and similar soils: 85 percent
Minor components: 15 percent

Description of Premier

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granitoid

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 4 percent
Maximum salinity: Nonsaline (0.2 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water capacity: Moderate (about 8.8 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2e

Land capability (nonirrigated): 7e
Hydrologic Soil Group: A

Typical profile
0 to 16 inches: Sandy loam
16 to 60 inches: Sandy loam

Minor Components

Bakersfield
Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Talf

Excelsior
Percent of map unit: 3 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf

Guijarral
Percent of map unit: 2 percent
Landform: Fan remnants
Landform position (three-dimensional): Talf

Granoso
Percent of map unit: 2 percent
Landform: Flood plains, alluvial fans
Landform position (three-dimensional): Talf

Kimberlina
Percent of map unit: 2 percent
Landform: Flood plains, alluvial fans
Landform position (three-dimensional): Talf

Wasco
Percent of map unit: 1 percent
Landform: Flood plains, alluvial fans
Landform position (three-dimensional): Talf

Unnamed, flood plain
Percent of map unit: 1 percent
Landform: Flood plains, depressions

Milagro
Percent of map unit: 1 percent
Landform: Alluvial fans, fan skirts
Landform position (three-dimensional): Talf

281—Premier sandy loam, 2 to 5 percent slopes

Map Unit Setting
Elevation: 930 to 1,310 feet
Mean annual precipitation: 6 to 9 inches

Mean annual air temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Premier and similar soils: 85 percent
Minor components: 15 percent

Description of Premier

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granitoid

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Very rare
Frequency of ponding: None
Calcium carbonate, maximum content: 4 percent
Maximum salinity: Nonsaline (0.2 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water capacity: Moderate (about 8.8 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 3e
Land capability (nonirrigated): 7e
Hydrologic Soil Group: A

Typical profile

0 to 16 inches: Sandy loam
16 to 60 inches: Sandy loam

Minor Components

Bakersfield

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (three-dimensional): Talf

Excelsior

Percent of map unit: 3 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf

Guijarral

Percent of map unit: 2 percent
Landform: Fan remnants
Landform position (three-dimensional): Talf

Granoso

Percent of map unit: 2 percent

Landform: Alluvial fans, flood plains
Landform position (three-dimensional): Talf

Kimberlina
Percent of map unit: 2 percent
Landform: Alluvial fans, flood plains
Landform position (three-dimensional): Talf

Milagro
Percent of map unit: 1 percent
Landform: Alluvial fans, fan skirts
Landform position (three-dimensional): Talf

Wasco
Percent of map unit: 1 percent
Landform: Alluvial fans, flood plains
Landform position (three-dimensional): Talf

290—Riverwash

Map Unit Setting
Elevation: 300 to 1,000 feet
Mean annual precipitation: 5 to 8 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 240 to 300 days

Map Unit Composition
Riverwash: 85 percent
Minor components: 15 percent

Description of Riverwash

Setting
Landform: Flood plains, channels
Parent material: Alluvium derived from mixed sources

Properties and qualities
Slope: 0 to 5 percent
Frequency of flooding: Rare

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 8

Minor Components

Xerofluvents
Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Talf

Fluvaquents
Percent of map unit: 5 percent

Landform: Flood plains, channels

Xerorthents, sandy

Percent of map unit: 5 percent
Landform: Flood plains

360—Wheelridge gravelly loamy sand, 0 to 2 percent slopes

Map Unit Setting

Elevation: 900 to 2,170 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Wheelridge and similar soils: 85 percent
Minor components: 15 percent

Description of Wheelridge

Setting

Landform: Fan remnants
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granitoid rock

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.09 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 4 percent
Maximum salinity: Nonsaline (0.4 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 4s
Land capability (nonirrigated): 7s
Hydrologic Soil Group: A

Typical profile

0 to 7 inches: Gravelly loamy sand
7 to 13 inches: Gravelly loamy sand
13 to 27 inches: Gravelly loamy sand

27 to 44 inches: Cobbly loamy sand
44 to 65 inches: Extremely gravelly sand

Minor Components

Vineland
Percent of map unit: 3 percent
Landform: Flood plains
Landform position (three-dimensional): Talf

Granoso
Percent of map unit: 3 percent
Landform: Flood plains, alluvial fans
Landform position (three-dimensional): Talf

Excelsior
Percent of map unit: 3 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf

Excelsior
Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf

Guijarral
Percent of map unit: 2 percent
Landform: Fan remnants
Landform position (three-dimensional): Talf

Kimberlina
Percent of map unit: 2 percent
Landform: Flood plains, alluvial fans
Landform position (three-dimensional): Talf

371—Whitewolf loamy sand, 2 to 5 percent slopes

Map Unit Setting
Elevation: 880 to 1,450 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 62 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition
Whitewolf and similar soils: 85 percent
Minor components: 15 percent

Description of Whitewolf

Setting
Landform: Flood plains, alluvial fans
Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granitoid rock

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.1 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum: 3.0
Available water capacity: Low (about 4.5 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): 3s
Land capability (nonirrigated): 7e
Hydrologic Soil Group: A

Typical profile

0 to 11 inches: Loamy sand
11 to 65 inches: Loamy coarse sand

Minor Components

Excelsior

Percent of map unit: 4 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf

Kimberlina

Percent of map unit: 3 percent
Landform: Flood plains, alluvial fans
Landform position (three-dimensional): Talf

Granoso

Percent of map unit: 3 percent
Landform: Flood plains, alluvial fans
Landform position (three-dimensional): Talf

Guijarral

Percent of map unit: 3 percent
Landform: Fan remnants
Landform position (three-dimensional): Talf

Milagro

Percent of map unit: 1 percent
Landform: Alluvial fans, fan skirts
Landform position (three-dimensional): Talf

Wasco

Percent of map unit: 1 percent
Landform: Flood plains, alluvial fans
Landform position (three-dimensional): Talf

390—Pleito sandy clay loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 1,080 to 1,670 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 60 to 64 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Pleito and similar soils: 85 percent
Minor components: 15 percent

Description of Pleito

Setting

Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 7 percent
Maximum salinity: Nonsaline (0.4 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 6.0
Available water capacity: Low (about 4.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 4s
Hydrologic Soil Group: B

Typical profile

0 to 4 inches: Sandy clay loam
4 to 8 inches: Sandy clay loam
8 to 18 inches: Sandy clay loam
18 to 25 inches: Sandy clay loam
25 to 32 inches: Gravelly sandy clay loam
32 to 46 inches: Gravelly sandy clay loam
46 to 56 inches: Gravelly sandy clay loam

56 to 64 inches: Gravelly sandy clay loam
64 to 80 inches: Gravelly sandy clay loam

Minor Components

Pleito, sandy loam
Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (three-dimensional): Talf

Xerofluvents
Percent of map unit: 4 percent
Landform: Flood plains, stream terraces
Landform position (three-dimensional): Tread, talf

Hesperia
Percent of map unit: 4 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf

Xeric torriorthents
Percent of map unit: 2 percent
Landform: Escarpments, stream terraces, fan remnants
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Free face, tread, talf

391—Pleito sandy clay loam, 2 to 5 percent slopes

Map Unit Setting
Elevation: 950 to 3,940 feet
Mean annual precipitation: 6 to 12 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 180 to 300 days

Map Unit Composition
Pleito and similar soils: 80 percent
Minor components: 20 percent

Description of Pleito

Setting
Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Properties and qualities
Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 7 percent
Maximum salinity: Nonsaline (0.4 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 6.0
Available water capacity: Low (about 4.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 4e
Hydrologic Soil Group: B

Typical profile

0 to 4 inches: Sandy clay loam
4 to 8 inches: Sandy clay loam
8 to 18 inches: Sandy clay loam
18 to 25 inches: Sandy clay loam
25 to 32 inches: Gravelly sandy clay loam
32 to 46 inches: Gravelly sandy clay loam
46 to 56 inches: Gravelly sandy clay loam
56 to 64 inches: Gravelly sandy clay loam
64 to 80 inches: Gravelly sandy clay loam

Minor Components

Pleito, sandy loam

Percent of map unit: 7 percent
Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf

Hesperia

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf

Xerofluvents

Percent of map unit: 4 percent
Landform: Flood plains, stream terraces
Landform position (three-dimensional): Tread, talf

Xeric torriorthents

Percent of map unit: 3 percent
Landform: Escarpments, stream terraces, fan remnants
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Free face, tread, talf

Riverwash

Percent of map unit: 1 percent
Landform: Channels
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave

392—Pleito sandy clay loam, 5 to 9 percent slopes

Map Unit Setting

Elevation: 1,030 to 3,770 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 60 to 64 degrees F

Map Unit Composition

Pleito and similar soils: 85 percent
Minor components: 15 percent

Description of Pleito

Setting

Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Interfluve, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 7 percent
Maximum salinity: Nonsaline (0.4 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 6.0
Available water capacity: Low (about 4.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 4e
Hydrologic Soil Group: B

Typical profile

0 to 4 inches: Sandy clay loam
4 to 8 inches: Sandy clay loam
8 to 18 inches: Sandy clay loam
18 to 25 inches: Sandy clay loam
25 to 32 inches: Gravelly sandy clay loam
32 to 46 inches: Gravelly sandy clay loam
46 to 56 inches: Gravelly sandy clay loam
56 to 64 inches: Gravelly sandy clay loam

64 to 80 inches: Gravelly sandy clay loam

Minor Components

Calleguas, moderately steep

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Harrisranch

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear

Xerofluvents

Percent of map unit: 3 percent
Landform: Flood plains, stream terraces
Landform position (three-dimensional): Tread, talf

Xeric torriorthents

Percent of map unit: 3 percent
Landform: Escarpments, stream terraces, fan remnants
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest, tread, talf

Unnamed, floodplain

Percent of map unit: 1 percent
Landform: Drainageways, flood plains
Landform position (three-dimensional): Tread, talf

460—Geghus-Tecuya association, 9 to 30 percent slopes

Map Unit Setting

Elevation: 1,350 to 4,140 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 200 to 300 days

Map Unit Composition

Geghus and similar soils: 50 percent
Tecuya and similar soils: 30 percent
Minor components: 20 percent

Description of Geghus

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from calcareous shale, sandstone, and/or conglomerate

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.2 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: High (about 10.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B

Typical profile

0 to 2 inches: Loam
2 to 6 inches: Loam
6 to 15 inches: Loam
15 to 29 inches: Clay loam
29 to 44 inches: Clay loam
44 to 54 inches: Clay loam
54 to 62 inches: Loam

Description of Tecuya

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from calcareous sandstone, shale, and/or conglomerate

Properties and qualities

Slope: 9 to 15 percent
Surface area covered with cobbles, stones or boulders: 6.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.2 to 1.0 mmhos/cm)

Sodium adsorption ratio, maximum: 4.0
Available water capacity: Low (about 5.6 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B

Typical profile
0 to 3 inches: Cobbly silt loam
3 to 9 inches: Cobbly silt loam
9 to 28 inches: Very cobbly silt loam
28 to 38 inches: Very cobbly silt loam
38 to 60 inches: Extremely cobbly loam

Minor Components

Xeric torriorthents
Percent of map unit: 6 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Free face

Balcom
Percent of map unit: 6 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Bitcreek
Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Loslobos
Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank

Unnamed, wet
Percent of map unit: 1 percent
Landform: Seeps

461—Geghus-Tecuya association, 30 to 75 percent slopes

Map Unit Setting
Elevation: 1,380 to 4,840 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 61 to 64 degrees F

Frost-free period: 250 to 300 days

Map Unit Composition

Geghus and similar soils: 50 percent
Tecuya and similar soils: 35 percent
Minor components: 15 percent

Description of Geghus

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from sandstone

Properties and qualities

Slope: 30 to 75 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.2 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: High (about 10.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B

Typical profile

0 to 2 inches: Loam
2 to 6 inches: Loam
6 to 15 inches: Loam
15 to 29 inches: Clay loam
29 to 44 inches: Clay loam
44 to 54 inches: Clay loam
54 to 62 inches: Loam

Description of Tecuya

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from calcareous sandstone, shale and/or conglomerate

Properties and qualities

Slope: 30 to 50 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.2 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water capacity: Low (about 5.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: B

Typical profile

0 to 3 inches: Cobbly silt loam
3 to 9 inches: Cobbly silt loam
9 to 28 inches: Very cobbly silt loam
28 to 38 inches: Very cobbly silt loam
38 to 60 inches: Extremely cobbly loam

Minor Components

Balhud

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope

Badlands

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (three-dimensional): Side slope

Bitcreek

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Harrisranch

Percent of map unit: 2 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear

Shimmon

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Beam

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Unnamed, wet

Percent of map unit: 1 percent
Landform: Seeps, drainageways

560—Laval-Pleitito complex, 1 to 5 percent slopes

Map Unit Setting

Elevation: 470 to 1,840 feet
Mean annual precipitation: 7 to 10 inches
Mean annual air temperature: 61 to 65 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Pleito and similar soils: 44 percent
Laval and similar soils: 44 percent
Minor components: 12 percent

Description of Laval

Setting

Landform: Flood plains, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granitoid and/or sedimentary rock

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Maximum salinity: Nonsaline (0.3 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water capacity: Very low (about 2.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 7e
Hydrologic Soil Group: A

Typical profile

0 to 4 inches: Sandy loam
4 to 13 inches: Extremely gravelly sandy loam
13 to 20 inches: Very gravelly coarse sandy loam
20 to 23 inches: Loamy coarse sand
23 to 32 inches: Extremely gravelly coarse sand
32 to 48 inches: Extremely gravelly loamy coarse sand
48 to 62 inches: Extremely gravelly loamy coarse sand

Description of Pleito

Setting

Landform: Flood plains, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary and/or granitoid rock

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum content: 3 percent
Maximum salinity: Nonsaline (0.2 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water capacity: Low (about 5.8 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 7e
Hydrologic Soil Group: A

Typical profile

0 to 3 inches: Sandy loam
3 to 8 inches: Sandy loam
8 to 11 inches: Stratified sand to fine sandy loam
11 to 18 inches: Very gravelly sand
18 to 21 inches: Stratified very gravelly sand to fine sandy loam
21 to 29 inches: Very gravelly coarse sandy loam
29 to 48 inches: Sandy loam
48 to 65 inches: Sandy loam

Minor Components

Cerini

Percent of map unit: 4 percent
Landform: Alluvial fans

Xerofluvents

Percent of map unit: 3 percent
Landform: Flood plains

Guijarral

Percent of map unit: 3 percent
Landform: Fan remnants

Tupman

Percent of map unit: 1 percent
Landform: Stream terraces, fan remnants
Landform position (three-dimensional): Talf

Excelsior

Percent of map unit: 1 percent
Landform: Alluvial fans

640—Bitcreek-Dibble-Eaglerest complex, 15 to 50 percent slopes

Map Unit Setting

Elevation: 1,170 to 5,190 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 57 to 60 degrees F
Frost-free period: 150 to 225 days

Map Unit Composition

Bitcreek and similar soils: 40 percent
Dibble and similar soils: 30 percent
Eaglerest and similar soils: 15 percent
Minor components: 15 percent

Description of Bitcreek

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and/or shale

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.2 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 6.0
Available water capacity: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: C

Typical profile

0 to 3 inches: Sandy clay loam
3 to 8 inches: Sandy clay loam
8 to 19 inches: Sandy clay loam
19 to 31 inches: Sandy clay loam
31 to 38 inches: Sandy clay loam
38 to 60 inches: Clay

Description of Dibble

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.2 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum: 3.0
Available water capacity: Low (about 5.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: D

Typical profile

0 to 3 inches: Gravelly loam
3 to 12 inches: Clay loam
12 to 22 inches: Clay loam
22 to 31 inches: Clay loam
31 to 38 inches: Very gravelly clay loam
38 to 48 inches: Weathered bedrock

Description of Eaglerest

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Concave

Parent material: Residuum weathered from shale

Properties and qualities

Slope: 15 to 50 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline (0.2 to 1.0 mmhos/cm)
Sodium adsorption ratio, maximum: 6.0
Available water capacity: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: D

Typical profile

0 to 2 inches: Loam
2 to 6 inches: Very gravelly silt loam
6 to 13 inches: Very gravelly silt loam
13 to 23 inches: Weathered bedrock

Minor Components

Harrisranch

Percent of map unit: 4 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank

Bitcreek

Percent of map unit: 4 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope

Lithic xerorthents

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank

Positas

Percent of map unit: 3 percent
Landform: Stream terraces, fan remnants
Landform position (three-dimensional): Riser, talf

Unnamed, wet

Percent of map unit: 1 percent
Landform: Seeps, drainageways
Landform position (three-dimensional): Talf

W—Water

Map Unit Composition

Water: 100 percent

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APPENDIX C

SUPPLEMENTAL JURISDICTIONAL DELINEATION FOR TEJON RANCH

GRAPEVINE STUDY AREA

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Aaron O. Allen, PhD
Chief, North Coast Branch
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Ventura Field Office
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Subject: ***Request for Jurisdictional Determination Renewal for Grapevine and Pastoria Creeks and Related Tributaries and Isolated Waters in the Tejon Mountain Village and Grapevine Study Areas in Tejon Ranch, Kern County, California***

Dear Dr. Allen:

This letter is being sent on behalf of the Tejon Ranchcorp as a request for renewal of the Approved Jurisdictional Determination (JD) for the Tejon Mountain Village (TMV) study area as approved on October 2, 2008 (File No. SPL-2006-02020-AOA). This Approved JD concluded that two creeks (and related tributaries) flowing north into the Central Valley, Grapevine and Pastoria Creeks, were not jurisdictional. We also hereby request approval of a Supplemental JD for further tributaries of Grapevine and Pastoria Creeks, as well as other isolated waters, in the Grapevine study area of Tejon Ranch.

We have confirmed through field inspections that there have been no changed circumstances relating to any water feature evaluated as part of the Approved JD. An application for a permit to fill less than 1 acre of jurisdictional waters and no wetlands for the TMV project was filed in a timely manner and remains pending with the U.S. Army Corps of Engineers (ACOE).

Further fieldwork was also completed for other tributaries of Grapevine and Pastoria Creeks, and other isolated waters, in the Grapevine study area of Tejon Ranch. Based on the enclosed formal Supplemental JD, there are no ACOE-jurisdictional waters of the United States within the Grapevine study area. The attached 2013 Supplemental Jurisdictional Delineation Report for Tejon Ranch, Grapevine Study Area (Attachment A) describes the methods and results of the JD conducted within the Grapevine study area in April–July 2013. Additionally, the Approved Jurisdictional Determination Forms are attached for your review (Attachment B).

We appreciate your review of this site and provision of an Approved JD. If you have any questions or comments regarding the content of this report, please do not hesitate to contact me via telephone at 760.479.4281 or via email at menright@dudek.com.

Sincerely,

Megan Enright
Senior Biologist

Att: A, 2013 Supplemental Jurisdictional Delineation Report for Tejon Ranch, Grapevine Study Area
B, Approved Jurisdictional Delineation Forms
cc: Steve Letterly, DMB Pacific Ventures

ATTACHMENT A

2013 Supplemental Jurisdictional Delineation Report for Tejon Ranch, Grapevine Study Area

SUPPLEMENTAL JURISDICTIONAL DELINEATION REPORT FOR TEJON RANCH, GRAPEVINE STUDY AREA

Prepared for:

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Contact: Steve Letterly, DMB Pacific Ventures
(On Behalf of Tejon Ranchcorp)

Prepared by:

DUDEK
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AUGUST 2013

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this document is to describe the methods and results of the supplemental jurisdictional delineation of further tributaries to the Grapevine and Pastoria Creeks that were previously determined to be non-jurisdictional by the U.S. Army Corps of Engineers (ACOE) (File No. SPL-2006-02020-AOA), and other isolated waters, within the Grapevine study area of Tejon Ranch, and to request a supplemental jurisdictional determination for this study area from the ACOE. Based upon this formal supplemental jurisdictional delineation, there are no ACOE-jurisdictional waters of the United States within the Grapevine study area.

1.2 Contents of Document

A general overview of the content of this document is provided below.

- **Chapter 1—Introduction**: This chapter describes the purpose of this document and the location of the study area.
- **Chapter 2—Environmental Setting**: This chapter describes the purpose of environmental setting of the study area including land uses, climate, soils, terrain, hydrology, watersheds, and beneficial uses.
- **Chapter 3—Methods**: This section provides an overview of the methods used by Dudek to conduct the jurisdictional delineation.
- **Chapter 4—Jurisdictional Determination**: This chapter briefly provides the results of the jurisdictional delineation.
- **Chapter 5—References**: The references cited in this document are provided in this chapter.

1.3 Overview of On-Site Resources

The Grapevine study area is located in the San Joaquin Valley at the base of the Tehachapi Mountains. Grapevine Creek and its tributaries; Pastoria Creek and its tributaries, including Live Oak Creek and Cattle Creek; and one unnamed tributary flow through the study area. Additionally, there are a few isolated, unnamed drainages and seeps within the study area.

As previously determined by the ACOE, Grapevine Creek ends in a playa in the San Joaquin Valley and has no connectivity to other waters of the United States; there is no hydrologic connection between Grapevine Creek and the California Aqueduct (ACOE 2008b; Appendix A-2).

Also as previously determined by the ACOE, Pastoria Creek either dissipates into agricultural lands north of the study area or flows into an unnamed drainage at the very northeast corner of the study area, which flows off site into a detention basin referred to as Tejon Reservoir No. 1. Tejon Reservoir No. 1 is not publicly accessible, has no boating opportunities, was created by excavating uplands, and is used exclusively for agricultural purposes. Tejon Reservoir No. 1 is an isolated, non-navigable water body that does not support substantial interstate commerce. Tejon Ranch diverts seasonal surface flows into Tejon Reservoir No. 1 and pumps water into the Wheeler Ridge–Maricopa Water District's 850 Canal (Appendix A-2, ACOE 2008b).

Both Live Oak Creek and Cattle Creek are tributaries to Pastoria Creek. Live Oak Creek connects to Cattle Creek via an artificially created agricultural irrigation ditch and Cattle Creek flows into Pastoria Creek, which, as noted above, does not have a hydrologic connection to any navigable water.

A jurisdictional determination for the Tejon Mountain Village project, located approximately 1.8 miles to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the on-site portions of Pastoria Creek and the unnamed tributary it flows into, as well as Cattle and Live Oak Creeks (tributaries to Pastoria Creek), are not considered waters of the United States. The on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream.

Finally, there are a few isolated, unnamed drainages and seeps within the study area that do not flow into navigable waters of the United States and are likewise non-jurisdictional.

1.4 Grapevine Study Area Location

The Grapevine study area is located in the west-central portion of Tejon Ranch (the Ranch). The approximately 270,000-acre Ranch is currently held in private ownership by Tejon Ranchcorp. The Ranch includes a large portion of the Tehachapi Mountains as well as smaller portions of the San Joaquin and Antelope Valleys. Generally, the Ranch extends from Interstate 5 (I-5) on the western side to Highway 58 on the northern side (Figure 1-1).

The 15,315-acre Grapevine study area is entirely within unincorporated Kern County just south of the junction of I-5 and Highway 99. The City of Bakersfield is approximately 13 miles north of the study area. The majority of the study area is on the east side of I-5, but approximately 12% lies on the west side of I-5. The study area is bisected by the California Aqueduct (Figure 1-2).

The Grapevine study area mainly lies in the Grapevine and Pastoria Creek U.S. Geological Survey (USGS) 7.5-minute quadrangles. There is one parcel and a portion of two other parcels in the study area that lie entirely within the Mettler USGS 7.5-minute quadrangles. The latitude and longitude of the approximate center of the site is 34°57'24" N and 118°53'21" W. The Universal Transverse Mercator (UTM) coordinates for the approximate center are UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.

2.0 ENVIRONMENTAL SETTING

2.1 Land Uses

Adjacent to the study area, west of I-5, the land is relatively flat and used for grazing purposes. The Tejon Ranch Commerce Center is to the northwest of the site and includes distribution centers and retail locations. South of the site, Pacific Pipeline Systems and Exxon-Mobil Corp operate oil/gas pump stations. The Wheeler Ridge–Maricopa Water District's 850 Canal is located just north of the study area and generally runs west–east (Figure 2-1). The Pastoria Energy Facility and Griffith Rock Plant are located just east of the site. Edmonston Pumping Station, located on the southeastern side of the study area, is a pump station at the southern end of the California Aqueduct. Edmonston Pumping Plant Road, off Grapevine Road East, runs east–west across the study area just north of the foothills and crosses the aqueduct on the eastern side of the study area. There are active and inactive oil and gas wells throughout the site and several oil and gas mineral leases in the northern portion of the site. Other existing land uses include agriculture and grazing.

The slopes to the south and east of the site are generally undeveloped. The Los Padres National Forest is located south and west of the site and extends west and south to Ventura and Santa Barbara Counties. North of the Los Padres National Forest and west of I-5, at the southern edge of the San Joaquin Valley, is the Wind Wolves Preserve, a privately owned preserve area. Lands immediately west, south, and east of the Grapevine study area are owned by Tejon Ranchcorp. Through the Ranchwide Agreement, Tejon Ranch Company committed to conserve 90% of the 270,000-acre ranch (for a total of approximately 240,000 acres of Ranchwide Agreement conservation lands). To date, conservation easements have been recorded on approximately 100,243 acres. At the regional level, there are undeveloped private lands to the east and south, and predominantly agricultural lands to the north and immediately west (Figure 2-1).

2.2 Climate

The Tejon Rancho National Oceanic and Atmospheric Administration (NOAA) Cooperative Station is approximately 6 miles to the northeast of the Grapevine study area at an elevation of 1,420 feet above mean sea level (amsl). Given the proximity to the study area and the elevation of the station, which is close to the mid-point of the study area elevation (i.e., 1,542 feet amsl), the approximate climate of the Grapevine study area is characterized herein using the data collected at this station.

As mentioned previously, the study area is located at the base of the Tehachapi Mountains on the extreme southern end of the San Joaquin Valley floor. However, the majority of the study area is located in the San Joaquin Valley, which has a semi-arid climate characterized by long, hot, dry summers and damp, short winters that have a heavy fog layer for weeks at a time. The average high temperature during the summer approaches 96 degrees Fahrenheit (°F) with an annual average of 75.9°F. Low temperatures range from approximately 37–68°F, with an annual average low temperature of 51.2°F. The average annual precipitation is 11.68 inches. The majority of the rainfall (precipitation over 1 inch/month) during the year occurs between November and April, the typical rainy season for this region. The summer months are virtually rainless with average monthly rainfalls ranging from 0.1–0.02 inch/month (WRCC 2013).

2.3 Soils

Soils mapping for the majority of the study area is included in the U.S. Department of Agriculture (USDA) Soil Survey Geographic database (SSURGO) (USDA 2007, 2009). The majority of the Grapevine study area is sandy loam (41.9%), very gravelly sandy loam (19.5%), and loamy sand (17.1%) (see Table 2-1).

Table 2-1
USDA Mapped Soil Units

Soil Groups	Soil Name	Acreage[1]	% of Total
Cobbly clay	Cibo cobbly clay, 30–75% slopes	36	0.2%
	Subtotal	*36*	*0.2%*
Cobbly sandy clay loam	Tehachapi cobbly sandy clay loam, warm, 2–9% slopes	11	0.1%
	Subtotal	*11*	*0.1%*
Fine sandy loam	Pleito sandy clay loam, 2–5% slopes	1,333	8.7%
	Pleito sandy clay loam, 5–9% slopes	41	0.3%
	Subtotal	*1,374*	*9.0%*
Gravelly clay loam	Bitcreek-Dibble-Eaglerest complex, 15–50% slopes	430	2.8%
	Subtotal	*430*	*2.8%*
Gravelly loam	Pleito-Loslobos, 15–75% slopes	35	0.2%
	Subtotal	*35*	*0.2%*
Gravelly sandy loam	Cuyama sandy loam, 2–5% slopes	132	0.9%
	Subtotal	*132*	*0.9%*
Loam	Cerini loam, 0–2% slopes	76	0.5%
	Geghus-Tecuya association, 30–75% slopes	361	2.4%
	Geghus-Tecuya association, 9–30% slopes	636	4.1%
	Subtotal	*1,072*	*7.0%*

Table 2-1
USDA Mapped Soil Units

Soil Groups	Soil Name	Acreage[1]	% of Total
Loamy sand	Psamments-Xerolls complex, nearly level	175	1.1%
	Wheelridge gravelly loamy sand, 0–2% slopes	2,290	15.0%
	Whitewolf loamy sand, 2–5% slopes	192	1.3%
	Subtotal	*2,657*	*17.3%*
Sandy clay loam	Pleito-Chanac sandy clay loams, 15–30% slopes	0	0.0%
	Subtotal	*0*	*0.0%*
Sandy loam	Arvin sandy loam, 2–5% slopes	1	0.0%
	Arvin sandy loam, 5–9% slopes	130	0.9%
	Guijarral sandy loam, 0–2% slopes	552	3.6%
	Guijarral sandy loam, 2–9% slopes	1,454	9.5%
	Hesperia sandy loam, 0–2% slopes	103	0.7%
	Hesperia sandy loam, 2–5% slopes	376	2.5%
	Hesperia sandy loam, 5–9% slopes	598	3.9%
	Loslobos-Walong association, 5–30% slopes	164	1.1%
	Pleitito-Laval complex, 1–5% slopes	166	1.1%
	Premier sandy loam, 0– 2% slopes	2,610	17.0%
	Premier sandy loam, 2–5% slopes	77	0.5%
	Subtotal	*6,232*	*40.7%*
Stony sandy loam	Arvin stony sandy loam, 5–9% slopes	100	0.7%
	Subtotal	*100*	*0.7%*
Very gravelly sandy loam	Guijarral-Klipstein complex, 2–5% slopes	2,394	15.6%
	Klipstein-Guijarral complex, 5–15% slopes	473	3.1%
	Riverwash	182	1.2%
	Subtotal	*3,049*	*19.9%*
Very stony sandy clay loam	Tehachapi loam, 2–5% slopes	157	1.0%
	Subtotal	*157*	*1.0%*
Area not surveyed, access denied		29	0.2%
	Total	**15,315**	**100.0%**

Source: USDA 2007, 2009.
[1] Numbers may not total precisely due to rounding.
Blue shading indicates that the soil is listed on the National List of Hydric Soils (USDA 2012a).

According to the National List of Hydric Soils (USDA 2012a), 18 of the 30 soil types within the Grapevine study area are considered hydric. These hydric soils are indicated by blue shading in Table 2-1. Soils within the Grapevine study area are shown on Figure 2-2. Hydric soils are defined as a soil that "formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. This definition includes soils that developed under anaerobic conditions in the upper part but no longer experience these conditions due to hydrologic alteration such as those hydric soils that have been artificially drained or protected (e.g., ditches or levees)" (USDA 2013). Hydric soils, hydrophytic vegetation, and hydrology are the three factors used to determine the presence and extent of wetlands per the 1987 *Corps of Engineers Wetlands Delineation Manual* (ACOE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (ACOE 2008c). The presence of USDA-mapped hydric soils does not automatically determine whether an area contains hydric soils. Instead, the list is used to identify areas that may contain hydric soils and guide the formal jurisdictional delineation. Hydric soils testing was performed in accordance with the methods discussed in Section 3.2.

2.4 Terrain

The Grapevine study area ranges in elevation from 898–2,186 feet amsl. The majority of the site is at the lower to mid-elevational range of approximately 1,000–1,400 feet amsl. The slopes in the southern portion of the site are steepest. Slopes become less steep from the southwestern corner of the site to the northeast corner. The majority of the site is relatively flat. The slopes along the southern boundary generally face north, but exhibit a range of aspects. Monroe and Aliso Canyons trend north to south in the southern portion of the site (Figure 2-3).

The lowest elevations in the study area occur in the northwestern part of the site and along the northern boundary of the site to the northeastern corner. Elevations generally rise in the southwesterly direction. The entire length of the aqueduct through the center of the site is approximately 1,250 feet amsl and elevations continue to increase to the southwest. Aspects vary considerably more in the southern portion of the site where the steepness increases. The highest point on the study area is located at the southern edge of the site east of I-5.

2.5 Hydrology

The Grapevine study area is located at the base of the Tehachapis. The hydrogeological history is summarized as follows: "at the base of the granitic basement rock of the Tehachapis are deep layers of sediments that have been eroded from the mountains and deposited in the adjacent valleys. Groundwater formed via the infiltration of rain, and snowmelt travels down-slope and accumulates in these alluvial groundwater basins. The faulting prevalent in the region produces fractures through which groundwater moves to the surface rather than continuing down-gradient, expressing as springs or seeps of water" (Tejon Ranch Conservancy 2013). Generally, groundwater in the southern San Joaquin Valley generally lies between 150 and 500 feet below ground surface (Faunt 2009, as cited in Tejon Ranch Conservancy 2013).

Within the study area, the USGS National Hydrography Dataset (NHD) identifies Grapevine Creek, Pastoria Creek, Live Oak Creek, and Cattle Creek as well as additional streams consisting of tributaries, pipelines, and artificially created channels (USGS 2013). A detailed discussion of the hydrology of the Grapevine study area based upon the jurisdictional delineation is provided in Section 4.2.

2.6 Watersheds and Beneficial Uses

The Grapevine study area is located within the Tulare Lake hydrologic basin. The majority of the study area is within the Arvin-Wheeler Ridge hydrologic area in the South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30). The southernmost portion of the study area lies within two hydrologic areas—Tejon Creek (HUC 556.20) and San Emigdio (HUC 556.3)—both of which are within the Grapevine hydrologic unit (Central Valley RWQCB 2004) (Figure 2-4).

The Water Quality Control Plan for the Tulare Lake Basin (Central Valley RWQCB 2004) includes the following beneficial uses, excerpted directly from the basin plan, for the surface waters of Westside Streams in Hydrologic Unit 556 and Valley Floor Waters in Hydrological Unit 557:

- Agricultural Supply (AGR)—Uses of water for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.
- Industrial Service Supply (IND)— Uses of water for industrial activities that do not depend primarily on water quality, including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.
- Industrial Process Supply (PRO)—Uses of water for industrial activities that depend primarily on water quality.
- Water Contact Recreation (REC-1)—Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.
- Non-Contact Water Recreation (REC-2)—Uses of water for recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
- Warm Freshwater Habitat (WARM)—Uses of water that support warm water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates. WARM includes support for reproduction and early development of warm water fish.

- Wildlife Habitat (WILD)—Uses of water that support terrestrial or wetland ecosystems, including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
- Rare, Threatened, or Endangered Species (RARE)—Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered.
- Ground Water Recharge (GWR)—Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.

3.0 METHODS

3.1 Literature Review

Dudek reviewed aerial maps from the Kern Council of Governments (2010), USDA (2012b), AirPhoto USA (2006) and Bing (2013); the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) (USFWS 2013a); the USGS NHD (USGS 2013); the National List of Hydric Soils (USDA 2012a); the *Jurisdictional Delineation Report for Tejon Mountain Village* (Impact Sciences Inc. 2008); intermittent stream and topographical data from Tejon Ranch Company (TRC 2013a; Intermap Technologies 2005, 2013); basins, ponds, and reservoirs data from TRC (2013b); and historical aerials and topographic maps (Google Earth 2013; Historic Aerials Online 2013). Dudek identified vegetation communities within the Grapevine study area by keying them out using the Manual of California, Second Edition (Sawyer et al. 2009) in accordance with the *Protocols for Surveying and Evaluating Impacts to Special Status Native Populations and Natural Communities* (CDFG 2009). The project-specific vegetation map was reviewed in conjunction with the delineation field data.

The NHD contains water features such as lakes, ponds, streams, rivers, canals, dams, and stream gages (USGS 2013). The USFWS created the NWI to "provide biologists and others with information on the distribution and type of wetlands to aid in conservation efforts" (USFWS 2013b). Potential wetlands and waters are mapped by the USFWS based on aerial images and that data is provided to the public. This compilation of data was reviewed to gain a better understanding of the hydrologic setting of the study area and identify areas potentially under the jurisdiction of the ACOE.

3.2 Jurisdictional Delineation

A formal (routine) jurisdictional wetlands delineation within the study area was conducted by Dudek biologists Patricia Schuyler, Callie Ford, Heather Moine, Britney Strittmater, Emily Weir, Danielle Mullen, Linda Archer, and Randall McInvale in April, May, June, and July 2013. Specifically, Dudek conducted the delineation on April 16–18; May 13 and 14; June 18, 19, 26, and 27; and July 9, 16, and 18. All areas of the study area were surveyed on foot for waters of the United States, including wetlands, under the jurisdiction of ACOE, pursuant to Section 404 of the federal Clean Water Act (CWA).

Non-wetland waters of the United States are delineated based on the presence of an ordinary high water mark (OHWM) as determined utilizing the methodology in *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States, A Delineation Manual* (ACOE 2008d). Wetland waters of the United

States are delineated based on methodology described in the 1987 *Corps of Engineers Wetlands Delineation Manual* (ACOE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (ACOE 2008c). The ACOE and U.S. Environmental Protection Agency (EPA) Rapanos Guidance states that the ACOE will regulate: (i) traditional navigable waters of the United States and (ii) their adjacent wetlands as well as (iii) non-navigable tributaries to traditional navigable waters that are relatively permanent and (iv) wetlands that directly abut such tributaries (ACOE and EPA 2008). In addition, if a significant nexus has been determined, the ACOE may also assert jurisdiction over (i) non-navigable tributaries that are not relatively permanent and (ii) their adjacent wetlands, as well as (iii) wetlands that are adjacent to but that do not directly abut a relatively permanent non-navigable tributary (ACOE and EPA 2008).

Drainage features were delineated using either a Trimble GeoXT handheld Global Positioning System (GPS) unit with sub-meter accuracy or directly onto a 500-scale (1 inch = 500 feet) topographic base with 5-foot contours overlaid onto an aerial photographic base (USDA 2012b; Intermap Technologies 2013). All of the drainage features were surveyed on foot and the OHWM width was recorded when changes in the width occurred.

The wetlands delineation was performed in accordance with the methods prescribed in the 1987 Wetlands Delineation Manual (ACOE 1987), the 2008 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (ACOE 2008c), and the ACOE and EPA Rapanos Guidance (ACOE and EPA 2008). Pursuant to the federal CWA, ACOE jurisdictional areas include those supporting all three wetlands criteria described in the ACOE manual: hydric soils, hydrology, and hydrophytic vegetation.

To assist in the determination of jurisdictional areas on site, data was collected at 38 locations (i.e., data stations) using wetland determination data forms (Appendix B). Hydrology, vegetation, and soils were assessed and data were collected and captured on approved ACOE forms. The location of data stations were collected either using a Trimble GeoXT handheld GPS unit with sub-meter accuracy or directly onto a 500-scale (1 inch = 500 feet) topographic base with 5-foot contours overlaid onto an aerial photographic base (USDA 2012b). Potentially jurisdictional area were digitized in GIS based on the GPS data collected in the field and data collected directly onto field maps into a project-specific geographic information system (GIS) using ArcGIS software. A more detailed description of the methods is described below.

Hydrophytic Vegetation

Seasonal changes in species composition, human land-use practices, wildfires, and other natural disturbances can adversely affect the wetlands vegetation determination. During the delineation, a data station point was considered positive for hydrophytic vegetation if it passed the basic dominance test (Indicator 1), meaning that more than 50% of the dominant species sampled were characterized as either obligate, facultative wetland, and/or facultative per *The National Wetland Plant List: 2013 Wetland Ratings* (Lichvar 2013), or if it passed the prevalence index (Indicator 2), which takes into account all plant species in the community, not just dominants. The standard plot sampling technique was used to sample vegetation within a 10-foot radius for herbaceous vegetation and a 30-foot radius for trees, shrubs, and woody vines (ACOE 1987). All plant species observed within the data station were identified and recorded on the forms. Where plant identification could not be made in the field, a sample was taken and later identified in the laboratory and the forms were modified to reflect the presence of the identified species at the data station from which it was collected (Appendix B).

Hydric Soils

According to the National Technical Committee for Hydric Soils, hydric soils are “soils that are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part” (USDA 1994). Soil pits were prepared using a “sharp shooter” shovel to determine if hydric soils were present. The presence of hydric soils was determined through consultations with the *ACOE 1987 Wetlands Delineation Manual* (ACOE 1987) as well as *Field Indicators of Hydric Soils in the United States* (USDA 2010) and ACOE’s *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (ACOE 2008c). Munsell Soil Color Charts were used to determine soil chroma and value. Where feasible, soil pits were prepared to depths ranging from 16–18 inches. Dry soils were moistened to obtain the most accurate color. In general, soils from test pits were determined to be hydric if found to be of a chroma one or chroma two with mottles. Excavated soils were examined for evidence of hydric conditions, including low chroma values and mottling, vertical streaking, sulfidic odor, and high organic matter content in the upper horizon. Evidence of previous ponding or flooding was assessed, along with the slope, slope shape, existing landform characteristics, soil material/composition, and hydrophytic vegetation to determine if hydric soils were present. See Appendix B for the completed data station forms.

Hydrology

In accordance with the guidelines prescribed in ACOE’s *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (ACOE 2008c), wetland hydrology indicators are separated into four major groups: Groups A, B, C, and D. Group A indicators are based on direct observations of surface flow, ponding, and soil saturation/groundwater. Group B indicators consist of evidence that the site has been or is currently subjected to ponding, including, but not limited to watermarks, drift deposits, and sediment deposits. Group C indicators include signs of previous and/or current saturation, including oxidized rhizospheres surrounding living roots and the presence of reduced iron or sulfur, both of which are indicative of extended periods of soil saturation. Group D indicators consist of "vegetation and soil features that are indicative of current rather than historic wet conditions and include a shallow aquitard and results of the FAC-Neutral test" (ACOE 2008c). Each group is subdivided into primary and secondary categories based on their frequency and reliability to occur in the Arid West region. See Appendix B for the completed data station forms and Appendix C for photos of each data station.

Survey Limitations

The survey was conducted during the spring and summer seasons, which resulted in detection and identification of most annual and perennial plant species that may potentially occur in the area. Due to the timing of the surveys, late blooming summer annuals may not have been detectable. However, based on characteristics observed at each of the investigation locations, this limitation would not have affected the jurisdictional determination.

The delineation was conducted at the end of the rainy season (see Section 2.2) into summer. Conducting a delineation during one weather season has the potential to limit the results by reflecting only a certain snapshot in time. However, a week prior to the May surveys, the study area received a rainstorm and portions of the site previously delineated were rechecked for signs of hydrology.

3.3 Site-Specific Methods

Due to the complexity and anthropogenic alteration of the study area, Dudek reviewed the site in conjunction with historical aerials and topographic maps and NHD data (Google 2013; Historic Aerials Online 2013; USGS 2013). In order to categorize all features within the study area, Dudek classified the potentially jurisdictional features as swales; ephemeral, intermittent, or perennial waters; irrigation ditches; seeps; wetlands habitat; detention basins; or as having none of three ACOE parameters. During the initial site visit, Dudek observed several areas that were mapped as streams within the NHD, aerial and topographic data, but were either non-existent or swale-like features that did not meet any of the parameters outlined in Section 3.2 (i.e., no OHWM).

4.0 JURISDICTONAL DETERMINATION

4.1 Results

Creeks and Tributaries

There are four named creeks within the study area: Grapevine Creek, Pastoria Creek, Live Oak Creek, and Cattle Creek (Figure 4-1). All of the features within the study area, except for five isolated drainages and four seeps drain to these four creeks. The five isolated drainages and four seeps are not connected to a feature with an ACOE field indicator of hydrology, hydrophytic vegetation, or hydric soils. The jurisdictional delineation determination conducted by the ACOE for the Tejon Mountain Village area of Tejon Ranch previously confirmed that Grapevine Creek and Pastoria Creek—the main drainages within the study area—both drain into the San Joaquin Valley Plain and are, therefore, isolated, non-navigable waters that do not support any recreation, fish, or shellfish production or industry that results in substantial interstate commerce. The ACOE confirmed the determination that Grapevine Creek and Pastoria Creek, and their associated tributaries (which would include Cattle Creek and Live Oak Creek), are not waters of the United States (ACOE 2008a, 2008b; Appendices A-1 and A-2).

A description of each creek and their tributaries is contained in Tables 4-1, 4-2, 4-2a, and 4-2b. Tributaries to Grapevine Creek are identified as GV-1 through GV-9 and tributaries to Cattle Creek are identified as CC-1 and CC-2 (Figure 4-1). Photos representing the creeks and various tributaries are provided in Appendix C. The acreages and linear feet for the features described in Tables 4-1, 4-2, 4-2a, and 4-2b and the isolated drainages are shown in Table 4-3.

Table 4-1
Grapevine Creek and Associated Tributaries and Ostrich Detention Basin

Attribute	Description
On-site location	Grapevine creek enters the project study area from the south and flows north between I-5 where the interstate is divided (Figures 4-2 and 4-3). The creek continues to flow under the eastern section of I-5 via a culvert. At this location, a portion of the creek has been diverted to the northeast (see Table 4-2b), becoming a tributary to Cattle Creek (CC-2), while the main channel continues north, crossing under Edmonston Pumping Plant Road. At the intersection of Grapevine creek and the aqueduct, the aqueduct is diverted underground and Grapevine Creek continues to follow downstream uninterrupted. The creek then continues to flow north and northeast into agricultural lands off site.
Tributaries present on site	There are several ephemeral tributaries (GV-1 through GV-9) that flow into Grapevine Creek, the majority of which originate in the foothills to the west of I-5 (Figure 4-2). Five of these tributaries (GV-2 through GV-6) merge into one larger tributary (GV-1) that flows northeast, through a commercial complex, and under I-5. This tributary flows through the study area for approximately 7,800 feet before connecting to Grapevine Creek, just south of the aqueduct. Tributary GV-9, located within the freeway divide, enters the study area through a culvert located under I-5 and

Table 4-1
Grapevine Creek and Associated Tributaries and Ostrich Detention Basin

Attribute	Description
	connects with Grapevine Creek approximately 1,300 feet downstream. A second tributary (GV-7) also originates downstream of I-5, just north of the commercial complex, and flows approximately 700 feet before it connects to GV-1. Another tributary (GV-8) originates at the outlet of a culvert under Edmonston Pumping Plant Road, adjacent to developed lands associated with the rest stop. This tributary connects to Grapevine Creek approximately 2,400 feet downstream.
On-site topography	The tributaries to the west of I-5 originate from steep slopes associated with the foothills located in the southern portion of the project. Upper elevations of the tributaries range from 1,835 to 2,070 feet amsl. These tributaries flow north towards the main tributary (GV-1), which is located at the base of the foothills. The main tributary starts at an elevation of approximately 1,780 feet amsl and flows northeast towards the I-5, dropping to 1,535 feet before crossing through the Grapevine commercial complex. The upstream portion of Grapevine creek is located at an elevation of 1,840 feet amsl and as the creek flows through the study area, the elevation gradually decreases to 930 feet.
Hydrology	The upstream portion of Grapevine Creek, where the creek parallels Grapevine Road, contains perennial flows that are regulated by the Grapevine Pump Station. There is a detention basin, constructed in uplands and used exclusively for agricultural purposes, referred to as the Ostrich Detention Basin, east of Grapevine Creek, and riparian habitat has established adjacent to the basin. The basin receives water from Grapevine Creek through an underground pipe. Once the creek crosses I-5, it becomes intermittent, and the upstream portions contain riparian habitat while the downstream portions are relatively unvegetated.
Tributary to ?	Based on the *Jurisdictional Delineation Report for Tejon Mountain Villag*e, Grapevine Creek flows into the San Joaquin Valley and off site the outflow either infiltrates into the soil, is captured and used for irrigation, or enters a playa without an outlet (Impact Sciences 2008). Field investigations conducted for the study area confirm that the upstream portion of the creek has been diverted for agricultural purposes (see Table 4-2b). Aerial photography shows that the creek naturally ends approximately 1,000 feet northeast of the study area boundary, as is represented by the NHD Data (USGS 2013). From this point, based on aerial photography, it appears that the creek is diverted and used for agricultural areas to the north of the study area. Based on current field investigations and aerial photography review, this delineation confirms that conditions cited in the *Jurisdictional Delineation Report for Tejon Mountain Village* (Impact Sciences 2008) have not changed and the determination that Grapevine Creek does not connect to other waters of the U.S. has not changed.
Riparian vegetation present?	There is riparian vegetation within the portion of the creek confined within the I-5 split. As the creek flows to the north, riparian vegetation becomes sparse to nonexistent. Riparian vegetation is also present around the edges of and adjacent to the Ostrich Detention Basin. None of the tributaries contain riparian vegetation.
Potential ACOE jurisdiction	None. See Section 4.3, ACOE Jurisdiction.
Data station numbers	DS 1, DS 2, DS 16, DS 17, DS 28, DS 29.

Table 4-2
Pastoria Creek and Unnamed Tributary

Attribute	Description
On-site location	Similar to Live Oak Creek and Cattle Creek, Pastoria Creek originates in the foothills in the southeastern portion of the study area (Figures 4-6 and 4-7). At the downstream end of Pastoria Creek, a portion of the creek has been diverted to the east and flows into an irrigation ditch, some of which contains riparian habitat, then flows into an unnamed tributary (Unnamed-1) that flows off site into Tejon Reservoir No. 1. The section of Pastoria Creek that has not been diverted flows north and off site into agricultural lands.
Tributaries present on site	Cattle Creek.
On-site topography	From the foothills to where the creek is diverted, the elevation ranges from approximately 1,310 to 930 feet amsl.
Hydrology	All of Pastoria Creek is intermittent. At the intersection of the creek and the aqueduct, the aqueduct is diverted underground and Pastoria Creek flows downstream without interruption at this location.
Tributary to ?	The downstream portion of Pastoria Creek is either diverted into an unnamed tributary (Unnamed-1) to Tejon Reservoir No. 1 or terminates within agricultural lands to the north (Figure 4-7). Tejon Reservoir No. 1 is not publicly accessible, has no boating opportunities, was created by excavating uplands, and is used exclusively for agricultural purposes. Tejon Reservoir No. 1 is an isolated, non-navigable water body that does not support substantial interstate commerce. Tejon Ranch diverts seasonal surface flows into Tejon Reservoir No. 1 and pumps water into the Wheeler Ridge–Maricopa Water District's 850 Canal (Appendix A-2, ACOE 2008b).
Riparian vegetation present?	Riparian vegetation is located at the downstream portion of the creek, within an area of the creek that has been diverted into the unnamed tributary.
Potential ACOE jurisdiction	None. See Section 4.3, ACOE Jurisdiction.
Data station numbers	DS 22, DS 23, DS 24, DS 25, DS 26, DS 27.

Table 4-2a
Pastoria Creek Tributary—Live Oak Creek

Attribute	Description
On-site location	Live Oak Creek is located just east of the center of the study area and originates within the foothills in the southern portion of the study area (Figure 4-5). Live Oak Creek crosses over the California Aqueduct via a concrete overcrossing and then flows into an irrigation ditch, which connects flows from Live Oak Creek to Cattle Creek (see Table 4-2b).
Tributaries present on site	There are no tributaries that flow directly into the on-site portions of the creek.
On-site topography	Live Oak Creek originates in the foothills at an elevation of 1,550 feet. The creek flows north, reaching an elevation of 1,370 feet before crossing under Edmonston Pumping Plant Road via a culvert. At its terminus (i.e., tributary to Cattle Creek), the creek is at an elevation of 1,175 feet.
Hydrology	The portion of Live Oak Creek within the study area is intermittent with groundwater observed reaching the surface in portions of the creek located in the foothills.
Tributary to ?	Cattle Creek (see Table 4-2b).
Riparian vegetation present?	The upstream portion of the Live Oak Creek contains riparian vegetation.

Table 4-2a
Pastoria Creek Tributary—Live Oak Creek

Attribute	Description
Potential ACOE jurisdiction	None. See Section 4.3, ACOE Jurisdiction.
Data station numbers	DS 20, DS 21.

Table 4-2b
Pastoria Creek Tributary – Cattle Creek (and Associated Tributaries to Cattle Creek)

Attribute	Description
On-site location	Cattle Creek originates in the foothills located on the eastern side of the study area (Figure 4-5). Cattle Creek flows into Pastoria Creek after crossing over the California Aqueduct and through agricultural lands via an irrigation ditch. A large portion of Cattle Creek is contained within an irrigation ditch. Based on historical data and field investigations, it appears that Cattle Creek would have dissipated into the landscape after crossing the aqueduct. The downstream portion of the creek, just north of the aqueduct, was channelized and diverted to Pastoria Creek (Historic Aerials Online 2013). Historical topographic maps show Cattle Creek terminating either prior to crossing the aqueduct or continuing north without connecting to Pastoria Creek (Historic Aerials Online 2013).
Tributaries present on site	An unnamed, ephemeral tributary (CC-1) flows into Cattle Creek just west of the creek. On the western side of the study area, flows from Grapevine Creek have been diverted and now flow into Cattle Creek (CC-2). Starting from the diversion point, the tributary to Cattle Creek contains riparian habitat but portions further downstream from the tributary are unvegetated and ephemeral. The tributary to Cattle Creek flows over the California Aqueduct via a concrete crossing and flows are ephemeral until it joins Cattle Creek.
On-site topography	In the foothills, the elevations for Cattle Creek and the adjacent tributary (CC-1) are 1,435 feet and 1,460 feet amsl, respectively. The creek continues downstream to an elevation of 1,025 feet where it converges with Pastoria Creek. The tributary originating from Grapevine creek spans an elevation range of approximately 1,600–1,110 feet.
Hydrology	The majority of Cattle Creek in the study area is ephemeral. The upstream portion is intermittent, where groundwater reaches the surface and riparian vegetation is present.
Tributary to ?	Pastoria Creek
Riparian vegetation present?	Riparian vegetation is located in the upstream portion of Cattle Creek in the southern foothills and in a tributary where the flows are diverted from Grapevine Creek.
Potential ACOE jurisdiction	None. See Section 4.3, ACOE Jurisdiction.
Data station numbers	DS 3, DS 4, DS 5, DS 6, DS 37, DS 38.

Other Isolated Drainages

Within the study area, there are five additional, unnamed drainages that are isolated, are wholly contained in the study area (meaning they originate and terminate within the study area), and do not connect to a feature with an ACOE field indicator of hydrology, hydrophytic vegetation, or hydric soils (Figures 4-2 and 4-4), nor do they connect hydrologically to the California aqueduct. All of these drainages are ephemeral channels that lack riparian vegetation.

Isolated drainages A and B originate at the outlets of culverts underneath and east of I-5 (Figure 4-2). Isolated drainage A had evidence of flow approximately 1,530 linear feet downstream of the outlet and isolated drainage B had evidence of flow for approximately 930 linear feet downstream of the outlet. Isolated drainage C originates at the outlet of a series of culverts located under Edmonston Pumping Plant Road (Figure 4-4). Because there are no corresponding drainage features located downstream of drainage C, it is likely that this drainage is the result of road runoff that then dissipates into the landscape. Isolated drainage C had evidence of flow approximately 750 linear feet downstream of the road. Based upon aerial photography (USDA 2012b) and field indicators, isolated drainages D and E were likely tributaries to Cattle Creek but through anthropogenic changes have since become isolated. Isolated drainage E is connected to the foothills southeast of the study area by a culvert that crosses under I-5 (Figure 4-2). Another culvert, approximately 730 feet south, is located under I-5 creating erosion upstream of drainage D. There is a culvert located under the dirt road that designates the beginning of drainage D. The erosional feature and drainage D would have once been connect by this culvert; however, the culvert is now obstructed with debris and does not convey water flow. The downstream portion of isolated drainage E once crossed back under I-5 via a culvert, but there are no longer signs of flow (i.e., an OHWM) east of I-5. It is likely that isolated drainage E may have been a tributary to Cattle Creek (USDA 2012b) (see Tables 4-1 and 4-2b; Figures 4-2 and 4-4).

Seeps

During the surveys, four seep features (seeps A-D) were observed within the foothills (Figure 4-4). These small seeps are seasonal, isolated, and not hydrologically connected with other surface or near-surface waters nor are they hydrologically connected to the California aqueduct. The seeps are located in the southern portion of the study area in the foothills.

4.2 Summary of Results

None of the features delineated within the study area and described in this report are under the jurisdiction of the ACOE. There are approximately 130.7 acres of stream channels, detention basins (Ostrich Detention Basin), and wetlands within the study area, consisting of approximately 115.0 acres of unvegetated stream channel, 15.3 acres of wetlands, and 0.4 acre of ponded water in the Ostrich Detention Basin (Table 4-3). More specifically, the majority of the features on site are braided channels associated with the downstream portions of both Grapevine Creek (78.6 acres) and Pastoria Creek (18.8 acres). There are approximately 17.6 acres of unbraided, unvegetated stream channels within the study area. Cattle Creek and its associated tributaries (CC-1 and CC-2) account for the majority of the unbraided, unvegetated stream channels on site. Of the 15.3 acres of wetlands delineated within the study area, 5.7 acres are associated with Grapevine Creek while the remaining wetlands are associated with Cattle Creek (5.6 acres), Live Oak Creek (1.9 acres), and Pastoria Creek (2.0 acres). The Ostrich Detention Basin is the only basin within the study area that contains a perennial water source that is fed from Grapevine Creek. This feature totals 0.4 acre of open water and 0.6 acre of wetlands.

Table 4-3
Potentially Jurisdictional Features

Potentially Jurisdictional Feature[1]	Grapevine Creek and Associated Tributaries and Ostrich Detention Basin		Live Oak Creek		Cattle Creek and Associated Tributaries		Pastoria Creek		Unnamed Tributary		Unnamed, Isolated Drainages		Total	
	Acres	Linear Feet	Acres	Linear Feet	Acres	Linear Feet	Acres	Linear Feet	Acres	Linear Feet	Acres	Linear Feet	Acres	Linear Feet
Unvegetated Stream Channels	2.8	36,448	0.2	4,935	11.1	31,289	3.1	15,401	0.1	555	0.4	6,489	**17.6**	**95,122**
Braided Channel	78.6	20,885	—	—	—	—	18.8	21,164	—	—	—	—	**97.4**	**42,049**
Detention Basin	0.4	248	—	—	—	—	—	—	—	—	—	—	**0.4**	**248**
Wetlands	5.7	7,998	1.9	1,990	5.6	6,968	2.0	1,783	—	—	—	—	**15.3**	**18,739**
Total	**87.5**	**65,579**	**2.1**	**6,925**	**16.8**	**38,256**	**23.9**	**38,348**	**0.1**	**555**	**0.4**	**6,489**	**130.7**	**156,157**

Notes: Due to rounding, columns may not precisely total.
[1] Seeps are not included in this table because these features were mapped as points due to their small size (i.e., less than 200 square feet).

4.3 ACOE Jurisdiction

Based on the jurisdictional delineation determination conducted for Tejon Mountain Village, the existing conditions described in this report, and the jurisdictional analysis herein, none of the features delineated within the study area are under the jurisdiction of the ACOE.

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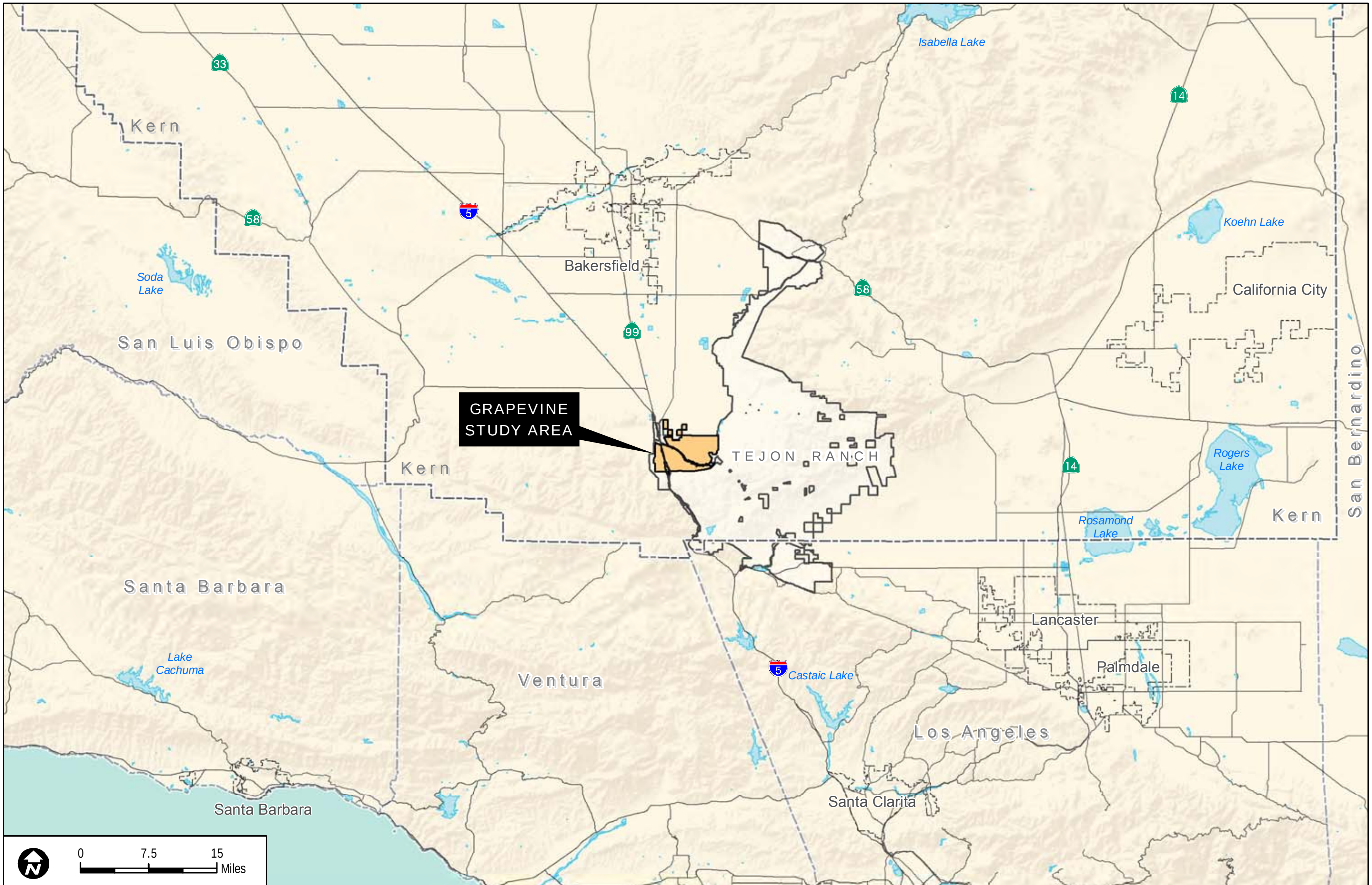

SOURCES: USGS, ESRI

FIGURE 1-1

Regional Map

SUPPLEMENTAL JURISDICTIONAL DELINEATION REPORT FOR TEJON RANCH, GRAPEVINE STUDY AREA

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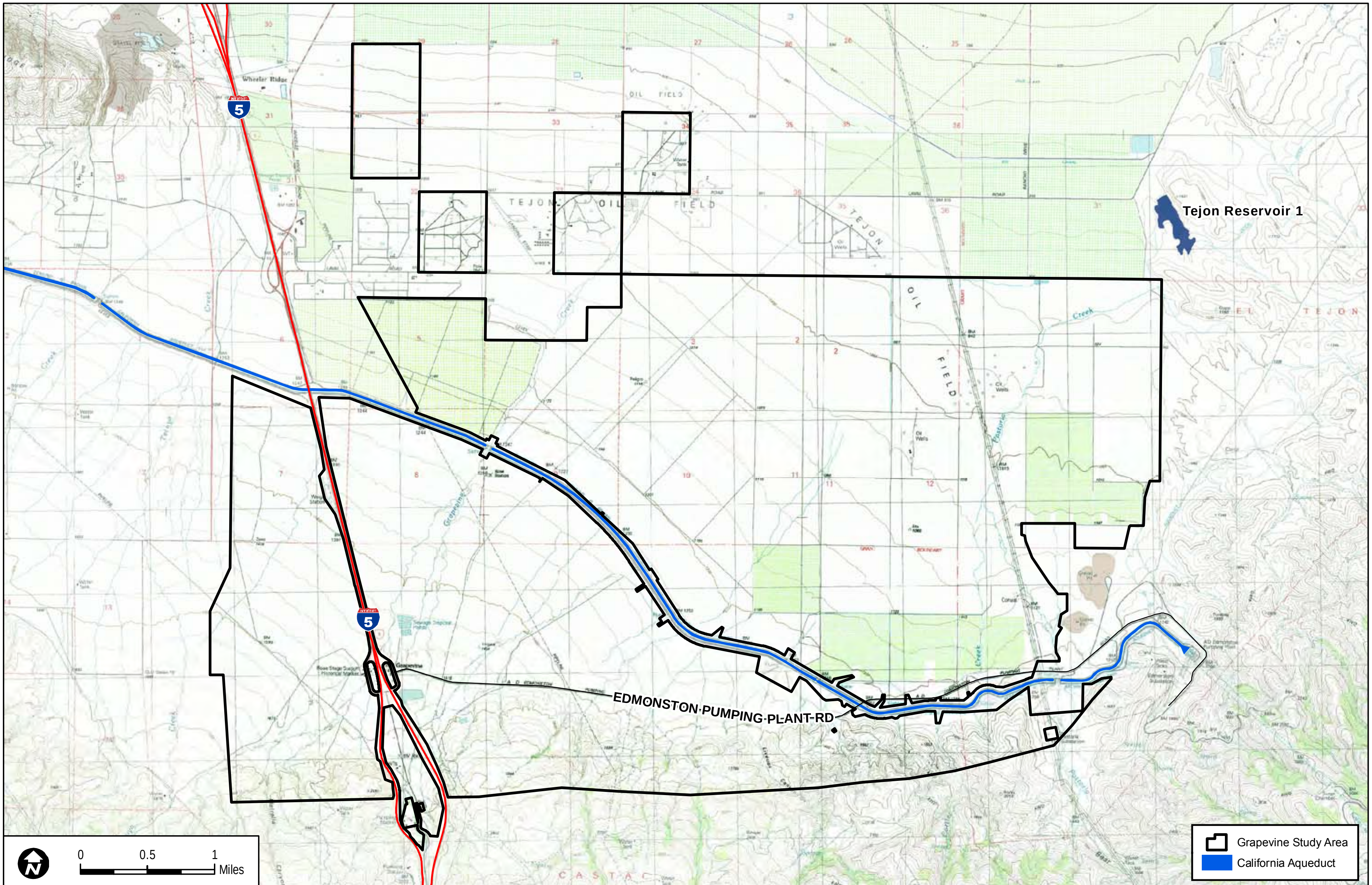

SOURCES: USGS 7.5-Minute Series Grapevine, Mettler, Pastoria Creek and Tejon Hills Quadrangles; TRC 2013a

FIGURE 1-2

Vicinity Map

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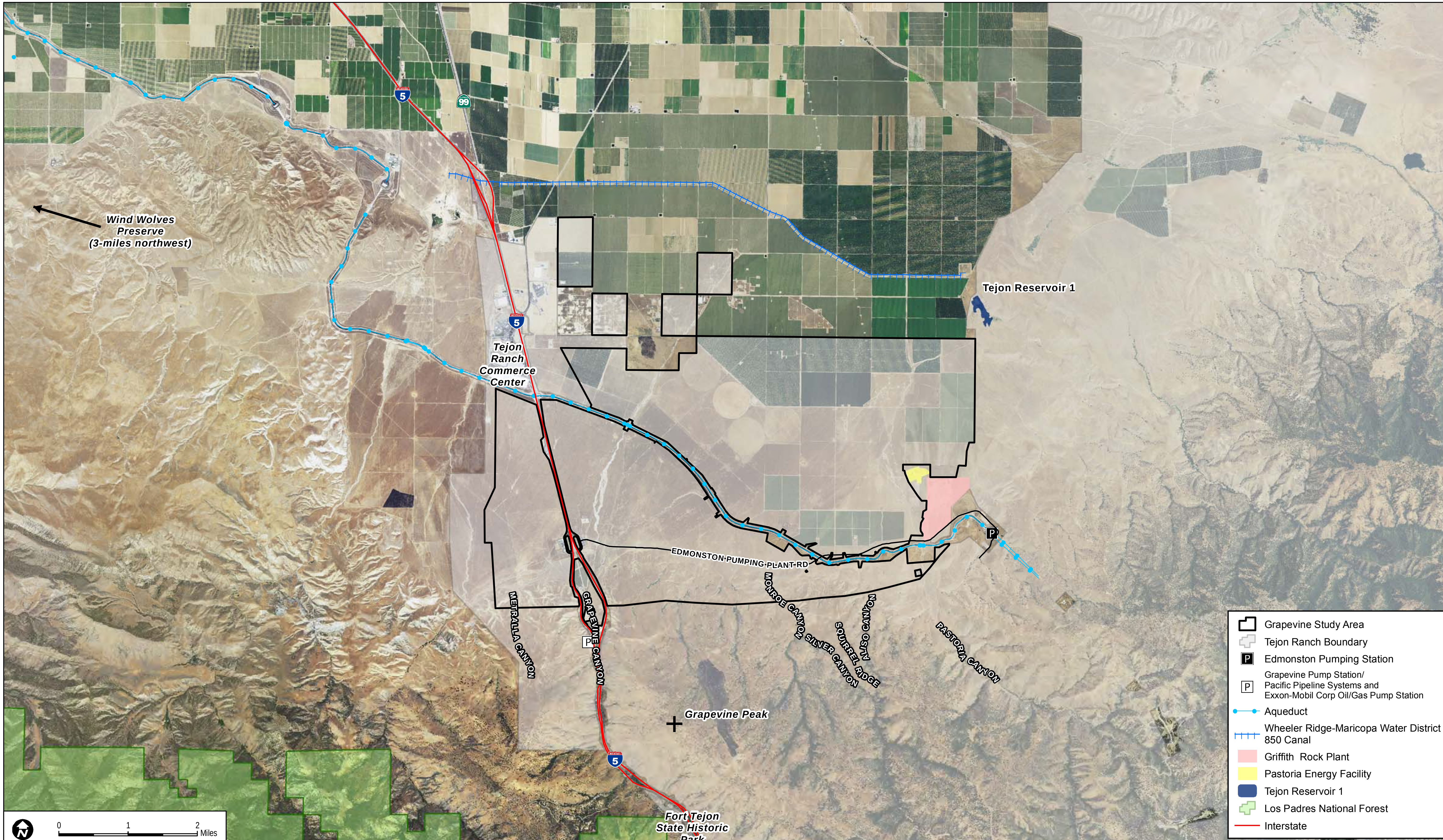

SOURCES: TRC 2013; US Forest Service; USDA NAIP 2012

FIGURE 2-1

Land Use Map

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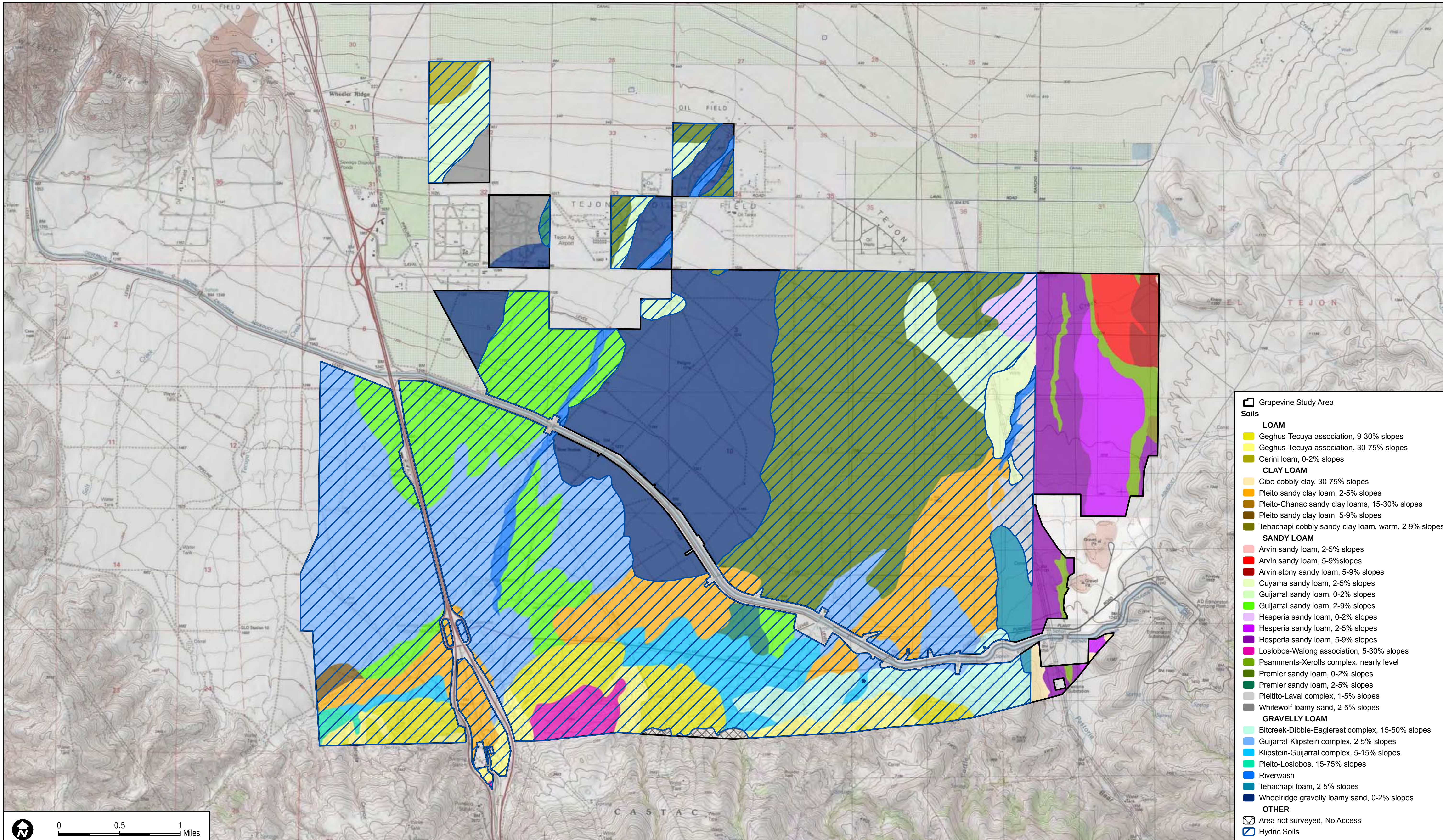

SOURCES: TRC 2013; ESRI USGS Basemap; USDA 2007 and 2009

FIGURE 2-2

Soils Map

SUPPLEMENTAL JURISDICTIONAL DELINEATION REPORT FOR TEJON RANCH, GRAPEVINE STUDY AREA

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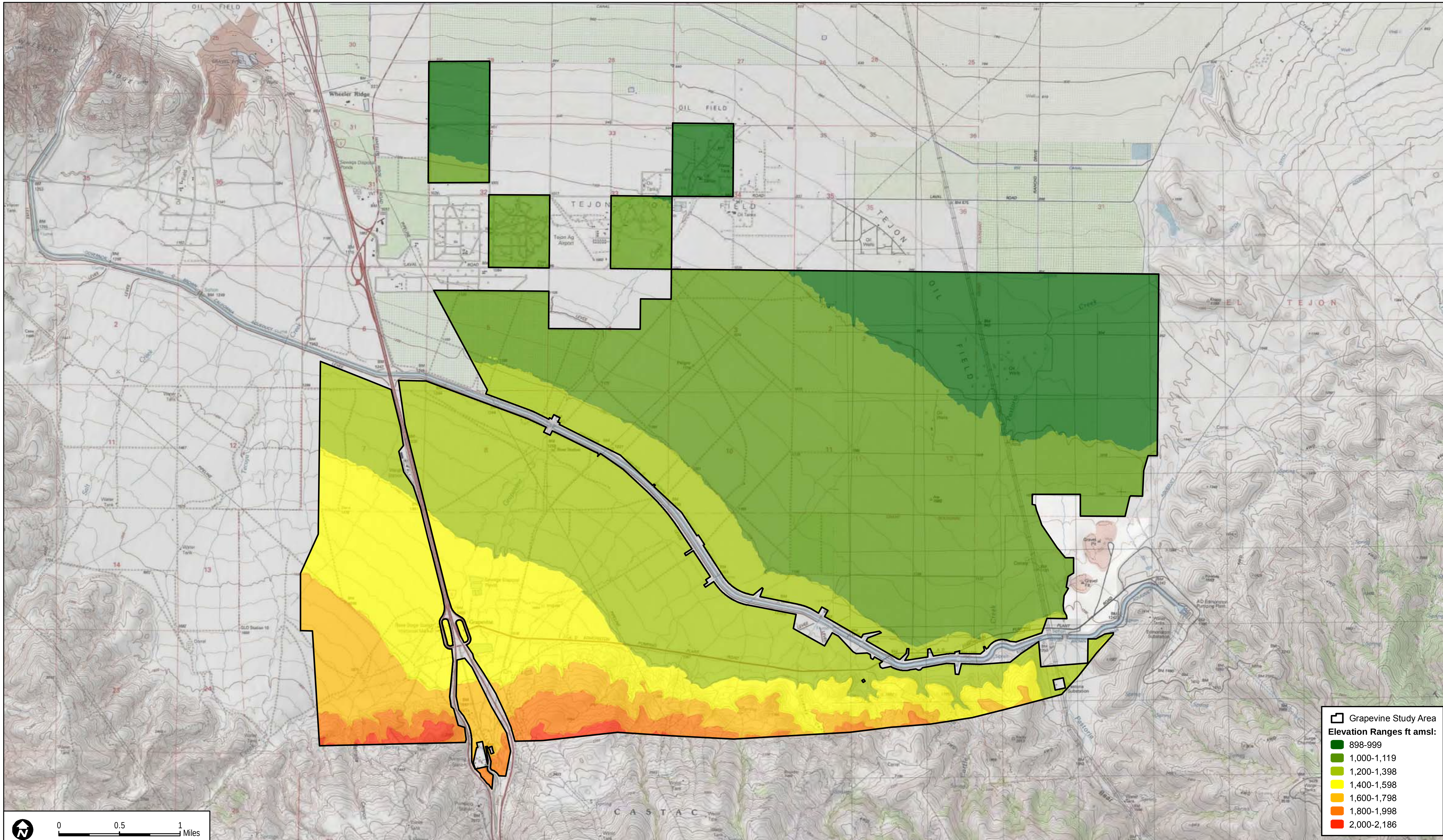

SOURCES: TRC 2013; ESRI USGS Basemap

FIGURE 2-3

Topography Map

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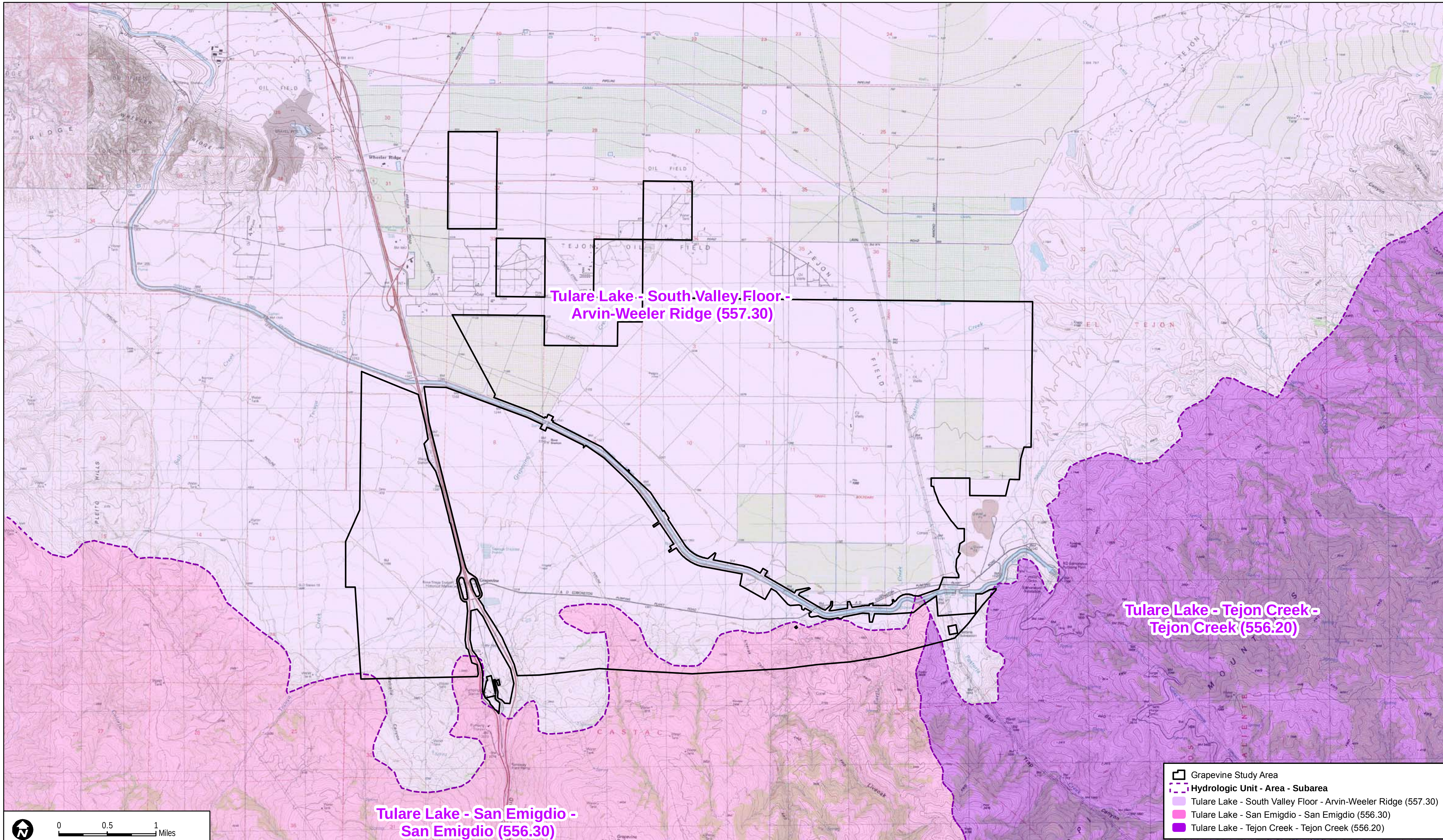

SOURCES: TRC 2013; ESRI USGS Basemap; DWR 2010

FIGURE 2-4
Hydrologic Setting

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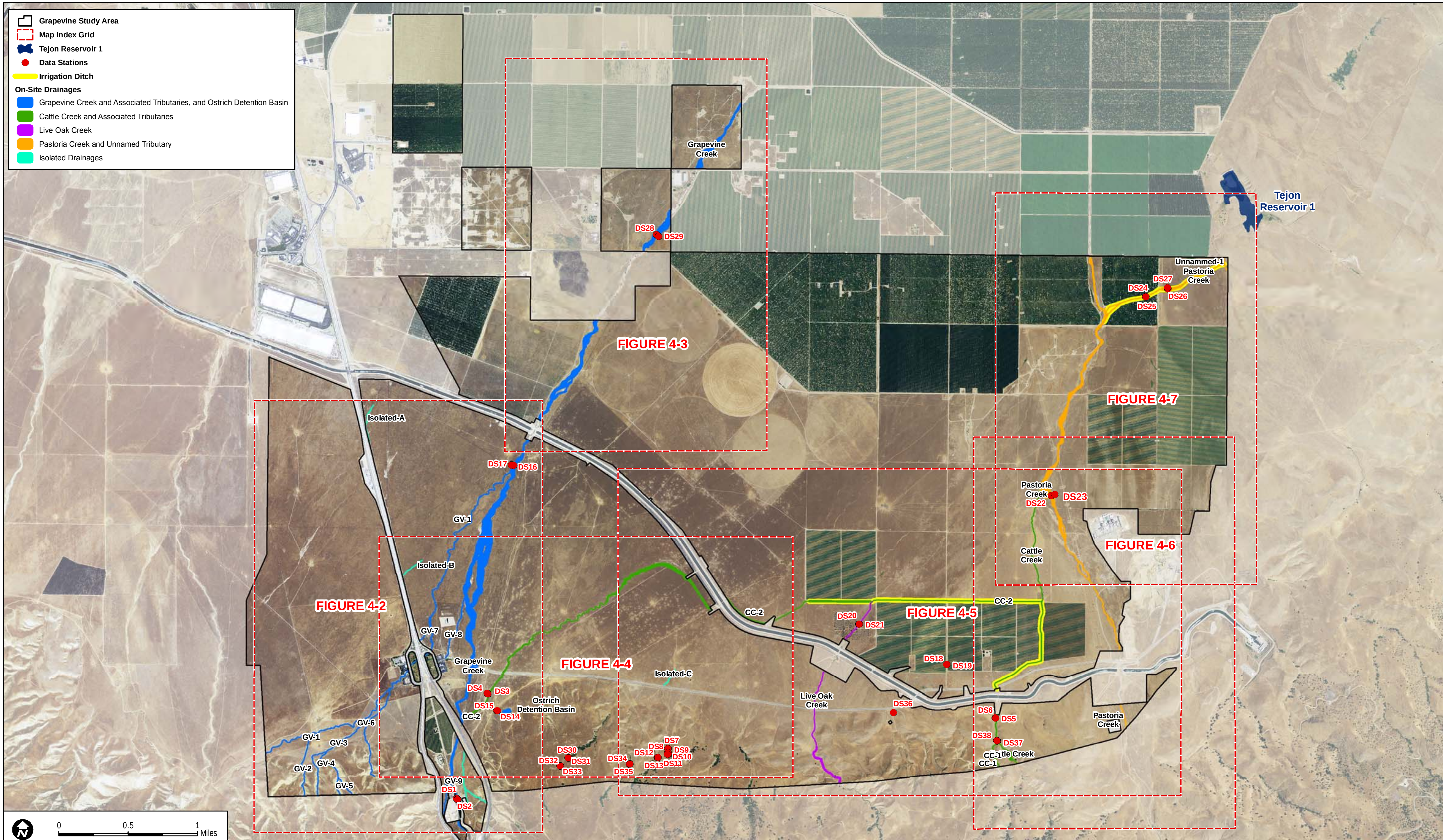

SOURCES: TRC 2013; USGS 2013; USDA NAIP 2012

FIGURE 4-1

Wetlands and Waters

SUPPLEMENTAL JURISDICTIONAL DELINEATION REPORT FOR TEJON RANCH, GRAPEVINE STUDY AREA

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SOURCES: TRC 2013; USGS 2013; USDA NAIP 2012

FIGURE 4-2

Grapevine Creek South and Associated Tributaries, Ostrich Detention Basin, and Isolated Drainages

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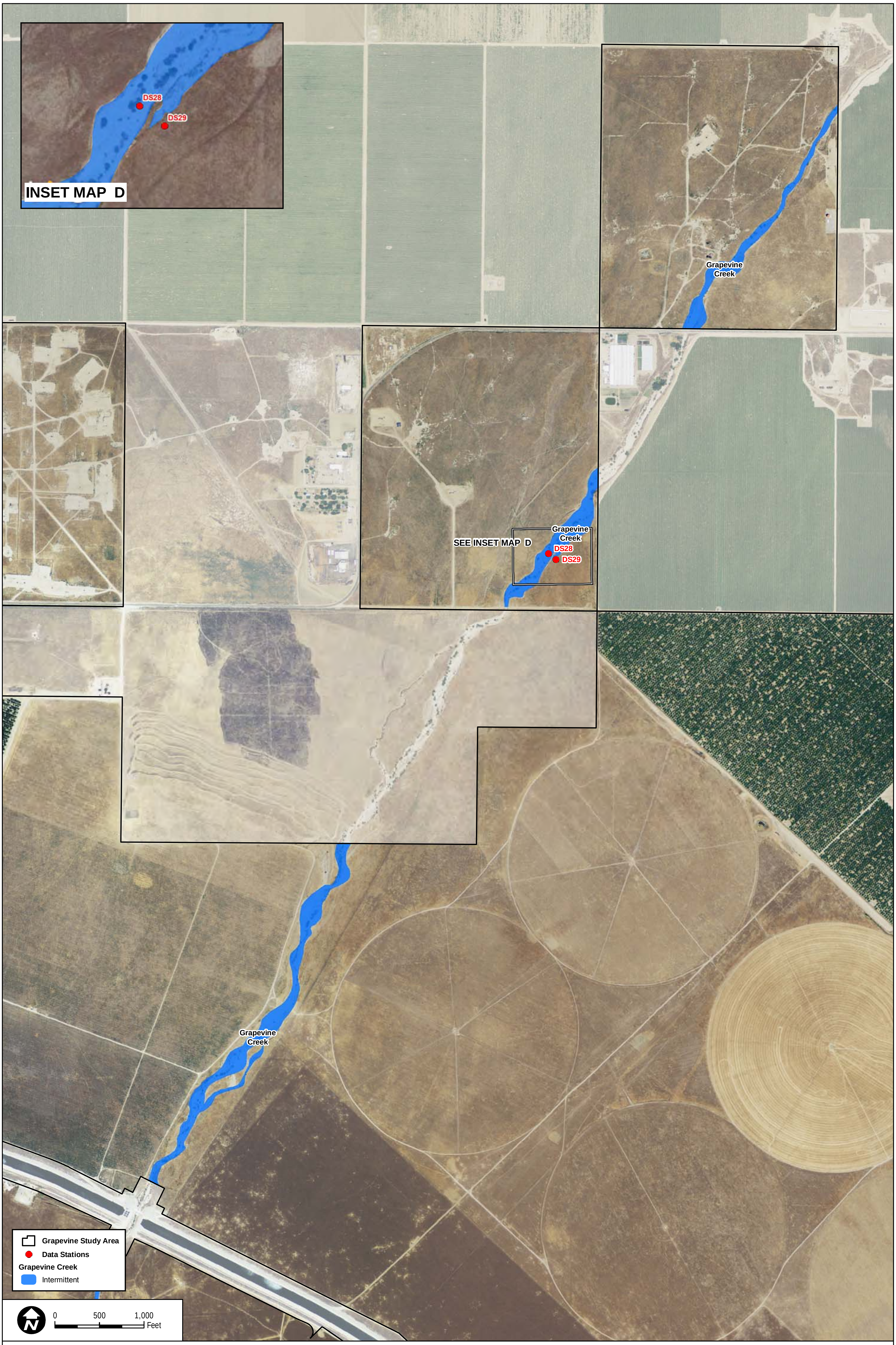

SOURCES: TRC 2013; USGS 2013; USDA NAIP 2012

FIGURE 4-3

Grapevine Creek North

SUPPLEMENTAL JURISDICTIONAL DELINEATION REPORT FOR TEJON RANCH, GRAPEVINE STUDY AREA

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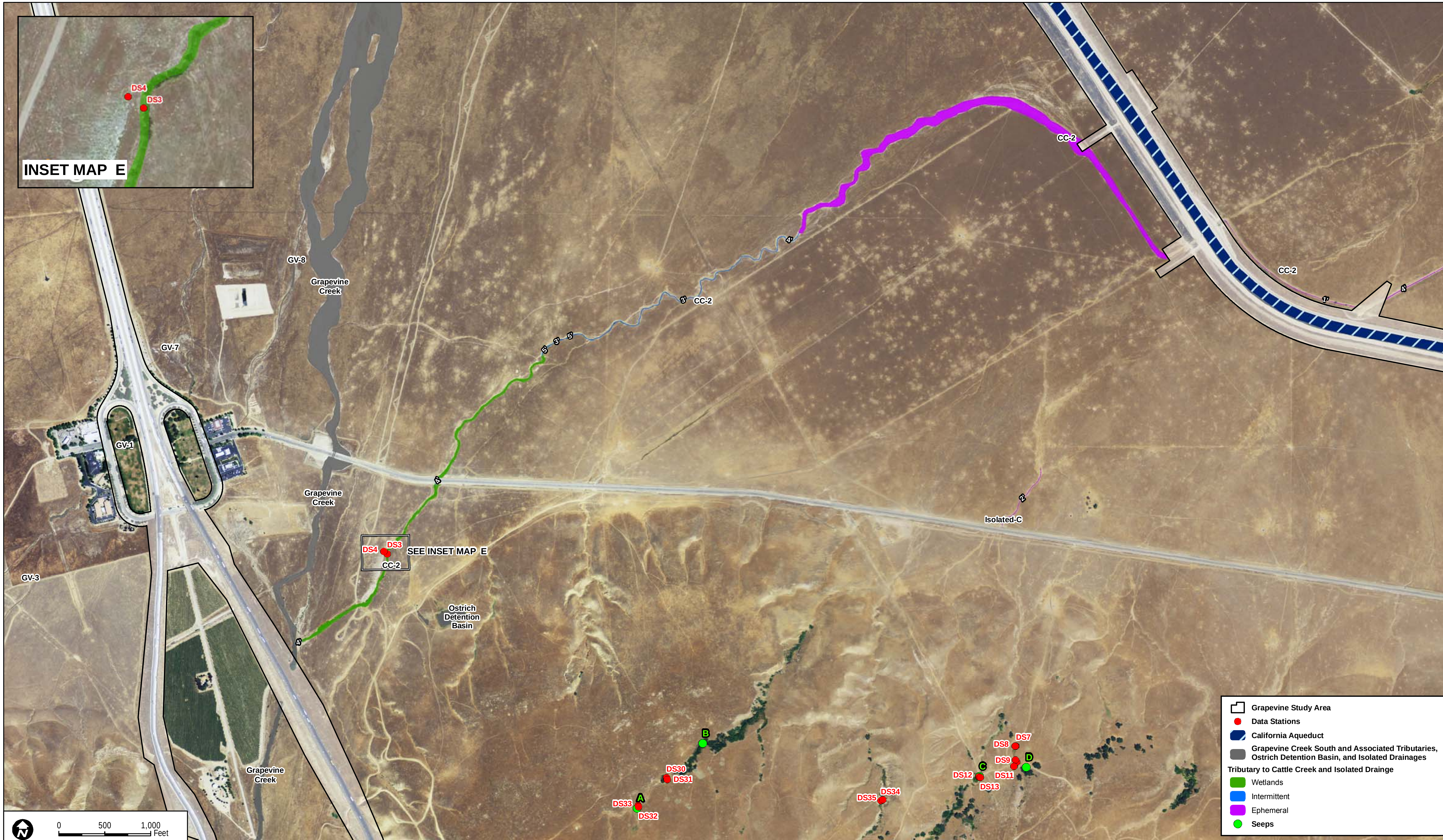

SOURCES: TRC 2013; USGS 2013; USDA NAIP 2012

FIGURE 4-4

Tributary to Pastoria Creek (Tributary to Cattle Creek and Isolated Drainage)

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SOURCES: TRC 2013; USGS 2013; USDA NAIP 2012; Bing Maps

FIGURE 4-5

Tributaries to Pastoria Creek (Cattle Creek and Associated Tributaries and Live Oak Creek) and Isolated Drainage

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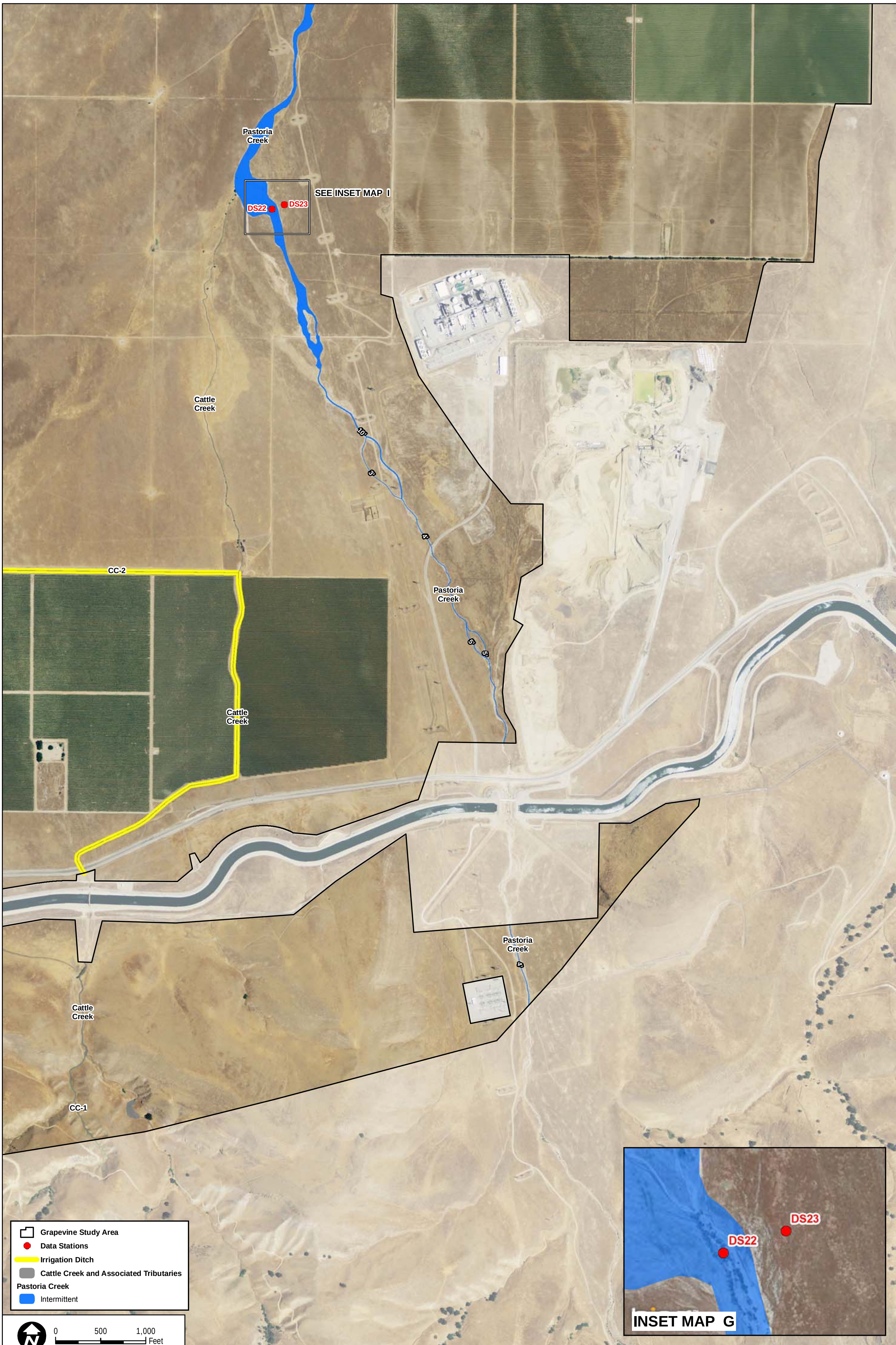

SOURCES: TRC 2013; USGS 2013; USDA NAIP 2012; Bing Maps

FIGURE 4-6

Pastoria Creek South

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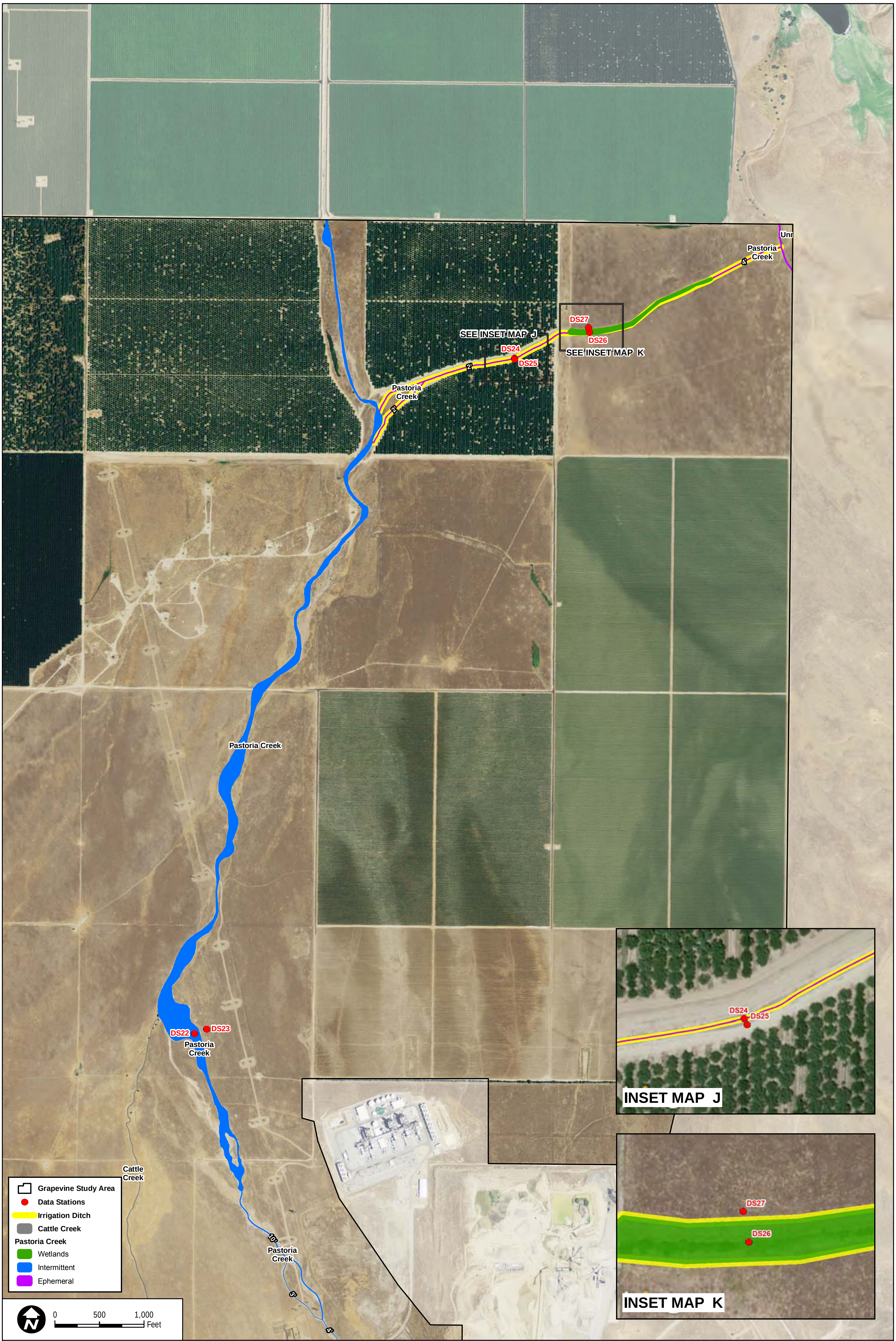

SOURCES: TRC 2013; USGS 2013; USDA NAIP 2012

FIGURE 4-7

Pastoria Creek North and Unnamed Tributary

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APPENDIX A

Tejon Mountain Village Jurisdictional Delineation Information

APPENDIX A-1

Jurisdictional Delineation Letter (ACOE 2008a)

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
VENTURA FIELD OFFICE
2151 ALESSANDRO DRIVE, SUITE 110
VENTURA, CALIFORNIA 93001

October 2, 2008

REPLY TO
ATTENTION OF
Office of the Chief
Regulatory Division

Tejon Mountain Village, LLC
c/o Impact Sciences
Attn: Larry Lodwick
803 Camarillo Springs Road, Suite A
Camarillo, California 93012

Dear Mr. Lodwick:

Reference is made to your request (File No. SPL-2006-02020-AOA) dated October 26, 2006, for a Department of the Army Permit to discharge fill material in waters of the United States for construction activities associated with a low density residential and commercial development on approximately 28,028 acres (Tejon Mountain Village) near the city of Gorman, Los Angeles and Kern Counties, California. As part of the permit evaluation process, we have made the jurisdictional determination below.

Based on the information furnished in your letter, our November 2006 and July 2008 site visits and the Jurisdictional Delineation Report for Tejon Mountain Village dated August 2008, we have determined that the 28,028-acre project area supports a total of 642 acres of jurisdictional waters of the United States, including the 346-acre Castac Lake, 286 acres of wetlands adjacent to Castac Lake and 123 tributaries to Castac Lake that support 10 acres of jurisdictional area (enclosure). As part of this jurisdictional determination, we have determined that 19 isolated drainages that support 84.7 acres of potential jurisdictional area are non-navigable and do not support substantial interstate commerce as identified in 33 CFR Part 328.3(a)(3). Pursuant to the Solid Waste Agency of Northern Cook County Supreme Court decision, we have determined that the 19 isolated drainages in the project area are not waters of the United States (enclosure). In addition, we have also determined that 41 tributaries to Castac Lake that support 0.6 acres of potential waters of the United States lack sufficient evidence of a significant nexus to meet the requirements in the June 2007 Joint Rapanos Guidance document and, as a result, would not be subject to jurisdiction under Section 404 of the Clean Water Act (enclosure). Based on the above analysis, we have determined that your proposed project would discharge dredged or fill material into a water of the United States or adjacent wetlands. Therefore, the proposed project is subject to our jurisdiction under Section 404 of the Clean Water Act and a Section 404 permit would be required from our office.

This letter contains an approved jurisdictional determination for the Tejon Mountain Village project area. If you object to this decision, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet (Appendix A) and Request for Appeal (RFA) form. If you request to appeal this decision you must submit a completed RFA form to the Corps South Pacific Division Office at the following address:

Tom Cavanaugh
Administrative Appeal Review Officer,
U.S. Army Corps of Engineers
South Pacific Division, CESPD-PDS-O, 2042B
1455 Market Street, San Francisco, California 94103-1399

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 C.F.R. Part 331.5, and that it has been received by the Division Office within 60 days of the date on the NAP. Should you decide to submit an RFA form, it must be received at the above address by **December 1, 2008**. It is not necessary to submit an RFA form to the Division office if you do not object to the decision in this letter.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. If you wish to submit new information regarding the approved jurisdictional determination for this site, please submit this information to Aaron Allen at the letterhead address by **December 1, 2008**. The Corps will consider any new information so submitted and respond within 60 days by either revising the prior determination, if appropriate, or reissuing the prior determination. A revised or reissued jurisdictional determination can be appealed as described above.

If you have any questions, please contact me at 805-585-2148 or via e-mail at Aaron.O.Allen@usace.army.mil.

Please be advised that you can now comment on your experience with Regulatory Division by accessing the Corps web-based customer survey form at: http://per2.nwp.usace.army.mil/survey.html.

Sincerely,

Aaron O. Allen, Ph.D.
Chief, North Coast Branch
Regulatory Division

Enclosures

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Tejon Mountain Village, LLC	File Number: SPL-2006-02020-AOA	Date: 10/02/2008

Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

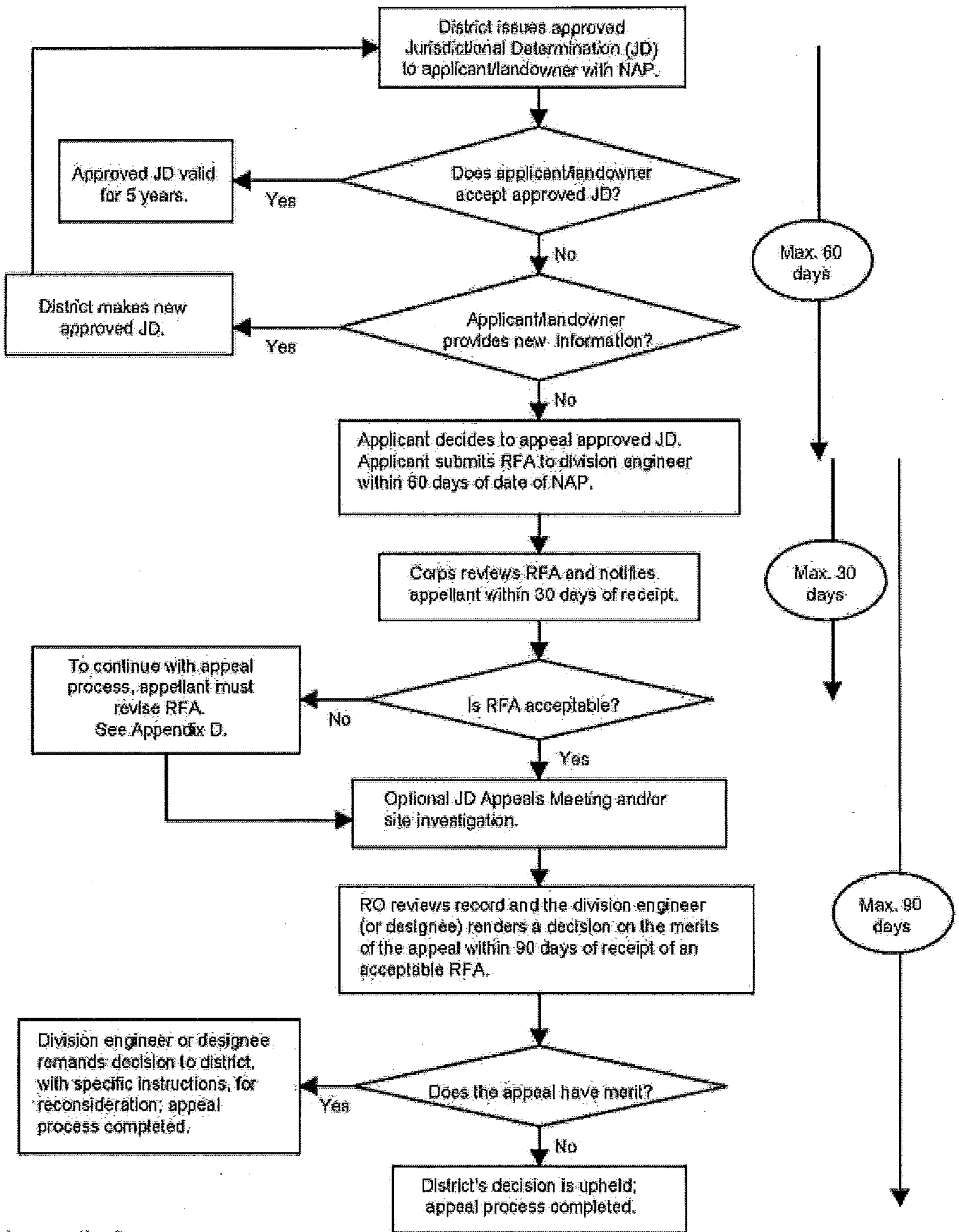
POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
DISTRICT ENGINEER Los Angeles District, Corps of Engineers ATTN: Chief, Regulatory Division P.O. Box 532711 Los Angeles, CA 90053-2325 Tel. (213) 452-3425	DIVISION ENGINEER South Pacific Division, Corps of Engineers ATTN: Tom Cavanaugh Administrative Appeal Review Officer, South Pacific Division, CESPD-PDS-O, 2042B 1455 Market Street, San Francisco, California 94103-1399 Tel. (415) 503-6574

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

______________________ Signature of appellant or agent.	Date:	Telephone number:

Administrative Appeal Process for Approved Jurisdictional Determinations



Appendix C

APPENDIX A-2

Significant Nexus and Isolated Waters Determination for Tejon Mountain Village (ACOE 2008b)

CESPL-RG-N September 11, 2008

MEMORANDUM FOR THE RECORD
SUBJECT: SIGNIFICANT NEXUS AND ISOLATED WATERS DETERMINATION FOR TEJON MOUNTAIN VILLAGE (SPL-2006-2020-AOA)

1. Background: Impact Sciences, on behalf of Tejon Ranch, submitted a jurisdictional determination package, including a hybrid functional assessment and detailed hydrology information, for the 28,028-acre Tejon Mountain Village site in Kern/Los Angeles County in October 2006. Based on additional field data and subsequent technical review, the above jurisdictional determination has been modified four times over the last two years. The final jurisdictional determination package was submitted to both the Corps and USEPA on August 5, 2008 and includes a determination that there are approximately 642 acres of waters of the United States in the project area, including the 346-acre Castac Lake (also known as Tejon Lake), 286 acres of wetlands adjacent to Castac Lake and approximately 123 tributaries to Castac Lake that support 10 acres of waters of the United States. Although the project design is still in the preliminary planning stages, the applicant has estimated that the proposed project would result in the discharge of fill into approximately three acres of waters of the United States in the project area. As a result, a large majority of the wetlands and stream reaches in the project area would be avoided. The final jurisdictional determination package also includes a finding that 41 tributaries (0.59 acres of potential jurisdictional waters of the United States) to Castac Lake lack sufficient evidence of a significant nexus to meet the requirements in the 2007 Rapanos Guidance and that 19 isolated drainages in the project area (approximately 84.7 acres of potential waters of the United States) are non-navigable and do not support substantial interstate commerce, as identified by 33 CFR 328.3 (a)(3) that directly or indirectly flow into Tejon Reservoir 1 an isolated, non-navigable water body that does not support substantial interstate commerce.

2. Site Visit: The Corps (Aaron Allen) visited the site with the agent (Larry Lodwick of Impact Sciences) and the applicant on November 1, 2006 to review the draft delineation and a potential significant nexus for a variety of tributaries to Castac Lake. The Corps examined a sample of delineated waters of the United States and other possible jurisdictional features throughout the project area. The Corps also examined all drainage connections with Castac Lake to verify the presence of a hydrologic connection. Most of the smaller tributaries that typically exhibit 100-year peak flows of less than 3 cfs were not specifically examined in the field. On July 15 and 16, 2008, the Corps conducted a second site visit with the applicant, agent and USEPA staff.

3. Methodology: The final jurisdictional delineation report dated August 2008 contains detailed information regarding the physical and biological characteristics of the project area. In general, the majority of the drainages in the project area are small ephemeral washes that exhibit low volume, infrequent and short duration flow. For the purposes of the significant nexus evaluation for the 164 tributaries, the Castac Lake watershed is for the most part natural. Based on existing information, very few of the drainages have any adjacent land uses that would generate pollutants that would be discharged into the stream channels. As a result, the contributing watersheds are not expected to be sources of pollutants or do not convey pollutants that would adversely affect water quality in Castac Lake (other than expected background inputs from natural sources and small-scale ranching activities). As a result, possible presence of nutrients, sediments, pesticides and other water quality parameters do not have much of an effect on the determination of significant nexus for the 164 tributaries. All of the tributaries to Castac Lake are located within approximately three miles and, therefore, are in relatively close proximity to the nearest traditional navigable water (Castac Lake). To account for the relatively close proximity of the tributaries, as part of the significant nexus evaluation the highest functional score was utilized to represent the physical and biological functions for each tributary, rather than a more conservative average or weighted average for the function scores. As a result, an ephemeral tributary with relatively low

hydrology and/or habitat functional scores could still exhibit a significant nexus with a relatively high score in the biogeochemical functions (for additional information please reference the Tejon Mountain Village Jurisdictional Delineation Report dated August 2008). Based on the above information, the two critical factors for the significant nexus evaluation, as defined in the 2007 Rapanos Guidance document, were considered to be physical and biological functional scores as well as the hydrology for each of the tributaries, which has been emphasized in the significant nexus evaluation through the use of the hybrid functional assessment and the hydrologic analysis. For additional information regarding the methodology, please reference the Jurisdictional Delineation Report for Tejon Mountain Village dated August 2008.

4. Significant Nexus Evaluation: As documented in Tables 11, B-2, B-3, B-4 and B-5 in the Tejon Mountain Village Jurisdictional Delineation Report that provides detailed functional and hydrologic information for the 164 tributaries to Castac Lake, a total of 123 tributaries exhibit sufficient evidence to support a significant nexus. The 41 drainages that were found to lack sufficient evidence of a significant nexus can be divided into the three following categories:

A. **100-year Peak flow equal to 1 cfs or less** (Drainages 3B-1B, 3B-1C, 3B-1D, 3B-2A, 3B-2B, 3C-1F, 3C-1I, 3F-1BBB, 3F-1EEE, 3F-1HHH, 3F-1II, 3F-1XX and 3F-1ZZ) – these 13 drainage features exhibit 100-year peak flows that vary from 0.1 cfs to 1 cfs. The 13 tributaries range in area from approximately 16 square feet to 517 square feet and have a total area of 2,179 square feet (0.05 acres of potential waters of the United States), with an average area of 168 square feet. Although some of these tributaries did exhibit functional scores above 0.8, the very small drainage area and associated low volume, frequency and duration of surface flows are insufficient to support a significant nexus (in most cases these drainages would not support any surface flow during small to moderate storm events and would only support surface flow for a very short amount of time, even during large storm events);

B. **100-year Peak Flow between 1 and 5 cfs with moderate functional scores** (1H-1B, 1I-1P, 1I-1U, 1I-1V, 3B-1A, 3B-3A, 3C-1A, 3C-1B, 3C-1C, 3C-1G, 3C-1H, 3C-2A, 3C-2B, 3F-1CCC, 3F-1DDD, 3F-1FFF, 3F-1III, 3F-1NN, 3F-1Q, 3F-1QQ, 3F-1TT, 3F-1UU, 3F-1VV and 3F-1YY) – these 24 drainages support relatively low 100-year peak flows with an average peak discharge of 2.2 cfs. The 24 tributaries range in area from approximately 82 square feet to 3,583 square feet and have a total area of 18,673 square feet (0.43 acres of potential waters of the United States), with an average area of 778 square feet. The highest functional score for most drainages in this category is approximately 0.6. In most cases these drainages would not support any surface flow during small to moderate storm events and would only support surface flow for a very short amount of time, even during relatively large storm events. With the combination of the relatively small 100-year peak flow and relatively low functional score, these drainages had insufficient evidence of a significant nexus (3C-1G, 3C-2B and 3F-1NN were examined in greater detail to see if any information from the site visits or the functional assessment warranted a significant nexus).

C. **100-year Peak Flow over 5 cfs with relatively low functional scores** (1I-1Q, 1I-1R, 1I-1T and 3F-1U) - these four drainages have 100-year peak flows of 8, 7, 7.7 and 14.4 cfs. In terms of the highest function, the drainages have scores of 0.6, 0.6, 0.51 and 0.31, respectively. The four tributaries range in area from approximately 188 square feet to 4,281 square feet and have a total area of 4872 square feet (0.11 acres of potential waters of the United States), with an average area of 1,218 square feet. With the combination of the relatively moderate 100-year peak flow and relatively low functional scores, these four drainages had insufficient evidence of a significant nexus (1I-1Q and 1I-1R both were examined in greater detail to see if any information from the site visits or the functional assessment warranted a significant nexus).

In general the 41 drainages that did not appear to support a significant nexus to Castac Lake were very narrow (1-2 feet in width), with limited potential waters of the United States. In terms of area, the 41 drainages varied from 16 square feet to 4,281 square feet, with an average of 627 square feet (the total potential waters of the United States for all 41 drainages is 0.59 acres).

Overall, the 41 drainages exemplify non-jurisdictional features referenced by the Rapanos Guidance. The Guidance states, "Swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow) are generally not waters of the United States because they are not tributaries or they do not have a significant nexus to downstream traditional navigable waters." The majority of the above reaches have 100-year peak flows that are well below 5 cfs, and have peak storm flows that would typically not last for more than a few hours, given the relatively steep slopes, small drainage area and the ephemeral nature of surface flow. In addition, the hybrid functional assessment for each of the 41 drainages indicates that most of these small tributaries generally exhibit low to moderate physical and biological functional scores.

5. Isolated Waters: As documented in Table 12 of the Jurisdictional Delineation Report, a total of 19 isolated drainages that support 84.7 acres of potential waters of the United States, including wetlands, are located within the Tejon Mountain Village project area. Oso Creek, the only isolated drainage in the southern section of the project area, was previously determined to be non-jurisdictional under the SWANCC Supreme Court decision in 2004 (File No. 2005-00026-AOA). The remaining 18 isolated drainages are concentrated in the northern section of the project area and include two relatively large intermittent/perennial drainages, Grapevine and Pastoria Creek, which support a variety of habitat types including adjacent wetlands and riparian vegetation that exhibits moderate to high physical and biological functions. In addition, there are also a number of smaller isolated drainages that are tributaries to Grapevine Creek or Pastoria Creek. Based on information in the Jurisdictional Delineation Report, none of the isolated drainages connect to an irrigation system that directs water outside of the Tejon Ranch agricultural fields (see Figure 3a). In addition, based on observations made during our July 2008 site visit, the California Aqueduct has a siphon that goes under Grapevine Creek and, as a result, there is no hydrologic connection between the isolated drainages and the aqueduct. Tejon Ranch does utilize some water from the above isolated drainages to irrigate farm fields by diverting seasonal surface flows into Tejon Reservoir 1 and pumping water into the 850 Irrigation Canal. Under one of the four factors in the "Migratory Bird Rule", which was invalidated by the 2001 SWANCC Supreme Court decision, water from isolated drainages that was used for irrigation could be utilized to establish substantial interstate commerce to determine jurisdictional waters of the United States; however, water uses in the isolated drainages in the project area do not appear to meet any of the current criteria at 33 CFR Part 328.3(a)(3). During our July 2008 site visit, Tejon Reservoir 1 was completely dry, with little if any potential for public access and no evidence of seasonal boating opportunities. For additional information, please reference the Jurisdictional Determination Report dated August 2008. Based on the above information, the Corps has made a preliminary determination that 19 isolated drainages that support approximately 84.7 acres of potential waters of the United States are non-navigable and do not support substantial interstate commerce, as identified by 33 CFR 328.3 (a)(3) that directly or indirectly flow into Tejon Reservoir 1 an isolated, non-navigable water body that does not support substantial interstate commerce.

6. Conclusion: Based on information in the Jurisdictional Delineation Report for Tejon Mountain Village (August 2008), two site visits and our independent review of all the above information, the Corps has made a final determination that 19 isolated drainages that support approximately 84.7 acres of potential waters of the United States are non-navigable and do not support substantial interstate commerce, as identified by 33 CFR 328.3 (a)(3) that directly or indirectly flow into Tejon Reservoir 1 an isolated, non-navigable water body that does not support substantial interstate commerce. In addition, 41 tributaries to Castac Lake, which support approximately 0.59 acres of potential waters of the United States, exhibit insufficient evidence of a significant nexus under the Rapanos Guidance dated June 2007.

Based on the above, the Tejon Mountain Village project area supports of total of 642 acres of waters of the United States in the project area, including the 346-acre Castac Lake, 286 acres of wetlands adjacent to Castac Lake and approximately 123 tributaries to Tejon Lake that support 10 acres of waters of the United States. If you have any questions regarding the above determinations, please contact me at (805) 585-2148.

Aaron O. Allen, Ph.D.
Chief, North Coast Branch
Regulatory Division

Impact Sciences, August 2008. Jurisdictional Delineation Report for Tejon Mountain Village.

APPENDIX B

Data Station Forms

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 04/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 1

Investigator(s): PCS and CJF | Section, Township, Range: 29-10N-19W

Landform (hillslope, terrace, etc.): Channel | Local relief (concave, convex, none): None | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34° 55' 37.04"N | Long: 118° 55' 34.91" | Datum:

Soil Map Unit Name: Pleito sandy clay loam | NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	(●)	( )
Hydric Soil Present?	(●)	( )
Wetland Hydrology Present?	(●)	( )

Is the Sampled Area within a Wetland? **Yes** (●) **No** ( )

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix laevigata*	20	Yes	FACW
2. *Populus fremontii ssp. fremontii*	75	Yes	FAC
3.			
4.			
Total Cover:	95 %		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Bromus diandrus*	2	No	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	2 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 60 % | % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	20	x 2 =	40
FAC species	75	x 3 =	225
FACU species		x 4 =	0
UPL species	2	x 5 =	10
Column Totals:	97 (A)		275 (B)

Prevalence Index = B/A = 2.84

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** (●) **No** ( )

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Cobble

Depth (inches): 0

Hydric Soil Present? Yes ◉ No ○

Remarks:

Cannot dig a soil pit in this location due to the large amount of rocks and cobbles. Some loamy sand in between rocks and cobbles. Assume hydric soils since data station is located within Grapevine Creek.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☒ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Evidence of flow in high flood years but does not appear to be regular flow. This could also be a sign of controlled flow from the pump station.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 04/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 2

Investigator(s): CJF and PCS and HM | Section, Township, Range: 20-10N-19W

Landform (hillslope, terrace, etc.): Terrace | Local relief (concave, convex, none): None | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34°55'36.65" | Long: 118°55'34.64" | Datum:

Soil Map Unit Name: Pleito sandy clay loam | NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		●
Hydric Soil Present?		●
Wetland Hydrology Present?		●

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Data station taken adjacent to and outside of OHWM of Grapevine Creek.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1. *Isomeris arborea*	1	No	Not Listed
2. *Isocoma menziesii*	<1	No	FAC
3.			
4.			
5.			
Total Cover:	1 %		
Herb Stratum			
1. *Bromus diandrus*	75	Yes	UPL
2. *Galium aparine*	25	Yes	FACU
3. *Bromus madritensis*	10	No	UPL
4.			
5.			
6.			
7.			
8.			
Total Cover:	110 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 = 0
FACW species		x 2 = 0
FAC species	0	x 3 = 0
FACU species	25	x 4 = 100
UPL species	86	x 5 = 430
Column Totals:	111 (A)	530 (B)

Prevalence Index = B/A = 4.77

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-8	10YR 3/2	100					Sandy Loam	
8+	rock							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Rock

Depth (inches): 8 "

Hydric Soil Present? Yes ○ No ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? **Yes** ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 05/14/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 3

Investigator(s): PCS and EW | Section, Township, Range: 20 - 10N - 19W

Landform (hillslope, terrace, etc.): channel | Local relief (concave, convex, none): None | Slope (%):

Subregion (LRR): C - Mediterranean California | Lat: 34° 56' 16.61" N | Long: 118° 55' 20.90"W | Datum:

Soil Map Unit Name: Guijarral-Klipstein complex | NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )
Hydric Soil Present?	Yes (●)	No ( )
Wetland Hydrology Present?	Yes (●)	No ( )

Is the Sampled Area within a Wetland? Yes (●) No ( )

Remarks: Data station within tributary to Cattle Creek (CC-2).

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1. *Baccharis salicifolia*	20	Yes	FACW
2. *Ambrosia psilostachya*	<1	No	FACU
3.			
4.			
5.			
Total Cover:	20 %		
Herb Stratum			
1. *Polypogon monspeliensis*	30	Yes	FACW
2. *Bromus hordeaceus*	<1	No	FACU
3. *Avena sp.*	<1	No	UPL
4. *Hordeum murinum*	<1	No	FACU
5. *Lepidium latifolium*	<1	No	FAC
6.			
7.			
8.			
Total Cover:	30 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 40 % | % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	50	x 2 =	100
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	50 (A)		100 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks:

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? **Yes** ◉ **No** ○

Remarks: Impenetrable rock with algal matting. Assume hydric soils due to presence of water.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☒ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☒ Water Marks (B1) (**Nonriverine**)
- ☒ Sediment Deposits (B2) (**Nonriverine**)
- ☒ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ◉	No ○	Depth (inches): 1
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? **Yes** ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: D.S. point in center of channel

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine City/County: Grapevine/Kern Sampling Date: 05/14/13

Applicant/Owner: Tejon Ranchcorp State: CA Sampling Point: 4

Investigator(s): PCS and EW Section, Township, Range: 20-10N-19W

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope (%):

Subregion (LRR): C - Mediterranean California Lat: 34° 56' 16.85" N Long: 118° 55' 21.31"W Datum:

Soil Map Unit Name: Guijarral-Klipstein complex NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ( )	No (●)
Hydric Soil Present?	Yes ( )	No (●)
Wetland Hydrology Present?	Yes ( )	No (●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Data station take in upland area adjacent to DS 3.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Brassica nigra*	5	No	UPL
2. *Bromus diandrus*	5	No	UPL
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	10 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 80 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species	10	x 5 =	50
Column Totals:	10	(A)	50 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks: Soil pit not dug because area is fill (concrete chunks).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? **Yes** ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Lebec/Kern | Sampling Date: 06/18/13

Applicant/Owner: Tejon | State: CA | Sampling Point: 5

Investigator(s): CJF and HLM | Section, Township, Range: 24-10N-19W

Landform (hillslope, terrace, etc.): Flat | Local relief (concave, convex, none): Concave | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34° 56' 9.13"N | Long: 118° 51' 28.81" W | Datum:

Soil Map Unit Name: Bitcreek-Dibble-Eaglecrest complex | NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☒ significantly disturbed? Are "Normal Circumstances" present? Yes ( ) No (●)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )
Hydric Soil Present?	Yes (●)	No ( )
Wetland Hydrology Present?	Yes (●)	No ( )

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Feature fed by water from adjacent above ground tank. Tank is creating the riparian/wetland area. Although the area meets all 3 parameters, it is not a wetland due to the fact that the water source is artificial.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Polypogon monspeliensis*	85	Yes	FACW
2. *Urtica dioica*	<1	No	FAC
3. *Nasturtium officinale*	15	Yes	OBL
4. *Rumex crispus*	<1	No	FAC
5. *Mimulus guttatus*	<1	No	OBL
6. *Hirshfeldia incana*	2	No	UPL
7.			
8.			
Total Cover:	102 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % | % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	85	x 2 =	170
FAC species	0	x 3 =	0
FACU species		x 4 =	0
UPL species	2	x 5 =	10
Column Totals:	102 (A)		195 (B)

Prevalence Index = B/A = 1.91

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks: Data station in patch of Polypogon monspeliensis.

SOIL

Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-10	5Y 2.5/1	100					Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [x] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: Rock/hard surface

Depth (inches): 10"

Hydric Soil Present? Yes (●) **No** ( )

Remarks: High percentage of organic material emitting odor (not hydrogen sulfide).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [x] Surface Water (A1)
- [x] High Water Table (A2)
- [x] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?	(●)	( )	1"
Water Table Present?	( )	(●)	
Saturation Present? (includes capillary fringe)	( )	(●)	

Wetland Hydrology Present? Yes (●) **No** ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Feature fed by water from adjacent above ground tank.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 6

Investigator(s): CJF and RJM | Section, Township, Range: 24, 10N, 19W

Landform (hillslope, terrace, etc.): Flat | Local relief (concave, convex, none): None | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34°56'09.2139" | Long: 118°51'28.9500" | Datum: NAD83

Soil Map Unit Name: Bitcreek-Dibble-Eaglerest complex, 15 to 50 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Data station taken in upland area, 10' west of data station 5.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Hirschfeldia incana*	40	Yes	UPL
2. *Hordeum murinum*	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	50 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 50 % | % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species	10	x 4 =	40
UPL species	40	x 5 =	200
Column Totals:	50 (A)		240 (B)

Prevalence Index = B/A = 4.80

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	7.5 YR 3/3	100	-	-			loamy sand	
4+	-	-	-	-			-	soil too hard

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: None.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Lebec/Kern | Sampling Date: 06/26/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 7

Investigator(s): CJF and BAS | Section, Township, Range: 22-10N-29W

Landform (hillslope, terrace, etc.): Swale | Local relief (concave, convex, none): Concave | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34° 55' 56.64"N | Long: 118° 53' 58.70"W | Datum:

Soil Map Unit Name: Geghus-Tecuya association | NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		●
Hydric Soil Present?	●	
Wetland Hydrology Present?	●	

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Juncus balticus ssp. ater*	50	Yes	FACW*
2. *Distichlis spicata*	5	No	FAC
3. *Helianthus annus*	60	Yes	FACU
4. *Polypogon monspeliensis*	<1	No	FACW
5. *Rumex crispus*	15	No	FAC
6.			
7.			
8.			
Total Cover:	130%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	50	x 2 =	100
FAC species	20	x 3 =	60
FACU species	60	x 4 =	240
UPL species		x 5 =	0
Column Totals:	130 (A)		400 (B)

Prevalence Index = B/A = 3.08

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture[3]	Remarks
0-4"	7.5 YR 3/2	95	5 YR 3/4	5	C	PL	Sandy Loam	Loc2 = PL/M
4-10"	7.5 YR 3/2	98	5 YR 3/4	2	C	M	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ◉ **No** ○

Remarks: Organic matter. Redox features at 0-4".

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?	○	◉	
Water Table Present?	○	◉	
Saturation Present? (includes capillary fringe)	○	◉	

Wetland Hydrology Present? **Yes** ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Oxidized rhizospheres at 0-4". No surface water or water within the soil pit present. No channel features present (i.e., no OWHM, erosion, or other drainage patterns).

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine — City/County: Lebec/Kern — Sampling Date: 06/26/13

Applicant/Owner: Tejon Ranchcorp — State: CA — Sampling Point: 8

Investigator(s): CJF and BAS — Section, Township, Range: 22-10N-19W

Landform (hillslope, terrace, etc.): Swale — Local relief (concave, convex, none): Concave — Slope (%):

Subregion (LRR): C - Mediterranean California — Lat: 34° 55' 56.32"N — Long: 118° 53' 58.54" W — Datum:

Soil Map Unit Name: Geghus Tecuya — NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	(●)	( )
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Taken 6' from DS #7

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Juncus balticus ssp. ater*	50	Yes	FACW*
2. *Distichlis spicata*	5	No	FAC
3. *Bromus diandrus*	20	Yes	UPL
4. *Helianthus annus*	10	Yes	FACU
5. *Rumex crispus*	5	No	FAC
6.			
7.			
8.			
Total Cover:	90 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % — % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	50	x 2 =	100
FAC species	10	x 3 =	30
FACU species	10	x 4 =	40
UPL species	20	x 5 =	100
Column Totals:	90 (A)		270 (B)

Prevalence Index = B/A = 3.00

Hydrophytic Vegetation Indicators:

- ☐ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks:

SOIL

Sampling Point: 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-3"	7.5YR 3/2						Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks: Only can dig to 3", soils too hard.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? **Yes** ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No hydrology indicators present.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine　City/County: Lebec/Kern　Sampling Date: 06/26/13

Applicant/Owner: Tejon Ranchcorp　State: CA　Sampling Point: 9

Investigator(s): CJF and BAS　Section, Township, Range: 22-10N-19W

Landform (hillslope, terrace, etc.): Swale　Local relief (concave, convex, none): Concave　Slope (%):

Subregion (LRR): C - Mediterranean California　Lat: 34° 55' 54.88"N　Long: 118° 53' 58.66"W　Datum:

Soil Map Unit Name: Geghus Tecuya　NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (X) No ( ) (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes (X) No ( )

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ( )	No (X)
Hydric Soil Present?	Yes ( )	No (X)
Wetland Hydrology Present?	Yes ( )	No (X)

Is the Sampled Area within a Wetland? Yes ( ) No (X)

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1. *Marrubium vulgare*	3	No	FACU
2.			
3.			
4.			
5.			
Total Cover:	3 %		
Herb Stratum			
1. *Centaurea melitensis*	5	No	UPL
2. *Brassica nigra*	5	No	UPL
3. *Bromus diandrus*	80	Yes	UPL
4. *Erigeron canadensis*	1	No	UPL
5. *Holocarpha sp.*	5	No	UPL
6.			
7.			
8.			
Total Cover:	96 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ %　% Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species	3	x 4 =	12
UPL species	96	x 5 =	480
Column Totals:	99	(A)	492 (B)

Prevalence Index = B/A = 4.97

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (X)

Remarks:

SOIL

Sampling Point: 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4"	10 YR 3/4						Sandy loam	
4+	Hard soil							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? **Yes** ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No indicators

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine City/County: Lebec/Kern Sampling Date: 06/26/13

Applicant/Owner: Tejon Ranchcorp State: CA Sampling Point: 10

Investigator(s): CJF and BAS Section, Township, Range: 22-10N-19W

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): None Slope (%):

Subregion (LRR): C - Mediterranean California Lat: 34° 55' 54.76" N Long: 118° 53' 58.52"W Datum:

Soil Map Unit Name: Geghus Tecuya NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ( )	No (●)	Is the Sampled Area within a Wetland? Yes ( ) No (●)
Hydric Soil Present?	Yes ( )	No (●)	
Wetland Hydrology Present?	Yes ( )	No (●)	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Bromus diandrus*	80	Yes	UPL
2. *Centaurea melitensis*	15	Yes	UPL
3. *Brassica nigra*	5	No	UPL
4.			
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species	100	x 5 =	500
Column Totals:	100 (A)		500 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-6"	10YR 3/4	99	5 YR 4/6	<1	C	M	Sandy loam	
6+	Hard soil							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 11

Investigator(s): CJF and RJM | Section, Township, Range: 22, 10N, 19W

Landform (hillslope, terrace, etc.): Terrace | Local relief (concave, convex, none): Tone | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34°55'54.3459" | Long: 118°53'58.7370" | Datum: NAD83

Soil Map Unit Name: Geghus-Tecuya association, 9 to 30 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Helianthus annuus*	15	Yes	FACU
2. *Centaurea melitensis*	8	No	UPL
3. *Polypogon monspeliensis*	6	No	FACW
4. *Bromus diandrus*	30	Yes	UPL
5. *Hirschfeldia incana*	8	No	UPL
6. *Erigeron canadensis*	2	No	FACU
7.			
8.			
Total Cover:	69 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ___ % | % Cover of Biotic Crust ___ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	6	x 2 =	12
FAC species		x 3 =	0
FACU species	17	x 4 =	68
UPL species	46	x 5 =	230
Column Totals:	69 (A)		310 (B)

Prevalence Index = B/A = 4.49

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-8	7.5YR 3/4	100	-	-			-	
8+	-	-	-	-			-	soil too hard

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? **Yes** ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: None.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 12

Investigator(s): CJF and RJM | Section, Township, Range: 21, 10N, 19W

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): none | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34°55'53.1655" | Long: 118°54'03.2906" | Datum: NAD83

Soil Map Unit Name: Geghus-Tecuya association, 9 to 30 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	(●)	( )
Wetland Hydrology Present?	(●)	( )

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix gooddingii*	5	Yes	FACW
2.			
3.			
4.			
Total Cover:	5 %		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Rumex crispus*	2	No	FAC
2. *Polypogon monspeliensis*	10	No	FACW
3. *Distichlis spicata*	20	Yes	FAC
4. *Helianthus annuus*	10	No	FACU
5. *Hordeum murinum*	25	Yes	FACU
6. *Elymus triticoides*	2	No	FAC
7. *Bromus diandrus*	30	Yes	UPL
8.			
Total Cover:	99 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % | % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	15	x 2 =	30
FAC species	24	x 3 =	72
FACU species	35	x 4 =	140
UPL species	30	x 5 =	150
Column Totals:	104 (A)		392 (B)

Prevalence Index = B/A = 3.77

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-6	10YR 4/2	96	2.5YR 4/6	1	C	M	loamy sand	
0-6	-	-	5YR 4/6	3	C	PL	loamy sand	
6-10	7.5YR 4/6	100	-	-			loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ◉ **No** ○

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Data station taken in depression that was muddy in May. No surface water or water within the soil pit present in July. No channel features present (i.e., no OWHM, erosion, or other drainage patterns).

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 13

Investigator(s): CJF and RJM | Section, Township, Range: 21, 10N, 19W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): none | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34°55'53.0999" | Long: 118°54'03.1087" | Datum:

Soil Map Unit Name: Geghus-Tecuya association, 9 to 30 percent slopes | NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Data station just 10' east of #12, slightly out of depression.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus lobata*	5	Yes	FACU
2. *Salix gooddingii*	5	Yes	FACW
3.			
4.			
Total Cover:	10 %		
Sapling/Shrub Stratum			
1. *Peritoma arborea*	1	Yes	UPL
2.			
3.			
4.			
5.			
Total Cover:	1 %		
Herb Stratum			
1. *Elymus triticoides*	5	No	FAC
2. *Distichlis spicata*	50	Yes	FAC
3. *Rumex crispus*	1	No	FAC
4. *Helianthus annuus*	1	No	FACU
5. *Avena sp.*	1	No	UPL
6. *Bromus diandrus*	30	Yes	UPL
7. *Hordeum sp.*	15	No	
8. *Epilobium canum*	1	No	UPL
Total Cover:	104 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % | % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 40.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	5	x 2 =	10
FAC species	56	x 3 =	168
FACU species	6	x 4 =	24
UPL species	33	x 5 =	165
Column Totals:	100 (A)		367 (B)

Prevalence Index = B/A = 3.67

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	10YR 3/2	99	10YR 6/8	1	C	M	loamy sand	
4+	-	-	-	-			-	soil too hard

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: Soil too hard to dig past 4". Not enough redox to meet the standards for hydric soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):
Water Table Present? Yes ○ No ◉ Depth (inches):
Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: None.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Lebec/Kern | Sampling Date: 07/09/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 14

Investigator(s): CJF, PCS, LA | Section, Township, Range: 21-10N-19W

Landform (hillslope, terrace, etc.): Erosion | Local relief (concave, convex, none): None | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34 56'10.24 | Long: 118 55'16.80 | Datum:

Soil Map Unit Name: Geghus-Tecuya association | NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☒ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ( ) No (●)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )
Hydric Soil Present?	Yes (●)	No ( )
Wetland Hydrology Present?	Yes (●)	No ( )

Is the Sampled Area within a Wetland? Yes (●) No ( )

Remarks: Anthropogenic influences via water piped into beginning of channel from pond (via underground pipe).

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Tamarix ramosissima=Tamarix chinensis*	15	Yes	FAC
2.			
3.			
4.			
Total Cover:	15 %		
Sapling/Shrub Stratum			
1. *Nicotiana glauca*	5	No	FAC
2.			
3.			
4.			
5.			
Total Cover:	5 %		
Herb Stratum			
1. *Helianthus annuus*	12	Yes	FACU
2. *Polypogon monspeliensis*	25	Yes	FACW
3. *Rumex crispus*	3	No	FAC
4. *Eleusine tristachya*	3	No	FAC
5. *Petroselinum crispum*	1	No	UPL
6. *Xanathium strumarium*	2	No	FAC
7. *Apium graveolens*	1	No	UPL
8. *Nasturtium officinale*	1	No	OBL
Total Cover:	48 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	66.7 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	1	x 1 =	1
FACW species	25	x 2 =	50
FAC species	28	x 3 =	84
FACU species	12	x 4 =	48
UPL species	2	x 5 =	10
Column Totals:	68 (A)		193 (B)

Prevalence Index = B/A = 2.84

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks:

SOIL

Sampling Point: 14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-16	2.5Y 4/2	85	2.5Y 3/4	15	C	PL	Clay loam	Loc squared = PL/M

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [x] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks: Both redox and oxidized roots throughout sample.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [x] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [x] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [x] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?	(●)	( )	
Water Table Present?	( )	(●)	
Saturation Present? (includes capillary fringe)	( )	(●)	

Wetland Hydrology Present? Yes (●) No ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 15

Investigator(s): CJF, PCS, LA | Section, Township, Range: 20, 10N, 19W

Landform (hillslope, terrace, etc.): hillslope | Local relief (concave, convex, none): none | Slope (%): 35

Subregion (LRR): C - Mediterranean California | Lat: 34°56'10.2669" | Long: 118°55'16.9367" | Datum: NAD83

Soil Map Unit Name: Guijarral-Klipstein, 2-5% slopes and Geghus-Tecuya, 9-30% slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) **No** (●)

Remarks: Data station taken approx. 10' west of #14 on slope of bank

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Nicotiana glauca*	1	No	FAC
2. *Helianthus annuus*	5	No	FACU
3. *Xanthium strumarium*	2	No	FAC
4. *Rumex crispus*	2	No	FAC
5. *Hirschfeldia incana*	15	Yes	UPL
6. *Bromus diandrus*	80	Yes	UPL
7.			
8.			
Total Cover:	105 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 5 % | % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	5	x 3 =	15
FACU species	5	x 4 =	20
UPL species	95	x 5 =	475
Column Totals:	105 (A)		510 (B)

Prevalence Index = B/A = 4.86

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) **No** (●)

Remarks:

SOIL

Sampling Point: 15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-2	2.5Y 4/4	100	-	-			clay loam	
2+								soil too hard to dig further

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: hard soil

Depth (inches): 2

Hydric Soil Present? Yes ◯ No ◉

Remarks: Soil too hard to dig further

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ◯ No ◉ Depth (inches):

Water Table Present? Yes ◯ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ◯ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◯ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No hydrology indicators.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 16

Investigator(s): HLM and BAS | Section, Township, Range: 8, 10N, 19W

Landform (hillslope, terrace, etc.): terrace lowland | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): C - Mediterranean California | Lat: 34°57'42.7229" | Long: 118°55'10.2184" | Datum: NAD83

Soil Map Unit Name: Riverwash | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☒ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		●
Hydric Soil Present?		●
Wetland Hydrology Present?	●	

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Data station located within Grapevine Creek. Vegetation disturbed by grazing. Multiple low flow channels and terraces within the active floodplain.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Bromus tectorum*	2	No	UPL
2. *Bromus madritensis*	7	Yes	UPL
3. *Avena barbata*	2	No	UPL
4. *Schismus barbatus*	1	No	UPL
5. *Erodium sp. (dried)*	3	No	
6. *Bromus diandrus*	1	No	NI
7.			
8.			
Total Cover:	16 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 84 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 = 0
FACW species		x 2 = 0
FAC species		x 3 = 0
FACU species		x 4 = 0
UPL species	13	x 5 = 65
Column Totals:	13 (A)	65 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-14	2.5Y 5/3	100	-	-			loamy sand	*

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: * soil pit collapsing during excavation due to high percentage of sand.
High percentage of angular cobbles
Matrix difficult to see because of high amount of sand.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☒ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):
Water Table Present? Yes ○ No ◉ Depth (inches):
Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine City/County: Grapevine/Kern Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp State: CA Sampling Point: 17

Investigator(s): HLM and BAS Section, Township, Range: 8, 10N, 19W

Landform (hillslope, terrace, etc.): terrace lowlands Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR): C - Mediterranean California Lat: 34°57'42.8390" Long: 118°55'11.2632" Datum: NAD83

Soil Map Unit Name: Guijarral-Klipstein complex, 2 to 5 percent slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation [X] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Vegetation disturbed by grazing.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Bromus madritensis*	33	Yes	UPL
2. *Avena barbata*	2	No	UPL
3. *Erodium sp. (dried)*	60	Yes	
4.			
5.			
6.			
7.			
8.			
Total Cover:	95 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 5 % % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species	35	x 5 =	175
Column Totals:	35 (A)		175 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-9	10YR 5/2	100	-	-			loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ●

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ● Depth (inches):

Water Table Present? Yes ○ No ● Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ● Depth (inches):

Wetland Hydrology Present? Yes ○ No ●

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 18

Investigator(s): HLM and BAS | Section, Township, Range: 13, 10N, 19W

Landform (hillslope, terrace, etc.): terrace lowland | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): C - Mediterranean California | Lat: 34°56'29.2420" | Long: 118°51'51.1464" | Datum: NAD83

Soil Map Unit Name: Pleito sandy clay loam, 2 to 5 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation [X] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	(●)	( )

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Data station taken in a man-made agricultural/drainage ditch. Vegetation shows potential signs of maintenance (manual removal and/or herbicides). While there are signs of hydrology due to irrigation run-off, this does not convey flow from a natural drainage and is not considered jurisdictional.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Croton setigerus*	5	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	5 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 95 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species	5	x 5 =	25
Column Totals:	5	(A)	25 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

- ( ) Dominance Test is >50%
- ( ) Prevalence Index is 3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-10	10YR 4/3	100	-	-			clay loam	*

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: *high percentage of angular cobbles in pit

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☒ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? **Yes** ◉ **No** ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Data station taken in a man-made agricultural/drainage ditch. While there are signs of hydrology due to irrigation run-off, this does not convey flow from a natural drainage and is not considered jurisdictional.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine City/County: Grapevine/Kern Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp State: CA Sampling Point: 19

Investigator(s): HLM and BAS Section, Township, Range: 13, 10N, 19W

Landform (hillslope, terrace, etc.): terrace lowlands Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR): C - Mediterranean California Lat: 34°56'29.2236" Long: 118°51'51.2287" Datum: NAD83

Soil Map Unit Name: Pleito sandy clay loam, 2 to 5 percent slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation [X] Soil [X] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ( )	No (●)
Hydric Soil Present?	Yes ( )	No (●)
Wetland Hydrology Present?	Yes ( )	No (●)

Is the Sampled Area within a Wetland? **Yes** ( ) **No** (●)

Remarks: Sample point within agriculture access road. Soil appears to be graded.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Croton setigerus*	1	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	1 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 99 % % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species	1	x 5 =	5
Column Totals:	1	(A)	5 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

- [ ] Dominance Test is >50%
- [ ] Prevalence Index is 3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ( ) **No** (●)

Remarks: Area lacks vegetation because of maintenance/removal.

SOIL

Sampling Point: 19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-6	10YR 4/3	100	-	-			silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? **Yes** ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 20

Investigator(s): HLM and BAS | Section, Township, Range: 14, 10N, 19W

Landform (hillslope, terrace, etc.): terrace lowland | Local relief (concave, convex, none): concave | Slope (%): 3

Subregion (LRR): C - Mediterranean California | Lat: 34°56'44.2198" | Long: 118°52'31.7486" | Datum: NAD83

Soil Map Unit Name: Guijarral-Klipstein complex, 2 to 5 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ (If no, explain in Remarks.)

Are Vegetation ☒ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	○	◉
Hydric Soil Present?	○	◉
Wetland Hydrology Present?	○	◉
Is the Sampled Area within a Wetland?	○	◉

Remarks: Vegetation disturbed by grazing. OHWM 2'. Pit depth 12".

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Hirschfeldia incana*	5	No	UPL
2. *Bromus madritensis*	40	Yes	UPL
3. *Bromus diandrus*	40	Yes	UPL
4. *Centaurea melitensis*	1	No	UPL
5.			
6.			
7.			
8.			
Total Cover:	86 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 14 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species	86	x 5 =	430
Column Totals:	86 (A)		430 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

- ○ Dominance Test is >50%
- ○ Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: 20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-12	10YR 3/3	100	-	-			clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No wetland hydrology is present, but drainage patterns are present and this data station is within Live Oak Creek.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine City/County: Grapevine/Kern Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp State: CA Sampling Point: 21

Investigator(s): HLM and BAS Section, Township, Range: 14, 10N, 19W

Landform (hillslope, terrace, etc.): terrace lowland Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 34°56'44.0962" Long: 118°52'31.5193" Datum: NAD83

Soil Map Unit Name: Guijarral-Klipstein complex, 2 to 5 percent slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation [X] Soil [X] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ( )	No (●)
Hydric Soil Present?	Yes ( )	No (●)
Wetland Hydrology Present?	Yes ( )	No (●)

Is the Sampled Area within a Wetland? **Yes** ( ) **No** (●)

Remarks: Data station taken east of data station 20. Vegetation disturbed by grazing. Soil disturbed by small mammal burrows.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Bromus diandrus*	40	Yes	UPL
2. *Bromus madritensis*	15	Yes	UPL
3. *Hirschfeldia incana*	5	No	UPL
4. *Chamaesyce ocellata ssp. ocellata*	1	No	UPL
5. *Amaranthus blitoides*	1	No	FACW
6.			
7.			
8.			
Total Cover:	62 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 38 % % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	1	x 2 =	2
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species	61	x 5 =	305
Column Totals:	62 (A)		307 (B)

Prevalence Index = B/A = 4.95

Hydrophytic Vegetation Indicators:

- ( ) Dominance Test is >50%
- ( ) Prevalence Index is ≤3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ( ) **No** (●)

Remarks:

SOIL

Sampling Point: 21

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-13	10YR 3/3	100	-	-			loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? **Yes** ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 22

Investigator(s): HLM and BAS | Section, Township, Range: 12, 10N, 19W

Landform (hillslope, terrace, etc.): terrace lowland | Local relief (concave, convex, none): concave | Slope (%): 1

Subregion (LRR): C - Mediterranean California | Lat: 34°57'33.1346" | Long: 118°51'04.0978" | Datum: NAD83

Soil Map Unit Name: Pleitito-Laval complex, 1 to 5 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation [X] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Vegetation disturbed by grazing.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1. *Baccharis salicifolia*	10	Yes	FAC
2. *Tamarix ramosissima=Tamarix chinensis*	30	Yes	FAC
3.			
4.			
5.			
Total Cover:	40 %		
Herb Stratum			
1. *Hirschfeldia incana*	5	No	UPL
2. *Bromus madritensis*	15	Yes	UPL
3. *Bromus diandrus*	10	Yes	UPL
4. *Datura wrightii*	5	No	UPL
5.			
6.			
7.			
8.			
Total Cover:	35 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 25 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	40	x 3 =	120
FACU species		x 4 =	0
UPL species	35	x 5 =	175
Column Totals:	75 (A)		295 (B)

Prevalence Index = B/A = 3.93

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 22

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-16	10YR 4/3	100	-	-			loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: Top soil layer collapsing due to high sand content.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Braided system within active floodplain.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 23

Investigator(s): HLM and BAS | Section, Township, Range: 12, 10N, 19W

Landform (hillslope, terrace, etc.): terrace lowland | Local relief (concave, convex, none): none | Slope (%): 1

Subregion (LRR): C - Mediterranean California | Lat: 34°57'33.6393" | Long: 118°51'02.4512" | Datum: NAD83

Soil Map Unit Name: Pleitito-Laval complex, 1 to 5 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◉ No ◯ (If no, explain in Remarks.)

Are Vegetation ☒ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ◯

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	◯	◉
Hydric Soil Present?	◯	◉
Wetland Hydrology Present?	◯	◉

Is the Sampled Area within a Wetland? **Yes** ◯ **No** ◉

Remarks: Data station taken upland of DS #22. Vegetation disturbed by grazing.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Bromus madritensis*	50	Yes	UPL
2. *Erodium sp. (dried)*	15	Yes	
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	65 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 35 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 = 0
FACW species		x 2 = 0
FAC species		x 3 = 0
FACU species		x 4 = 0
UPL species	50	x 5 = 250
Column Totals:	50 (A)	250 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ◯ **No** ◉

Remarks:

SOIL

Sampling Point: 23

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-16	10YR 3/3	100	-	-			loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? **Yes** ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine — City/County: Grapevine/Kern — Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp — State: CA — Sampling Point: 24

Investigator(s): HLM and BAS — Section, Township, Range: 6, 10N, 18W

Landform (hillslope, terrace, etc.): terrace lowland — Local relief (concave, convex, none): concave — Slope (%): 2

Subregion (LRR): C - Mediterranean California — Lat: 34°58'48.3749" — Long: 118°50'21.7379" — Datum: NAD83

Soil Map Unit Name: Hesperia sandy loam, 5 to 9 percent slopes — NWI classification: freshwater emergent wtl

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation [X] Soil [X] or Hydrology [X] significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Anthropogenic feature (irrigation ditch) in agricultural field. Vegetation disturbed by maintenance. Soils and hydrology disturbed by anthropogenic creation.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Erigeron canadensis*	1	Yes	FACU
2. *Datura wrightii*	1	Yes	UPL
3. *Hordeum murinum*	1	Yes	FACU
4.			
5.			
6.			
7.			
8.			
Total Cover:	3 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 97 % — % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species	2	x 4 =	8
UPL species	1	x 5 =	5
Column Totals:	3 (A)		13 (B)

Prevalence Index = B/A = 4.33

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 24

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-16	2.5Y 4/3	100	-	-			loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? Yes ○ No ●

Remarks: Soil pit collapsing while excavating due to high percentage of sandy soils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ● Depth (inches):
Water Table Present? Yes ○ No ● Depth (inches):
Saturation Present? (includes capillary fringe) Yes ○ No ● Depth (inches):

Wetland Hydrology Present? Yes ○ No ●

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No wetland hydrology is present, but drainage patterns are present and this data station is within the diverted portion of Pastoria Creek.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine　City/County: Grapevine/Kern　Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp　State: CA　Sampling Point: 25

Investigator(s): HLM and BAS　Section, Township, Range: 6, 10N, 18W

Landform (hillslope, terrace, etc.): terrace lowland　Local relief (concave, convex, none): none　Slope (%): 1

Subregion (LRR): C - Mediterranean California　Lat: 34°58'48.2787"　Long: 118°50'21.6815"　Datum: NAD83

Soil Map Unit Name: Hesperia sandy loam, 5 to 9 percent slopes　NWI classification: freshwater emergent wtl

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (•) No ( ) (If no, explain in Remarks.)

Are Vegetation [X] Soil [X] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes (•) No ( )

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ( )	No (•)
Hydric Soil Present?	Yes ( )	No (•)
Wetland Hydrology Present?	Yes ( )	No (•)

Is the Sampled Area within a Wetland? Yes ( ) No (•)

Remarks: Agricultural field access road absent of vegetation. Road has evidence of grading.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Datura wrightii*	1	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	1 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 99 %　% Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 = 0
FACW species		x 2 = 0
FAC species		x 3 = 0
FACU species		x 4 = 0
UPL species	1	x 5 = 5
Column Totals:	1 (A)	5 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (•)

Remarks:

SOIL

Sampling Point: 25

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-14	2.5Y 4/3	100	-	-			loamy sand	
14-16	10YR 4/3	95	7.5YR 4-6	5	C	RC	silty clay loam	*

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: *Redox features observed at depth 14-16", likely due to agricultural irrigation for adjacent crops.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 26

Investigator(s): HLM and BAS | Section, Township, Range: 6, 10N, 18W

Landform (hillslope, terrace, etc.): terrace lowland | Local relief (concave, convex, none): concave | Slope (%): 2

Subregion (LRR): C - Mediterranean California | Lat: 34°58'51.3606" | Long: 118°50'11.6555" | Datum: NAD83

Soil Map Unit Name: Arvin sandy loam, 5 to 9 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )
Hydric Soil Present?	Yes (●)	No ( )
Wetland Hydrology Present?	Yes (●)	No ( )

Is the Sampled Area within a Wetland? **Yes (●)** **No ( )**

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix laevigata*	15	Yes	FACW
2. *Baccharis salicifolia*	35	Yes	FACW
3.			
4.			
Total Cover:	50 %		
Sapling/Shrub Stratum			
1. *Artemisia douglasiana*	15	Yes	FAC
2.			
3.			
4.			
5.			
Total Cover:	15 %		
Herb Stratum			
1. *Melilotus indicus*	1	No	FACU
2. *Polypogon monspeliensis*	5	No	FACW
3. *Rumex crispus*	1	No	FAC
4. *Hirschfeldia incana*	5	No	UPL
5. *Helianthus annuus*	15	Yes	FACU
6. *Hordeum sp. (dried)*	5	No	
7. *Cynodon dactylon*	30	Yes	FACU
8. *Stachys rigida*	1	No	FACW
Total Cover:	63 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	5	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	60.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	56	x 2 =	112
FAC species	16	x 3 =	48
FACU species	46	x 4 =	184
UPL species	5	x 5 =	25
Column Totals:	123 (A)		369 (B)

Prevalence Index = B/A = 3.00

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes (●)** **No ( )**

Remarks:

SOIL

Sampling Point: 26

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-13	10YR 4/2	93	7.5YR 4/6	7	C	RC	loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [ ] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [x] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes (●) **No** ( )

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [x] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [x] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?	(●)	( )	2
Water Table Present?	( )	(●)	
Saturation Present? (includes capillary fringe)	(●)	( )	0

Wetland Hydrology Present? Yes (●) **No** ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine City/County: Grapevine/Kern Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp State: CA Sampling Point: 27

Investigator(s): HLM and BAS Section, Township, Range: 6, 10N, 18W

Landform (hillslope, terrace, etc.): terrace lowland Local relief (concave, convex, none): none Slope (%): 1

Subregion (LRR): C - Mediterranean California Lat: 34°58'51.5588" Long: 118°50'11.7152" Datum: NAD83

Soil Map Unit Name: Arvin sandy loam, 5 to 9 percent slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation [X] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Vegetation disturbed by grazing and competition form non-native plant species. Data station located on berm.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Hordeum sp. (dried)*	50	Yes	FAC
2. *Bromus diandrus*	50	Yes	UPL
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	100%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 0 % % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	50.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	50	x 3 =	150
FACU species		x 4 =	0
UPL species	50	x 5 =	250
Column Totals:	100	(A)	400 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

- ( ) Dominance Test is >50%
- ( ) Prevalence Index is 3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks: The Hordeum sp. recorded in conjunction with this data station could not be identified to species because it was desiccated. However, the only two Hordeum spp. observed in the study area were Hordeum marinum (FAC) and Hordeum marinum (FACU). This area would not be a wetlands regardless of which species was present in the data station. For analysis purposes, it is assumed that the species is FAC. Additionally, the data station was taken in a non-native grassland area.

SOIL

Sampling Point: 27

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-14	10YR 3/3	100	-	-			loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine
City/County: Grapevine/Kern
Sampling Date: 07/16/13
Applicant/Owner: Tejon Ranchcorp
State: CA
Sampling Point: 28
Investigator(s): HLM and BAS
Section, Township, Range: 33, 11N, 19W
Landform (hillslope, terrace, etc.): terrace lowland
Local relief (concave, convex, none): concave
Slope (%): 2
Subregion (LRR): C - Mediterranean California
Lat: 34°59'10.1067"
Long: 118°54'05.9762"
Datum: NAD83
Soil Map Unit Name: Riverwash
NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (•) No ( ) (If no, explain in Remarks.)

Are Vegetation [X] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes (•) No ( )

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(•)
Hydric Soil Present?	( )	(•)
Wetland Hydrology Present?	(•)	( )

Is the Sampled Area within a Wetland? Yes ( ) No (•)

Remarks: Vegetation disturbed by grazing.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1. *Tamarix ramosissima=Tamarix chinensis*	30	Yes	FAC
2.			
3.			
4.			
5.			
Total Cover:	30 %		
Herb Stratum			
1. *Bromus madritensis*	15	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	15 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 55 % % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	30	x 3 =	90
FACU species		x 4 =	0
UPL species	15	x 5 =	75
Column Totals:	45	(A)	165 (B)

Prevalence Index = B/A = 3.67

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (•)

Remarks:

SOIL

Sampling Point: 28

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-14	2.5Y 5/3	100	-	-			sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: High percentage of sand and cobble. Excavation pit collapsing while digging.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☒ Sediment Deposits (B2) (**Nonriverine**)
- ☒ Drift Deposits (B3) (**Nonriverine**)
- ☒ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine City/County: Grapevine/Kern Sampling Date: 07/16/13

Applicant/Owner: Tejon Ranchcorp State: CA Sampling Point: 29

Investigator(s): HLM and BAS Section, Township, Range: 33, 11N, 19W

Landform (hillslope, terrace, etc.): flat terrace Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 34°59'09.4693" Long: 118°54'04.9500" Datum: NAD83

Soil Map Unit Name: Riverwash NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? **Yes** ( ) **No** (●)

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Bromus madritensis*	95	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	95 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 5 % % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species		x 4 =	0
UPL species	95	x 5 =	475
Column Totals:	95	(A)	475 (B)

Prevalence Index = B/A = 5.00

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ( ) **No** (●)

Remarks:

SOIL

Sampling Point: 29

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-13	10YR 4/3	100	-	-			loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? **Yes** ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 30

Investigator(s): CJF | Section, Township, Range: 21, 10N, 19W

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34°55'52.7664" | Long: 118°54'44.1032" | Datum: NAD83

Soil Map Unit Name: Loslobos-Walong association, 5 to 30 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (•) No ( ) (If no, explain in Remarks.)

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? Are "Normal Circumstances" present? Yes (•) No ( )

Are Vegetation [ ] Soil [ ] or Hydrology [ ] naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (•)	No ( )
Hydric Soil Present?	Yes ( )	No (•)
Wetland Hydrology Present?	Yes ( )	No (•)

Is the Sampled Area within a Wetland? Yes ( ) No (•)

Remarks: Data station taken in depression by Salix laevigata

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix laevigata*	70	Yes	FACW
2.			
3.			
4.			
Total Cover:	70 %		
Sapling/Shrub Stratum			
1. *Salix laevigata (sapling)*	1	No	FACW
2. *Baccharis salicifolia*	5	Yes	FAC
3.			
4.			
5.			
Total Cover:	6 %		
Herb Stratum			
1. *Helianthus annuus*	1	No	FACU
2. *Bromus diandrus*	50	Yes	UPL
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	51 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	71	x 2 =	142
FAC species	5	x 3 =	15
FACU species	1	x 4 =	4
UPL species	50	x 5 =	250
Column Totals:	127 (A)		411 (B)

Prevalence Index = B/A = 3.24

Hydrophytic Vegetation Indicators:

- [x] Dominance Test is >50%
- [ ] Prevalence Index is ≤3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (•) No ( )

Remarks:

SOIL

Sampling Point: 30

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	-	-	-	-			-	organic material
4-12	10YR 2/2	100	-	-			loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: None observed. No defined bed and bank.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine City/County: Grapevine/Kern Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp State: CA Sampling Point: 31

Investigator(s): CJF Section, Township, Range: 24, 10N, 19W

Landform (hillslope, terrace, etc.): top of slope Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 34°55'52.5970" Long: 118°54'44.0290" Datum: NAD83

Soil Map Unit Name: Loslobos-Walong association, 5 to 30 percent slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	○	◉
Hydric Soil Present?	○	◉
Wetland Hydrology Present?	○	◉

Is the Sampled Area within a Wetland? Yes ○ No ◉

Remarks: Taken 20' south of #30 outside wetland vegetation.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix laevigata*	5	No	FACW
2.			
3.			
4.			
Total Cover:	5 %		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Helianthus annuus*	20	Yes	FACU
2. *Croton setigerus*	3	No	UPL
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	23 %		
Woody Vine Stratum			
1. *Cucurbita foetidissima*	1	Yes	UPL
2.			
Total Cover:	1 %		

% Bare Ground in Herb Stratum 80 % % Cover of Biotic Crust %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	5	x 2 =	10
FAC species		x 3 =	0
FACU species	20	x 4 =	80
UPL species	4	x 5 =	20
Column Totals:	29 (A)		110 (B)

Prevalence Index = B/A = 3.79

Hydrophytic Vegetation Indicators:

- ☐ Dominance Test is >50%
- ☐ Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: 31

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	10YR 3/2	100	-	-			loamy sand	
4+	-	-	-	-			-	soil too hard

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ○	No ◉	Depth (inches):
Water Table Present?	Yes ○	No ◉	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ○	No ◉	Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: none

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 32

Investigator(s): CJF | Section, Township, Range: 21, 10N, 19W

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34°55'49.6078" | Long: 118°54'47.7139" | Datum: NAD83

Soil Map Unit Name: Loslobos-Walong association, 5 to 30 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Data station taken in depression with herbs growing. Natural or anthropogenic berm cuts off from "downstream".

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		

Sapling/Shrub Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		

Herb Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1. *Xanthium strumarium*	40	Yes	FAC
2. *Helianthus annuus*	25	Yes	FACU
3. *Rumex crispus*	5	No	FAC
4. *Polypogon monspeliensis*	10	No	FACW
5. *Elymus triticoides*	5	No	FAC
6.			
7.			
8.			
Total Cover:	85 %		

Woody Vine Stratum	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % | % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	50.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	10	x 2 =	20
FAC species	50	x 3 =	150
FACU species	25	x 4 =	100
UPL species		x 5 =	0
Column Totals:	85 (A)		270 (B)

Prevalence Index = B/A = 3.18

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 32

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-6	10YR 3/1	100	-	-			loamy sand	
6+	-	-	-	-			-	soil too hard

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Water was observed in this location in May, but the area was not wet in July when this data station was recorded. This area may be periodically inundated due to a seep located approximately 22 feet southwest of the data station.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine City/County: Grapevine/Kern Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp State: CA Sampling Point: 33

Investigator(s): CJF Section, Township, Range: 21, 10N, 19W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 34°55'49.7613" Long: 118°54'47.7497" Datum: NAD83

Soil Map Unit Name: Loslobos-Walong association, 5 to 30 percent slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes (●)	No ( )
Hydric Soil Present?	Yes ( )	No (●)
Wetland Hydrology Present?	Yes ( )	No (●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Data station taken 15' north of #32.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Bromus diandrus*	20	Yes	UPL
2. *Distichlis spicata*	50	Yes	FAC
3. *Lotus sp.*	5	No	
4. *Helianthus annuus*	5	No	FACU
5. *Eleocharis macrostachya*	35	Yes	OBL
6.			
7.			
8.			
Total Cover:	115%		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	35	x 1 =	35
FACW species		x 2 =	0
FAC species	50	x 3 =	150
FACU species	5	x 4 =	20
UPL species	20	x 5 =	100
Column Totals:	110 (A)		305 (B)

Prevalence Index = B/A = 2.77

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes (●) No ( )

Remarks: Area containing hydrophytic vegetation is less than 0.1 acre.

SOIL

Sampling Point: 33

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	10YR 3/2	100	-	-			-	
4+	-	-	-	-			-	soil too hard

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ **No** ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 34

Investigator(s): CJF and RJM | Section, Township, Range: 21, 10N, 19W

Landform (hillslope, terrace, etc.): Canyon | Local relief (concave, convex, none): concave | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34°55'50.5145" | Long: 118°54'16.0705" | Datum: NAD83

Soil Map Unit Name: Geghus-Tecuya association, 30 to 75 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? **Yes** ( ) **No** (●)

Remarks: No signs of flow or surface water.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix laevigata*	40	Yes	FACW
2.			
3.			
4.			
Total Cover:	40 %		
Sapling/Shrub Stratum			
1. *Toxicodendron diversilobum*	5	Yes	UPL
2.			
3.			
4.			
5.			
Total Cover:	5 %		
Herb Stratum			
1. *Bromus diandrus*	40	Yes	UPL
2. *Bromus madritensis*	5	No	UPL
3. *Centaurea melitensis*	1	No	UPL
4. *Rumex crispus*	1	No	FAC
5. *Croton setigerus*	1	No	UPL
6. *Elymus triticoides*	3	No	FAC
7.			
8.			
Total Cover:	51 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	40	x 2 =	80
FAC species	4	x 3 =	12
FACU species		x 4 =	0
UPL species	52	x 5 =	260
Column Totals:	96	(A)	352 (B)

Prevalence Index = B/A = 3.67

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ( ) **No** (●)

Remarks:

SOIL

Sampling Point: 34

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	2.5Y 4/3	100	-	-			loam	
4+	-	-	-	-			-	soil too hard

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: None. No defined bed and bank.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine　City/County: Grapevine/Kern　Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp　State: CA　Sampling Point: 35

Investigator(s): CJF and RJM　Section, Township, Range: 21, 10N, 19W

Landform (hillslope, terrace, etc.): top of slope　Local relief (concave, convex, none): none　Slope (%): 0

Subregion (LRR): C - Mediterranean California　Lat: 34°55'50.6118"　Long: 118°54'15.8253"　Datum: NAD83

Soil Map Unit Name: Geghus-Tecuya association, 30 to 75 percent slopes　NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	○	◉
Hydric Soil Present?	○	◉
Wetland Hydrology Present?	○	◉

Is the Sampled Area within a Wetland? Yes ○ No ◉

Remarks: Data station taken 15' east from #34.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus lobata*	5	Yes	FACU
2.			
3.			
4.			
Total Cover:	5 %		
Sapling/Shrub Stratum			
1. *Toxicodendron diversilobum*	2	Yes	UPL
2. *Peritoma arborea*	2	Yes	UPL
3.			
4.			
5.			
Total Cover:	4 %		
Herb Stratum			
1. *Bromus diandrus*	70	Yes	UPL
2. *Isocoma acradenia*	1	No	FACU
3. *Avena barbata*	5	No	UPL
4.			
5.			
6.			
7.			
8.			
Total Cover:	76 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 10 %　% Cover of Biotic Crust ___ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species	6	x 4 =	24
UPL species	79	x 5 =	395
Column Totals:	85 (A)		419 (B)

Prevalence Index = B/A = 4.93

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: 35

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-1	-	-	-	-			-	organic matter
1-10	2.5Y 4/4	100	-	-			sandy loam	
10+	-	-	-	-			-	soil too hard

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 36

Investigator(s): CJF and RJM | Section, Township, Range: 23, 10N, 19W

Landform (hillslope, terrace, etc.): swale | Local relief (concave, convex, none): none | Slope (%):

Subregion (LRR): C - Mediterranean California | Lat: 34°56'10.9384" | Long: 118°52'15.4973" | Datum: NAD83

Soil Map Unit Name: Klipstein-Guijarral complex, 5 to 15 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Data station taken in swale feature.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Hirschfeldia incana*	35	Yes	UPL
2. *Bromus madritensis*	40	Yes	UPL
3. *Bromus hordeaceus*	10	No	FACU
4.			
5.			
6.			
7.			
8.			
Total Cover:	85 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ___ % % Cover of Biotic Crust ___ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	0	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	0.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species		x 3 =	0
FACU species	10	x 4 =	40
UPL species	75	x 5 =	375
Column Totals:	85	(A)	415 (B)

Prevalence Index = B/A = 4.88

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 36

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-6	10YR 2/2	20	-	-			clay	
0-6	10YR 4/3	80	7.5YR 5/8	1	C	M	loamy sand	
6+	-	-	-	-			-	soil too hard

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: A few redox features found, but less than 1% of matrix. Clay soils mottled in soil.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No OHWM features.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 37

Investigator(s): CJF and RJM | Section, Township, Range: 24, 10N, 19W

Landform (hillslope, terrace, etc.): channel | Local relief (concave, convex, none): none | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 34°56'00.5458" | Long: 118°51'27.9984" | Datum: NAD83

Soil Map Unit Name: Bitcreek-Dibble-Eaglerest complex, 15 to 50 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ◉ No ○ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○
Hydric Soil Present?	Yes ◉	No ○
Wetland Hydrology Present?	Yes ◉	No ○

Is the Sampled Area within a Wetland? Yes ◉ No ○

Remarks: Data station in standing water, associated with Cattle Creek.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1. *Salix exigua*	15	Yes	FACW
2.			
3.			
4.			
5.			
Total Cover:	15 %		
Herb Stratum			
1. *Polypogon monspeliensis*	35	Yes	FACW
2. *Distichlis spicata*	35	Yes	FAC
3. *Helianthus annuus*	3	No	FACU
4. *Rumex crispus*	2	No	FAC
5. *Eleocharis macrostachya*	10	No	OBL
6.			
7.			
8.			
Total Cover:	85 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % | % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	50	x 2 =	100
FAC species	37	x 3 =	111
FACU species	3	x 4 =	12
UPL species		x 5 =	0
Column Totals:	100 (A)		233 (B)

Prevalence Index = B/A = 2.33

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: 37

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture[3]	Remarks
0-12	7.5YR 3/1	81	7.5YR 5/8	4	C	PL	-	
0-12	10YR 2/1	15	-	-			-	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- [ ] Histosol (A1)
- [ ] Histic Epipedon (A2)
- [ ] Black Histic (A3)
- [ ] Hydrogen Sulfide (A4)
- [ ] Stratified Layers (A5) (**LRR C**)
- [ ] 1 cm Muck (A9) (**LRR D**)
- [ ] Depleted Below Dark Surface (A11)
- [ ] Thick Dark Surface (A12)
- [ ] Sandy Mucky Mineral (S1)
- [ ] Sandy Gleyed Matrix (S4)
- [ ] Sandy Redox (S5)
- [ ] Stripped Matrix (S6)
- [ ] Loamy Mucky Mineral (F1)
- [ ] Loamy Gleyed Matrix (F2)
- [x] Depleted Matrix (F3)
- [ ] Redox Dark Surface (F6)
- [ ] Depleted Dark Surface (F7)
- [ ] Redox Depressions (F8)
- [ ] Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- [ ] 1 cm Muck (A9) (**LRR C**)
- [ ] 2 cm Muck (A10) (**LRR B**)
- [ ] Reduced Vertic (F18)
- [ ] Red Parent Material (TF2)
- [ ] Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):
Type:
Depth (inches):

Hydric Soil Present? Yes (●) No ( )

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- [x] Surface Water (A1)
- [ ] High Water Table (A2)
- [x] Saturation (A3)
- [ ] Water Marks (B1) (**Nonriverine**)
- [ ] Sediment Deposits (B2) (**Nonriverine**)
- [ ] Drift Deposits (B3) (**Nonriverine**)
- [ ] Surface Soil Cracks (B6)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Salt Crust (B11)
- [ ] Biotic Crust (B12)
- [ ] Aquatic Invertebrates (B13)
- [ ] Hydrogen Sulfide Odor (C1)
- [x] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Plowed Soils (C6)
- [ ] Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- [ ] Water Marks (B1) (**Riverine**)
- [ ] Sediment Deposits (B2) (**Riverine**)
- [ ] Drift Deposits (B3) (**Riverine**)
- [ ] Drainage Patterns (B10)
- [ ] Dry-Season Water Table (C2)
- [ ] Thin Muck Surface (C7)
- [ ] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes (●)	No ( )	Depth (inches): 0.5
Water Table Present?	Yes (●)	No ( )	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes (●)	No ( )	Depth (inches):

Wetland Hydrology Present? **Yes** (●) **No** ( )

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Data station located within Cattle Creek.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Grapevine | City/County: Grapevine/Kern | Sampling Date: 07/18/13

Applicant/Owner: Tejon Ranchcorp | State: CA | Sampling Point: 38

Investigator(s): CJF and RJM | Section, Township, Range: 24, 10N, 19W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): none | Slope (%): 5

Subregion (LRR): C - Mediterranean California | Lat: 34°56'00.6063" | Long: 118°51'28.0977" | Datum: NAD83

Soil Map Unit Name: Bitcreek-Dibble-Eaglerest complex, 15 to 50 percent slopes | NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes (●) No ( ) (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes (●) No ( )

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	( )	(●)
Hydric Soil Present?	( )	(●)
Wetland Hydrology Present?	( )	(●)

Is the Sampled Area within a Wetland? Yes ( ) No (●)

Remarks: Data station upland 25' west of #37.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Distichlis spicata*	20	Yes	FAC
2. *Hirschfeldia incana*	20	Yes	UPL
3. *Bromus hordeaceus*	10	No	FACU
4. *Centaurea melitensis*	2	No	UPL
5.			
6.			
7.			
8.			
Total Cover:	52 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum ____ % | % Cover of Biotic Crust ____ %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	50.0 %	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species		x 2 =	0
FAC species	20	x 3 =	60
FACU species	10	x 4 =	40
UPL species	22	x 5 =	110
Column Totals:	52 (A)		210 (B)

Prevalence Index = B/A = 4.04

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is 3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ( ) No (●)

Remarks:

SOIL

Sampling Point: 38

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture[3]	Remarks
0-4	10YR 3/2	100	-	-			sandy loam	
4+	-	-	-	-			-	soil too hard

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.
[3]Soil Textures: Clay, Silty Clay, Sandy Clay, Loam, Sandy Clay Loam, Sandy Loam, Clay Loam, Silty Clay Loam, Silt Loam, Silt, Loamy Sand, Sand.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[4]:

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[4]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** ○ **No** ◉

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Thin Muck Surface (C7)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ **No** ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: None.

APPENDIX C

Grapevine Jurisdictional Delineation Photos

Data Station Photos

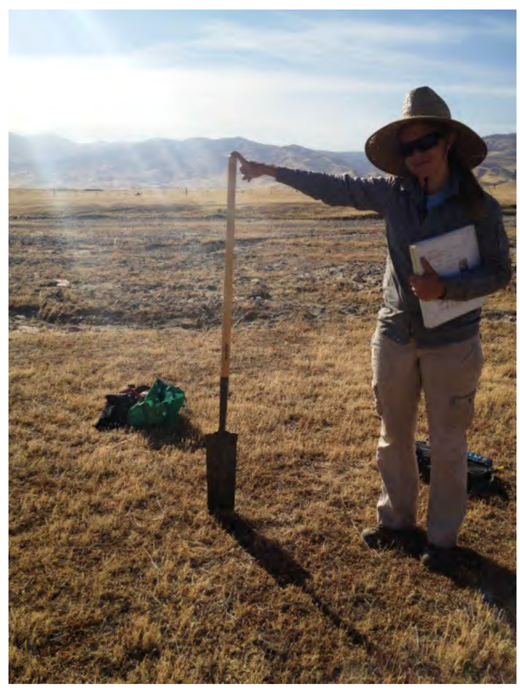
APPENDIX C
Grapevine Jurisdictional Delineation Photos

DATA STATION PHOTOS

	
Data Station 1	Data Station 2
	
Data Stations 3 and 4	Data Station 5

	
Data Station 6	Data Station 7
	
Data Station 8	Data Station 9

	
Data Station 10	Data Station 11
	
Data Station 12	Data Station 13

	
Data Station 14	Data Station 15
	
Data Station 16	Data Station 17

Data Station 18

Data Station 19

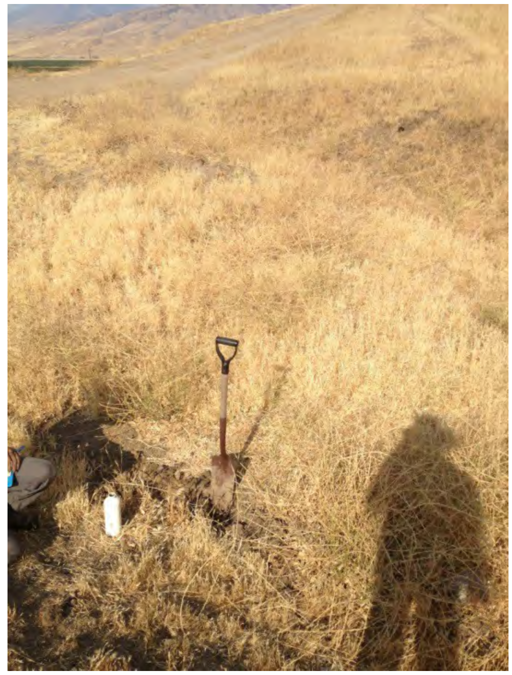
Data Station 20

Data Station 21

	
Data Station 22	Data Station 23
	
Data Stations 24 and 25	Data Station 26

	
Data Station 27	Data Station 28
	
Data Station 29	Data Station 30

	
Data Station 31	Data Station 32
	
Data Station 33	Data Station 34

	
Data Station 35	Data Station 36
	
Data Station 37	Data Station 38

Overview Photos

OVERVIEW PHOTOS

	
Grapevine Creek	Tributary to Grapevine Creek
	
Tributary to Pastoria Creek	Cattle Creek

	
Live Oak Creek	Pastoria Creek
	
Tributary to Cattle Creek	Pond

ATTACHMENT B

Approved Jurisdictional Delineation Forms

Approved Jurisdictional Determination Form: Cattle Creek

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° **N**, Long. 118°53'21" ° **W**.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: Pastoria Creek

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that cross through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **square miles**
Drainage area: **acres**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:

Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

---

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
 ☐ Federally Listed species. Explain findings: .
 ☐ Fish/spawn areas. Explain findings: .
 ☐ Other environmentally-sensitive species. Explain findings: .
 ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
 ☐ Discrete wetland hydrologic connection. Explain: .
 ☐ Ecological connection. Explain: .
 ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
 ☐ Federally Listed species. Explain findings: .
 ☐ Fish/spawn areas. Explain findings: .
 ☐ Other environmentally-sensitive species. Explain findings: .
 ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):

- ☐ Tributary waters: linear feet width (ft).
- ☐ Other non-wetland waters: acres.

Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.

☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):

- ☐ Tributary waters: linear feet width (ft).
- ☐ Other non-wetland waters: acres.

Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.

☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.

☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

- ☐ Demonstrate that impoundment was created from "waters of the U.S.," or
- ☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
- ☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

- ☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
- ☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
- ☐ which are or could be used for industrial purposes by industries in interstate commerce.
- ☐ Interstate isolated waters. Explain: .
- ☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

---

[8]See Footnote # 3.

[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☒ Non-wetland waters (i.e., rivers, streams): **10,818** linear feet, **2-10** width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☒ Wetlands: 0.4 acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☒ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).
or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.
☐ Applicable/supporting case law: .
☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: Cattle Creek and Associated Tributaries

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° N, Long. 118°53'21" ° W.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: Cattle Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. Waters of the U.S.

a. Indicate presence of waters of U.S. in review area (check all that apply): [1]

☐ TNWs, including territorial seas
☐ Wetlands adjacent to TNWs
☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
☐ Non-RPWs that flow directly or indirectly into TNWs
☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
☐ Impoundments of jurisdictional waters
☐ Isolated (interstate or intrastate) waters, including isolated wetlands

b. Identify (estimate) size of waters of the U.S. in the review area:
Non-wetland waters: linear feet: width (ft) and/or acres.
Wetlands: 0 acres.

c. Limits (boundaries) of jurisdiction based on: **Not Applicable.**
Elevation of established OHWM (if known): .

2. Non-regulated waters/wetlands (check if applicable):[3]

☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that cross through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **square miles**
Drainage area: **acres**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):

☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

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[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
  ☐ Discrete wetland hydrologic connection. Explain: .
  ☐ Ecological connection. Explain: .
  ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

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[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: .

☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.

☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.

☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).

☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .

☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).

☐ Lakes/ponds: acres.

☐ Other non-wetland waters: acres. List type of aquatic resource: .

☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

☒ Non-wetland waters (i.e., rivers, streams): **20,470** linear feet, **2-10** width (ft).

☐ Lakes/ponds: acres.

☐ Other non-wetland waters: acres. List type of aquatic resource: .

☒ Wetlands: 5.2 acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .

☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.

☐ Office concurs with data sheets/delineation report.

☐ Office does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps: .

☐ Corps navigable waters' study: .

☒ U.S. Geological Survey Hydrologic Atlas: .

☒ USGS NHD data.

☒ USGS 8 and 12 digit HUC maps.

☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.

☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.

☐ National wetlands inventory map(s). Cite name: .

☐ State/Local wetland inventory map(s): .

☐ FEMA/FIRM maps: .

☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)

☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).

or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).

☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.

☐ Applicable/supporting case law: .

☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).

☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: Grapevine Creek

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° **N**, Long. 118°53'21" ° **W**.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: N/A

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

- ☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
- ☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

- ☐ Office (Desk) Determination. Date:
- ☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

- ☐ Waters subject to the ebb and flow of the tide.
- ☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**

   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]

   - ☐ TNWs, including territorial seas
   - ☐ Wetlands adjacent to TNWs
   - ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
   - ☐ Non-RPWs that flow directly or indirectly into TNWs
   - ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   - ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
   - ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   - ☐ Impoundments of jurisdictional waters
   - ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: linear feet: width (ft) and/or acres.
   Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
   Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]

   - ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that cross through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. **TNW**
   Identify TNW: .

   Summarize rationale supporting determination: .

2. **Wetland adjacent to TNW**
   Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. **Characteristics of non-TNWs that flow directly or indirectly into TNW**

   (i) General Area Conditions:
   Watershed size: **square miles**
   Drainage area: **acres**
   Average annual rainfall: inches
   Average annual snowfall: inches

   (ii) Physical Characteristics:
   (a) Relationship with TNW:
   ☐ Tributary flows directly into TNW.
   ☐ Tributary flows through **Pick List** tributaries before entering TNW.

   Project waters are **Pick List** river miles from TNW.
   Project waters are **Pick List** river miles from RPW.
   Project waters are **Pick List** aerial (straight) miles from TNW.
   Project waters are **Pick List** aerial (straight) miles from RPW.
   Project waters cross or serve as state boundaries. Explain: .

   Identify flow route to TNW[5]: .
   Tributary stream order, if known: .

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[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

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[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
☐ Federally Listed species. Explain findings: .
☐ Fish/spawn areas. Explain findings: .
☐ Other environmentally-sensitive species. Explain findings: .
☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
☐ Discrete wetland hydrologic connection. Explain: .
☐ Ecological connection. Explain: .
☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
☐ Federally Listed species. Explain findings: .
☐ Fish/spawn areas. Explain findings: .
☐ Other environmentally-sensitive species. Explain findings: .
☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

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[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):
- ☐ Tributary waters: linear feet width (ft).
- ☐ Other non-wetland waters: acres.
  - Identify type(s) of waters: .
- ☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
- ☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
- ☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
  - ☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
- ☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
- ☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
- ☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
- ☐ Lakes/ponds: acres.
- ☐ Other non-wetland waters: acres. List type of aquatic resource: .
- ☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
- ☒ Non-wetland waters (i.e., rivers, streams): **18,794** linear feet, **40-550** width (ft).
- ☐ Lakes/ponds: acres.
- ☐ Other non-wetland waters: acres. List type of aquatic resource: .
- ☒ Wetlands: 8.0 acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
- ☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
- ☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - ☐ Office concurs with data sheets/delineation report.
  - ☐ Office does not concur with data sheets/delineation report.
- ☐ Data sheets prepared by the Corps: .
- ☐ Corps navigable waters' study: .
- ☒ U.S. Geological Survey Hydrologic Atlas: .
  - ☒ USGS NHD data.
  - ☒ USGS 8 and 12 digit HUC maps.
- ☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.
- ☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.
- ☐ National wetlands inventory map(s). Cite name: .
- ☐ State/Local wetland inventory map(s): .
- ☐ FEMA/FIRM maps: .
- ☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
- ☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).
  or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
- ☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.
- ☐ Applicable/supporting case law: .
- ☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
- ☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: Grapevine Creek and Associated Tributaries

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° **N**, Long. 118°53'21" ° **W**.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: Grapevine Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that cross through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **square miles**
Drainage area: **acres**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

---

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:

Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

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[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☒ Non-wetland waters (i.e., rivers, streams): **36,270** linear feet, **42-24** width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☒ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).
or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.
☐ Applicable/supporting case law: .
☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: GV Detention Basin

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° **N**, Long. 118°53'21" ° **W**.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: N/A
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that crosses through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. **TNW**
   Identify TNW: .

   Summarize rationale supporting determination: .

2. **Wetland adjacent to TNW**
   Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. **Characteristics of non-TNWs that flow directly or indirectly into TNW**

   (i) General Area Conditions:
   Watershed size: **square miles**
   Drainage area: **acres**
   Average annual rainfall: inches
   Average annual snowfall: inches

   (ii) Physical Characteristics:
   (a) Relationship with TNW:
   ☐ Tributary flows directly into TNW.
   ☐ Tributary flows through **Pick List** tributaries before entering TNW.

   Project waters are **Pick List** river miles from TNW.
   Project waters are **Pick List** river miles from RPW.
   Project waters are **Pick List** aerial (straight) miles from TNW.
   Project waters are **Pick List** aerial (straight) miles from RPW.
   Project waters cross or serve as state boundaries. Explain: .

   Identify flow route to TNW[5]: .
   Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

- ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

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[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☒ Lakes/ponds: 1.0 acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☒ Wetlands: 0.2 acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☒ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).
or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.
☐ Applicable/supporting case law: .
☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: Isolated Drainage A

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° N, Long. 118°53'21" ° W.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: N/A
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that cross through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. **TNW**
   Identify TNW: .

   Summarize rationale supporting determination: .

2. **Wetland adjacent to TNW**
   Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. **Characteristics of non-TNWs that flow directly or indirectly into TNW**

   (i) General Area Conditions:
   Watershed size: **square miles**
   Drainage area: **acres**
   Average annual rainfall: inches
   Average annual snowfall: inches

   (ii) Physical Characteristics:
   (a) Relationship with TNW:
   ☐ Tributary flows directly into TNW.
   ☐ Tributary flows through **Pick List** tributaries before entering TNW.

   Project waters are **Pick List** river miles from TNW.
   Project waters are **Pick List** river miles from RPW.
   Project waters are **Pick List** aerial (straight) miles from TNW.
   Project waters are **Pick List** aerial (straight) miles from RPW.
   Project waters cross or serve as state boundaries. Explain: .

   Identify flow route to TNW[5]: .
   Tributary stream order, if known: .

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[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**:** **Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
☐ Discrete wetland hydrologic connection. Explain: .
☐ Ecological connection. Explain: .
☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
- ☐ Tributary waters: linear feet width (ft).
- ☐ Other non-wetland waters: acres.
  Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
- ☐ Tributary waters: linear feet width (ft).
- ☐ Other non-wetland waters: acres.
  Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
- ☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

- ☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
- ☐ Demonstrate that impoundment was created from "waters of the U.S.," or
- ☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
- ☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
- ☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
- ☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
- ☐ which are or could be used for industrial purposes by industries in interstate commerce.
- ☐ Interstate isolated waters. Explain: .
- ☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

---

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☒ Non-wetland waters (i.e., rivers, streams): **1,543** linear feet, **2-6** width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☒ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).
or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.
☐ Applicable/supporting case law: .
☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: Isolated Drainage B

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° **N**, Long. 118°53'21" ° **W**.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: N/A
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply): [1]**
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):[3]**
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that cross through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **square miles**
Drainage area: **acres**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

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[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):
☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6] A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7] Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately (   ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
- ☐ Tributary waters: linear feet width (ft).
- ☐ Other non-wetland waters: acres.
  Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.

☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
- ☐ Tributary waters: linear feet width (ft).
- ☐ Other non-wetland waters: acres.
  Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.

☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.

☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
- ☐ Demonstrate that impoundment was created from "waters of the U.S.," or
- ☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
- ☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
- ☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
- ☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
- ☐ which are or could be used for industrial purposes by industries in interstate commerce.
- ☐ Interstate isolated waters. Explain: .
- ☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

---

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☒ Non-wetland waters (i.e., rivers, streams): **946** linear feet, **2-4** width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☒ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).
or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.
☐ Applicable/supporting case law: .
☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: Isolated Drainage C

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° **N**, Long. 118°53'21" ° **W**.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: N/A
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that cross through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **square miles**
Drainage area: **acres**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):
☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

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[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
  ☐ Discrete wetland hydrologic connection. Explain: .
  ☐ Ecological connection. Explain: .
  ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☒ Non-wetland waters (i.e., rivers, streams): **791** linear feet, **2** width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☒ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).
or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.
☐ Applicable/supporting case law: .
☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: Isolated Drainage D

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° **N**, Long. 118°53'21" ° **W**.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: N/A
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**

   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]

   ☐ TNWs, including territorial seas
   ☐ Wetlands adjacent to TNWs
   ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
   ☐ Non-RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   ☐ Impoundments of jurisdictional waters
   ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: linear feet: width (ft) and/or acres.
   Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
   Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]

   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that cross through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **square miles**
Drainage area: **acres**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is:
- ☐ Natural
- ☐ Artificial (man-made). Explain: .
- ☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):

Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

- ☐ Silts
- ☐ Sands
- ☐ Concrete
- ☐ Cobbles
- ☐ Gravel
- ☐ Muck
- ☐ Bedrock
- ☐ Vegetation. Type/% cover:
- ☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:

Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**

Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.

Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).

- ☐ Dye (or other) test performed: No.

Tributary has (check all that apply):

- ☐ Bed and banks
- ☐ OHWM[6] (check all indicators that apply):
  - ☐ clear, natural line impressed on the bank
  - ☐ changes in the character of soil
  - ☐ shelving
  - ☐ vegetation matted down, bent, or absent
  - ☐ leaf litter disturbed or washed away
  - ☐ sediment deposition
  - ☐ water staining
  - ☐ other (list):
  - ☐ the presence of litter and debris
  - ☐ destruction of terrestrial vegetation
  - ☐ the presence of wrack line
  - ☐ sediment sorting
  - ☐ scour
  - ☐ multiple observed or predicted flow events
  - ☐ abrupt change in plant community
- ☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

- ☐ High Tide Line indicated by:
  - ☐ oil or scum line along shore objects
  - ☐ fine shell or debris deposits (foreshore)
  - ☐ physical markings/characteristics
  - ☐ tidal gauges
  - ☐ other (list):
- ☐ Mean High Water Mark indicated by:
  - ☐ survey to available datum;
  - ☐ physical markings;
  - ☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

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[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

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[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☒ Non-wetland waters (i.e., rivers, streams): **735** linear feet, **4** width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☒ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).
or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.
☐ Applicable/supporting case law: .
☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: Isolated Drainage E

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

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SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° **N**, Long. 118°53'21" ° **W**.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: N/A
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      - ☐ TNWs, including territorial seas
      - ☐ Wetlands adjacent to TNWs
      - ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      - ☐ Non-RPWs that flow directly or indirectly into TNWs
      - ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      - ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      - ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      - ☐ Impoundments of jurisdictional waters
      - ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that crosses through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **square miles**
Drainage area: **acres**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

---

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
  Wetland size: acres
  Wetland type. Explain: .
  Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
  Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
  ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
  ☐ Discrete wetland hydrologic connection. Explain: .
  ☐ Ecological connection. Explain: .
  ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately (   ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

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[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: **.**

☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.

☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.

☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).

☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**

☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).

☐ Lakes/ponds: acres.

☐ Other non-wetland waters: acres. List type of aquatic resource: .

☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

☒ Non-wetland waters (i.e., rivers, streams): **2,474** linear feet, **2-4** width (ft).

☐ Lakes/ponds: acres.

☐ Other non-wetland waters: acres. List type of aquatic resource: .

☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .

☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.

☐ Office concurs with data sheets/delineation report.

☐ Office does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps: .

☐ Corps navigable waters' study: .

☒ U.S. Geological Survey Hydrologic Atlas: .

☒ USGS NHD data.

☒ USGS 8 and 12 digit HUC maps.

☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.

☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.

☐ National wetlands inventory map(s). Cite name: .

☐ State/Local wetland inventory map(s): .

☐ FEMA/FIRM maps: .

☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)

☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).

or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).

☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.

☐ Applicable/supporting case law: .

☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).

☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: Live Oak Creek

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° **N**, Long. 118°53'21" ° **W**.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: Tributaries to Cattle Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that cross through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **square miles**
Drainage area: **acres**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

---

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):
☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

---

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
  Wetland size: acres
  Wetland type. Explain: .
  Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
  Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
  ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
  ☐ Discrete wetland hydrologic connection. Explain: .
  ☐ Ecological connection. Explain: .
  ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

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[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
   Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
   ☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

☒ Non-wetland waters (i.e., rivers, streams): **4,935** linear feet, **2** width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☒ Wetlands: 1.9 acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
   ☐ Office concurs with data sheets/delineation report.
   ☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
   ☒ USGS NHD data.
   ☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).
   or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.
☐ Applicable/supporting case law: .
☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: Pastoria Creek

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° **N**, Long. 118°53'21" ° **W**.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: Unnamed Drainage
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that cross through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **square miles**
Drainage area: **acres**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

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[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):

☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

---

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
- ☐ Federally Listed species. Explain findings: .
- ☐ Fish/spawn areas. Explain findings: .
- ☐ Other environmentally-sensitive species. Explain findings: .
- ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
- ☐ Discrete wetland hydrologic connection. Explain: .
- ☐ Ecological connection. Explain: .
- ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
- ☐ Federally Listed species. Explain findings: .
- ☐ Fish/spawn areas. Explain findings: .
- ☐ Other environmentally-sensitive species. Explain findings: .
- ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☐ Tributaries of TNW where tributaries have continuous flow “seasonally” (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

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[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

☒ Non-wetland waters (i.e., rivers, streams): **21,558** linear feet, **2-350** width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☒ Wetlands: 2 acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☒ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).
or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.
☐ Applicable/supporting case law: .
☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

Approved Jurisdictional Determination Form: Unnamed Drainage

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 08/16/13

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: Sacramento District

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: California County/parish/borough: Kern City: Unincorporated County
Center coordinates of site (lat/long in degree decimal format): Lat. 34°57'24" ° **N**, Long. 118°53'21" ° **W**.
Universal Transverse Mercator: UTM Easting (meters) 327509 and UTM Northing (meters) 3869867 in Zone 11.
Name of nearest waterbody: Tejon Reservoir No. 1
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Not Applicable
Name of watershed or Hydrologic Unit Code (HUC): South Valley Floor hydrologic unit (Hydrologic Unit Code (HUC) 557.30); Tejon Creek (HUC 556.20); and San Emigdio (HUC 556.3).

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are no** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**

   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]

   ☐ TNWs, including territorial seas
   ☐ Wetlands adjacent to TNWs
   ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
   ☐ Non-RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   ☐ Impoundments of jurisdictional waters
   ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: linear feet: width (ft) and/or acres.
   Wetlands: 0 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **Not Applicable.**
   Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]

   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: **The drainages that cross through or are located in the study area do not have a significant nexus (no direct or indirect connectivity) to a TNW**.

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **square miles**
Drainage area: **acres**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is:
- ☐ Natural
- ☐ Artificial (man-made). Explain: .
- ☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):

Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts	☐ Sands	☐ Concrete
☐ Cobbles	☐ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:

Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: Flow during and for a brief period after rain events typical of ephemeral channels in the region.
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: No evidence of subsurface flow (emergent wetland vegetation, etc.).
☐ Dye (or other) test performed: No.

Tributary has (check all that apply):
- ☐ Bed and banks
- ☐ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank	☐ the presence of litter and debris
☐ changes in the character of soil	☐ destruction of terrestrial vegetation
☐ shelving	☐ the presence of wrack line
☐ vegetation matted down, bent, or absent	☐ sediment sorting
☐ leaf litter disturbed or washed away	☐ scour
☐ sediment deposition	☐ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

- ☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

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[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .

☐ Wetland fringe. Characteristics: .

☐ Habitat for:

- ☐ Federally Listed species. Explain findings: .
- ☐ Fish/spawn areas. Explain findings: .
- ☐ Other environmentally-sensitive species. Explain findings: .
- ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

☐ Directly abutting

☐ Not directly abutting

- ☐ Discrete wetland hydrologic connection. Explain: .
- ☐ Ecological connection. Explain: .
- ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .

☐ Vegetation type/percent cover. Explain: .

☐ Habitat for:

- ☐ Federally Listed species. Explain findings: .
- ☐ Fish/spawn areas. Explain findings: .
- ☐ Other environmentally-sensitive species. Explain findings: .
- ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

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[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Provide estimates for jurisdictional waters in the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: **.**

☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.

☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.

☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).

☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**

☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):

☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).

☐ Lakes/ponds: acres.

☐ Other non-wetland waters: acres. List type of aquatic resource: .

☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):

☒ Non-wetland waters (i.e., rivers, streams): **555** linear feet, **4** width (ft).

☐ Lakes/ponds: acres.

☐ Other non-wetland waters: acres. List type of aquatic resource: .

☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .

☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.

☐ Office concurs with data sheets/delineation report.

☐ Office does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps: .

☐ Corps navigable waters' study: .

☒ U.S. Geological Survey Hydrologic Atlas: .

☒ USGS NHD data.

☒ USGS 8 and 12 digit HUC maps.

☒ U.S. Geological Survey map(s). Cite scale & quad name:7.5-minute Frazier Park quadrangle.

☒ USDA Natural Resources Conservation Service Soil Survey. Citation: USGS 2007; USGS 2009.

☐ National wetlands inventory map(s). Cite name: .

☐ State/Local wetland inventory map(s): .

☐ FEMA/FIRM maps: .

☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)

☒ Photographs: ☒ Aerial (Name & Date): Kern Council of Governments (2010); USDA (2012b); AirPhoto USA (2006); Bing (2013); Google Earth (2013); and Historic Aerials Online (2013).

or ☒ Other (Name & Date): Attachment C of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).

☒ Previous determination(s). File no. and date of response letter:File No. SPL-2006-02020-AOA; October 2, 2008.

☐ Applicable/supporting case law: .

☒ Applicable/supporting scientific literature: See Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013).

☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: A jurisdictional determination for the Tejon Mountain Village project, located approximately 1 mile to the south of the Grapevine study area, was made in 2008 by the ACOE (ACOE 2008a). The ACOE determined that

Grapevine and Pastoria Creeks were isolated, non-jurisdictional streams (ACOE 2008a, 2008b; Appendices A-1 and A-2 of Jurisdictional Delineation Report for the Grapevine Project (Dudek 2013)). Therefore, the portions of Grapevine Creek within the Grapevine study area are not considered waters of the United States. Additionally, the on-site tributaries to Grapevine Creek are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Similarly, the portions of Pastoria Creek within the Grapevine study area as well as Cattle and Live Oak Creeks, tributaries to Pastoria Creek, are not considered waters of the United States. Finally, the on-site tributaries to Cattle, Live Oak, and Pastoria Creeks are not considered waters of the United States because they are tributaries to and flow into a non-jurisdictional stream. Water from the 850 Canal is only distributed to the adjacent agricultural fields. No water from the 850 Canal comes close to any navigable water, tributary of a navigable water, aqueduct, or any jurisdictional water body (Impact Sciences 2008). Additionally, there are a few isolated, unnamed drainages within the study area that do not flow into navigable waters of the U.S.

APPENDIX D

GROUNDWATER MONITORING DATA SUMMARY

Table D-1
TRC 200 (TA Well) - 11/5/2007

Parameter	Units	Value	MCL
Standing Water	ft	880	N/A
Yield	gpm/ft drawdown	10	N/A
Total Recoverable Calcium	mg/L	160	N/A
Total Recoverable Magnesium	mg/L	59	N/A
Total Recoverable Sodium	mg/L	210	N/A
Total Recoverable Potassium	mg/L	12	N/A
Bicarbonate	mg/L	110	N/A
Carbonate	mg/L	ND	N/A
Hydroxide	mg/L	ND	N/A
Alkalinity as CaCO3	mg/L	93	N/A
Chloride	mg/L	47	250/500 (secondary MCLs)[a]
Fluoride	mg/L	0.87	2
Nitrate as NO3	mg/L	13	45
Sulfate	mg/L	780	250/500 (secondary MCLs)[a]
Total Cations	meq/L	22	N/A
Total Anions	meq/L	20	N/A
Hardness as CaCO3	mg/L	650	N/A
pH	pH Units	7.94	N/A
Electrical Conductivity @ 25 C	umhos/cm	1670	900/1600 (secondary MCLs)[a]
Total Dissolved Solids @ 180 C	mg/L	1400	500/1000 (secondary MCL)[a]
Color	Color Units	10	15 (secondary MCL)
Odor	TON	No Observed Odor	3 (secondary MCL)
Turbidity	NTU	0.16	5 (secondary MCL)
MBAS	mg/L	ND	0.5 (secondary MCL)
Nitrite as N	ug/L	14	1000
Total Recoverable Aluminum	ug/L	ND	1000/200 (primary/secondary MCLs)
Total Recoverable Antimony	ug/L	ND	6
Total Recoverable Arsenic	ug/L	1.1	10
Total Recoverable Barium	ug/L	25	1000
Total Recoverable Beryllium	ug/L	ND	4
Total Recoverable Cadmium	ug/L	ND	5
Total Recoverable Chromium	ug/L	ND	50
Total Recoverable Copper	ug/L	2.5	1000 (secondary MCL)
Total Recoverable Iron	ug/L	ND	300 (secondary MCL)
Total Recoverable Lead	ug/L	0.087	15[b]
Total Recoverable Manganese	ug/L	ND	50 (secondary MCL)
Total Recoverable Mercury	ug/L	0.092	2

Parameter	Units	Value	MCL
Total Recoverable Nickel	ug/L	ND	100
Total Recoverable Selenium	ug/L	ND	50
Total Recoverable Silver	ug/L	ND	100 (secondary MCL)
Total Recoverable Thallium	ug/L	ND	2
Total Recoverable Zinc	ug/L	12	5000 (secondary MCL)

[a] Secondary MCLs for Total Dissolved Solids, Electrical Conductance, Chloride, and Sulfate are ranges rather than single limits. The MCLs listed in this table are the 'Recommended'/'Upper' Secondary MCLs. The California Code of Regulations states that concentrations lower than the Recommended limit "are desirable for a higher degree of consumer acceptance" while those lower than the Upper limit are "acceptable if it is neither reasonable nor feasible to provide more suitable waters."
[b] The numeric limit for lead is a requirement of the Tulare Lake Basin Plan, not MCL tables.

Table D-2
TRC 201 (Rose Well) - 1/31/2012

Parameter	Units	Value	MCL
Chloride	mg/L	31	250/500 (secondary MCLs)[a]
Fluoride	mg/L	0.46	2
Nitrate as NO3	mg/L	1.9	45
Sulfate	mg/L	290	250/500 (secondary MCLs)[a]
Turbidity	NTU	1.3	5 (secondary MCL)
Nitrite as N	ug/L	ND	1000
Perchlorate	ug/L	ND	6
Total Recoverable Aluminum	ug/L	ND	1000/200 (primary/secondary MCLs)
Total Recoverable Antimony	ug/L	ND	6
Total Recoverable Arsenic	ug/L	ND	10
Total Recoverable Barium	ug/L	23	1000
Total Recoverable Beryllium	ug/L	ND	4
Total Recoverable Cadmium	ug/L	ND	5
Total Recoverable Chromium	ug/L	ND	50
Total Recoverable Copper	ug/L	ND	1000 (secondary MCL)
Total Recoverable Iron	ug/L	260	300 (secondary MCL)
Total Recoverable Lead	ug/L	ND	15[b]
Total Recoverable Manganese	ug/L	15	50 (secondary MCL)
Total Recoverable Nickel	ug/L	ND	100
Total Recoverable Selenium	ug/L	ND	50
Total Recoverable Silver	ug/L	ND	100 (secondary MCL)
Total Recoverable Thallium	ug/L	ND	2
Total Recoverable Zinc	ug/L	ND	5000 (secondary MCL)
1,2-Dibromo-3-chloropropane	ug/L	ND	0.2
Ethylene dibromide	ug/L	ND	0.05
Benzene	ug/L	ND	1
Bromobenzene	ug/L	ND	N/A
Bromochloromethane	ug/L	ND	N/A
Bromodichloromethane	ug/L	ND	N/A
Bromoform	ug/L	ND	N/A
Bromomethane	ug/L	ND	N/A
n-Butylbenzene	ug/L	ND	N/A
sec-Butylbenzene	ug/L	ND	N/A
tert-Butylbenzene	ug/L	ND	N/A
Carbon tetrachloride	ug/L	ND	0.5
Chlorobenzene	ug/L	ND	70

Parameter	Units	Value	MCL
Chloroethane	ug/L	ND	N/A
Chloroform	ug/L	ND	N/A
Chloromethane	ug/L	ND	N/A
2-Chlorotoluene	ug/L	ND	N/A
4-Chlorotoluene	ug/L	ND	N/A
Dibromochloromethane	ug/L	ND	N/A
1,2-Dibromoethane	ug/L	ND	N/A
Dibromomethane	ug/L	ND	N/A
1,2-Dichlorobenzene	ug/L	ND	600
1,3-Dichlorobenzene	ug/L	ND	N/A
1,4-Dichlorobenzene	ug/L	ND	5
Dichlorodifluromethane	ug/L	ND	N/A
1,1-Dichloroethane	ug/L	ND	5
1,2-Dichloroethane	ug/L	ND	0.5
1,1-Dichloroethene	ug/L	ND	6
cis-1,2-Dichloroethene	ug/L	ND	6
trans-1,2-Dichloroethene	ug/L	ND	10
1,2-Dichloropropane	ug/L	ND	5
1,3-Dichloropropane	ug/L	ND	N/A
2,2-Dichloropropane	ug/L	ND	N/A
1,1-Dichloropropane	ug/L	ND	N/A
cis-1,3-Dichloropropane	ug/L	ND	N/A
trans-1,3-Dichloropropane	ug/L	ND	N/A
Total-1,3-Dichloropropane	ug/L	ND	N/A
Ethylbenzene	ug/L	ND	300
Hexachlorobutadiene	ug/L	ND	N/A
Isopropylbenzene	ug/L	ND	N/A
p-Isopropyltoluene	ug/L	ND	N/A
Methylene chloride	ug/L	ND	5
Methyl t-butyl ether	ug/L	ND	13
Naphthalene	ug/L	ND	N/A
n-Propylbenzene	ug/L	ND	N/A
Styrene	ug/L	ND	100
1,1,1,2-Tetrachloroethane	ug/L	ND	N/A
1,1,2,2-Tetrachloroethane	ug/L	ND	1
Trichloroethene	ug/L	ND	5
Tichlorofluoromethane	ug/L	ND	150
1,2,3-Trichloropropane	ug/L	ND	N/A
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/L	ND	1200

Parameter	Units	Value	MCL
1,2,4-Trimethylbenzene	ug/L	ND	N/A
1,3,5-Trimethylbenzene	ug/L	ND	N/A
Vinyl chloride	ug/L	ND	0.5
Total Xylenes	ug/L	ND	1750
Total Trihalomethanes	ug/L	ND	80
t-Amyl Methyl ether	ug/L	ND	N/A
t-Butyl alcohol	ug/L	ND	N/A
Ethyl t-butyl ether	ug/L	ND	N/A
p- & m-Xylenes	ug/L	ND	N/A
o-Xylene	ug/L	ND	N/A
1,2-Dichloroethane-d4 (surrogate)	%	103	N/A
Toluene-d8 (surrogate)	%	100	N/A
4-Bromofluorobenzene (surrogate)	%	100	N/A
Alachlor	ug/L	ND	2
Atraton	ug/L	ND	N/A
Atrazine	ug/L	0.86	1
Bromacil	ug/L	ND	N/A
Diazinon	ug/L	ND	N/A
Dimethoate	ug/L	ND	N/A
Metolachlor	ug/L	ND	N/A
Metribuzin	ug/L	ND	N/A
Molinate	ug/L	ND	20
Prometon	ug/L	ND	N/A
Prometryn	ug/L	ND	N/A
Secbumelon	ug/L	ND	N/A
Simazine	ug/L	ND	4
Terbutryn	ug/L	ND	N/A
Thiobencarb	ug/L	ND	70/1 (primary/secondary MCLs)
Perylene-d12	%	78.4	N/A
Diisopropyl ether	ug/L	ND	N/A
Butachlor	ug/L	ND	N/A
Propachlor	ug/L	ND	N/A
1,3,-Dimethyl-2-nitrobenzene	%	97.9	N/A
Triphenylphosphate	%	101	N/A
Total Recoverable Calcium	mg/L	77	N/A
Total Recoverable Magnesium	mg/L	36	N/A
Total Recoverable Sodium	mg/L	140	N/A
Total Recoverable Potassium	mg/L	11	N/A
Bicarbonate	mg/L	350	N/A

Parameter	Units	Value	MCL
Carbonate	mg/L	ND	N/A
Hydroxide	mg/L	ND	N/A
Alkalinity as CaCO3	mg/L	290	N/A
Total Cations	meq/L	13	N/A
Total Anions	meq/L	13	N/A
Hardness as CaCO3	mg/L	340	N/A
pH*	pH units	7.8	N/A
Electrical Conductivity @ 25 C*	umhos/cm	1180	900/1600 (secondary MCLs)[a]
Total Dissolved Solids @ 180 C*	mg/L	780	500/1000 (secondary MCLs)[a]
Color	Color units	2	15 (secondary MCL)
MBAS	mg/L	ND	0.5 (secondary MCL)
Total Recoverable Mercury	ug/L	ND	2
Total Recoverable Uranium	pCi/L	17	20
Gross Alpha*	pCi/L	22.2	15
1.65 Sigma Uncertainty*	±	0.52	N/A
Radium 226*	pCi/L	0.363 ± 0.399	N/A
Radium 228*	pCi/L	0.732 ± 0.469	N/A
Combined Radium 226 and 228 (calc'd)	pCi/L	1.095 ± 0.868	5

* Poor quality of document made these values difficult to decipher, therefore these results are uncertain

[a] Secondary MCLs for Total Dissolved Solids, Electrical Conductance, Chloride, and Sulfate are ranges rather than single limits. The MCLs listed in this table are the 'Recommended'/'Upper' Secondary MCLs. The California Code of Regulations states that concentrations lower than the Recommended limit "are desirable for a higher degree of consumer acceptance" while those lower than the Upper limit are "acceptable if it is neither reasonable nor feasible to provide more suitable waters."

[b] The numeric limit for lead is a requirement of the Tulare Lake Basin Plan, not MCL tables.

APPENDIX E

POLLUTANTS AND PARAMETERS OF CONCERN AND SIGNIFICANCE CRITERIA

Table E-1
Summary of Pollutants and Parameters of Concern

Pollutant/Parameter of Concern [1]	Rationale for Selection	Significance Criteria
Surface Water Pollutants/Parameters of Concern		
Sediment: Total Suspended Solids (TSS) & Turbidity	1. "Sediment is a common component of stormwater, and can be a pollutant. Sediment can be detrimental to aquatic life (primary producers, benthic invertebrates, and fish) by interfering with photosynthesis, respiration, growth, reproduction, and oxygen exchange in water bodies. Sediment can transport other pollutants that are attached to it including nutrients, trace metals, and hydrocarbons. Sediment is the primary component of total suspended solids (TSS), a common water quality analytical parameter" (CASQA, 2003). 2. Excessive erosion, transport, and deposition of sediment in surface waters can impair designated uses. Excessive sediment can impair aquatic life by filling interstitial spaces of spawning gravels, impairing fish food sources, filling rearing pools, and reducing beneficial habitat structure in stream channels.	Objectives from the Tulare Lake Basin Plan (CVWB, 2004): 1. Sediment: "The suspended sediment load and suspended sediment discharge rate of waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses." 2. Settleable material: "Waters shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses." 3. Suspended material: "Waters shall not contain suspended material in concentrations that cause nuisance or adversely affects beneficial uses." 4. Turbidity: "Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in natural turbidity attributable to controllable water quality factors shall not exceed the following limits: Natural Turbidity — Max Increase 0-5 NTU — 1 NTU 5-50 NTU — 20% 50-100 NTU — 10 NTU >100 NTU — 10 %
Nutrients: Nitrogen and Phosphorous	1. "Nutrients including nitrogen and phosphorous are the major plant nutrients used for fertilizing landscapes, and are often found in stormwater. These nutrients can result in excessive or accelerated growth of vegetation, such as algae, resulting in impaired use of water in lakes and other sources of water supply. For example, nutrients have led to a loss of	Objectives from the Tulare Lake Basin Plan (CVWB, 2004): 1. Ammonia: "Waters shall not contain un-ionized ammonia in amounts which adversely affect beneficial uses. In no case shall the discharge of wastes cause concentrations of un-ionized ammonia (NH_3) to exceed 0.025 mg/L (as N) in

Pollutant/Parameter of Concern [1]	Rationale for Selection	Significance Criteria
	water clarity in Lake Tahoe. In addition, un-ionized ammonia (one of the nitrogen forms) can be toxic to fish" (CASQA, 2003). 2. There are several sources of nutrients in runoff from urban areas, mainly fertilizers in runoff from lawns, pet wastes, failing septic systems, atmospheric deposition from certain industrial land uses, and automobile emissions. 3. Nutrients are a biostimulatory substance. Eutrophication due to excessive nutrient input can lead to changes in water quality, temperature, and aquatic plant and animal communities. Decomposition of algae can result in depressed dissolved oxygen levels that can threaten aquatic species and also change the benthic chemistry thereby resulting in release of metals and nutrients from bottom sediments.	receiving waters." 2. Biostimulatory substances: "Waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance of adversely affects beneficial uses."
Trace metals: Copper, Lead, Zinc	1. "Metals including lead, zinc, cadmium, copper, chromium, and nickel are commonly found in stormwater. Many of the artificial surfaces of the urban environment (e.g., galvanized metal, paint, automobiles, or preserved wood) contain metals, which enter stormwater as the surfaces corrode, flake, dissolve, decay, or leach. Over half the trace metal load carried in stormwater is associated with sediments. Metals are of concern because they are toxic to aquatic organisms, can bioaccumulate (accumulate to toxic levels in aquatic animals such as fish), and have the potential to contaminate drinking water supplies" (CASQA, 2003). 2. LA Basin Plan requires that discharges into receiving waters shall not cause or contribute to toxicity. 3. Urban development can increase potential sources of these metals due to sources from vehicles and building materials.	Objectives in the Tulare Lake Basin Plan (CVWB, 2004): 1. "All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life." 2. The Basin Plan also states: "At minimum, water designate MUN shall not contain lead in excess of 0.015 mg/L." 3. The CTR criteria are the applicable water quality objectives for protection of aquatic life (40 CFR 131.38). For most metals, the CTR criteria are expressed for acute and chronic (4-day average) conditions; however, only acute conditions are applicable for stormwater discharges because the duration of stormwater discharges is typically less than 4 days. CTR criteria are expressed for dissolved metal concentrations and are determined on the basis of hardness in the receiving

Pollutant/Parameter of Concern [1]	Rationale for Selection	Significance Criteria
	Metals are also found in fuels, adhesives, paints, and other coatings. Copper, lead, and zinc are the most prevalent metals typically found in urban runoff.	water. In application of criteria to the Project, local hardness data will be used to determine the most appropriate criteria.
Pathogens (Bacteria, Viruses, and Protozoa)	1. "Bacteria and viruses are common contaminants of stormwater. For separate storm drain systems, sources of these contaminants include animal excrement and sanitary sewer overflow. High levels of indicator bacteria in stormwater have led to the closure of beaches, lakes, and rivers to contact recreation such as swimming" (CASQA, 2003). 2. Fecal coliform is a frequently monitored indicator organism of human pathogens. The presence of fecal coliform bacteria indicates the presence of fecal contamination, but it does not necessarily correlate with pathogen presence and therefore human health risk. Human related activities can increase fecal coliform concentrations. 3. Concentrations of fecal coliform in stormwater can be elevated, often due in part to the presence of coliform bacteria from natural sources.	Objectives in the Tulare Lake Basin Plan (CVWB, 2004): 1. The objectives are based on the designated uses of the water body. The Basin Plan includes the following standards for fecal coliform in REC-1 designated waters: "Not less than five samples for any 30 day period shall not exceed a geometric mean of 200/100 mL, nor shall more than 10% of the total number of samples taken during any 30-day period exceed 400/100 mL."
Trash and Debris	1. "Gross Pollutants (trash, debris, and floatables) may include heavy metals, pesticides, and bacteria in stormwater. Typically resulting from an urban environment, industrial sites and construction sites, trash and floatables may create an aesthetic "eye sore" in waterways. Gross pollutants also include plant debris (such as leaves and lawn-clippings from landscape maintenance), animal excrement, street litter, and other organic matter. Such substances may harbor bacteria, viruses, vectors, and depress the dissolved oxygen levels in streams, lakes, and estuaries sometimes causing fish kills" (CASQA, 2003).	Objectives in the Tulare Lake Basin Plan (CVWB, 2004): 1. The floating material objective includes the following: "Waters shall not contain floating material, including but not limited to solids, liquids, foams, and scum, in concentrations that cause a nuisance or adversely affect beneficial uses."

Pollutant/Parameter of Concern (1)	Rationale for Selection	Significance Criteria
	2. Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic debris (such as leaves, grass cuttings, and food waste) are general waste products on the landscape that can be entrained in urban runoff. The presence of trash & debris may have a significant impact on the recreational value of a water body and aquatic habitat. Also, in areas where stagnant water exists, the presence of excess organic matter can promote septic conditions resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds such as hydrogen sulfide.	
Temperature	1. Increased water temperature negatively impacts aquatic life and reduces the oxygen content of nearby water bodies. 2. Detention of stormwater runoff in basins, increases in imperviousness, and decreases in tree canopy can result in elevating water temperatures. 3. Studies conducted in Prince George's County Maryland by Galli (1990) found that most cold water organisms are severely stressed at temperatures above 21°C (70°F), and a 2°C to 3°C change in temperature is enough to eliminate sensitive insect species. Galli's studies (1990) demonstrated (1) higher stream temperatures directly related to increasing levels of impervious surface in the watershed, and increases in stream temperatures by between 5°F and 12°F resulting from development; and (2) increased runoff temperatures through open channels. In addition, BMPs that rely on detention are not thermally neutral. Galli's studies indicated higher outflow temperatures from in-line stormwater detention structures compared to the inflow temperatures. Generally, BMPs with permanent pools have a greater	Objectives in the Tulare Lake Basin Plan (CVWB, 2004): 1. The objectives for temperature include the following: "Temperature objectives for COLD interstate waters, WARM interstate waters, and Enclosed Bays and Estuaries are as specified in the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California, including any revisions. Elevated temperature wastes shall not cause the temperature of waters designated COLD or WARM to increase by more than 5º F above the natural receiving water temperature."

Pollutant/Parameter of Concern (1)	Rationale for Selection	Significance Criteria
	potential to affect downstream temperatures than detention BMPs without permanent pools. But even basins without permanent pools that lack shade and have detention times longer than 12 hours may contribute to stream warming (Galli, 1990).	
Polycyclic Aromatic Hydrocarbons (PAHs)	1. Sources of PAHs in runoff include spillage of fuels and lubricants, discharge of domestic and industrial wastes, atmospheric deposition, and automobile exhaust. Therefore, development would generally be expected to increase levels of PAHs. 2. Runoff can be contaminated by leaching hydrocarbons from asphalt roads, tire wear, and deposition from automobile exhaust. PAHs are of particular concern as they can accumulate in aquatic organisms and are toxic to aquatic life at low concentrations. Some hydrocarbons can persist in sediments for long periods of time and result in adverse impacts on the diversity and abundance of benthic communities.	1. CTR values for individual PAHs are available for protection of human health only. There are no regulatory standards for the protection of aquatic health.
Pesticides	1. "Pesticides (including herbicides, fungicides, rodenticides, and insecticides) have been repeatedly detected in stormwater at toxic levels, even when pesticides have been applied in accordance with label instructions. As pesticide use has increased, so too have concerns about adverse effects of pesticides on the environment and human health. Accumulation of these compounds in simple aquatic organisms, such as plankton, provides an avenue for biomagnification through the food web, potentially resulting in elevated levels of toxins in organisms that feed on them, such as fish and birds" (CASQA, 2003). 2. Pesticide loads may be present in runoff from developed areas due to pesticide	Objectives in the Tulare Lake Basin Plan (CVWB, 2004): 1. "Waters shall not contain pesticides in concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial uses … At a minimum, waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the limiting concentrations specified in … Title 22 of the California Code of Regulations …." 2. CTR lists numeric objectives for some, but not all pesticides. There are no CTR criteria for diazinon and chlorpyrifos, but

Pollutant/Parameter of Concern (1)	Rationale for Selection	Significance Criteria
	use for urban landscaping.	these substances are now banned from most urban uses.
Chemicals of Emerging Concern (CEC)	1. Although thousands of substances may be detected in the environment, only a small percentage of known chemicals are currently regulated and/or routinely monitored in California receiving waters. The much larger group of chemicals that remain largely unregulated and/or unmonitored in the aquatic environment, known as chemicals of emerging concern (CECs), may originate from a wide range of point and non-point sources (SCCWRP, 2012a). The largest class of CECs is industrial chemicals, followed by ingredients in personal care products, food additives, pharmaceuticals, and pesticides (SCCWRP, 2012b). CECs may be present in stormwater runoff. 2. Once discharged into receiving waters, CECs are subject to physical, chemical and biological processes that may result in attenuation (lower concentrations), enrichment, or magnification (higher concentrations) in a given environment. CECs that are readily soluble in water will remain in the dissolved phase and provide a route of exposure to aquatic life. A smaller subset of CECs that are hydrophobic will associate with particles, where they may remain suspended in the water column or accumulate in sediments and ultimately in tissues of aquatic and terrestrial biota. Most CECs do not have approved measurement methods, and few studies have examined the environmental fate and potential harmful effects of CECs on organisms (including humans). Preliminary research has found some effects on wildlife at the individual organism level, but not larger population effects. CEC effects on humans are not evident, although biological effects research is still in its early stages	

Pollutant/Parameter of Concern (1)	Rationale for Selection	Significance Criteria
	(SCCWRP, 2012a).	
Groundwater Pollutants of Concern		
Nitrate-N	1. The State Water Board indicates that total nitrogen may not be removed as effectively in septic system leach fields as other pollutants (State Water Resources Control Board, 2012). 2. High nitrate levels in drinking water can cause health problems in humans. The primary health concern is with the consumption of water with elevated nitrate, which is the condition known as methemoglobinemia, or "blue baby syndrome."	1. The MCL for nitrate-N is 10 mg/L.
Contaminants of Emerging Concern	1. CECs have been found to have adverse effects on ecological ecosystems and cannot be completely removed by wastewater treatment plant processes.	1. The Tulare Lake Basin Plan (CVWB, 2004) states "Ground waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life associated with designated beneficial use(s)."
Total Dissolved Solids (TDS)	1. The Tulare Lake Basin Plan identifies salts as a crucial problem in the Tulare Lake Basin "due to evaporation and crop transpiration removing water from soils, resulting in accumulation of salts in the root zone of the soils at levels that retard or inhibit plant growth. Additional amount of water often are applied to leach the salts below the root zone. The leached salts eventually enter ground or surface water."	1. The Tulare Lake Basin Plan (CVWB, 2004) states "All ground waters shall be maintained as close to natural concentrations of dissolved matter as is reasonable considering careful use and management of water resources." 2. The Kern River Hydrographic Unit, in which the Project site is located, is limited to a maximum average annual increase in salinity in groundwater, as measured by electrical conductivity, of 5 μmhos/cm. 3. The applicable water quality objective for TDS is the secondary Federal MCL (taste and odor or welfare based), which is 500 mg/L; in California, the CDPH has set a recommended MCL of 500 mg/L, and upper concentration of 1,000 mg/L.

1. Pollutants of concern are those pollutants that are anticipated or potentially could be generated by development that have been identified by regulatory agencies as potentially impairing beneficial uses in the receiving water bodies or that could adversely affect receiving water quality.

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SCCWRP, 2012b. Fact Sheet: Contaminants of Emerging Concern (CECs). January 2012.

State Water Resources Control Board, 2012. Onsite Wastewater Treatment System Policy Draft Substitute Environmental Document. June 6, 2012.

United States Environmental Protection Agency California Toxics Rule (CTR), 40 C.F.R. §131.38.

APPENDIX F

WATER QUALITY MODEL METHODOLOGY

1.0 MODEL DESCRIPTION

1.1 Model Overview

The model used to assess stormwater quality impacts associated with the proposed Grapevine project of Tejon Ranch (the Ranch) and off-site road impacts is an empirical, volume-based pollutant loads model. This type of loadings model is generally applicable in the planning and evaluation stages of a project. The model was developed to assess the potential impact of development on water quality and to evaluate the effectiveness of the structural Best Management Practices (BMPs) that will treat stormwater runoff as part of the project stormwater treatment system. Two project conditions were evaluated with the water quality model:

1. Pre-development
2. Post-development with Project Design Features (PDFs)

Measured runoff volumes and water quality characteristics of stormwater are highly variable. To account for this variability, a statistical modeling approach was used to estimate the volume of stormwater, the concentration of pollutants in stormwater, and the overall pollutant load (total mass of pollutants) in stormwater runoff. A statistical description of stormwater provides an indication of the average characteristics and variability of the water quality parameters of stormwater, and the probability of compliance with regulatory criteria. It does not forecast runoff characteristics or regulatory compliance for specific storms or monitoring periods.

The statistical model is based on relatively simple expressions describing rainfall/runoff relationships and estimated concentrations in stormwater runoff. The volume of stormwater runoff is estimated using a modification to the Rational Formula, an empirical expression that relates runoff volume to the rainfall depth and the broad basin characteristics. The pollutant concentration in stormwater runoff is represented by an expected average pollutant concentration, called the event mean concentration (EMC). EMCs are estimated from available monitoring data from land use-specific monitoring stations and are considered to be dependent on land use type.

The model does not incorporate the detailed hydraulics or hydrology of the site, which would be more appropriate for detailed design stages and requires additional data and more sophisticated modeling. The model includes water quality benefits achieved by treatment control and low impact development (LID) BMPs, but not source control BMPs, because data is generally not available or is inconclusive for the latter.

As with all environmental modeling, the precision of results is dependent on how well the hydrologic, water quality and BMP effectiveness data describe the actual site characteristics. Local and regional data used to the fullest extent possible helps to minimize errors in predictions.

Model results are presented for average annual runoff volumes, pollutant loads, and pollutant concentrations. The flow chart in Figure F-1 provides an overview of the modeling methodology.

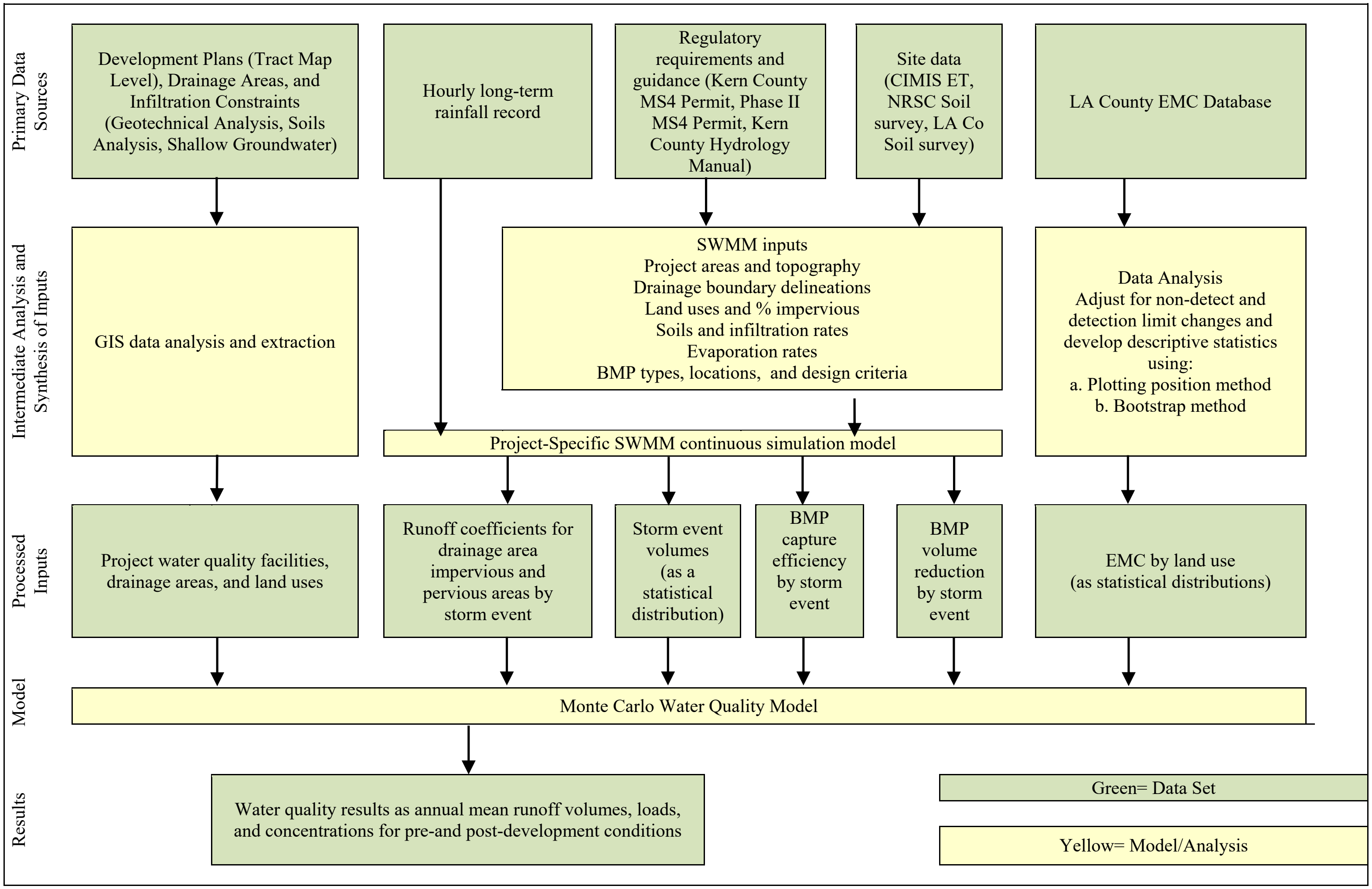

Figure F-1 Overview of Water Quality Analysis Methodology

1.2 Technical Basis for Modeling Methodology

A variety of modeling approaches are capable of meeting the technical requirements of this analysis. In general, models can be grouped into three categories:

- Stochastic (or probabilistic): this type of model utilizes observed statistical patterns to produce model estimates. This type of model generally relies on empirical observations, but does not necessarily ignore causal relationships.

- Deterministic (or mechanistic, physically-based): this type of model attempts to perfectly represent physical processes and mechanisms using closed form equations derived from physical phenomena. It is noted that because these models attempt to describe systems that are inherently complex and poorly defined, most deterministic models must rely in part on empirical observations to represent causal relationships.

- Hybrid: this type of model combines elements of stochastic and deterministic models to provide more reliable model estimates.

The modeling methodology used for the project incorporates stochastic and empirical elements, and is therefore most accurately described as a hybrid approach. The approach uses an empirical, stochastic water quality estimation approach (Monte Carlo) to produce water quality and pollutant loading estimates. Inputs to this model are derived from empirical sources (Los Angeles County Land Use Monitoring Program) and deterministic modeling of hydrology and hydraulics (EPA SWMM4.4h). This approach makes use of robust land use and BMP monitoring datasets applicable to the project and incorporates important causal relationships in hydrologic and hydraulic response that can be reliably represented with deterministic methods. This approach is believed to be most appropriate to meet the technical requirements of the impact analysis for the project-level analysis at the tract map scale.

The literature studies summarized below generally support the use of an empirically-based hybrid approach for the type of analysis required for the project:

- Obropta et al. (2007) evaluated six deterministic models, three stochastic models, and three hybrid approaches. They concluded that *hybrid approaches show strong potential for reducing stormwater quality model prediction error and uncertainty* [improving the ability to assess] *best management practice design, land use change impact assessment* [and other applications].

- Charbeneau and Barrett (1998) evaluated different approaches for estimating stormwater pollutant loads based on a comparison of model results to observed land use monitoring data. They found that (1) the development of accurate physically-based models *remains a difficult and elusive goal*, and current understanding of processes *is not sufficient to accurately predict event loads*, (2) a simple empirical stochastic approach is generally as reliable or more reliable than more complicated mechanistic approaches, (3) the use of land use event mean concentrations (EMCs) is appropriate for planning purposes, (4) the land use EMC approach is most reliable when land use EMCs are used as a stochastic input parameter generated from a probabilistic distribution, and (5) stormwater volume is the single most important variable in predicting pollutant loads.

- The National Research Council's (NRC) 2008 report on *Urban Stormwater Management in the United States* generally supports these findings regarding the appropriate use of stormwater quality and quantity models.

As with all environmental modeling, the precision of results is heavily dependent on how well the hydrologic, water quality and BMP effectiveness data describe the actual site characteristics. Local and regional data are used to the fullest extent possible to help minimize errors in predictions, but such data are limited and traditional calibration and verification of the model is not feasible. It is important to note that the predictions of relative differences should be more accurate than absolute values.

1.3 Model Assumptions

The water quality modeling methodology requires that some assumptions be made for both the model input parameters and the way the modeling calculations are carried out. Section E.2 discusses the assumptions that were made in the development of the model parameters and Section E.3 discusses the assumptions inherent in the modeling methodology. Section E.4 discusses the effects of the modeling assumptions on model accuracy.

2.0 MODEL INPUT PARAMETERS

Many parameters that can affect pollutant loads and concentrations vary spatially and may not be adequately represented by stormwater monitoring data collected at discrete locations. Examples include source concentrations, topography, soil type, and rainfall characteristics, all of which can influence the buildup and mobilization of pollutants. The following model parameters represent the best data currently available for representation of existing and developed site conditions in the water quality model.

2.1 Storm Events

2.1.1 NCDC Rainfall Gauge Selection

Two rainfall gauges were identified to be the most representative for the project: (1) National Climatic Data Center (NCDC) Bakersfield Airport gauge and (2) the Western Regional Climate Center Tejon Rancho weather station. The Bakersfield Airport gauge (station number 040442) contains hourly precipitation data from a 61 year period of record (water year [WY] 1949-2010) and is located in Kern County, California. Figure F-2 shows the location of the Bakersfield Airport gauge in relation to the Grapevine project area, located approximately 32 miles from the project. The gauge elevation of 489 ft above mean sea level (AMSL) is comparable to the project area elevation of approximately 300-1500 ft AMSL, and the gauge location is assumed to have similar rainfall patterns as the Project location. The rainfall record for this gauge has 2.8 percent missing or flagged data over the 61 year period of record. The average annual rainfall depth for the Bakersfield Airport rain gauge is approximately 5.8 inches.

The Tejon Rancho weather station (station number 048839), a Western Regional Climate Center gauge located roughly 10 miles from the project and is at an elevation of 1,300 ft AMSL, records daily rainfall data (Figure F-2). The average annual rainfall depth for the Tejon Rancho station is approximately 11.7 inches. This gauge was used for detention basin design. While much of the Project is located below 1,300 ft AMSL, for conservatism the hourly Bakersfield gauge was scaled such that the annual rainfall would match that recorded at the Tejon Rancho gauge. This was performed to avoid underestimation of rainfall totals, especially in the higher Project elevations. A scaling factor of 2.0 (11.7/5.8) was used for each measurement within the Bakersfield Airport gauge rainfall data. The resulting scaled continuous record of the Bakersfield Airport gauge is assumed to be representative of overall precipitation conditions for the project.

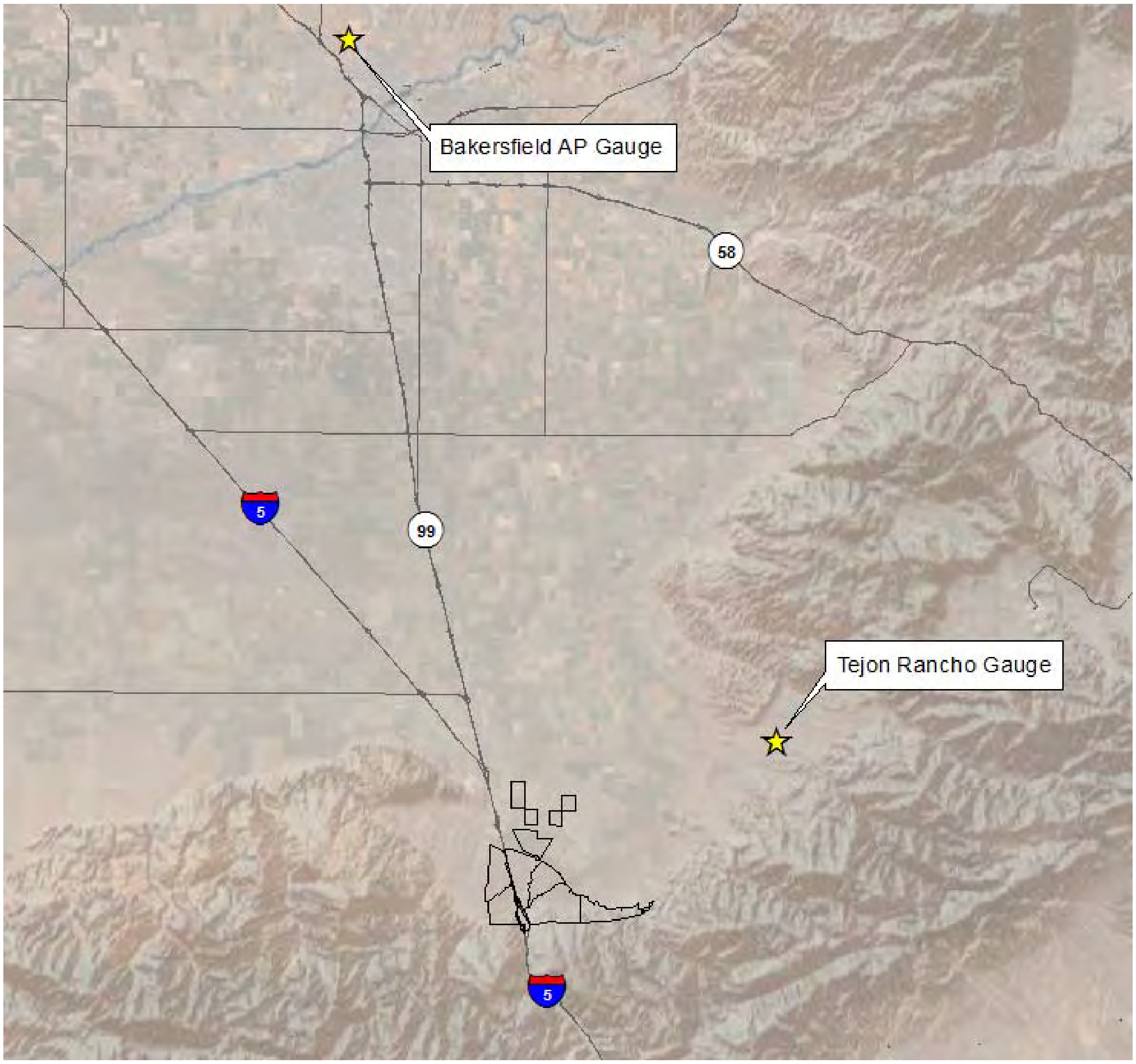

Figure F-2 Location of Bakersfield AP and Tejon Ranch Gauges in the Vicinity of the Grapevine Project

Rainfall analysis on the scaled gauge was conducted for two data groups: all storm events; and only the storms that were expected to contribute to stormwater runoff (storms >0.1 inches). The rainfall data were analyzed using EPA's Storm Water Management Model (SWMM) 5.0 by subdividing the rainfall record into discrete events separated by an inter-event try period, which in this case was set to a minimum of 6 hours, with a minimum event storm depth of 0.01 in. Table F-1 provides the storm statistics for all storm events between October 11, 1948 and May 21, 2006.

Table F-1
Rainfall Statistics for the scaled Bakersfield Airport Gauge

All Storms	*No. of Storm Events*	1989
	Average Storm Depth (in)	0.34
	Average Annual Rainfall Depth (in)	11.8
Storms > 0.1" Depth	*No. of Storm Events*	1180
	Average Storm Depth (in)	0.55
	Average Annual Rainfall Depth (in)	11.1

2.2 Runoff Coefficients

The long term runoff coefficient (i.e. the fraction of precipitation that runs off as stormwater) is dependent on a number of factors, the most significant being catchment imperviousness. However, for pervious areas, soil characteristics, watershed slope, precipitation patterns, evapotranspiration rates and a variety of other factors also influence runoff coefficient. Runoff coefficients are expected to vary from storm event to storm event as a function of antecedent conditions, storm intensity distribution, storm duration, and storm depth. The following describes how runoff coefficients were estimated for use in the water quality model.

2.2.1 SWMM Runoff Coefficient Modeling Parameters

The water quality model uses a modification of the Rational Method to estimate a runoff coefficient for sub-basins as a function of the percent impervious for a given storm event. The format of this equation is described as:

$$C = C_i * i + C_p * (1-i)$$

Where:

C = composite runoff coefficient
C_i = runoff coefficient from impervious areas
C_p = runoff coefficient from pervious areas
i = imperviousness fraction (ranges from 0 to 1)

Various references provide estimated values for Ci and Cp. The Kern County Hydrology Manual specifies 0.90 as Ci and bases the determination of C_p on the ratio of average rainfall intensity to average infiltration rate for the drainage area using a simplified ratio calculation (Kern County, 1992). However, because the pervious and impervious runoff coefficients that make up the runoff coefficient equation are dependent on many site-specific parameters, the runoff coefficient equation used in modeling was estimated for each special plan area, and the more simplified representation of the runoff pervious coefficient may not be representative of conditions on-site. Therefore, C_p and C_i were determined for each special plan area over a continuous record, rather than the average rainfall intensity and area weighted soil parameters. It is recognized that C_p for smaller storms may be zero, while for larger storms it may greatly exceed the long-term average. Thus, the water quality model was developed based on estimates of special plan pervious area runoff coefficients on a storm-by-storm basis, using a robust method that accounts for more detailed hydrologic processes and antecedent conditions. This method considered the range of conditions that occur and could occur within the SPA and selected appropriately conservative values to account for uncertainty.

Continuous simulation modeling, using SWMM, was conducted for each special plan area to generate appropriate storm-by-storm pervious and impervious runoff coefficients to use in the runoff coefficient equation for each storm event. A modified version of SWMM 4.4h was used that segregates continuous precipitation records (discussed above) into storm events, tracks the fate of precipitation to losses (i.e. infiltration, evapotranspiration) and runoff for each storm, and tabulates runoff coefficients by storm event.

Assumed flow path lengths were changed between undeveloped areas (areas where no development is expected in the proposed condition and no treatment is required) and existing and developed conditions for areas proposed for development (developed areas). The undeveloped areas retained the same parameters in the existing and developed model conditions. For areas proposed for development, flow path length and hydraulic conductivity were changed from the existing non-developed condition model to the proposed developed condition to reflect changes (i.e. soil compaction, etc.) due to development. The majority of the SWMM modeling parameters assumed for this analysis are shown in Table F-2.

Table F-2
SWMM Version 4.4h Runoff Module Parameters

Parameter	Unit	Value	Source/Rationale
Dry Weather Time Step	Minutes	240	N/A
Wet Weather Time Step	Minutes	15	N/A
Routing Time Step	Seconds	60	N/A
Flow Path Length	Feet	500 (Existing non-developed condition; development footprint)	Represents typical overland flow path lengths, not a very sensitive parameter
		250 (Proposed developed condition; development footprint)	Represents typical overland flow path lengths, not a very sensitive parameter
Slope	ft/ft	5	Represents average of relatively flat landscaping, streets, and roofs
Impervious Manning's n	--	0.012	Best professional judgment
Pervious Manning's n	--	0.25	Best professional judgment

Depression storage, impervious	Inches	0.02	Based on Table 5-14 in SWMM manual (James and James, 2000)
Depression storage, pervious	Inches	0.06	Based on Table 5-14 in SWMM manual (James and James, 2000)
Infiltration	Method	Green Ampt, see parameters in Table F-6	See Table F-6
Groundwater	-	Not simulated	N/A
Snowmelt	-	Not simulated	N/A

Special plan areas were divided into sub-catchments based on soil texture and corresponding NRCS hydraulic conductivity as shown in Figure 3 of the Initial Infiltration Testing Evaluations Report (Geosyntec, 2014) (also attached as Appendix A to this WQTR). Using a post-processing engine, SWMM output file runoff results were weighted by sub-catchment (i.e. soil texture) area distribution and combined to obtain a composite pervious area runoff coefficient for each watershed for each storm event. The soils texture distributions assumed for this modeling effort are shown in Table F-3.

Table F-3
Modeled Soils Texture Distributions (Special Plan Areas)

Special Plan Area[1]	Percent Cobbly Clay	Percent Fine Sandy Loam	Percent Gravelly Clay Loam	Percent Gravelly Loam	Percent Very Gravelly Sandy Loam	Percent Loam	Percent Loamy Sand	Percent Sandy Loam	Percent Very Stony Sandy Clay Loam
1	0%	28%	0%	3%	24%	0%	0%	8%	37%
2	0%	0%	0%	0%	0%	0%	0%	14%	86%
3	0%	1%	0%	0%	0%	1%	0%	42%	56%
4	0%	0%	0%	0%	0%	26%	0%	28%	46%
5a	0%	22%	1%	0%	33%	5%	2%	16%	21%
5b	4%	5%	40%	0%	22%	1%	0%	11%	17%
6a	0%	0%	0%	0%	0%	24%	0%	70%	6%
6b	0%	0%	0%	0%	24%	20%	0%	56%	0%
6c	0%	0%	0%	0%	0%	92%	0%	8%	0%
6d	0%	0%	0%	0%	0%	49%	0%	41%	10%
6e	0%	0%	0%	0%	0%	43%	0%	46%	11%

[1]Areas outside of designated special plan areas (off-site disturbed areas) or those located in areas where access was denied for soil texture evaluation are assumed to have runoff coefficients of the SPA soils adjacent to them.

Table F-4
NRCS Soil Texture Hydraulic Conductivity Values

Soil Texture	Max NRCS Ksat (in/hr)	Min NRCS Ksat (in/hr)	Min NRCS Ksat with 2.5 FOS (in/hr)
Cobbly Clay	0.2	0.06	0.02
Fine Sandy Loam	6.0	2.0	0.8
Gravelly Clay Loam	0.6	0.06	0.02
Gravelly Loam	2.0	0.6	0.2
Loam	2.0	0.6	0.2
Loamy Sand	20	6.0	2.4
Sandy Loam	6.0	2.0	0.8
Very Gravelly Sandy Loam	6.0	2.0	0.8
Very Stony Sandy Clay Loam	0.6	0.2	0.08

Soils in the project area will exhibit a range of infiltrative capacity, depending on soil texture and condition. Soil type or texture can be used to estimate a typical range in soil parameters, such as the Green-Ampt parameters, while soil condition (pre- or post-development) may be used to select the most appropriate parameters within the range. Soil texture classes provided in the 2014 Infiltration Report were used to classify soils in each special plan areas into the nine soil texture groups shown in Table F-3 above and assign typical ranges of soil parameters to these soil groups (Table F-4). Green-Ampt suction head, saturated hydraulic conductivities and initial moisture deficit values for each soil texture were based on the soil texture class reported by the NRCS soil survey in the 2014 Infiltration Report. The lower value of the NRCS hydraulic conductivity range was used to represent the soils in the model with an additional factor of safety of 2.5 applied. The safety factor is based upon the Ventura County Technical Guidance Manual suitability assessment related considerations for watersheds draining to infiltration facilities (Ventura County, 2011). Table F-5 contains the site suitability assessment and Table F-6 includes all of the modeled Green-Ampt soil parameters. It has also been assumed that compaction during construction will reduce the hydraulic conductivity by 25% in the post-development condition in areas where construction is planned. While localized effects of incidental compaction may be greater, this assumption is believed to represent a reasonable estimate of drainage basin-wide reduction in long term infiltration rate considering that not all pervious areas will be subjected to incidental compaction. Additionally, vegetation and other natural process tend to restore infiltration rates with time.

Table F-5
Watershed Soils Factor of Safety Assessment

		Assigned Weight	Factor Value	Product (p)
Site Suitability Assessment	*Soil Assessment Methods*[1]	0.25	3	0.75
	Predominant Soil Texture[2]	0.25	3	0.75
	Soil Site Variability[3]	0.25	3	0.75
	Depth to Groundwater[4]	0.25	1	0.25
			Combined Safety Factor	2.5

[1]Soil assessment methods value is assigned a 3 (high concern) as soil survey maps and texture analysis was primarily used to determine infiltration rates. Direct measurement of rates was not conducted for >20% of the area.
[2]Predominant soil texture value is assigned a 3 (high concern) as the lowest infiltration rate used from the NRCS soil texture survey may influence the potential for clogging. This is a conservative estimate.
[3]Site soil variability value is assigned a 3 (high concern) as the site soils are variable according to the NRCS soil texture map and limited soil boring information is available.
[4]Depth to groundwater value is a 1 (low concern) as the groundwater table is located >700 feet below the surface.

Table F-6
Green-Ampt Soil Parameters

Soil Texture Class[1]	Suction Head[2] (in)	Saturated Soil Conductivity (in/hr)		IMD[2] (in/in)
		Existing Condition[3]	*Developed Condition*[4]	
Cobbly Clay	7	0.02	0.02	0.21
Fine Sandy Loam	8	0.80	0.60	0.33
Gravelly Clay Loam	10	0.02	0.02	0.24
Gravelly Loam	8	0.24	0.18	0.31
Very Gravelly Sandy Loam	8	0.80	0.60	0.33
Loam	8	0.24	0.18	0.31
Loamy Sand	8	2.40	1.80	0.33
Sandy Loam	8	0.80	0.60	0.33
Very Stony Sandy Clay Loam	10	0.08	0.06	0.24

[1]Where soil texture unknown (access denied), the adjacent soil texture class was assigned.
[2] Estimated based on texture class from Rawls, et al., (1983).
[3] Estimated based on lower value from range of values in the Infiltration Report (Geosyntec, 2014).
[4] Determined based on an assumption of 25% reduction of conductivity due to compaction.

Reference ET values for estimating actual ET rates was taken from Figure F-2, produced by the California Department of Water Resources (CIMIS, 1999). The Grapevine project is located in Zone 14. Reference ET values for Zone 14 are reproduced in Table F-7.

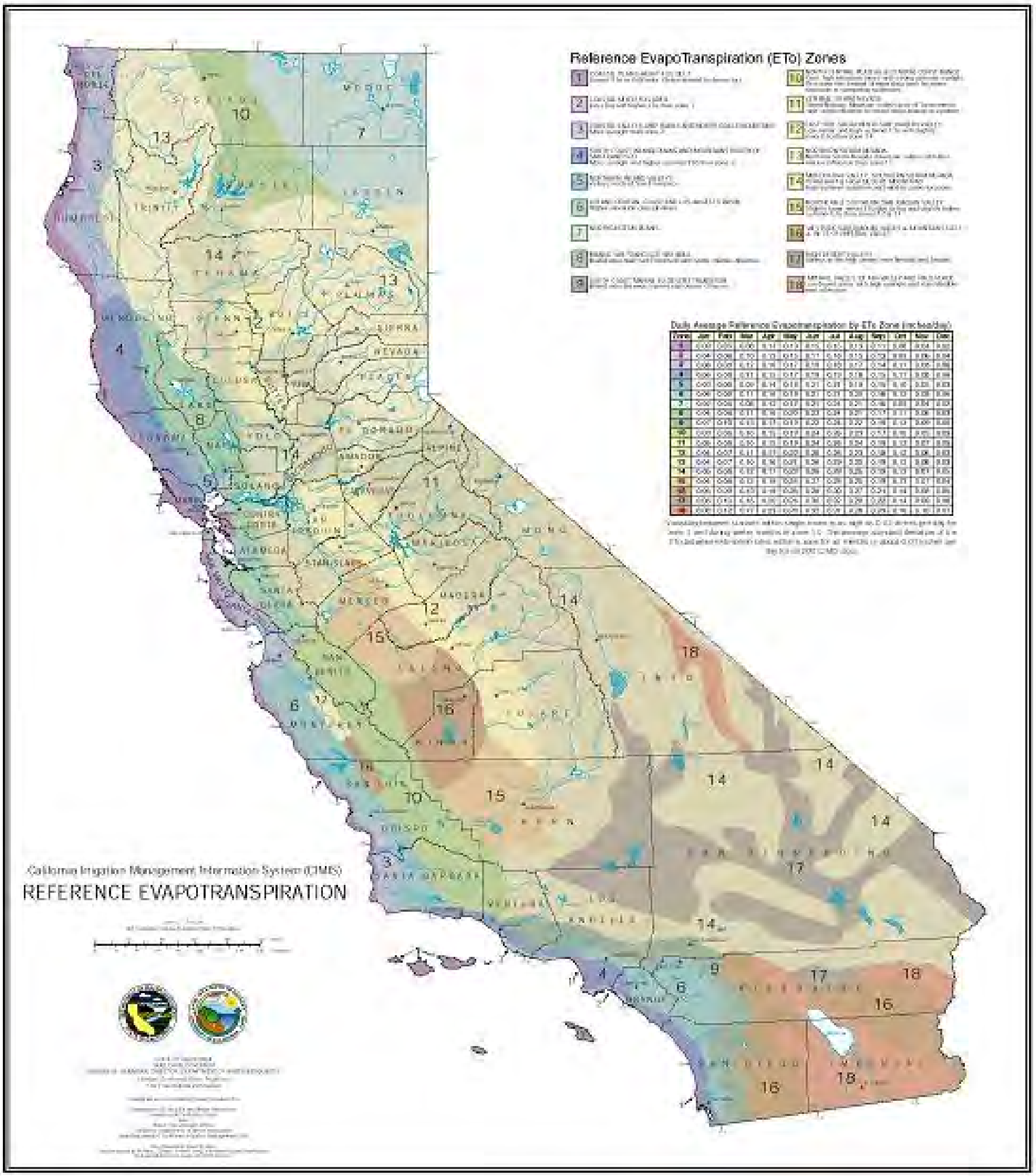

Figure F-2 Reference ET for CA Zones

The existing site land use can be described as primarily exclusive agriculture, with some general commercial and floodplain areas. A scaling factor of 0.60 was applied to the reference ET values to reflect partially shaded conditions (shaded by scrub vegetation), semi-arid vegetation, dry crops and bare soil that are typical of exclusive agriculture. This scaling factor is also used to simulate the landscaped areas and agricultural areas in the post-development condition, which will generally be planted with predominantly drought-tolerant vegetation.

Table F-7
Evaporation Parameters for Hydrology Model (from CA ETo map, Zone 14)

Month	Evapotranspiration Rates			60%
	inch / day	*days / month*	*inch / month*	*inch / month*
January	0.05	31	1.55	0.93
February	0.08	28	2.24	1.34
March	0.12	31	3.72	2.23
April	0.17	30	5.1	3.06
May	0.22	31	6.82	4.09
June	0.26	30	7.8	4.68
July	0.28	31	8.68	5.21
August	0.25	31	7.75	4.65
September	0.19	30	5.7	3.42
October	0.13	31	4.03	2.42
November	0.07	30	2.1	1.26
December	0.05	31	1.55	0.93
Total (year)	*1.87*	*365*	57.04	34.22

2.2.2 SWMM Runoff Coefficient Results

Using the SWMM Stormwater Modeling Methodology explained in Section 3.1, the pervious and impervious storm-weighted (weighted by storm over the entire period of record) runoff coefficients were calculated and are displayed in Table F-8. These coefficients are compared to the runoff coefficients as calculated using the Kern County Hydrology manual method (Kern County, 1992), assuming 100% imperviousness for the impervious runoff coefficient and 0% imperviousness for the undeveloped runoff coefficient.

Table F-8
SWMM Runoff Coefficients for Watershed Areas

Modeled Special plan area	Impervious Runoff Coefficient		Undeveloped Pervious Runoff Coefficient		Developed Pervious Runoff Coefficient	
	Kern County Hydrology Manual[1]	*Model Methodology*[2]	*Kern County Hydrology Manual*[3]	*Model Methodology*[2,4]	*Kern County Hydrology Manual*[3]	*Model Methodology*[2,5]
1	90	93	0-9	0.2	0-9	0.5
2	90	93	0-9	0	0-9	0
3	90	93	0-9	0	0-9	0
4	90	93	0-9	0	0-9	0
5a	90	93	0-9	0.5	0-9	1.0
5b	90	93	0-9	13	0-9	13
6a	90	93	0-9	0	0-9	0
6b	90	93	0-9	0.2	0-9	0.5
6c	90	93	0-9	0	0-9	0
6d	90	93	0-9	0	0-9	0
6e	90	93	0-9	0	0-9	0

[1]Included for comparison purposes
[2]Only includes storms that would produce runoff, i.e. those >0.1”
[3]Included for comparison purposes; based on tables for composite runoff coefficients for NRCS Type A and B soils with variable imperviousness.
[4]Includes areas that are not treated and remain unchanged from existing to proposed conditions.
[5]Includes areas within the bounds of development that are treated in the proposed condition.

As shown in Table F-8, the average runoff coefficients for impervious areas used in the model are similar to the runoff coefficient calculated using the Kern County Hydrology Manual method. The pervious runoff calculations estimated using the model methodology account for the expected increase in runoff associated with incidental compaction during development. The runoff coefficients are indicative of the soils in the project area and are zero for the special plan areas containing the highest permeability soils.

2.3 Modeled Land Use

The development projections for the Grapevine project are based on the land uses listed for each special plan area as provided in the Grapevine Special Planning (SP) District Plan, the Land Use Program Summary, and subsequent GIS shapefiles (KenKay, 2014). The existing condition land use was assumed to be mostly extensive agriculture, with some existing general commercial areas and areas zoned as floodplain primary. Table F-9 provides the modeled land uses, areas, and percent impervious values used to represent the pre-development project condition. Table F-

10 provides the modeled land uses, areas, and percent impervious values used to represent the developed project condition. The imperviousness of the modeled land uses are based off of the most representative general plan map codes and associated land uses within the available data sets. Land uses included in the analysis are included in Table F-11 with the imperviousness percentage assumptions for each model land use type. Any undisturbed portions of the special plan areas were modeled as 0% impervious and were not assumed to be treated. The disturbed land use portions were modeled for each special plan area as area-weighted parcels by the tributary zoned areas. The disturbed land use portion was assumed to be treated.

Off-site disturbed areas include water quality facilities, roadways connecting the separate special plan areas, an agricultural area haul road, and a proposed weigh station. These areas are represented as exclusive agriculture in the existing condition and impervious roadway areas in the developed condition. Runoff from these areas is assumed to be treated.

Table F-9
Pre-Development Project Land Use Areas[1]

Special Plan Area	Exclusive Agriculture (acres)	Floodplain Primary (acres)	General Commercial (acres)	Total (acres)
1	961	6	67	1034
2	927	0	0	927
3	995	0	64	1059
4	820	0	0	820
5a	1631	0	0	1631
5b	975	0	0	975
6a	620	0	0	620
6b	322	0	0	322
6c	193	0	0	193
6d	194	0	0	194
6e	194	0	0	194
Off-site Road	57	0	0	57
Off-site Disturbed	138	0	0	138
Total	8027	6	131	8162

[1]Areas that are proposed to be relocated Freeway Ramps in the Development condition are omitted from the model as they are to be managed and treated by Caltrans.

Table F-10
Developed Project Land Uses[1,2]

Special Plan Area	Exclusive Agriculture (acres)	Residential (acres)	Village Center Residential (acres)	Village Center Commercial (acres)	Office/ R&D (acres)	Freeway-Oriented Commercial (acres)	Light Industrial/ Warehouse (acres)	Schools (acres)	Parks (acres)	Arterial Streets (acres)	Collector Streets (acres)	Total (acres)
1	578	284	23	8	68	-	41	-	-	13	19	1034
2	19	475	98	30	46	22	95	30	58	24	31	927
3	363	303	73	20	70	106	58	5	5	47	8	1059
4	126	489	57	15	-	-	-	30	58	24	21	820
5a	1090	448	33	5	-	-	-	5	5	5	39	1631
5b	872	93	-	-	-	-	-	-	-	-	10	975
6a	109	149	75	20	21	-	207	5	5	2	27	620
6b	-	-	-	-	-	-	322	-	-	-	-	322
6c	-	-	-	-	-	-	190	-	-	-	3	193
6d	17	-	-	-	-	-	173	-	-	-	4	194
6e	23	-	-	-	-	-	171	-	-	-	-	194
Off-site Road	-	-	-	-	-	-	-	-	-	-	57	57
Off-site Disturbed	138	-	-	-	-	-	-	-	-	-	-	138
Total	3335	2240	359	98	204	128	1357	75	132	116	218	8162

1- Land use program summary based on GIS shapefile provided by KenKay Associates, dated 07-07-2014. This is the same land use distribution used for flood control basin design.
2 – Land use program summary omits areas designated in the development condition as "Freeway Ramp" as they are not included in the model and are to be treated by Caltrans.

Table F-11
Modeled Land Use, Imperviousness and EMC Values

Land Use	Imperviousness[1]	EMC Category
Exclusive Agriculture	0%	Agriculture, Vacant[2]
Freeway-Oriented Commercial	90%	Commercial
General Commercial	90%	Commercial
Light Industrial/Warehouse	90%	Light Industrial
Office/R&D	90%	Commercial
Parks	17.5%	Educational
Residential	45%	High Density Single Family Residential
Roadway	100%	Transportation
School	40%	Education
Vacant	0%	Vacant
Village Center Commercial	90%	Commercial
Village Center Residential	77.5%	Multi-Family Residential
Water Quality	100%	Water

[1]Imperviousness values were estimated as the median imperviousness from the range provided in the Kern County Hydrology Manual (Kern County, 1992).
[2]Areas assigned as exclusive agriculture are assumed to be 20% agriculture and 80% vacant in the developed condition only, as specified by the maximum disturbed percentage of exclusive agriculture in the Land Use Program Summary (KenKay, 2014)

2.4 Stormwater Runoff Pollutant Concentrations

Stormwater monitoring data collected by the Los Angeles Department of Public Works (LACDPW) and the Ventura County Flood Control District was used to derive estimates of pollutant concentrations in runoff from urban land uses.

2.4.1 Los Angeles County Monitoring Data

Recent and regional land-use based stormwater quality monitoring data was collected through the LA County Stormwater Monitoring Program, which is conducted by the Los Angeles County Department of Public Works (LACDPW) (LA County, 2000 and 2001). This program was initiated with the goal of providing technical data and information to support effective watershed stormwater quality management programs in Los Angeles County. Specific objectives of this project included monitoring and assessing pollutant concentrations from specific land uses and watershed areas. In order to achieve this objective, the County undertook an extensive stormwater sampling project that included 8 land use stations and 5 mass emission stations (located at the mouths of major streams and rivers), which were tested for 82 water quality constituents on an annual basis beginning in 1995 through 2001. For each year of monitoring several storm event mean concentrations (EMCs) are reported and included in the County's annual water quality report to the Los Angeles Regional Water Quality Control Board. These data are presented in *Los Angeles County 1994-2000 Integrated Receiving Water Impacts Report, 2000* and *Los Angeles County 2000-2001 Stormwater Monitoring Report, 2001*.

Stormwater quality for the Grapevine project was estimated based on the recent EMC data collected by LA County (LA County, 2000 and 2001). These data were used because of their relative proximity to the project site and because the monitored land uses provide a relatively good representation of the proposed land uses for the Grapevine project. The monitored land uses stations are listed in Table F-12 with a brief description of the site and when the monitoring data were collected.

Table F-12
LA County Land Use Monitoring Stations Available for Water Quality Modeling

Station Name	#	Modeled Land Use	Site Description[1]	Years Monitoring Conducted
Santa Monica Pier	S08	Commercial	The monitoring site is located near intersection of Appian Way and Moss Avenue in Santa Monica. The storm drain discharges below the Santa Monica Pier. Drainage area is approximately 81 acres. The Santa Monica Mall and Third St. Promenade dominate the watershed with remaining land uses consisting of office buildings, small shops, restaurants, hotels and high-density apartments.	1995-1999
Sawpit Creek	S11	Open Space (& Parks)	Located in Los Angeles River watershed in City of Monrovia. The monitoring station is Sawpit Creek, downstream of Monrovia Creek. Sawpit Creek is a natural watercourse at this location. Drainage area is approximately 3300 acres.	1995-2001
Project 620	S18	Residential	Located in the Los Angeles River watershed in the City of Glendale. The monitoring station is at the intersection of Glenwood Road and Cleveland Avenue. Land use is predominantly high-density, single-family residential. Drainage area is approximately 120 acres.	1995-2001
Project 1202	S24	Light Industrial	Located in the Dominguez Channel/Los Angeles Harbor Watershed in the City of Carson. The monitoring station is near the intersection of Wilmington Avenue and 220th Street. The overall watershed land use is predominantly industrial.	1995-2001
Dominguez Channel	S23	Freeway (Roadways)	Located within the Dominguez Channel/Los Angeles Harbor watershed in Lennox, near LAX. The monitoring station is near the intersection of 116th Street and Isis Avenue. Land use is predominantly transportation and includes areas of LAX and Interstate 105.	1995-2001
Project 474	S25	Education (Schools)	Located in Los Angeles River watershed in the Northridge section of the City of Los Angeles. The monitoring station is located along Lindley Avenue, one block south of Nordoff Street. The station monitors runoff from the California State University of Northridge. Drainage area is approximately 262 acres.	1997-2001

Station Name	#	Modeled Land Use	Site Description[1]	Years Monitoring Conducted
Project 404	S26	Village Residential	Located in Los Angeles River watershed in City of Arcadia. The monitoring station is located along Duarte Road, between Holly Ave and La Cadena Ave. Drainage area is approximately 214 acres.	1997-2001

[1]Los Angeles County 1999-2000 Draft Stormwater Monitoring Report (Los Angeles County, 2000)

2.4.2 Ventura County Monitoring Data

As part of its NPDES permit, the Ventura County Flood Control District conducts monitoring to determine the water quality of stormwater runoff from areas with specific land uses. One monitoring station, Wood Road at Revolon Slough (site A-1), drains the approximately 350 acre Oxnard Agricultural Plain, which is comprised almost entirely of agricultural land (primarily row crops), including a small number of farm residences and ancillary farm facilities for equipment maintenance and storage. Data from the Wood Road station was used to estimate pollutant concentrations in stormwater runoff for agricultural land use.

Land use runoff sampling for the Ventura County stormwater monitoring program originally began during the 1992/93 monitoring season, with up to several samples collected at each site during each storm season. For the A-1 site, the period of record begins during the 1996/97 storm season, and continues through the present. Data through 2008 were available at the time of preparation of this report. All land use monitoring sites are equipped with automated monitoring equipment, including flowmeters (with area-velocity probes and level sensors) and refrigerated auto-samplers which enable the collection of flow-weighted composite samples. Stormwater quality monitoring data for the agricultural land use site was provided by the Ventura County Watershed Protection District (Ventura County, 1997, 1998, 1999, 2001, 2002, and 2003).

2.4.3 Data Analysis for Derivation of Land Use EMCs

The convention for dealing with the censored data (e.g., data only known to be below the analytical detection limit) is to substitute half of the detection limit for all non-detects. L.A. County and Ventura County have followed this convention when providing summary arithmetic statistics of the stormwater monitoring data. This method tends to introduce bias into the estimate of the mean and standard deviation and the summary statistics are not believed to be robust or adequately account for non-detects. Additionally, the detection limit for dissolved copper and total lead has changed during the period stormwater monitoring was conducted by LACDPW.

In an effort to provide more reliable and accurate estimates of land use EMCs for the project water quality modeling, a robust method of estimating descriptive statistics for censored data with multiple detection limits was employed. The plotting position method described in Helsel and Cohn (1988) was used to estimate censored values using the distribution of uncensored values. Descriptive statistics were then estimated using the parametric bootstrap method suggested by Singh, Singh, and Engelhardt (1997).

The final land use EMC input parameters developed for the Monte Carlo water quality model include the log-normal mean and log-normal standard deviation. Analyses demonstrate that nearly all of the Los Angeles County land use data sets and the Ventura County data set can be more closely represented by the log-normal distribution than the normal distribution[1], which is consistent with findings by Pitt et al. (2004) based on analyses of the National Stormwater Quality Database (NSQD). Table F-14 summarizes the number of data points and the percent non-detects for the pollutants and land uses of interest that have sufficient data available for modeling based on the Los Angeles County and Ventura County data sets. While data may be available to develop descriptive statistics for other pollutants (e.g., organics, other metal constituents, trash), reliable land use EMCs statistics could not be computed due to statistically insufficient number of detected results or due to the use sampling techniques not amenable to estimating representative EMCs (e.g., catch basin clean-outs in the case of trash). Also, the availability of BMP effluent quality data similarly limits the number of pollutants that can be effectively modeled; i.e., other pollutants (e.g., organics, other metal constituents) may have land use EMC data available but not BMP effluent data.

2.4.4 Example Data Set

To illustrate the statistical methods used to obtain land use EMCs, the LACDPW stormwater monitoring data collected for total lead from the transportation land use station is used. The data were collected from 01/1996 to 04/2001. At the beginning of March 1997 the detection limit for total lead changed from 10 to 5 µg/L. Table F-13 describes the data according to the number of censored and uncensored values in the example data set.

Table F-13
Number of Censored and Uncensored Data Points in the Total Lead Transportation Land Use Data Set

Total Lead EMC Data for Transportation Land Use	
Uncensored	37
Censored < 10 µg/L	2

[1] Statistical distribution test results reported by Los Angeles County also confirm this assessment, as summarized by Table 4-14 found at http://LACDPW.org/wmd/npdes/Int_report/Tables/Table_4-14.pdf.

Censored < 5 µg/L	38
Total Data Count	77

Prior to applying the plotting position method, it is necessary to check the normality of the data. Figure F-3 shows histograms and probability plots of the transportation land use total lead data above detection limits in normal and lognormal space. As indicated in the figure, the data tends to follow a lognormal distribution, a finding that is common with many pollutants in stormwater.

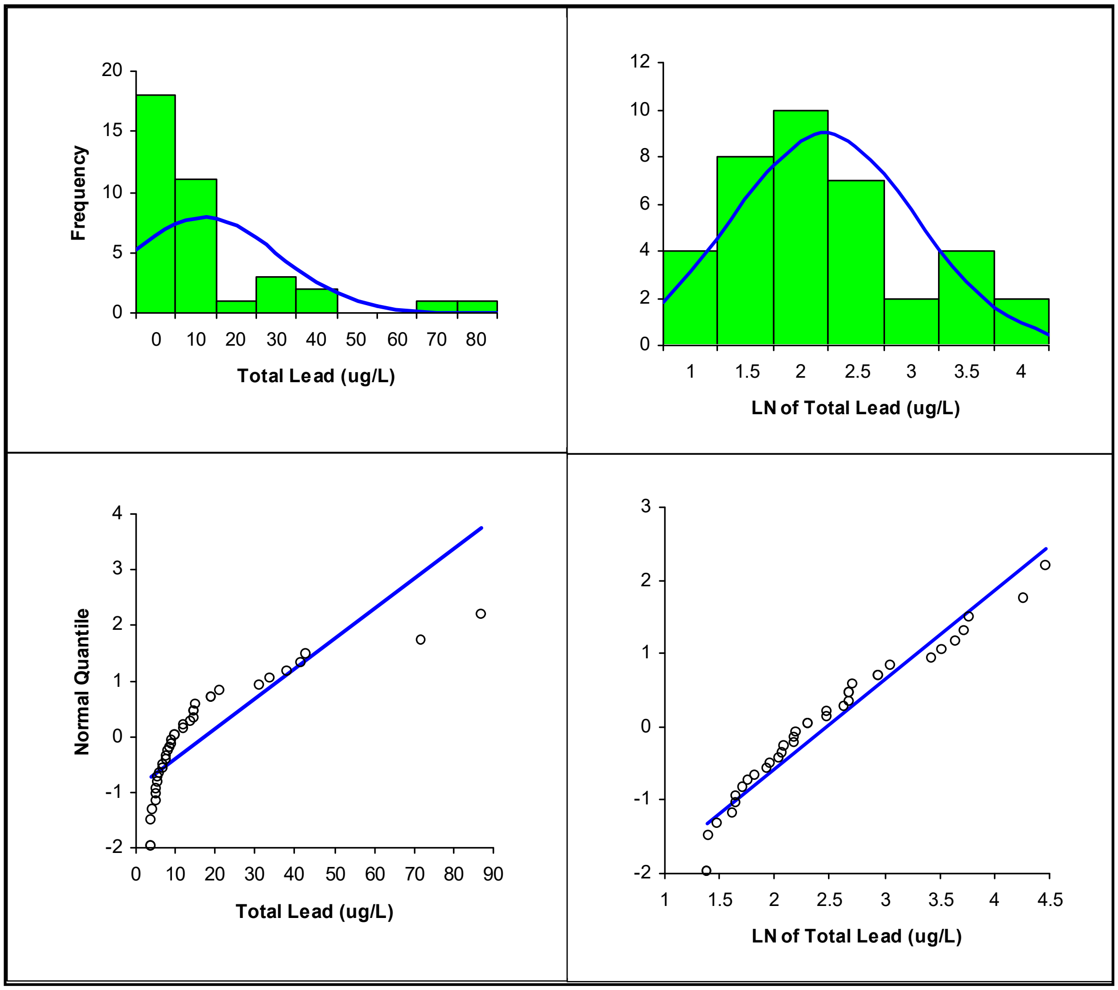

Figure F-3 Histograms and Probability Plots of Transportation Total Lead Data in Arithmetic and Lognormal Space

To verify the visual check that the data are lognormally distributed, the Shapiro-Wilk goodness-of-fit test was used (Royston, 1992). In this test, if $p > 0.1$, the null hypothesis that the log data follow a normal distribution cannot be rejected. For this example data set, the p-value of the log-transformed uncensored data is 0.293, which indicates that lognormal distribution is a good approximation of the distribution of the data set.

2.4.4.1 Method for Dealing with Multiple Detection Limits

To account for the multiple detection limits in the censored data sets, a regression on order statistics (ROS) method was employed. ROS is a category of robust methods for estimating descriptive statistics of censored data sets that utilize the normal scores for the order statistics (Shumway et al. 2002). The plotting position method by Hirsch and Stendinger (1987) (summarized by Helsel and Cohn, 1988) was the ROS method used. In this method, plotting positions are based on conditional probabilities and ranks, where the ranks of the censored (below detection) and uncensored data (above detection) related to each detection limit are ranked independently. The method is summarized in the equations below.

After plotting positions for the censored and uncensored values have been calculated, the uncensored values are plotted against the z-statistic corresponding to the plotting position and the best-fit line of the known data points is derived. Using this line and the plotting positions for the uncensored data, the values for the uncensored data are extrapolated. Figure F-4 illustrates the results of the application of the plotting position method on the total lead data for transportation land use.

$$pe_j = pe_{j+1} + \frac{A_j}{(A_j + B_j)} \times (1 - pe_{j+1}) \qquad (1)$$

Where:

A_j = the number of uncensored observations above the j detection limit and below the j +1 detection limit.

B_j = the number of censored and uncensored observations less than or equal to the j detection limit.

pe_j = the probability of exceeding the j threshold for j = m, m -1, … 2, 1 where m is the number of thresholds; by convention $pe_{m+1} = 0$.

Equation 2 was used for plotting the uncensored data and equation 3 was used for plotting the censored data; the plotting positions of the data were calculated using the Weibull plotting position formula.

$$p(i) = (1 - pe_j) + \frac{(pe_j - pe_{j+1}) \times r}{(A_j + 1)} \qquad (2)$$

Where:

p(i) = the plotting position of the uncensored i data point.

r = the rank of the i^{th} observation of the A_j observations above the j detection limit.

$$pc(i) = \frac{(1 - pe_j) \times r}{(n_j + 1)} \qquad (3)$$

Where:

pc(i) = the plotting position of the censored i data point.

R = the rank of the i^{th} observation of the n_j censored values below the j detection limit.

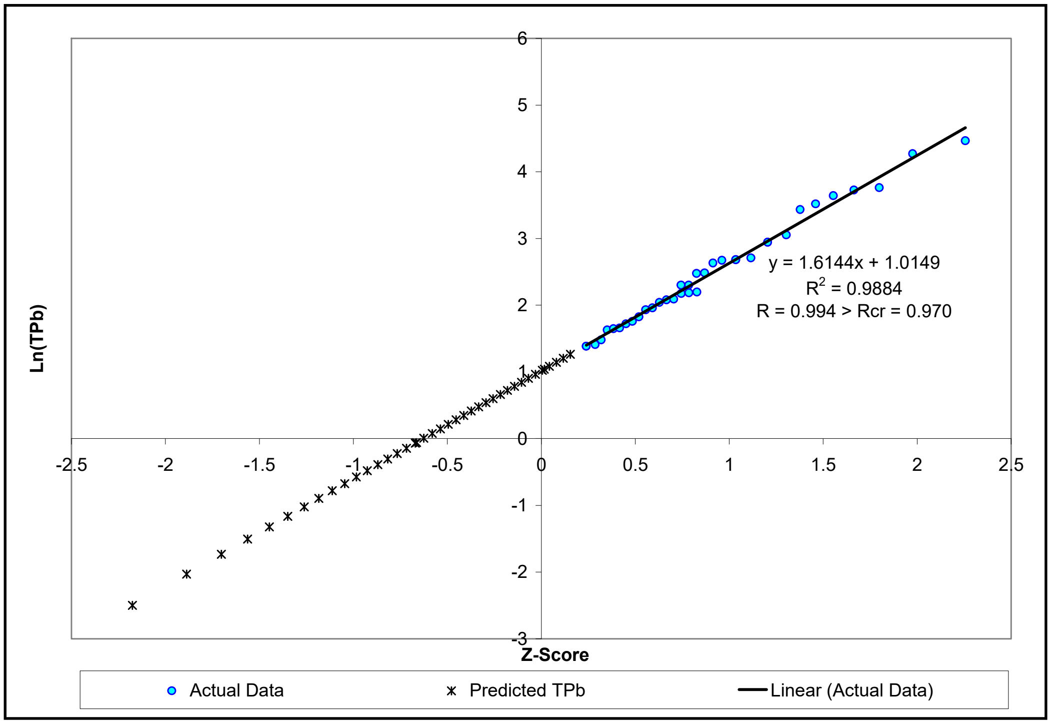

Figure F-4 Probability Plot of the Uncensored and Predicted (Censored) Total Lead Transportation EMCs

2.4.4.2 Method for Calculating Descriptive Statistics

After the censored data are estimated (or for datasets without non-detects), descriptive statistics were computed using the bootstrap method (Singh et al. 1997). The bootstrap method samples from the data set with replacement several thousand times and calculates the desired descriptive statistics from the sampled data. The steps of the bootstrap estimation method are described below.

1. Take a sample of size *n* with replacement (the sampled data point remains in the data set for subsequent sampling) from the existing data set (Singh et al. recommends n be the same size as the original data set, this recommendation was followed for the analysis) and compute the descriptive statistic, θ_i, from the sampled data.

2. Repeat Step 1 independently N times (20,000 for this analysis) each time calculating a new estimate for θ_i.

3. Calculate the bootstrap estimate θ_B by averaging the θ_i's for i=1 to N.

Fundamentally, the bootstrap procedure is based on the Central Limit Theorem (CLT), which suggests that even when the underlying population distribution is non-normal, averaging produces a distribution more closely approximated with normal distribution than the sampled distribution (Devore 1995). Figure F-5 compares the total lead data after estimating censored values using the ROS method described prior to applying the bootstrap method with bootstrapped means of the ROS data. Note the bootstrap means are more normally distributed than the original data and the central tendency of the data is centered near 8 µg/L.

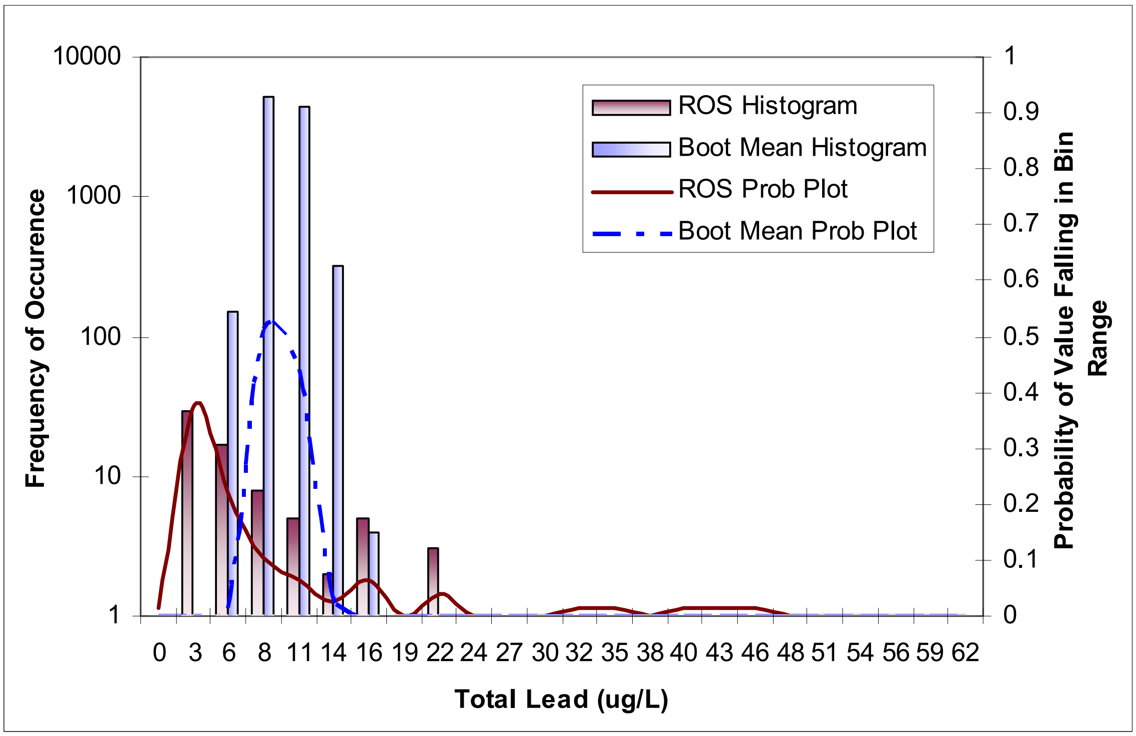

Figure F-5 Comparison of the Distribution of ROS Method Total Lead Data and the Bootstrap Means of the ROS Data.

The majority of the LACDPW stormwater monitoring for the pollutant land use combinations analyzed fit a lognormal distribution. The data that did not statistically fit the lognormal distribution were more closely approximated with a lognormal distribution than a normal distribution. The bootstrap method was applied differently depending on the distributional fit of the data.

If the pollutant EMC data for a particular land use fit a lognormal distribution according to the Shapiro-Wilk goodness-of-fit test, the log-transformed data were bootstrapped and an estimate of the mean and standard deviation were obtained in log space and then converted to arithmetic space. The assumption of lognormality was more stringently applied than normal by using an alpha significance value of 0.1. This was done to improve the estimate of the standard deviation when the hypothesis of lognormality is rejected. When analyzing data in log space there is a tendency to overestimate the standard deviation for relatively symmetric data and underestimate the standard deviation for severely skewed data. For datasets that did not fit the lognormal distribution, the raw data were bootstrapped to obtain the mean and standard deviation statistics. Bootstrapping the data in arithmetic space assumes no distribution in those instances when a distribution could not be confirmed through goodness-of-fit testing.

2.4.4.3 Conclusions

The plotting position method for multiple detection limits has been used in conjunction with the bootstrap procedure for calculating the descriptive statistics used to represent pollutant EMC distributions in the water quality model. Table F-15 summarizes the lognormal descriptive statistics, and Table F-16 summarizes the resulting arithmetic means. The latter data represent the land use specific pollutant EMCs in the Monte Carlo water quality model.

Table F-14
Summary of Number of Data Points and Percent Non Detects for Los Angeles County and Ventura County Land Use EMCs

Land Use		TSS	TP	NH3-N	NO3-N	NO2-N	TKN	DCu	TCu	TPb	DZn	TZn	Cl	TFe	DFe
Commercial	Count	31	32	33	33	7	36	40	40	40	40	40	33	40	39
	% ND	0%	3%	21%	21%	0%	3%	15%	0%	45%	10%	10%	0%	5%	44%
Industrial	Count	53	55	57	56	9	57	61	61	61	61	61	57	61	61
	% ND	0%	5%	19%	5%	16%	0%	15%	0%	43%	7%	5%	0%	25%	67%
Transportation	Count	75	71	74	75	10	75	77	77	77	77	77	76	77	77
	% ND	0%	1%	27%	20%	0%	0%	1%	0%	52%	6%	6%	4%	18%	70%
Education	Count	51	49	52	51	15	51	54	54	54	54	54	52	54	54
	% ND	0%	0%	35%	24%	0%	0%	19%	0%	76%	39%	35%	4%	30%	67%
Village Residential	Count	45	38	46	46	11	50	54	54	54	54	54	46	54	54
	% ND	2%	3%	24%	26%	0%	0%	37%	7%	72%	41%	39%	8%	33%	80%
Residential	Count	41	42	44	43	15	46	48	48	48	48	48	43	48	48
	% ND	0%	0%	16%	30%	0%	0%	40%	4%	52%	81%	79%	2%	35%	85%
Vacant / Open Space	Count	48	46	48	50	35	50	52	52	57	52	52	50	52	52
	% ND	2%	41%	67%	2%	70%	0%	90%	38%	88%	96%	96%	0%	40%	87%
Agriculture (Ventura County)	Count	24	6	25	23	7	21	25	25	25	25	25[1]	16	--[2]	--[2]
	% ND	13%	0%	48%	9%	0%	10%	0%	0%	0%	0%	0%[1]	19%	--[2]	--[2]

[1]Total zinc data was insufficient to compute statistics for agriculture in Ventura County; statistics for dissolved zinc were used for total zinc within the model.
[2]Total and dissolved iron data was insufficient to compute statistics for agriculture in Ventura County; statistics for vacant/open space were used within the model.

Table F-15
Lognormal Statistics for Modeling Pollutant Concentrations from Land Uses

Land Use		TSS	TP	NH3	NO3	NO2	TKN	DCu	TCu	TPb	DZn	TZn	Cl	TFe	DFe
Commercial	Mean	4.00	-1.19	-1.08	-0.947	-2.63	0.698	2.25	3.19	1.45	4.87	5.30	3.44	6.47	4.51
	St. Dev	0.634	0.733	1.60	0.832	1.17	1.04	0.723	0.72	1.47	0.575	0.58	0.969	1.45	1.49
Industrial	Mean	5.07	-1.30	-1.14	-0.532	-2.67	0.803	2.39	3.16	1.68	5.57	5.99	2.27	6.78	3.53
	St. Dev	0.798	0.860	1.12	0.891	0.788	0.711	0.818	0.87	1.49	0.978	0.78	0.620	1.77	2.72
Transportation	Mean	3.97	-0.909	-1.71	-0.863	-2.69	0.373	3.24	3.75	1.60	5.10	5.46	1.58	6.39	4.08
	St. Dev	0.878	1.03	1.20	1.06	0.755	0.690	0.693	0.65	1.12	0.776	0.66	0.718	1.14	1.45
Education	Mean	4.14	-1.35	-1.92	-0.888	-3.05	0.359	2.20	2.80	0.770	4.13	4.56	2.06	6.93	4.97
	St. Dev	0.961	0.538	1.41	0.886	1.22	0.599	0.773	0.62	1.02	0.626	0.64	1.54	1.30	1.46
Village Residential	Mean	3.20	-1.75	-1.26	-0.401	-2.94	0.391	1.76	2.40	0.827	3.96	4.58	1.71	5.97	2.94
	St. Dev	0.988	0.777	1.07	1.28	1.20	0.624	0.687	0.44	1.17	0.882	0.71	1.69	1.26	2.37
Residential	Mean	4.24	-1.13	-1.20	-1.17	-3.14	0.776	1.91	2.72	1.85	2.49	3.99	1.49	6.67	3.63
	St. Dev	1.08	0.672	0.996	1.35	1.24	0.787	0.811	0.64	1.07	1.28	0.75	0.640	1.17	1.45
Vacant / Open Space	Mean	3.44	-3.20	-3.18	-0.031	-3.95	-0.354	-1.83	1.43	-0.375	3.24	2.23	1.87	4.76	4.10
	St. Dev	1.97	1.44	1.37	0.615	0.494	0.792	1.59	1.36	1.72	0.438	1.44	0.249	2.02	0.64
Agriculture (Ventura County)	Mean	6.56	0.930	-0.080	2.59	-1.17	1.58	2.64	4.08	2.65	3.06	3.06[1]	3.93	4.76[2]	4.10[2]
	St. Dev	0.654	1.38	0.976	0.654	0.725	0.639	0.863	0.99	1.23	1.03	1.03[1]	0.926	2.02[2]	0.64[2]

[1]Total zinc data was insufficient to compute statistics for agriculture in Ventura County; statistics for dissolved zinc were used for total zinc within the model.
[2]Total and dissolved iron data was insufficient to compute statistics for agriculture in Ventura County; statistics for vacant/open space were used within the model.

Table F-16
Resulting Arithmetic Means from Lognormal Statistics used for Modeling Pollutant Concentrations[1]

Land Use	TSS	TP	NH3	NO3	NO2	TKN	DCu	TCu	TPb	DZn	TZn	Cl	TFe	DFe
Units	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*mg/L*	*µg/L*	*µg/L*
Commercial	67	0.40	0.29	1.21	0.55	3.4	12	31	12	153	237	50	4942	357
Industrial	219	0.39	0.60	0.87	0.09	2.9	15	34	16	422	541	12	7461	711
Transportation	78	0.68	0.37	0.74	0.09	1.8	32	53	9.2	222	292	6.3	1212	185
Education	100	0.30	0.40	0.61	0.10	1.7	12	20	3.6	75	117	26	3590	475
Village Residential	40	0.23	0.50	1.5	0.11	1.8	7.4	12	4.5	78	125	23	965	204
Residential	124	0.40	0.49	0.78	0.09	3.0	9.4	19	11	27	72	5.4	1429	103
Vacant / Open Space	217	0.12	0.11	1.2	0.02	1.0	0.6	11	3.0	28	26	6.7	2725	152
Agriculture (Ventura County)	877	6.59	1.5	17	0.40	6.0	20	97	30	36	36	78	2725[2]	152[2]

[1]Calculated from values provided in Table F-15
[2]Total and dissolved iron data was insufficient to compute statistics for agriculture in Ventura County; statistics for vacant/open space were used within the model.

2.4.4 Comparison to Kern County, Tulare County, and San Joaquin County Data

The California Environmental Data Exchange Network (CEDEN) contains stormwater monitoring data for Kern County, Tulare County, and San Joaquin County (SWRCB, 2012a; SWRCB, 2012b; SWRCB, 2012c). The characterization of land uses tributary to each monitoring location was not specified; however, it was assumed that the monitoring data that was collected as part of the Irrigated Lands Regulatory Program within CEDEN was representative of irrigated agriculture and was removed from the overall County monitoring data summary presented in Table F-17. The range of EMCs provided for LA County is for all land uses represented in the water quality model, with the exception of agriculture. In general, the land use specific EMC data from LA County is greater than those observed in Kern County, Tulare County, and San Joaquin County, which provides a conservative estimate for the land use generated EMCs.

Table F-17
EMC Monitoring Data Comparison for LA County, Kern County, Tulare County, and San Joaquin County

Parameter	Units	LA County Range	Kern County Range	Tulare County Range	San Joaquin County Range
Period of Record	--	1995-2001	2002-2011	2002-2011	1995-2012
Number of Samples	--	7-77	2-95	1-68	1-300
Ammonia as N, Total	mg/L	0.11-0.60	N/A	0.004[1]	0.03-8.23
Chloride, Dissolved	mg/L	5.4-50	4.6-11.2	0.2-7.2	1.2-5.3
Copper, Dissolved	ug/L	1-32	N/A	12[1]	1-24
Copper, Total	ug/L	11-53	N/A	5-29	1-270
Iron, Total	ug/L	965-7461	110-220	110-340	N/A
Lead, Total	ug/L	3-12	N/A	N/A	0-10
Nitrate as N, Dissolved	mg/L	0.61-1.5	N/A	0.05[1]	0.06-0.28
Nitrite as N, Dissolved	mg/L	0.02-0.55	N/A	0.002[1]	0.004-0.04
Nitrogen, Total Kjeldahl, Total	mg/L	1.0-3.4	0.2-1.5	0.1[1]	1.9[1]
Phosphorus as P, Total	mg/L	0.12-0.68	0.01-0.55	0.05-0.07	0.02-4.5
Total Suspended Solids, Particulate	mg/L	40-877	1-3	6-9	1-420
Zinc, Dissolved	ug/L	27-422	N/A	N/A	2-26
Zinc, Total	ug/L	26-541	N/A	N/A	1-59

1-One data point was collected; therefore, a range was not provided.

The CEDEN data for irrigated agriculture was not used for the water quality model because the exclusive agriculture within the project is assumed not to be irrigated and to be more representative of agriculture used primarily for grazing.

2.5 Treatment Assumptions and Estimate of Treatment BMP Performance Parameters

Developed areas within the Grapevine project will be treated in either distributed LID BMPs or community-scale infiltration facilities based off of the type of tributary land use (Table F-18). Land uses that drain to distributed LID BMPs and are also located within community-scale infiltration BMP are subsequently routed to the community-scale BMPs following treatment in the LID BMPs. As the distributed LID BMPs are infiltration facilities, this is comprised of the bypass flows around the distributed LID BMPs.

Table F-18
Treatment Facility Types

Treatment Type	Land Uses Treated
Distributed LID BMPs (Infiltration)	Village Commercial, Village Residential, Commercial, Residential, Parks, Schools, Light Industrial, Roadways
Community-Scale Infiltration Facilities	Agriculture[1]
No Treatment	Vacant

1-Agriculture within developed areas is treated within community-scale BMPs and is estimated to be 20% of the exclusive agriculture zoning category.

BMP performance is a function of the fraction of stormwater runoff receiving treatment (i.e., percent capture), the amount of captured volume that is "lost" in the facility and does not discharge (i.e., volume reduction), and the effectiveness of removing pollutants from the treated stormwater. The facilities are also evaluated on the ability to retain the 85th percentile, 24-hour storm.

2.5.1 BMP Capture Efficiency and Volume Reduction

The modeled water quality treatment BMPs were analyzed to ensure that they meet volume-based sizing criteria (80% watershed capture and the 85th percentile, 24-hour storm volume). The community-scale infiltration facilities were sized according to the stage-storage curves provided by Geosyntec for two scenarios, intended to assess the smallest and largest facility sizes that would be designed as part of the development condition:

- **CS BMP #1:** Community-scale BMPs were sized using the Kern County Hydrology Manual flood control sizing procedure for the 10-year, 5-day storm event. Stage-storage curves are based on the Master Drainage Study dated February 2015 completed by Geosyntec Consultants (Geosyntec, 2015). This sizing procedure does not allow for direct consideration of distributed bioretention BMP features up gradient of the community-scale BMPs and results in features that are significantly oversized for the purpose of water quality.

- **CS BMP #2:** Community-scale BMPs were sized using a simplified parameter adjustment for impervious cover in the Kern County Hydrology Manual flood control sizing procedure as described in detail in Geosyntec's memorandum entitled *Task 2: Results of Test Catchment for Assessment of Parameter Adjustments* (Geosyntec, 2014), Attachment G to this WQTR. The impervious cover adjustment selected (reduction of 48.8%) incorporates distributed bioretention BMPs and downspout disconnections that route impervious rooftop areas to down gradient pervious areas.

The two community-scale BMP representations provide a range of anticipated sump sizes for the project, inclusive of scenarios in which only distributed bioretention BMPs are implemented or where all rooftop areas are not routed to pervious surfaces. In both scenarios, the determination of the stage-storage curves is based on flood control sizing requirements, which results in a larger footprint than required for water quality and will allow for the benefit of additional volume reduction achieved in the community-scale BMPs as a result of combining water quality and flood control facilities.

2.5.1.1 Volume Based BMP Capture Efficiency

The BMP capture efficiency is a measure of how much runoff from the BMP drainage area is captured and routed through the BMP. The volume not captured by the BMP bypasses or overflows the BMP. Event-based capture efficiencies and volume reductions were estimated for LID BMPs and community-scale BMPs by sizing hypothetical BMPs to comply with the BMP sizing criteria, assigning SWMM model parameters to represent these BMPs, and then using SWMM to analyze the long-term capture and volume reduction performance. Specific assumptions are described in this section.

For the distributed BMPs, an analysis of capture efficiency and volume reduction was conducted to meet the sizing criteria. In this analysis, a representative 1-acre catchment (calculated composite imperviousness and soil distribution of the proposed total drainage area, and parameterized per the modeling assumptions in Table F-19) was used for the total area designated to be treated with distributed BMPs. This catchment was simulated in the SWMM "runoff" block to produce a characteristic runoff hydrograph, which was routed through the distributed BMP using the SWMM "storage/treatment" block. A standard distributed infiltration BMP configuration was developed to represent the approximate characteristics of facilities that are anticipated to be employed within the project. The infiltration rate beneath the representative BMP was set at the most conservative infiltration rate tested for the SPAs where distributed BMPs are to be utilized. The total storage depth within the distributed BMPs was set at 2.3 feet to ensure that the BMP draws down within 48 hours with the conservative infiltration rate of 0.57 in/hr. The water quality basins were conservatively sized to achieve 80% capture, as sizing for the 85th percentile, 24-hour storm could potentially overestimate the retention in the watershed and underestimate the runoff reaching the community-scale infiltration BMPs. All of the discharge or bypass from the distributed BMPs, with the exception of the off-site areas, will be routed to downgradient community-scale BMPs.

Infiltration rates beneath community-scale BMPs were derived from the lowest (most conservative) of the measured infiltration rates within each planning area (Geosyntec, 2013). A factor of safety of 2.5 was also applied to each KSat value. KSat values simulated for each basin are summarized in Table F-19.

Table F-19
Distributed and Community-Scale Infiltration Rates used in Model

Name	Special Plan Area	Model KSat (in/hr)
Distributed BMPs	--	0.57
Basin A	1	0.94
Basin BC	1	0.94
Basin D	1	0.94
Basin EF	2	0.57[1]
Basin G	2	0.57[1]
Basin H	2	0.57[1]
Basin I	2	0.57[1]
Basin J	3	0.85
Basin KL	3	0.85
Basin M	3	0.85
Basin N	4	0.99
Basin O	4	0.99
Basin P	4	0.99
Basin Q	4	0.99
Basin R	5a	0.76[1]
Basin S	5a	0.76[1]
Basin TU	5a	0.76[1]
Basin V	5a	0.76[1]
Basin W	5b	0.25
Basin X	6a	0.69
Basin Y	6a	0.69
Basin Z	6a	0.69
Basin AA	6a	0.69
Basin BB	6b	0.69[2]

Basin CC	6b	0.69[2]
Basin DD	6b	0.69[2]
Basin EE	6b	0.69[2]
Basin FF	6c	0.69[2]
Basin GG	6d	1.23
Basin HH	6e	1.11

[1]Two measurements were taken within special plan areas 2 and 5a; the lower of the 2 measured rates was used to represent the infiltration rate beneath the facilities.
[2]No measurements were taken within special plan areas 6b and 6c; the infiltration rate from special plan area 6a was used as it is the most conservative rate measured in the nearby special plan areas and has a similar soil distribution.

The stand-alone distributed BMPs and the combined distributed BMP and community-scale BMP systems were then simulated in SWMM to yield estimates of the unit capture efficiency and volume reduction that would be expected from each type of BMP within specific basin tributary areas. To approximately account for the effects of the distributed BMPs in each community-scale BMP drainage area, "hydrologic representations" of distributed BMPs were used. These representations do not account for detailed hydraulic routing, but generally account for the effect of distributed BMPs on the overall volumetric response from the drainage area. These representations included increasing the depression storage of selected pervious and impervious areas, and routing impervious area runoff to these "sump" areas based on the distributed BMPs in each community-scale BMP drainage area. Table F-20 includes the hydrologic modeling assumptions and Table F-21 includes the BMP modeling assumptions for percent capture and percent volume reduction.

Table F-20
SWMM Hydrologic Model Representation of Distributed BMPs

SWMM Runoff Parameters	Units	Distributed LID BMP Representation
Depression Storage, pervious	inches	29
Depression Storage, impervious	inches	NA
Imperviousness	%	0
Infiltration Rate	in/hr	0.57[1]
Hydrologic Distributed BMP Surface Area (as a % of tributary impervious area)	%	2.4
Average Annual Reduction in Runoff Volume from Hydrologic Representation	%	80%
Average Annual Reduction in Runoff Volume from Hydraulic Representation	%	80%

[1] An infiltration rate of 0.57 in/hr was used as it is the most conservative measured infiltration rate located within the special plan areas that contain distributed BMPs. If actual measured infiltration rates are greater, the facility dimensions may be adjusted as long as the facility achieves 80% capture and draws down in less than 48 hours.

Table F-21

BMP Modeling Assumptions for Percent Capture and Percent Volume Reduction Estimates

BMP Parameter	Distributed BMPs[1]	Community-Scale BMP Scenario #1	Community-Scale BMP Scenario #2
Storage Volume	Sized for 80% Watershed Capture	Equivalent to project Flood Control Sumps (Geosyntec, 2015)[2]	Equivalent to Adjusted Flood Control Sumps (Geosyntec, 2015)[2]
BMP Functionality	Infiltration	Infiltration	Infiltration
Planning Level BMP Configuration	No underdrain; all discharge to infiltration	No underdrain for facilities; all discharge to infiltration	No underdrain for facilities; all discharge to infiltration
BMP Drain Time	48 hours	7 days[3]	7 days[3]

[1]Generic modeling assumptions were used to develop planning level performance estimates that are considered to be representative of infiltrating distributed BMPs that will draw down in 48 hours.
[2] Facilities checked to ensure that they meet sizing criteria (80% capture and runoff from the 85th percentile, 24-hour storm event)
[3]The community-scale BMPs are held to the flood control sizing draw down criteria of 7-days based on the Kern County Development Standards.

Results from the SWMM simulations were then post-processed in a modified SWMM engine to yield capture efficiency and volume reduction for each storm. The modified SWMM engine tracks precipitation, runoff, and treatment system routing in the context of individual storm events. In the RAIN block of the model, storm events are delineated from within the continuous precipitation record using algorithms identical in performance to GeoSYNOP, described herein; depth and start and stop times of each event are recorded. In the "runoff" block, the precipitation volume associated with each event is tracked between the volume lost and that which runs off; start and stop times of runoff for each storm are recorded for later use. Finally, in the "storage/treatment" block, the runoff volume associated with each storm event is routed through the treatment system as described above, and amounts of treated volume, bypassed volume, infiltrated volume and evaporated volume are tracked. This constitutes a volume-tracking approach of calculating capture efficiency and volume reduction by storm event. The result of these algorithms is a capture efficiency and volume reduction for each storm in the period of record. Resulting long-term average annual capture efficiency and volume reduction for each facility by drainage basin is shown in Table F-22 and Table F-23. Water overflowing the distributed BMPs within drainage basin areas was considered to be bypassed and routed to the down gradient community-scale BMP. Water overflowing the community-scale facilities or off-site distributed BMPs was considered to be bypassed (not captured).

2.5.1.2 BMP Volume Reductions

The volume reduction achieved by a BMP is a function of the capture efficiency and the fraction of captured stormwater runoff that is infiltrated, evaporated, or transpired by vegetation. Volume reduction was estimated via SWMM modeling of catchments as discussed above.

Long-term average volume reductions estimated in water quality basins are shown in Table F-21 as a percentage of captured volume.

2.5.1.3 BMP Capture Efficiency and Volume Reduction Results

The estimated average capture efficiencies for the water quality facilities proposed for the project are shown by basin drainage area for CS BMP Scenario #1 in Table F-22 and for CS BMP Scenario #2 in Table F-23. The capture efficiency methods described above were used to estimate the fraction of runoff captured by each facility for each storm in the period of record.

As mentioned above, treatment BMPs were sized to store the volume equivalent to that produced by the 85th percentile, 24-hour storm event and also sized to ensure that they achieve watershed 80% capture (includes nested distributed BMPs in areas tributary to the community-scale facilities). As summarized in the tables below, this results in capture efficiencies ranging from 80% to 100%.

Table F-22
Average BMP Percent Capture Estimates for Water Quality BMPs (CS BMP Scenario #1)

Basin Name or Distributed BMP	Total Treated Area (ac)	Total % Impervious	85th Percentile, 24-Hour Volume[1] (ac-ft)	Provided Volume (ac-ft)	Estimated Basin Capture Efficiency[2]	Modeled Basin Volume Reduction[3]	Estimated Watershed Capture Efficiency[4]
Basin A	76.2	53.9	1.5	16.3	100%	100%	100%
Basin BC[5]	15.8	69.0	0.4	4.5	100%	100%	100%
Basin D	454.2	50.5	8.7	89.5	100%	100%	100%
Basin EF[5]	180.0	26.2	2.0	17.4	99%	100%	100%
Basin G	264.8	55.5	5.5	53.5	99%	100%	100%
Basin H	265.8	70.1	7.3	49.1	98%	100%	99%
Basin I	339.0	62.8	8.1	95.8	100%	100%	100%
Basin J	116.5	66.1	3.0	28.6	100%	100%	100%
Basin KL[5]	451.3	72.5	13.0	118.9	100%	100%	100%
Basin M	228.4	78.7	7.4	65.4	100%	100%	100%
Basin Local	32.2	42.7	0.5	5.2	100%	100%	100%
Basin N	87.7	51.7	1.7	17.7	100%	100%	100%
Basin OPQ[5]	625.7	58.3	13.8	136.7	100%	100%	100%
Basin R	81.1	54.5	1.7	16.7	100%	100%	100%
Basin S	31.4	61.2	0.7	7.7	100%	100%	100%
Basin TU[5]	287.6	59.1	6.4	63.8	100%	100%	100%
Basin V	163.2	53.2	3.3	32.8	100%	100%	100%
Basin W	103.7	55.3	2.2	22.2	98%	100%	99%
Basin X[6]	104.5	62.9	2.5	6.8	64%	100%	92%
Basin Y	176.6	86.4	6.7	67.2	100%	100%	100%
Basin Z	101.2	54.6	2.1	18.9	99%	100%	100%
Basin AA	132.0	90.8	5.4	40.9	99%	100%	100%
Basin BB	80.6	90.5	3.3	22.4	99%	100%	100%
Basin CC	90.6	90.5	3.7	25.7	99%	100%	100%
Basin DD	72.0	90.5	3.0	20.1	99%	100%	100%
Basin EE	78.5	90.5	3.2	22.0	99%	100%	100%
Basin FF	192.9	90.6	7.9	55.3	99%	100%	100%
Basin GG	177.0	90.6	7.3	50.3	99%	100%	100%
Basin HH	171.0	90.5	7.0	45.7	99%	100%	100%
Distributed BMPs	4609.3[7]	68.1[7]	0.04[8]	0.04[8]	80%	100%	80%[9]

[1]Calculated using the Water Environment Federation (WEF) sizing criteria for volume based controls (WEF, 1998).
[2]The estimated basin capture efficiency represents the percentage of surface runoff that reaches the basin to be captured and infiltrated. The percentage of runoff that is not captured is assumed to bypass the facility.
[3]The modeled basin volume reduction represents the percentage of the captured volume in the basin that is infiltrated (as a percent of the estimated basin capture efficiency). The percentage of the captured volume that is not infiltrated is assumed to leave the basin through an underdrain.

[4]The total estimated watershed capture refers to the cumulative capture in the basin drainage area, which includes the capture within the nested distributed BMPs upstream of the community-scale BMPs as well as capture by the community-scale BMPs themselves. The total estimated watershed capture is what is used to evaluate compliance with the 80% watershed capture standard as it includes all runoff and treatment within the drainage area.
[5]The required 85th percentile, 24-hour volumes and provided volumes are calculated for the overall area draining to the combined basins. The total volume provided is the sum of the volumes provided by the combined sump storage.
[6]For flood control purposes, Basin X will divert 69% of its flows to Basin Y. However, the provided volume achieves 92% watershed capture of the inflows to Basin X and was used for water quality with the acknowledgement that actual removal may be higher. The model is conservative in terms of routing.
[7]Total area treated by distributed BMPs within the project; most areas are also included within the community-scale BMP tributary area as the bypassed flows around the distributed BMPs are routed to the community-scale BMP. A 1-acre representative catchment was used to determine the 85th percentile, 24-hour volume, percent capture and percent volume reduction as described in Section E.2.5.1.
[8]Distributed BMP calculated and provided volumes are based on the 1-acre representative parcel used to develop the sizing factor for each parcel based on tributary impervious area.
[9]Distributed BMPs that do not drain to a downstream community-scale BMP achieve 80% watershed capture.

Table F-23
Average BMP Percent Capture Estimates for Water Quality BMPs (CS BMP Scenario #2)

Basin Name or Distributed BMP	Total Treated Area (ac)	Total % Impervious	85th Percentile, 24-Hour Volume[1] (ac-ft)	Provided Volume (ac-ft)	Estimated Basin Capture Efficiency[2]	Modeled Basin Volume Reduction[3]	Estimated Watershed Capture Efficiency[4]
Basin A	76.2	53.9	1.5	8.5	97%	100%	99%
Basin BC[5]	15.8	69.0	0.4	2.4	100%	100%	100%
Basin D	454.2	50.5	8.7	44.0	96%	100%	99%
Basin EF[5]	180.0	26.2	2.0	9.0	97%	100%	99%
Basin G	264.8	55.5	5.5	26.6	96%	100%	99%
Basin H	265.8	70.1	7.3	33.5	96%	100%	99%
Basin I	339.0	62.8	8.1	38.0	96%	100%	99%
Basin J	116.5	66.1	3.0	14.1	97%	100%	99%
Basin KL[5]	451.3	72.5	13.0	58.1	97%	100%	99%
Basin M	228.4	78.7	7.4	32.7	98%	100%	99%
Basin Local	32.2	42.7	0.5	2.9	98%	100%	99%
Basin N	87.7	51.7	1.7	8.8	97%	100%	99%
Basin OPQ[5]	625.7	58.3	13.8	67.1	97%	100%	99%
Basin R	81.1	54.5	1.7	8.4	96%	100%	99%
Basin S	31.4	61.2	0.7	4.0	98%	100%	99%
Basin TU[5]	287.6	59.1	6.4	31.1	97%	100%	99%
Basin V	163.2	53.2	3.3	16.2	97%	100%	99%
Basin W	103.7	55.3	2.2	11.4	94%	100%	98%
Basin XY[6]	176.6	86.4	8.9	36.6	96%	100%	99%
Basin Z	101.2	54.6	2.1	9.6	96%	100%	99%
Basin AA	132.0	90.8	5.4	20.1	96%	100%	99%

Basin BB	80.6	90.5	3.3	11.4	95%	100%	99%
Basin CC	90.6	90.5	3.7	12.8	95%	100%	99%
Basin DD	72.0	90.5	3.0	10.3	95%	100%	99%
Basin EE	78.5	90.5	3.2	11.1	95%	100%	99%
Basin FF	192.9	90.6	7.9	27.4	95%	100%	99%
Basin GG	177.0	90.6	7.3	24.8	96%	100%	99%
Basin HH	171.0	90.5	7.0	22.6	95%	100%	99%
Distributed BMPs	4609.3[7]	68.1[7]	0.04[8]	0.04[8]	80%	100%	80%[9]

[1]Calculated using the Water Environment Federation (WEF) sizing criteria for volume based controls (WEF, 1998).
[2]The estimated basin capture efficiency represents the percentage of surface runoff that reaches the basin to be captured and infiltrated. The percentage of runoff that is not captured is assumed to bypass the facility.
[3]The modeled basin volume reduction represents the percentage of the captured volume in the basin that is infiltrated (as a percent of the estimated basin capture efficiency). The percentage of the captured volume that is not infiltrated is assumed to leave the basin through an underdrain.
[4]The total estimated watershed capture refers to the cumulative capture in the basin drainage area, which includes the capture within the nested distributed BMPs upstream of the community-scale BMPs as well as capture by the community-scale BMPs themselves. The total estimated watershed capture is what is used to evaluate compliance with the 80% watershed capture standard as it includes all runoff and treatment within the drainage area.
[5]The required 85th percentile, 24-hour volumes and provided volumes are calculated for the overall area draining to the combined basins. The total volume provided is the sum of the volumes provided by the combined sump storage.
[6]Basin X and Basin Y were combined for the CS BMP Scenario #2, as Basin Y was able to provide the required flood control volume for both Basin X and Y tributary areas, eliminating the need for an additional Basin X.
[7]Total area treated by distributed BMPs within the project; most areas are also included within the community-scale BMP tributary area as the bypassed flows around the distributed BMPs are routed to the community-scale BMP. A 1-acre representative catchment was used to determine the 85th percentile, 24-hour volume, percent capture and percent volume reduction as described in Section E.2.5.1.
[8]Distributed BMP calculated and provided volumes are based on the 1-acre representative parcel used to develop the sizing factor for each parcel based on tributary impervious area.
[9]Distributed BMPs that do not drain to a downstream community-scale BMP achieve 80% watershed capture.

2.5.2 BMP Pollutant Removal

All of the proposed facilities for the project are assumed to include treatment via infiltration. Infiltration BMPs were assumed to provide no treatment for water that either overflows or bypasses the BMP and all constituents that are infiltrated are assumed to be removed. Therefore, there is no treated outflow simulated within the model, as treated flows are fully infiltrated and bypassed flows are assumed to remain unchanged.

2.5.2.1 Model Parameter Reliability & Assumptions

The input parameters for the water quality model fall into five main categories shown below. Each of the categories of input data is evaluated for accuracy reflecting the project site conditions:

- Precipitation;

- Runoff coefficients;
- Land uses;
- Stormwater pollutant EMCs; and
- BMP performance estimates.

Precipitation Data: The adjusted Bakersfield Airport precipitation record was used as the base rainfall gauge for the project (with an applied scaling factor to account for the difference in average annual precipitation at the gauge used to size the flood control basins). The scaling of the precipitation record should result in precipitation data that more accurately represents precipitation depths that would occur at the elevation of the project site. While some simplifying assumptions were made in the modification of existing NCDC records, these modifications are considered to improve the reliability of precipitation inputs by using gauges with high quality records and accounting for elevation effects.

The modeling methodology does not simulate snowfall/snowmelt, which may occur in small quantities at higher elevations of the project site. The overall percent of precipitation falling as snow in the vicinity of the project site is relatively small, and this simplification is not believed to have a significant influence on model results.

Runoff Coefficients: The estimation of runoff coefficients, described in Section E.2.2., is highly dependent on soil properties (i.e. infiltration potential) and less dependent on parameters such as ET rates, slopes, and depression storage. Soil properties are estimated as accurately as possible from available data such as soil surveys and site-specific infiltration testing. The soils within the project are highly infiltrating, so a factor of safety was incorporated into the estimate for the saturated hydraulic conductivity to provide a more conservative representation of the runoff from the model. However, this safety factor did not artificially reduce infiltration capability within the watersheds to the level where runoff is simulated over soils where that is unlikely. Therefore, the net result on the water quality model is that this parameter is estimated as accurately as the available information permits.

Land Use Data: Land use data for the existing conditions are based on the CEQA project description. Land use data for the developed conditions are based on the CEQA project description as well as the development projections in the Special Planning District Plan. The percent impervious values used in the water quality model for the urban land uses in the developed project condition are based upon the Kern County Hydrology Manual ranges, with the average value used as the model input. These percent impervious values are assumed to be representative of the land uses anticipated within the development zones for the project at this phase of planning.

Stormwater Pollutant EMCs: Stormwater pollutant EMCs are estimated from monitoring data collected by the LADPW and Ventura County from land use characterization stations that do not have the same level (if any) of site design and source control BMPs that will be implemented for the project. Therefore the stormwater pollutant EMCs estimated from the LADPW data are probably somewhat conservative compared to the pollutant concentrations in stormwater runoff that will occur from the developed conditions of the project site.

BMP Capture Efficiency & Effluent Concentrations: Stormwater capture efficiency estimates were calculated in SWMM to provide results on a storm-by-storm basis for input into the water quality model, to accurately reflect the anticipated performance of the distributed and community-scale facilities. Infiltration, evapotranspiration and flows out of the BMPs were estimated based on planning level representation of anticipated facility types. The community-scale BMP geometries are based on cross-sections produced by Geosyntec and are assumed to be accurate to the resolution of data provided. The model does not account for additional treatment potentially provided by bypass mechanisms included in basins for flood control purposes, which is conservatively assuming that each basin only treats waters from each respective drainage area.

Additional conservatism is introduced into the model through the use of the lowest infiltration rate within each special plan area where infiltration testing was conducted. Site-specific testing will be conducted when siting the BMPs and placement of the facilities will likely be over soils tested to have high infiltration rates. The use of a factor of safety on the lowest measured infiltration rates introduces some conservatism into the model, especially for the distributed BMPs.

Conclusions: The precipitation data, runoff coefficient, land use type and area, and land use percent imperviousness are thought to be reasonably accurate representations of the site conditions and do not significantly increase the conservativeness of the water quality model. The stormwater pollutant EMC estimates are believed to result in conservative estimates of pollutant concentrations and therefore pollutant loads because they do not account for source control and site design practices that will be implemented by the project. There is some uncertainty in predevelopment and post-development model input parameters which may result in overestimation or underestimation of volumes, loads, and concentrations due to land use designations and imperviousness. The water quality estimates for the developed project condition are believed to be moderately conservative (i.e., tend to overestimate loads and concentrations) due to pollutant concentration estimates, and BMP performance estimates that in general do not include the benefits of site design or source control BMPs that are planned to be implemented in the project.

3.0 MODEL METHODOLOGY

A Monte Carlo simulation method was used to develop the statistical description for storm water quality. In this approach, the storm water characteristics from a single storm event are first estimated. The storm depth was determined by randomly sampling from the historical storm depth frequency distribution. Similarly, an EMC was determined by randomly sampling from the frequency distribution of EMCs. The precipitation volume and EMC were used to determine runoff volume, pollutant concentration, and pollutant load of the single storm event. BMP volume reduction and performance (effluent quality), determined by randomly sampling from the developed frequency distributions, were used to calculate the pollutant removal resulting from treatment in the BMP system. This procedure was then repeated thousands of times (20,000), recording the volume, EMC and load from each randomly selected storm event, including treatment for the developed project condition. The statistics of these recorded results provide a description of the average characteristics and variability of the volume and water quality of storm water runoff.

This method was applied to the project using project-specific inputs as described above. The modeled pollutants for the Project were:

- Total Suspended Solids (sediment)
- Total Phosphorus
- Ammonia
- Nitrate
- Nitrite
- Total Kjeldahl Nitrogen
- Dissolved Copper
- Total Copper
- Total Lead
- Dissolved Zinc
- Total Zinc
- Total Aluminum

The steps in the Monte Carlo Water Quality Model are as follows:

1. Develop a statistical description of the number of storm events per year, and randomly select a number N_{storms}.
2. Estimate the volume of storm runoff for each land use area from a randomly selected storm event.
3. Randomly select a pollutant concentration in storm runoff for each land-use area and each pollutant.
4. Calculate the total runoff volume, pollutant load, and concentration in runoff from the modeled portion of the project, for both existing and developed conditions.
5. Calculate a total annual pollutant load by repeating steps 2-4 N_{storms} times, where N_{storms} is the number of storms per year, randomly selected in step 1.
6. Repeat steps 1 - 6 a total of 20,000 times for each pollutant modeled, recording the estimated pollutant concentration and annual load for each iteration.

7. Develop a statistical representation (mean annual value) of the recorded storm water pollutant loads and concentrations.

Each of the seven steps is described below.

3.1 Storms & Stormwater Runoff (steps 1 & 2)

3.1.1 Step 1 – Statistical Representation of Number of Storm Events per Water Year

3.1.1.1 Number of Storms per Water Year

The number of storm events per water year was calculated for the scaled precipitation record used for the model. The modeled average number of storm events per year (>0.1 inches, defined using an inter-event time of 6 hours and obtained using SWMM) and standard deviation for both rainfall records are included in Table F-24 below.

Table F-24
Number of Storm Events[1] per Year and Standard Deviation by Record

Rainfall Record	Number of Storm Events[1] (N)	Standard Deviation (SD)
Bakersfield Airport (scaled)	20.7	6.9

[1] Defined using an inter-event time of 6 hours and obtained using SWMM analyses.

Figure F-6 illustrates frequency histograms of the number of storm events per water year at the gauge. The number of storm events per year was modeled with a normal distribution. In the simulation, the number of storms per year was determined by randomly sampling from the normal distribution and rounding to the nearest whole number, using the equation:

$$N_{storms} = N + SD \times R_N$$

where:

R_N = a standard normal variant with a mean of 0 and a standard deviation of 1.

If the arbitrary number of storms per year was zero or negative, then the normal distribution was re-sampled until a positive number was obtained.

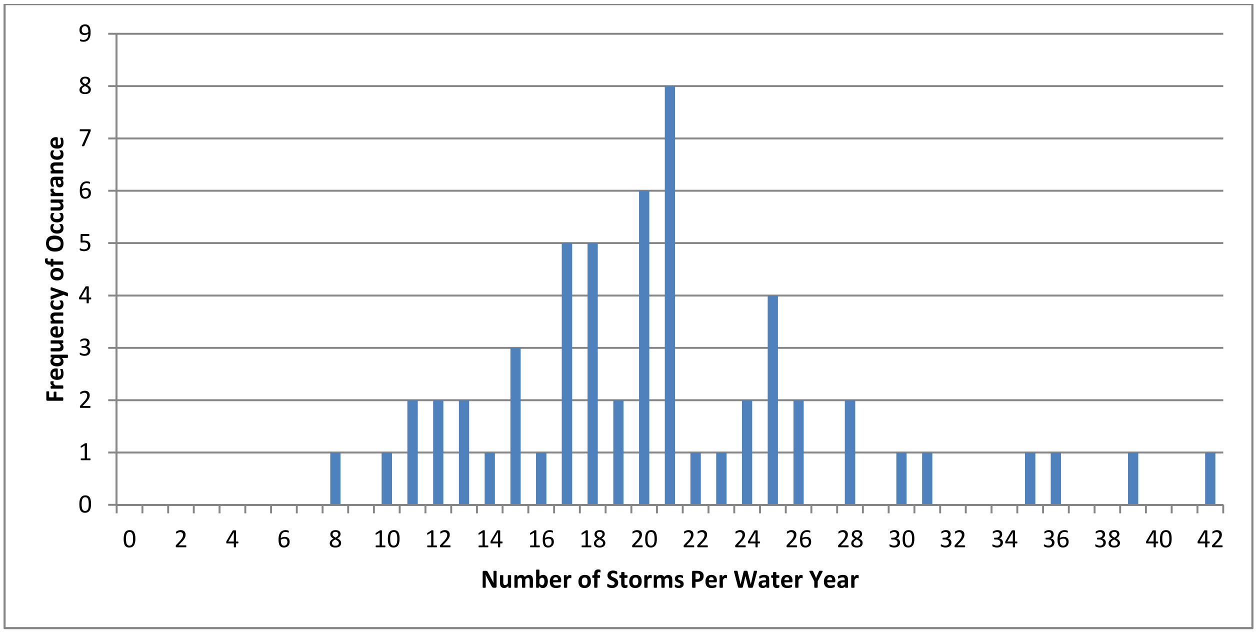

Figure F-6 Distribution of Storms per Year for the Scaled Bakersfield Airport Gauge

3.1.2 Step 2 – Estimate the Volume of Storm Runoff from a Storm Event

The runoff volume from each storm was estimated using the following equation:

$$V = R_v PA \qquad (5)$$

where:

V = the stormwater runoff volume (ft^3)
P = the precipitation depth of the storm (ft)
A = the drainage area (ft^2)
R_v = the volumetric runoff coefficient for each storm event, a unit-less value that is a function of the imperviousness of the drainage.

For sub-basins that contain multiple land-use types, the total stormwater runoff volume is determined as the sum of runoff from each land-use type:

$$V_{wshed} = \Sigma_{lu} V_{lu} = \Sigma_{lu} (R_{v\,lu} PA_{lu}) \qquad (6)$$

where *lu* designates the land-use type. It is assumed that rain falls uniformly over all land-uses in the sub-basin.

The steps used to calculate the volume of runoff from a randomly selected storm event were:

Step 2a: Obtain a storm depth by randomly sampling from all storm events in the record.

Step 2b: For each land-use area, calculate a runoff volume using equation (5). The same storm depth is applied to each land-use area.

Step 2c: Sum the runoff volumes from each land-use area to obtain the total runoff from the watershed for a particular storm event with equation (6).

3.2 Pollutant Loads & Concentrations (step 3 & 4)

3.2.1 Step 3 – Estimate a Pollutant Concentration in Storm Runoff from Each Land Use Area

3.2.1.1 Runoff Concentration

The distribution of land use-based pollutant concentration in storm runoff was developed based on the process described in Section E.2.4.3. For each storm event, stormwater EMCs were sampled randomly for each modeled land use and water quality parameter. The runoff concentration from each land-use area was evaluated with the expression:

$$C_{land-use} = \exp\left(\mu_{\ln x} + \sigma_{\ln x} R_N\right) \qquad (7)$$

where:

$\mu_{\ln x}$ = the log-normal mean

$\sigma_{\ln x}$ = the log-normal standard deviation

R_N = a standard normal random variable

3.2.2 Step 4 – Calculate the Total Runoff Volume, Pollutant Load, and Pollutant Concentration in a Storm Event

Step 4a: The total runoff volume in the watershed was calculated with equation (6) as discussed in Step 2:

$$V_{wshed} = V_{land-use1} + V_{land-use2} + \ldots + V_{land-usei} \qquad (8)$$

where the same randomly selected storm event was used to calculate runoff volume in each of the land-use areas.

Step 4b: The total pollutant load from the watershed was calculated by:

$$L_{wshed} = V_{land-use1} C_{land-use1} + \ldots + V_{land-usei} C_{land-usei} \qquad (9)$$

where the concentration in each individual land-use area was calculated with equation (7) discussed in step 3.

Step 4c: The average pollutant concentration in runoff from the entire watershed from a single storm event was calculated by dividing the total watershed load (Step 4B) by the total watershed runoff volume (Step 4A):

$$C_{wshed} = L_{wshed} / V_{wshed} \quad (10)$$

Model steps up to 4C (Eq 10) were used in the model calculations for catchments with and without modeled BMPs. The resulting values from Equation 9 and Equation 10 represent the end model output for catchments without modeled BMPs and represent intermediate calculations for catchments with modeled BMPs

Catchments with treatment BMPs used additional calculations to determine the reduction in pollutant load and concentration achieved with treatment BMPs via infiltration. The fraction of stormwater runoff receiving treatment was calculated for each storm event, using the capture efficiency associated with that event, as described in Section E.2.5. BMP performance was modeled assuming treatment via infiltration of captured runoff volume within the BMP for each water quality pollutant.

Step 4d: The total pollutant load from watersheds with treatment BMPs was calculated by:

$$L_{wshed\_BMPs} = \left[Cap_{\%} \times V_{wshed} \times C_{eff} \times (1 - VR\%)\right] + \left[(1 - Cap_{\%}) \times V_{wshed} \times C_{wshed}\right] \qquad (11)$$

where:

$Cap_{\%}$ = the volumetric percent capture of the BMP.

C_{eff} = the effluent concentration from the BMP (0 used for infiltrating BMPs).

$VR\%$ = the percent reduction in effluent volume achieved by the BMP (see Section B.2.5.1).

V_{wshed} and C_{wshed} were calculated per Steps 4A and 4C, respectively. C_{eff} is assumed to be zero, as there is no treated effluent from infiltrating BMPs simulated; all treatment is achieved via infiltration.

Step 4e: The average pollutant concentration in runoff from the entire watershed with treatment from a single storm event was calculated by dividing the total watershed load with treatment by the total watershed runoff volume less the volume lost in BMPs:

$$C_{wshed\_BMPs} = L_{wshed\_BMPs} / V_{wshed\_BMPs} \qquad (12)$$

where:

$$V_{wshed\_BMPs} = V_{wshed} \times \left[1 - (Cap_{\%} \times VR\%)\right] \qquad (13)$$

The results of step 4D (Eq 11) and step 4E (Eq. 12) were used to compute model results for developed conditions with treatment.

Figure F-7 provides a diagrammatic representation of these water quality calculations.

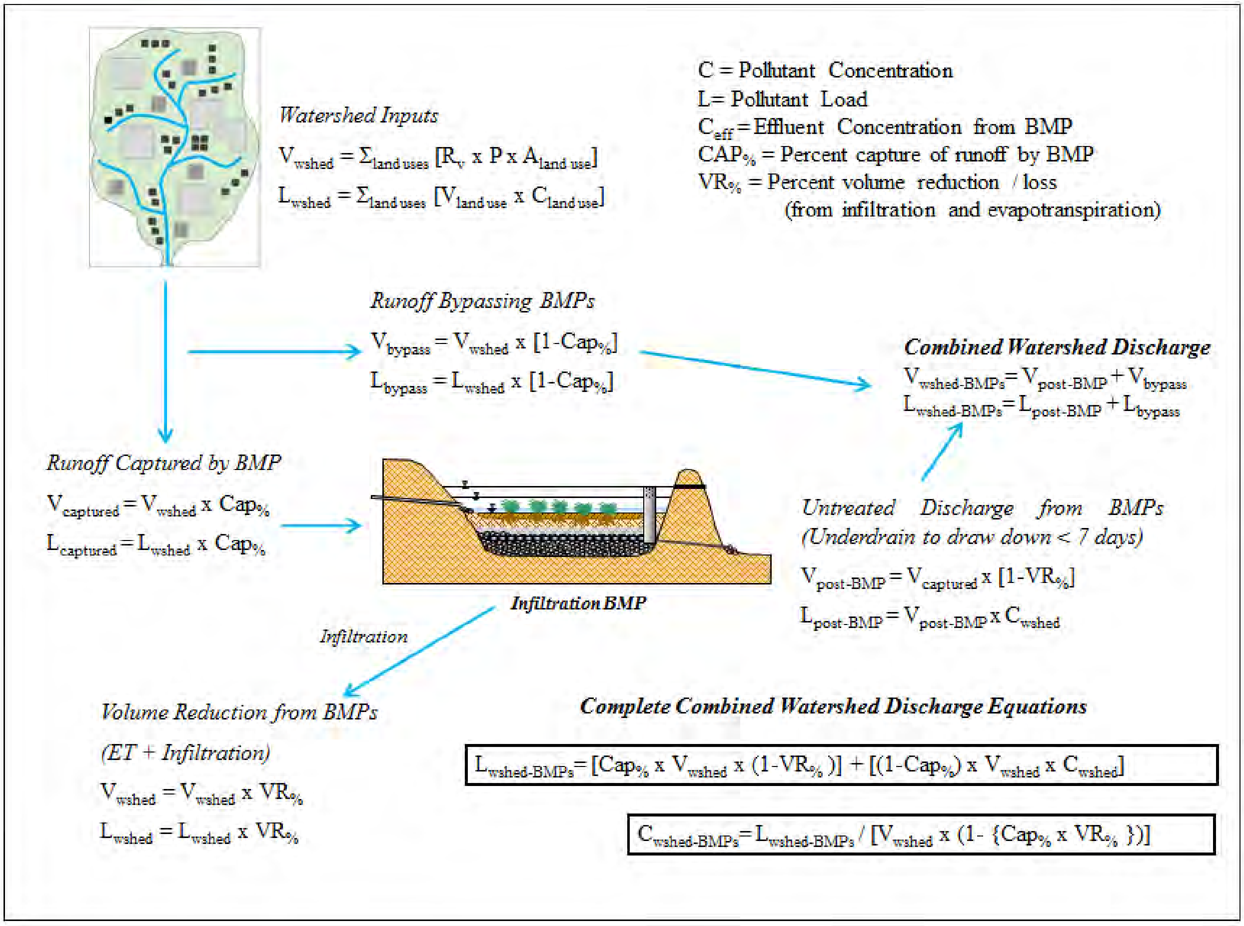

Figure F-7 Diagrammatic representation of water quality calculations

3.3 Annual Pollutant Loads, Concentrations, and Distributions (steps 5, 6, & 7)

3.3.1 Step 5 – Calculate a Total Annual Pollutant Load

The annual pollutant load is simply the sum of pollutant loads generated from all storms in a given year, based on the random selection described in Step 1. Therefore, steps 2-4 were repeated N_{storms} times (where N_{storms} was randomly selected per step 1), recording the total pollutant load from each randomly selected storm event. The individual storm loads were summed to obtain the total annual pollutant load.

3.3.2 Step 6 & 7 – Determine Distribution of Storm Concentration and Annual Loads

Steps 1-5 were repeated a total of 20,000 times, recording the pollutant concentration and annual load from each iteration. The resultant distributions can be used to present a frequency distribution for pollutant concentrations or loads using statistics calculated from the 20,000 Monte-Carlo iterations.

3.3.3 Model Methodology Assumptions

The following four key assumptions are made for the Monte Carlo water quality modeling methodology:

1. The assumed probability distributions of model parameters;
2. The assumption of independence between model parameters (i.e. no correlation between randomly determined variables);
3. Limiting pollutant removals to pollutants with data; and
4. Modeling structural BMPs to only remove pollutants and not acting as a source.

The implications of each of these assumptions to the water quality projections are discussed below.

1) <u>Distribution Assumptions</u>: Probability distributions are assumed to represent the number of storms per year and stormwater pollutant concentrations. Observed precipitation data (i.e., storm frequency) and stormwater monitoring data are fit with either a normal or lognormal distribution using standard statistical procedures. The values of storms per year, storm depth, and runoff pollutant concentrations used in a given iteration in the Monte Carlo analysis are governed by the selected distributions. Large samples of these estimated variables will approximate the assumed distributions, and will have the same mean and variance that was observed in the precipitation and monitoring data. The following describes the distributions for various input parameters.

Storms per Year: Figures F-6 shows the number of storms per year occurring at the selected gauge (augmented as described earlier). The number of storms occurring per year for the Project record appears to lie between the normal and lognormal distributions. The normal distribution was used to determine the number of storms per year simulated in the water quality model, as use of the lognormal distribution would overestimate the average annual precipitation, as well as its variability, when the distribution of the data are not heavily skewed.

Stormwater Pollutant Concentrations: The Shapiro-Wilk Test was used to determine the statistical distribution that best represents the raw stormwater runoff monitoring data collected in

Los Angeles and Ventura Counties. In most instances the data were found to be log-normally distributed at a confidence level of 0.10. In some instances, the data were not well fit by either the normal or lognormal distributions, but were found to be more closely approximated by the log-normal distribution. For data sets with greater than 50 percent non-detects or that were not log-normally distributed according to the Shapiro-Wilk test, data were analyzed (ROS and bootstrap) in arithmetic space as to not unreasonably overestimate the standard deviation of the data set. Since stormwater pollutant concentrations, in general, tend to be well approximated by the lognormal distribution (Helsel and Hirsh, 2002), the data sets that did not meet the lognormal criterion are still believed to belong to a log-normally distributed population, but the number of data points is too few to statistically confirm that this is the case. Therefore, simulations of stormwater concentrations in the water quality model were still conducted in lognormal space. This assumption is believed to result in a more accurate prediction than would the application of the normal distribution.

2) Assumption of No Correlation between Model Parameters: The water quality model randomly selects stormwater pollutant concentrations independent of the storm depth or antecedent dry period for each storm event modeled. The validity of the assumption of independence between variables is supported by analyses conducted by Environmental Defense Sciences (2002), who did not find a strong correlation between storm volume and event mean concentrations (EMCs) in the LA County data for the education land-use site. Data analyses for the single family residential land use were found to be weakly correlated (R^2 of 0.6 ± 0.1) for some pollutants with storm depth; however some pollutant showed little correlation between these variables. Where weak correlations were present, stormwater pollutant concentrations tended to decrease with storm size. Correlations between pollutant concentration and antecedent dry period were similarly variable. For the single family land use, correlations between pollutant concentration and antecedent dry period were moderately significant for a few pollutants (R^2 of 0.8 ± 0.03), and weak for other pollutants. Correlations between pollutant concentration and antecedent dry period varied widely for the educational and multi-family land uses.

The results of these analyses indicated that no consistent level of correlation has been demonstrated between the stormwater EMCs and the storm depth or the antecedent dry period, with weak or no correlation observed for most pollutants and land-uses. On this basis, random selection of stormwater pollutant concentrations, independent of storm depth and antecedent dry period, is warranted for the water quality model.

3**)** BMP Performance – Limiting Pollutant Removal Estimates to Available Data: Pollutant removal is only simulated for those pollutants with available data for land use EMCs from LA and Ventura Counties. In instances where data is not available for a parameter, no treatment is assumed for that parameter. Treatment is estimated by calculating load reductions of the pollutant as a result of volume reduction through infiltration.

4) BMP Performance – BMPs are not a Source of Pollutants: In instances when the randomly determined BMP effluent concentration exceeds the modeled influent concentration, no pollutant removal occurs and the effluent concentration is modified to equal the influent concentration. This prevents BMPs from acting as a source of pollutants in the water quality modeling. The commitment to regular and effective maintenance of the stormwater BMPs provides support for this assumption.

Conclusions: The above assumptions are expected to improve the accuracy of the water quality model estimates. The net result for the model outputs are somewhat conservative estimates of pollutant loads and concentrations due to estimation of model input parameters that are not compromised by the model methodology.

4.0 MODEL RELIABILITY

Factors that affect model reliability include variability in environmental conditions and model error. To account for environmental variability, a statistical modeling approach was used that takes into account the observed variability in precipitation from storm to storm and from year to year. The model also takes into account the observed variability in water quality from storm to storm, and for different types of land uses. One way to express this variability is the coefficient of variation (COV) which is the ratio of the standard deviation of the variable to the mean value. Based on the statistical model, the range of COVs for annual pollutant loads was from 0.4 to 19.7 on an average annual basis, depending on the pollutant. This variability, or greater, is expected in typical BMP effluent values, particularly when the effluent loads are small due to high levels of infiltration and even slight variability produces a high COV. The high range of this range corresponds to the COV of dissolved iron in the proposed condition, and is expected considering the loads for some watersheds are close to 0 and others have higher effluent loads as they do not achieve 100% capture and 100% volume reduction.

Model error relates to the ability of the model to properly simulate the processes that affect storm water runoff, concentrations, and loads. Ideally model error is measured through calibration, but calibration is not feasible when considering a future condition. We are confident that the model is a reasonable reflection of storm water processes because the model relies largely on measured regional data. For example, the runoff water quality data are obtained from a comprehensive monitoring program conducted by LA County that has measured runoff concentrations from a variety of land use catchments and for a statistically reliable number of storm events. In addition parameter estimation is fairly conservative resulting in moderately conservative estimates of changes in pollutant concentrations and loads.

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APPENDIX G

TEST CATCHMENT PILOT ANALYSIS

TASK 1 AND 2 MEMOS

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Memorandum

Date: 22 July 2014

To: Diana Hurlbert, Tejon Ranch Company

Copies to: Sean Reed, McIntosh & Associates

From: Eric Strecker, Principal; Megan Otto, Project Engineer; Raina Dwivedi, Senior Staff Engineer

Subject: Task 1: Test Catchment Selection for Pilot Analysis of Potential Flood Control Calculation Parameter Adjustments
Geosyntec Project Number: PNW0184

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1. INTRODUCTION

Geosyntec Consultants (Geosyntec) is providing water quality and hydrology technical support to the Tejon Ranch Company (TRC), in support of the environmental documents for the Grapevine Development Area Project (Grapevine). TRC has requested additional technical support with regarding to better integration of flood control with water quality and hydromodification controls to optimize the environmental benefits and land uses of the project.

Geosyntec has produced a water quality and hydromodification technical appendix for the Environmental Impact Report (EIR) based upon the February version of the Land Plan for the Grapevine Development Area (GDA) and comments received from TRC and its attorney. We are in the process of updating the appendix, including our water quality model, based on the new land plan received on July 7, 2014. McIntosh and Associates (McIntosh) produced a Master Drainage Study dated June 5, 2014 utilizing the Kern County Hydrology Manual sizing procedure. The procedure does not allow for direct consideration of low impact development (LID) features and how they would affect flood control requirements and ultimately the size and extent of flood conveyance and detention systems. At a meeting held with Kern County, staff indicated that they would consider potential adaptations to the method, specifically the representation of the "effective impervious area" contributing to the runoff ultimately reaching the flood control facilities. The "effective impervious area" is proposed to be used as the representative metric for treatment in the watershed as there is no runoff coefficient explicitly calculated or incorporated in the Hydrology Manual sizing procedure. The modification of the tributary imperviousness is intended to represent a change in runoff coefficient within the watershed as well as the impact of LID features on the time of concentration, as they tend to slow flows down. TRC has requested that Geosyntec prepare a study plan to develop recommendations regarding adaption of the flood control procedure that then could be presented and discussed with the County. The goal would be to result in appropriate sized LID, flood conveyance, and detention systems that integrate the multiple objectives and minimize duplicative infrastructure and maximizes environmental benefits. As the project areas have soils that are conducive to infiltration, it is likely that flood control facilities sized using a method that does not account for the planned LID project design features would be significantly over sized.

2. SCOPE OF WORK

Under Task 1, Geosyntec has been retained to compile drainage information and flood control procedure data as developed by McIntosh and review potential basins for conducting a pilot analysis of potential flood control procedure parameter adjustments. Geosyntec has recommended a catchment for analysis below, for TRC and McIntosh comment and concurrence.

3. TEST CATCHMENT SELECTION METHODOLOGY

A revised land plan file was received from Dudek on July 7, 2014 and incorporated into this analysis to reflect the most current data available. The following criteria were applied to each catchment area in an effort to identify a test catchment for pilot analysis that would be representative of the Grapevine Project as whole:

1. **Catchment Area:** The catchment area, or the total area tributary to each flood control facility, was calculated based on the GIS delineations of the drainage area and the basin footprint itself. A total area equivalent to or greater than the average sump tributary area of 164 acres was prioritized.
2. **Imperviousness:** The imperviousness of the catchment tributary to each flood control facility was calculated based on the July 7, 2014 GIS land use data and assumed imperviousness values consistent with the WQTR analyses. A total imperviousness similar to the Grapevine Project overall imperviousness of 68% was prioritized.
3. **Multiple Contributing Catchments:** Flood control facilities that are designed to receive flows from more than one catchment were removed from consideration in order to simplify the representativeness of the test catchment. The facilities removed from consideration are B/C, E/F, K/L and T/U.
4. **Receives or Bypasses Flows:** Some flood control facilities were not sized for full capture of the required flood control volume (as determined by McIntosh in their Master

Drainage Study) and bypassed to down-gradient facilities. Those that either produce or receive bypassed flood control design flows were removed from consideration (sumps B/C, D, O, Q, R, S, X, and Y).

5. **Diverse Land Uses:** Catchments that contained multiple land uses, including roadways, were prioritized to increase the test catchment's representativeness of the Grapevine Project as a whole.
6. **Distributed BMPs within Tributary Area:** Tributary areas without distributed BMPs represented were eliminated from consideration in order to increase the test catchment's representativeness.

Table 1 below presents each of the flood control sumps with respect to each of the selection criteria. The starred sumps represent the six tributary areas that were not eliminated from consideration following application of the selection criteria (Sumps G, H, I, J, M, and N). Each of these catchments is located in Sandy Loam soils, which reflect the majority (81%) of the soil distribution across the proposed development areas of the Grapevine Project; therefore, the underlying soil characteristics were not a deciding factor. The average catchment size across the Grapevine Project Area is 162 acres and the average catchment imperviousness is 70%. The desired pilot catchment should be greater than the average catchment size to represent the response of large tributary areas to distributed LID BMPs when sizing flood control facilities. The catchment area criteria further eliminated tributary areas J and N. The desired pilot catchment imperviousness should be approximately equal to the average imperviousness to represent the mix of land uses and impervious area located across the Grapevine Project Area. The tributary areas to Sump H and Sump I are both within 10% of the average imperviousness, but the tributary area to Sump H was ultimately selected because of the higher overall imperviousness and the greater proportion of area that drains to distributed LID BMPs prior to the flood control facility.

Table 1: Screening Criteria for Test Catchment Pilot Analysis

Sump	Special Plan Area	Sump Screening Criteria						Eliminated Facilities
		Catchment Area[1] (Acres)	Imperviousness[1] (%)	Multiple Contributing Catchments	Receives or Bypasses Flows	Homogeneous Land Use or No Roadways	No Distributed BMPs	
A	1	76	54%				X	X
B/C	1	16	70%	X	X		X	X
D	1	350	66%		X			X
E/F	2	88	53%	X		X	X	X
G*	2	244	54%					

H*	2	260	71%					
I*	2	317	67%					
J*	3	98	75%					
K/L	3	413	71%	X				X
M*	3	250	80%					
N*	4	124	52%					
O	4	261	64%		X			X
P	4	124	54%				X	X
Q	4	225	54%		X			X
R	5a	77	57%		X		X	X
S	5a	31	60%		X		X	X
T/U	5a	286	59%	X				X
V	5a	154	55%				X	X
W	5b	102	55%				X	X
X	6a	104	63%		X			X
Y	6a	176	86%		X			X
Z	6a	101	55%				X	X
AA	6a	132	91%			X		X
BB	6b	81	91%			X		X
CC	6b	91	91%			X		X
DD	6b	72	91%			X		X
EE	6b	79	91%			X		X
FF	6c	193	91%			X		X
GG	6d	177	91%			X		X
HH	6e	171	90%			X		X

[1]Total areas and impervious fractions include the flood control/water quality facility footprints
* Catchments remaining for consideration after initial screening.

4. RECOMMENDED TEST CATCHMENT FOR PILOT ANALYSIS

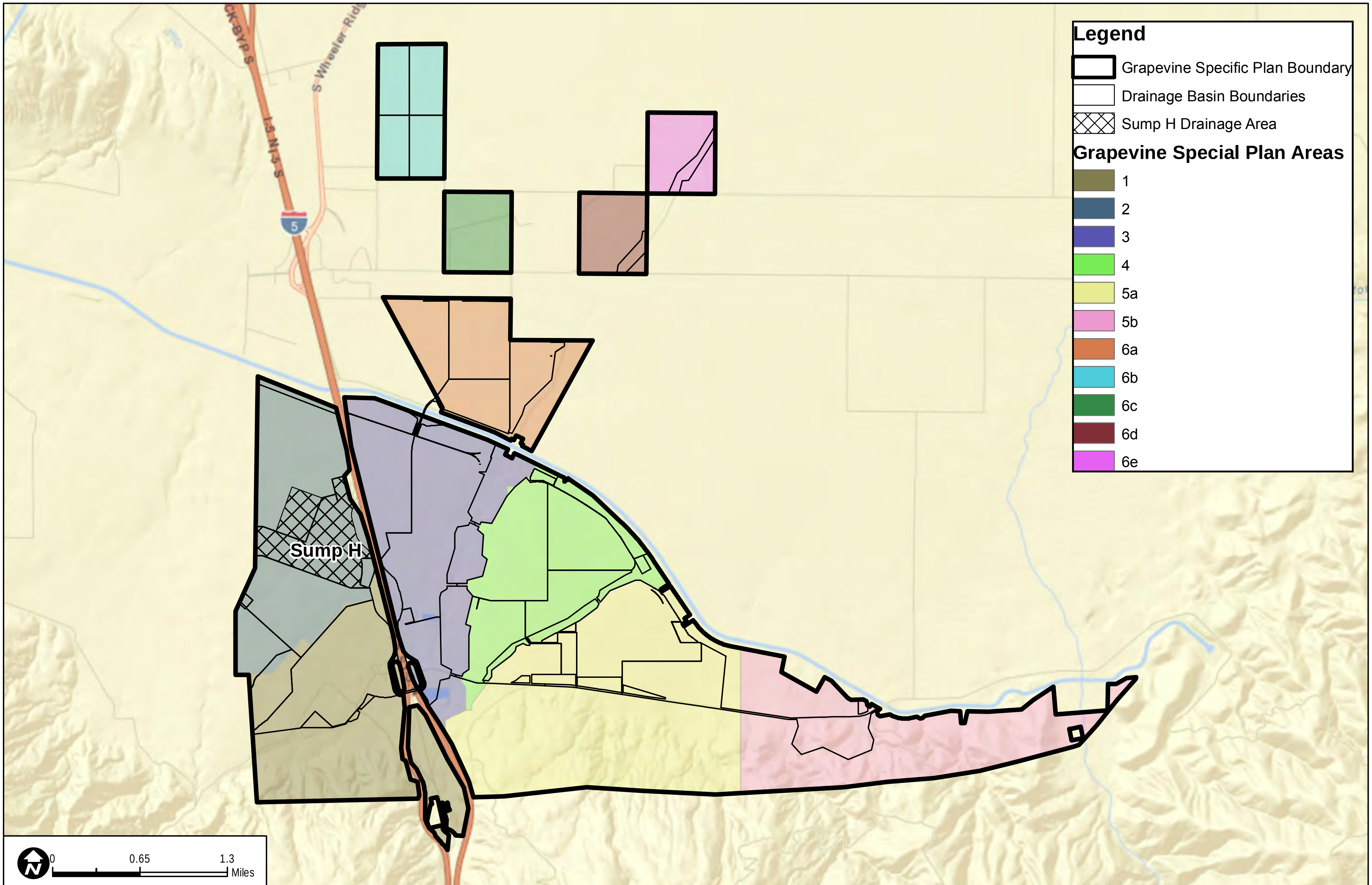
The catchment tributary to flood control Sump H was selected as the test catchment for the flood control methodology and parameter modification analysis and is located in Special Plan Area 2 (Figure 1). The catchment drainage area is 260 acres with an area-weighted imperviousness of 71%. The land use distribution and treatment categorization within the tributary area is presented below in Table 2 and is shown in Figure 2. Although the percent of developed area for catchment H does not identically align with that of the overall Grapevine Project, this can partially be attributed to the fact that some land uses are highly localized in the Grapevine Project (e.g., primarily industrial in northern catchments). This catchment does, for the most part, reflect the distribution of land uses which are present Project-wide in the proposed plan, with residential being the greatest fraction in both catchment H and the overall Grapevine Project.

Table 2: Comparison of Recommended Test Catchment H BMPs, Land Uses, and Imperviousness

Proposed Land Use	Imperviousness[1]	Treatment[2]	Area (Acres)		Percent of Development Area	
			Grapevine Project	Catchment H	Grapevine Project	Catchment H
Agriculture	0%	Community-Scale[3]	22	0	0.5%	0%
Freeway Retail	90%	Distributed Treatment BMPs	110	21	2.3%	8.0%
Light Industrial	90%	Community-Scale	1240	15	25.4%	5.7%
Office R&D	90%	Distributed Treatment BMPs	203	4	4.2%	1.6%
Parks	15%	Distributed Treatment BMPs	132	1	2.7%	0.4%
Residential	50%	Distributed Treatment BMPs	2131	101	43.7%	38.7%
Roadways	95%	Community-Scale	267	20	5.5%	7.8%
Schools	50%	Distributed Treatment BMPs	75	10	1.5%	3.8%
Village Commercial	90%	Distributed Treatment BMPs	98	30	2.0%	11.7%
Village Residential	78%	Distributed Treatment BMPs	359	47	7.4%	18.2%
Water Quality	100%[4]	Community-Scale	234	11	4.8%	4.1%
Total	70%	--	4,871[5]	260	100%	100%

[1]Imperviousness values are from Kern County Hydrology Manual, adjusted by McIntosh & Associates based on site-specific conditions.
[2]Land uses treated by distributed treatment BMPs are assumed to convey any bypassed flows to the downgradient community-scale facility.
[3]Agricultural areas that are within a drainage basin area are assumed to drain to the community-scale facility; those outside of the development bounds are assumed to be untreated.
[4]Water quality facilities are represented in the water quality model as 100% impervious because all of the rainfall that falls onto the facility is considered to "runoff" into the facility and be treated in SWMM. The representation simply prevents any of the runoff to be "infiltrated" up-gradient from the facility in the model to account for the rainfall that falls on the footprint itself.
[5]Grapevine Project total includes the water quality facility footprints, which are not included in the Development Area total in the Land Use Summary received in July 2014 from KenKay Associates.

* * * * *

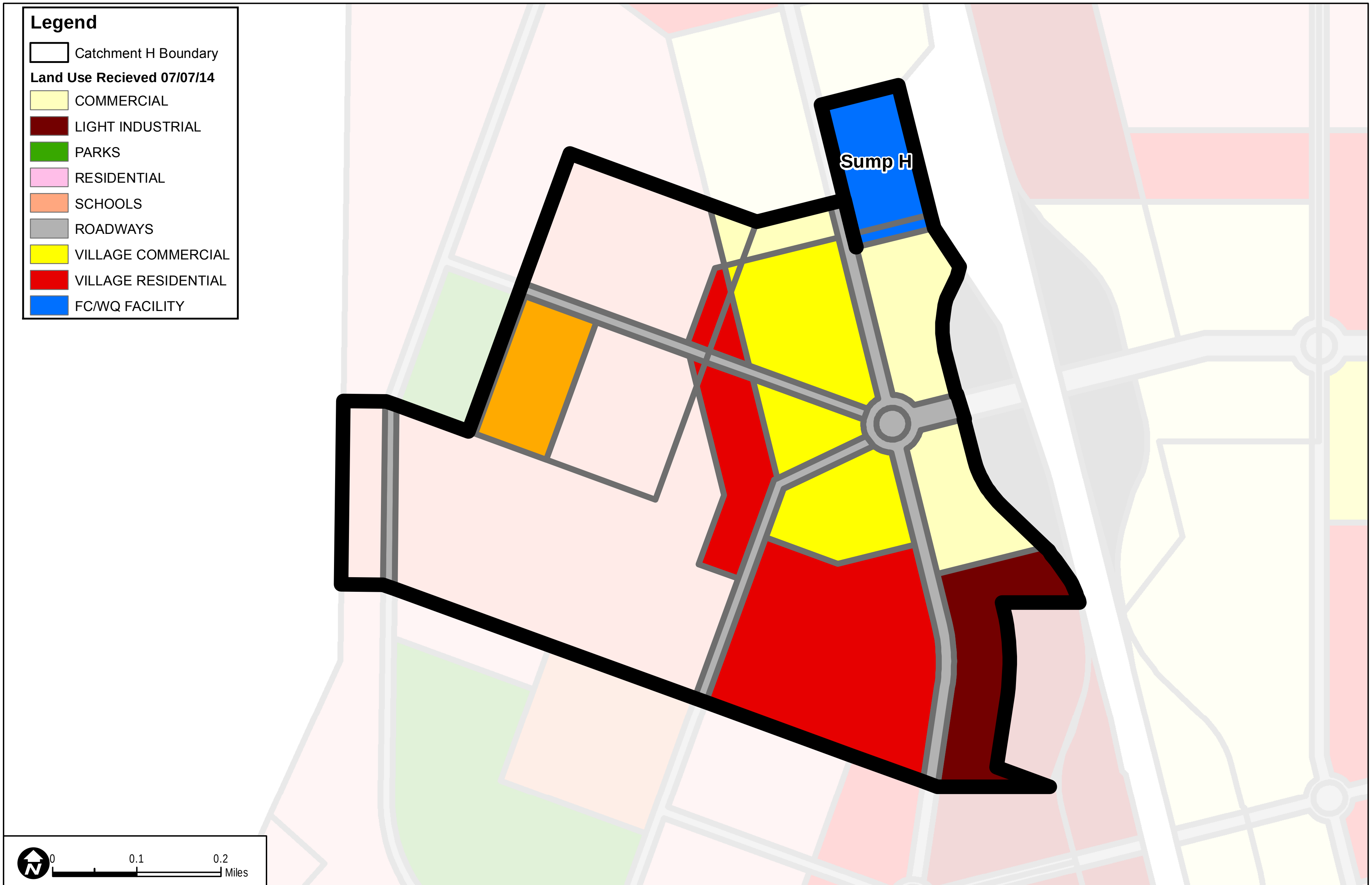


SOURCES: USGS, ESRI

FIGURE 1

Proximity Map (Sump H)

GRAPEVINE PROJECT



SOURCES: USGS, ESRI

FIGURE 2

Pilot Catchment (Sump H)

GRAPEVINE PROJECT

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Memorandum

Date: 29 September 2014

To: Diana Hurlbert and Derek Abbott, Tejon Ranch Company

Copies to: Sean Reed, McIntosh & Associates

From: Eric Strecker, Principal; Megan Otto, Project Engineer; Brandon Klenzendorf, Engineer; Raina Dwivedi, Senior Staff Engineer

Subject: Task 2: Results of Test Catchment for Assessment of Parameter Adjustments
Geosyntec Project Number: PNW0184

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1. INTRODUCTION

Geosyntec Consultants (Geosyntec) is providing water quality and hydrology technical support to the Tejon Ranch Company (TRC), in support of the environmental documents for the Grapevine Development Area Project (Grapevine). This memo provides additional technical information with regards to how to better integrate flood control with water quality and hydromodification control infrastructure to optimize the environmental benefits and land uses of the project.

Geosyntec is producing a water quality and hydromodification technical appendix for use by Kern County in development of the Environmental Impact Report (EIR) based upon the Land Plan for the Grapevine Development Area (GDA), hydrologic analyses completed by McIntosh and Associates. McIntosh produced a Master Drainage Study dated June 5, 2014 utilizing the standard Kern County Hydrology Manual sizing procedure. This procedure does not allow for direct consideration of low impact development (LID) features and how they would affect meeting flood control requirements, specifically the resulting size and extent of flood conveyance and detention systems. At a meeting held with Kern County, staff indicated that they would consider potential adaptations to the method, specifically the representation of the "effective impervious area" contributing to the runoff ultimately reaching the flood control facilities. In addition to the runoff coefficient, LID features would also impact the time of concentration as they tend to slow flows down. TRC has requested that Geosyntec prepare a study plan to develop recommendations regarding adaption of the flood control procedure that then could be presented and discussed with the County. The goal would be to result in appropriately sized LID, flood conveyance, and detention systems that integrate the multiple objectives, minimize duplicative infrastructure, and maximize environmental benefits. As the project areas have soils that are conducive to infiltration, it is likely that flood control facilities sized using a method that does not account for the planned LID project design features would be significantly over sized.

There are also many benefits to incorporating LID into the Grapevine Project beyond the potential for downsized flood control facilities. Groundwater recharge over a more distributed area, as compared to the sumps, would be a benefit to the community with respect to water supply. Additional environmental benefits include improved water quality through the filtering of stormwater runoff through soils and vegetation, enhanced habitat for native birds and other animals (using native and drought-tolerant plants), reduction of the urban heat island effect, improved air quality (USEPA, 2010). The USEPA's *Green Infrastructure in Arid and Semi-Arid Climates* (2010) also describes social benefits (e.g., improved public health due to cooler temperatures and cleaner air, traffic calming, neighborhood beautification, etc.) and economic benefits (e.g., reduces landscape maintenance costs, increased groundwater resources, reduced water imports, and reduced energy use) to LID implementation.

Lastly, the City of Bakersfield and County of Kern Municipal Separate Storm Sewer System (MS4) Permit (Order No. R5-2013-0153) (Central Valley Water Board, 2013), although not applicable to the Grapevine Project, encourages the use of LID:

> *Low Impact Development (LID) is a storm water management strategy concerned with maintaining or restoring the natural hydrologic functions of a site to achieve natural resource protection objectives and fulfill environmental regulatory requirements. LID employs a variety of natural and built features that reduce the rate of runoff, filter out its pollutants, and facilitate the infiltration of water into the ground. By reducing water pollution and increasing groundwater recharge, LID helps to improve the quality of receiving surface waters and stabilize the flow rates of nearby streams.* ***Therefore, LID design concepts should be promoted for new developments and significant redevelopments.***

In summary, this analysis serves to assess the potential for adjustments to the Kern County Flood Control Basin sizing methodology to account for the hydrological and hydraulic effects of upstream LID facilities, which would provide multiple environmental, social, and economic benefits.

2. SCOPE OF WORK

For this memo, Geosyntec reviewed drainage information and flood control procedure data developed by McIntosh to identify a representative basin and catchment area that could be used to conduct a pilot analysis of potential flood control procedure parameter adjustments. Geosyntec recommended Catchment H to be used in the analysis in a memorandum dated July 22, 2014.

Following identification of the representative catchment, Geosyntec developed a planning level United States Environmental Protection Agency (USEPA) Stormwater Management Model (SWMM) of the selected catchment that includes the planned land uses, conceptual layout of streets, LID BMP features, and the drainage system, including piping and detention systems designed by McIntosh in their analysis. Geosyntec developed the following SWMM model scenarios:

- The original development conditions as analyzed by McIntosh without consideration/incorporation of LID features;
- Several distributed LID scenarios, where the LID features were represented as explicit storage units; and
- A proposed adjusted Kern County method, where the retention achieved by LID features in the watershed is represented through modifying the effective impervious cover based upon modeling results from the above scenario.

Long-term continuous simulations were modeled for specific scenarios (non-LID, explicit LID, explicit LID with the infiltration rate reduced by half, and the adjusted Kern County method implementing distributed LID).

3. SWMM INPUT PARAMETERS AND MODEL DEVELOPMENT

The Master Drainage Study (June 5, 2014) was provided by McIntosh and Associates (McIntosh) and incorporated into this analysis to reflect the most current data available. Additional input data that has been used for water quality modeling as part of the EIR analyses for the Grapevine Project was also incorporated into this analysis for consistency. The following provides a summary of the significant input parameters applied to the SWMM model.

1. **Precipitation:** The SWMM simulations were run with two precipitation scenarios: a 10-year frequency, 5-day duration design storm event and the 64 year long-term simulation based on a modified precipitation record as described below.

a. The 10-year, 5-day design storm event was chosen to correspond with the previous analysis conducted by McIntosh as described in the Master Drainage Study, consistent with the Kern County Development Standards for retention basin sizing (2011). McIntosh identified the 10-year, 5-day rainfall depth for Sump H from NOAA Atlas 14 as 4.33 inches. This total depth was used in the SWMM model for a 5-day simulation with the rainfall hyetograph developed using guidance from the Kern County Hydrology Manual. The Kern County Manual indicates that for multiday design storms, successive day storms are developed and added in the front of the previously developed design storm patterns. Each of the 24-hour storm patterns are construction by a simple scaling of the peak 24-hour design pattern according to the ratios provided in Table 1 (from Table B.1 in the Kern County Hydrology Manual). The rainfall depth for each day of the 10-year, 5-day storm for Catchment H was scaled using these rations to maintain the total rainfall depth of 4.33 inches (Table 1).

Table 1 – Multiday Rainfall Mass Ratios for Kern County

Rainfall Duration	Ratio to Peak 24-Hours	Catchment H Rainfall Depths (in)
Day 1	0.05	0.15
Day 2	0.07	0.21
Day 3	0.11	0.33
Day 4	0.21	0.63
Day 5	1.0	3.01
Total	N/A	4.33

b. The long-term continuous simulation precipitation records were modified from 64 years (water years 1949-2013) of hourly precipitation data measured at the National Climatic Data Center (NCDC) Bakersfield Airport gauge (35 miles from the site; closest long-term hourly precipitation record) that was scaled by the Western Regional Climate Center Tejon Rancho weather station (11 miles from site) to better represent the weather patterns and average annual rainfall totals characteristic of the project. This procedure is described in further detail in Appendix E of the Water Quality Technical Report.

2. **Evaporation:** Average monthly evapotranspiration (ET) values were used in the SWMM simulations as shown in Table 2 below. ET was only incorporated into the continuous simulations, not the design event runs. The evaporation data was obtained from the

California Department of Water Resources ETo Map (CIMIS, 1999) that contains reference ET values by Zone in California. The Grapevine Project is located in Zone 14 and a scaling factor of 0.60 was applied to the reference ET values to reflect partially shaded conditions, semi-arid vegetation, dry crops, and bare soil that are expected to be present in the developed condition.

Table 2 – Monthly Evaporation Values in Inches per Day

January	**February**	**March**	**April**	**May**	**June**
0.030	0.048	0.072	0.102	0.132	0.156
July	**August**	**September**	**October**	**November**	**December**
0.168	0.150	0.114	0.078	0.042	0.030

3. **Topography:** Elevation contours were provided in GIS on January 29, 2013 by Dudek for existing topographic conditions at five foot intervals. The existing contours were used to approximate the proposed development conditions elevations for roadways, pond elevations, pipe elevations, etc. The average slope across the entire Sump H catchment was approximately 3.5%. This value was used as the slope for all modeled subcatchments.

4. **Land Use:** Land use information was provided by Dudek on July 4, 2014 for the proposed development revised plan. Subcatchment impervious cover values were assigned based on the land use types defined in Table 3 and which correspond with the assumptions made by McIntosh in their Master Drainage Study. Also included is the assumed rooftop impervious areas per gross land use area as provided by Ken Kay Associates on August 13, 2014. The rooftop areas are used to model downspout disconnections as described below.

Table 3 – Land Use Impervious Cover Values

Land Use	Impervious Cover (%)	Rooftop Impervious Area per Gross Area (%)
Freeway Retail	90.0	18
Light Industrial	90.0	30
Office R&D	90.0	15
Parks	15.0	10
Residential	50.0	20
Schools	50.0	20
Roadways	95.0	0
Village Commercial	90.0	15
Village Residential	77.5	50
Water Quality	100.0	0

5. **Soils Information and Infiltration Parameters:** Soil textures were obtained from the Natural Resources Conservation Service (NRCS) Web Soil Survey. The majority of the soils within the Sump H catchment correspond to sandy loam or very gravelly sandy loam soils. The Green-Ampt model was used to simulate infiltration with the following infiltration parameters: suction head = 8 inches, hydraulic conductivity = 0.6 in/hr, and initial moisture deficit = 0.33. The hydraulic conductivity is reflective of infiltration conditions for sandy loam and sandy gravelly sandy loam soils as estimated in the 2014 Infiltration Report, with an additional reduction of 25% of the reported values to account for potential compaction during construction in the developed condition (See Appendix E of the WQTR for additional details). Infiltration was assumed in the roadside swales for several of the LID option scenarios.

6. **Subcatchment Hydrologic Properties:** Subcatchments to each sump were delineated based on the provided land use designations and the proposed locations of streets shown in the Master Drainage Study provided by McIntosh. Professional judgment was used when selecting other hydrologic properties of the subcatchments such as depression storage and roughness for both pervious and impervious areas. Subcatchment width was selected based on scaling of the delineated subcatchments while considering that the expected flow path length will generally not exceed 500 feet before an interior conveyance structure (i.e., curb and gutter, drainage ditch, etc.) is reached in developed conditions. Figure 1 below shows the subcatchment delineations represented in SWMM.

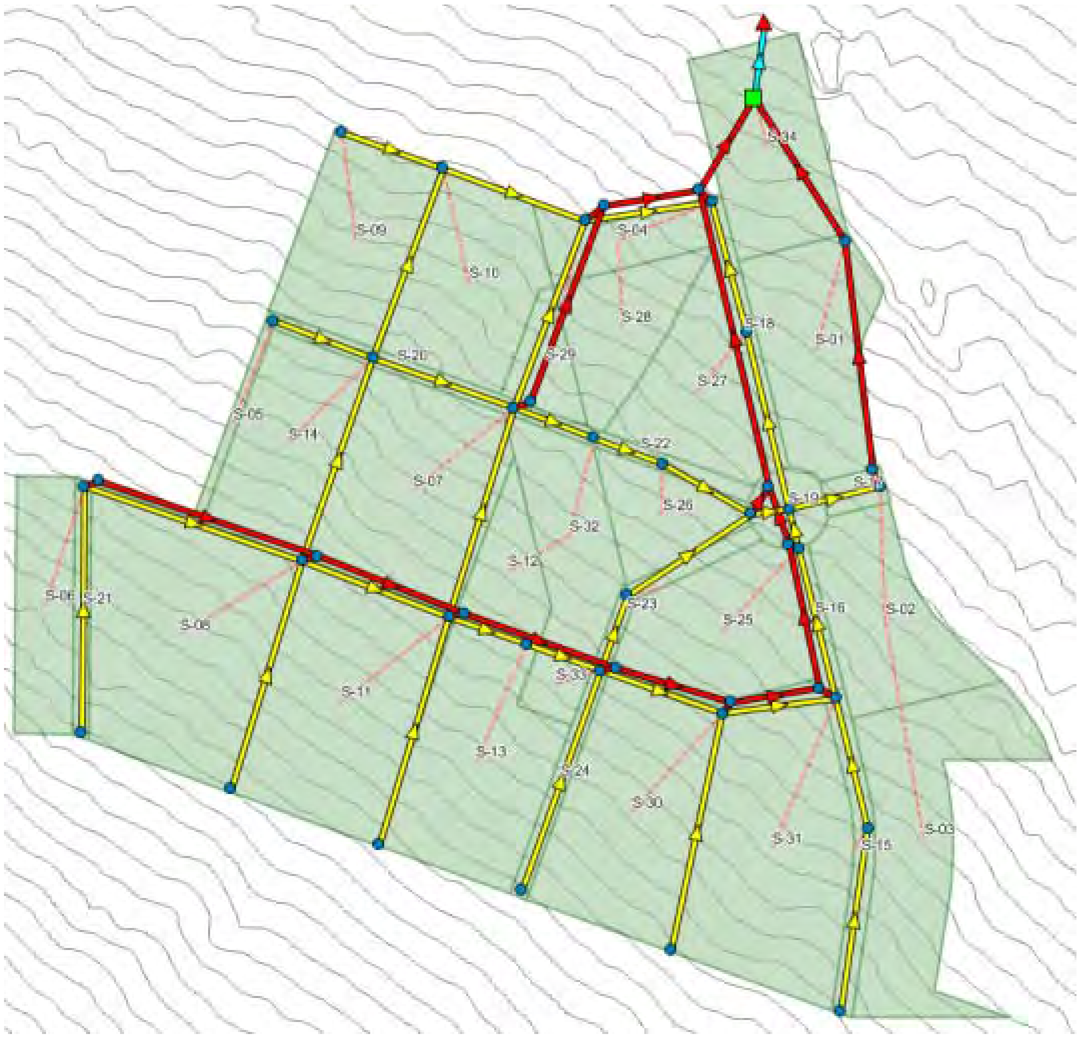

Figure 1 – Subcatchment Delineation in SWMM Model
(yellow conduits are roads/swales and red conduits are pipes)

7. **Conduits:** Two conduit types were simulated in the SWMM model: storm drain pipes and streets with roadside swales.

   a. The storm drain pipe sizes were obtained from the Master Drainage Study provided by McIntosh. The storm drain pipes were modeled to have slopes based on the existing contours provided and depths maintaining six feet of cover. Conduits directly connected to the storm drain inlet structures were modeled with depths of three feet of cover at the inlet structure. A roughness value of 0.011 was selected to represent concrete pipes (Chow, 1959).

b. The street and surface conduits were modeled with an irregular cross-section shown in Figure 2. Roadside ditches on either side of the roads were modeled as trapezoidal channels two feet deep with a bottom width of three feet and 3:1 (horizontal:vertical) side slopes. A flat area five feet wide divides the ditch from the roadway. The roadway was modeled with a six inch curb and a six inch crown on the road. The roadway width and number of lanes was taken from the "Street Section Coordination" document dated August 12, 2014. A roughness value of 0.027 was selected for the conduits representing straight channels lined with short grass (Chow, 1959). Although the roadway surface is expected to have a smaller roughness value (representative of asphalt or concrete), the majority of the flow occurs within the swales, justifying the larger roughness value. In addition, a larger roughness value conservatively represents the entire conduit roughness.

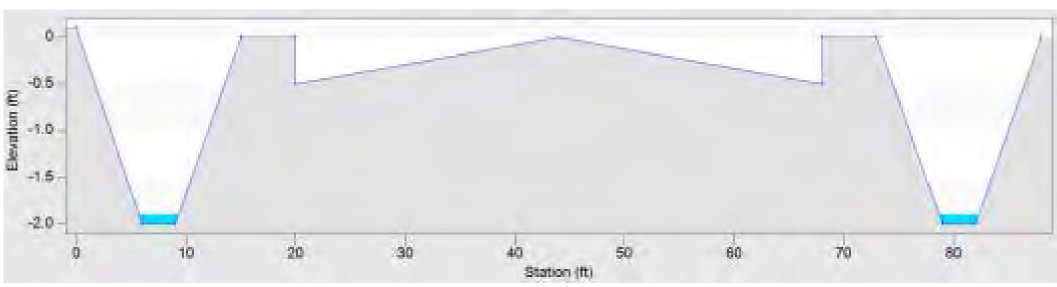

Figure 2 – Cross-Section for Modeling Streets with Trapezoidal Ditches

8. **Sump H Design:** The Sump H (flood control/ infiltration basin) design was modeled using a surface area-depth relationship developed by McIntosh. The total depth of Sump H is modeled as ten feet which corresponds to a provided capacity of 3.09 million cubic feet (MCF) as indicated in the Master Drainage Study. For the SWMM analysis, the area-depth relationship was not altered when modeling Sump H. However, the total depth of ten feet is not required to contain the 10-year, 5-day design storm runoff volume modeled in SWMM. Due to the differences in the methodology for calculating runoff volumes using the SWMM model versus guidance in the Kern County Hydrology Manual, a new Sump H capacity was calculated in SWMM for comparison with the LID scenarios. Results of the Sump H capacity and LID scenario SWMM models are presented below.

   The Sump H capacity calculated in SWMM is based on the maximum depth needed to contain the design storm runoff volume using the area-depth relationship developed by

McIntosh. This methodology assumes a constant footprint area for Sump H with a variable required depth needed for complete capture. An alternative methodology for calculating the required Sump H capacity would be to maintain a constant design depth at ten feet and vary the sump footprint to achieve the necessary capacity. This method would reduce the area available for infiltration, but would have higher average depths (head) to increase infiltration in the reduced areas and has not been investigated for this analysis.

9. **LID Facilities:** Table 4 reflects the planned and optional BMP concepts for each land use type, as included in the WQTR. An in-depth analysis for siting the LID facilities throughout the catchment area was not conducted for this modeling effort. Instead, an explicit storage unit was modeled for each subcatchment to represent the aggregate LID BMP volume placed within the planned distributed LID concepts based upon BMP sizing proposed for the project.

   This methodology resulted in a total of 33 explicit distributed LID storage units. The aggregate storage units represent the cumulative capture volumes and potential infiltration for all the planned distributed LID facilities throughout each subcatchment, such as bioretention, infiltration trenches, stormwater planter boxes, and flow dispersion of roof and driveway runoff. The explicit representation of these facilities allows for both runoff volume reduction (through infiltration processes) and peak flow rate reduction (through detention and peak shaving processes). The total volume of modeled LID facilities is 355,307 CF.

   The distributed LID facilities were sized for an average annual capture efficiency of 80% to meet volume-based sizing criteria, which results in 20% bypass or overflow of the LID facility on an average annual basis. The storage units were sized using a functional relationship between the area and depth of the facility. A simple square footprint shape was assumed with typical 3:1 side slopes to develop the functional relationship. The storage units provided in the LID features were sized using an iterative approach on the long-term rainfall record to find the functional relationship which results in 80% capture efficiency[1]. The modeled distributed LID total percent loss, representing the total

[1] In order to reduce computational times during this iterative process, the rainfall record for only the 1980 decade was used. The 1980 rainfall record was selected by analyzing rainfall statistics for each decade and comparing to the total rainfall record (i.e., 64 year) statistics. The 64 year rainfall record has an average monthly rainfall of 0.97 inches, resulting in an average annual rainfall of 11.67 inches. The 1980 decade closely matched the 64 year

computed percent loss due to infiltration and evaporation during the simulation, is expected to correspond to the capture efficiency of the facility.

Simulations were also established to assess the incremental benefits of bioretention, downspout disconnects, and swales. Swale scenarios included: on-line swales on arterial streets only, on-line swales along all roads including under driveways (i.e., driveway bridges), on-line swales along all roads excluding under driveways (culverts assumed), and off-line swales along all roads (off-line swales do not have outlets). Downspout disconnects were modeled by routing the portion of the impervious area attributed to rooftops (as shown in Table 3 above) to the down gradient pervious areas to allow for additional infiltration and runoff volume reduction.

The maintenance responsibility associated with the proposed LID features on private and communal private property is assumed to lie with the homeowners' associations (HOAs). The maintenance responsibility associated with the proposed LID features in the public right of way, including the flood control basins, would be negotiated with the County with the intent to develop joint use facilities (e.g., parks, recreational fields, etc.) to the greatest extent feasible.

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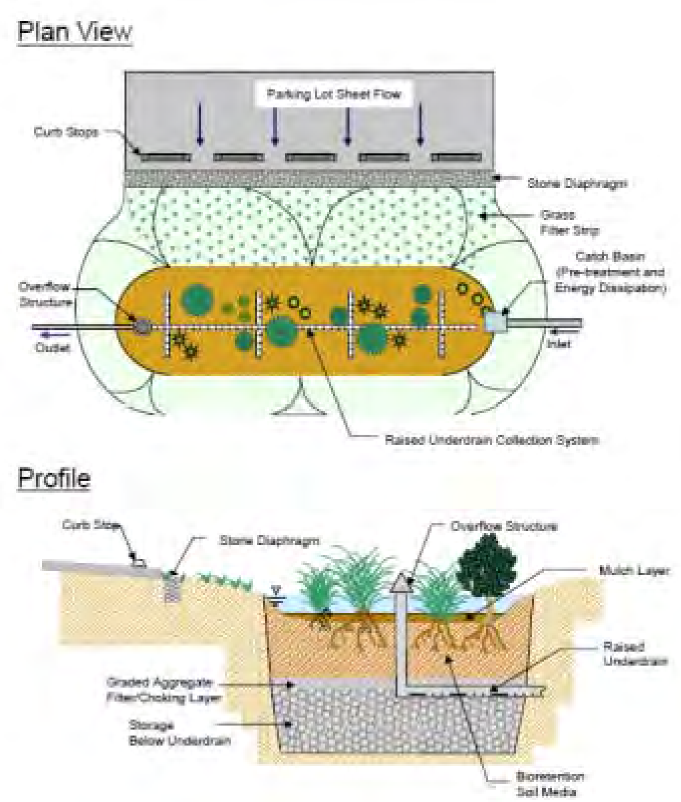
average with an average monthly rainfall of 0.966 inches and average annual rainfall of 11.60 inches. Therefore, the 1980 decade was selected for the iterative approach used for sizing the LID storage unit model elements.

Table 4 – Planned and Optional BMP Concepts

Land Use	Planned BMP Concepts	Optional BMP Concepts
Single-family residential	• Bioretention in landscaping for runoff from roofs and local impervious areas (requires 5-ft building setback from buildings) • Flow dispersion of roof and driveway runoff into landscaped areas (no formal bioretention) (requires 5-ft building setback) • Infiltration trenches in landscaping for runoff from roofs and local impervious area (requires 5-ft building setback) • Stormwater planter boxes for rooftop runoff when landscape area is limited • Community-scale system (see below) • Combinations of the above, potentially with "neighborhood-scale" combinations (i.e., shared common area locations for bioretention for example)	• Permeable pavement for driveways, surface parking, and walkways
Village (multi-family) residential	• Same options as for single-family residential (but advantage of landscaped areas being in common areas for O&M)	• Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing
Commercial, schools, and parks	• Bioretention in courtyards and stormwater planter boxes for roof top runoff • Bioretention or infiltration trenches in landscaped areas for local impervious areas • Community-scale system (see below) • Combinations of the above	• Permeable pavement for walkways and courtyards • Permeable asphalt for parking lots • Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing
Industrial	• Bioretention in courtyards and stormwater planter boxes for roof top runoff	• Permeable pavement for walkways and courtyards • Permeable asphalt for

Land Use	Planned BMP Concepts	Optional BMP Concepts
	• Bioretention or infiltration trenches in landscaped areas for local impervious areas • Community-scale system (see below)	parking lots • Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing
Local streets and public access ways	• Bioretention in roadway bulbouts, or in place of some parking spaces (standing water must drain within 48 hours) • Vegetated swale in roadways for treatment/infiltration of roadway runoff and adjacent development where feasible • Vegetated swale adjacent to roadway • Community-scale system (see below) • Combinations of the above	• Permeable pavement for walkways and bikeways • Drain low gradient trails directly to edge for sheet flow dispersion
Relocated interchange	• Community-scale system (see below)	• Vegetated swale in roadways for treatment/infiltration of roadway runoff and adjacent development where feasible • Vegetated swale adjacent to roadway • Bioretention/infiltration basin island in traffic turnabout
Community-scale systems	• Infiltration facilities • Community-scale vegetated detention basin(s) where infiltration rates are limiting	• Vegetated swales route runoff to community-scale infiltration basin(s) • Infiltration trenches or bioretention along riverbanks

Bioretention



Bioretention facilities (see figure to the right) are vegetated (i.e., landscaped) shallow depressions that provide storage, infiltration, and evapotranspiration. Bioretention facilities also remove pollutants by filtering stormwater through an engineered soil mix and plants adapted to the local climate and soil moisture conditions. In bioretention facilities, pore spaces, microbes, and organic material in the engineered soils help to retain water in the form of soil moisture and to promote the adsorption of pollutants (e.g., dissolved metals and petroleum hydrocarbons) into the soil matrix. Plants utilize soil moisture and promote the drying of the soil through transpiration. A bio*infiltration* facility includes the same pollutant removal processes and design components as a bioretention facility, but also incorporates a raised underdrain above a gravel storage area to promote increased infiltration. If no underdrain is provided, deeper percolation of the stored runoff into the underlying soils occurs at a rate dependent on the infiltration rate associated with the underlying soils.

Maintenance requirements associated with bioretention facilities are typical landscape care procedures and may include irrigation (varies depending on plant palette), trash removal, removal of fine sediments and/or debris if infiltration is inhibited, clearing of inlet, outlet, and flow spreaders, and any major structural repairs as-needed.

Photographs of examples of bioretention facilities are provided below.


LEFT: Parking lot bioretention in Manteca, CA (San Joaquin Valley Stormwater Quality Partnership)
RIGHT: Parking lot bioretention in El Monte, CA (LID Center, LID Manual for Southern California, 2010)

ABOVE: Bioretention in commercial parking lot (CASQA)


LEFT: Bioretention in community space (San Francisco Better Streets)
RIGHT: Chino, CA. Bioretention in parking lot, native vegetation.

LEFT: Mission Valley, CA (San Diego County LID Handbook, 2007)
RIGHT: Bioretention in bulb-out (Portland Bureau of Environmental Services)

Disconnected Downspouts

Flow dispersion involves redirecting channeled flow to vegetated areas to maximize the infiltration potential and provide volume reduction. The most common use of flow dispersion involves disconnecting downspouts from buildings that collect roof runoff. The flow from the downspout is then directed by a shallow channel or overland flow conveyance towards a vegetated area for infiltration into the underlying soil. Buried rock trenches may be incorporated to promote storage of the dispersed runoff while being infiltrated. In addition to promoting volume reduction through infiltration, flow dispersion also attenuates peak flows that would be entering the storm drain network. Other flow dispersion opportunities, such as directing roadway runoff towards vegetated medians, may be incorporated that also intercept existing drainage patterns and promote infiltration.

Required maintenance activities for disconnected downspouts are expected to be very minimal. Activities beyond those required for typical downspouts (e.g., clearing roof inlet of debris) would likely only include clearing or re-setting of the splash pad to reduce erosion at the point of discharge.

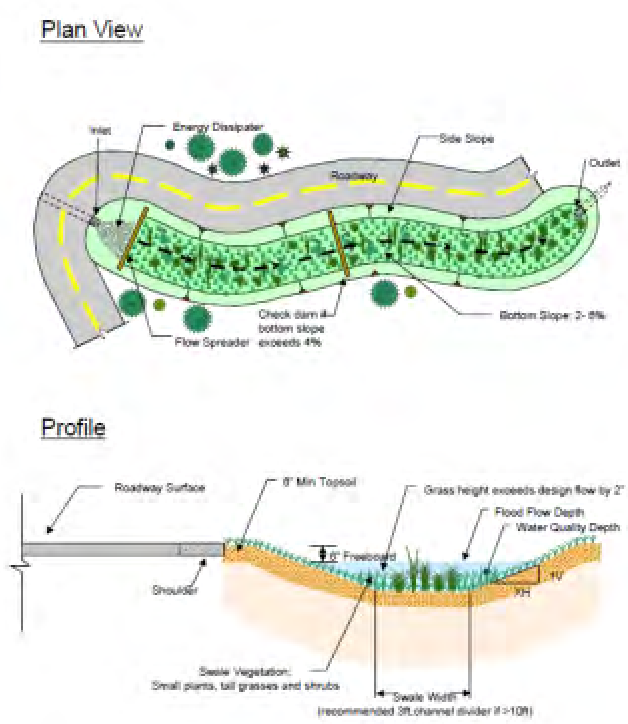
Photographs of examples of disconnected downspouts are provided below.


LEFT: Prince George's County, MD (MD Department of Environmental Resources)
RIGHT: Downspout disconnection with concrete splash pad.


LEFT: Disconnected downspout with rip-rap splash pad.
RIGHT: Close-up of disconnected downspout.

Swales

Swales (see figure on next page) are open, shallow channels with low-lying vegetation covering the side slopes and bottom that collect and slowly convey runoff to downstream discharge points. Vegetated swales achieve pollutant removal through settling and filtration in the vegetation (native grasses and small plants) lining the channels, provide the opportunity for volume reduction through infiltration and evapotranspiration, and reduce the flow velocity in addition to conveying stormwater runoff. Swales are most effective when longitudinal slopes are small (two to six percent) and where water depths are less than the vegetation height. The effectiveness of swales with longitudinal slopes of more than 2% can be enhanced by adding check dams at approximately 50 foot increments along their length. These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Typical stormwater



conveyance infrastructure can often be reduced in size due to the volume and flow reductions attributable to swales.

Although maintenance activities associated with swales will vary based on the swale design (e.g., grassy vs. rock swale), typical routine activities are expected to include: removal of excess sediment and trash/debris, resetting flow spreaders to restore original function, removal of visual contamination (e.g., oil and grease), stabilization of observed erosion, and clearing of inlet and outlet structures. Less frequent maintenance activities may include regarding of the swale bottom to mitigate ponding and re-vegetation of bare patches, as needed.

Photographs of examples of swales are provided below.

LEFT, BOTH: Roadside swales in Tucson, AZ (Watershed Management Group, 2010)
RIGHT: Curb cut to roadside swale in Playa Vista, CA (LID Center)


LEFT: Planted swale in Downey, CA (Source: Jessica Hall)
RIGHT: Rock swale at Scripps Institute of Oceanography (KTU+A)


LEFT: Bioswale along roadside, planted with grasses
RIGHT: Parking lot bioswale

4. MODELED LID PERFORMANCE RESULTS

The 10-year, 5-day design storm simulation was conducted for the non-distributed LID scenario, explicit distributed LID scenarios, and parameter (effective impervious areas) adjusted scenarios. The maximum capacity and depth of Sump H necessary to capture the design storm for each of the model variations are discussed below. The Sump H design provided by McIntosh, developed from guidance provided in the Kern County Hydrology Manual, is also discussed for comparison.

4.1 Sump H Sizing

The 10-year, 5-day design storm in SWMM was estimated to produce 2.91 MCF of runoff in the "Non-LID", or baseline, scenario. The necessary retention volume for Sump H, or the required sump capacity (capacity that prevents overflow at any time from the basin) for the design event, was determined to be 1.80 MCF. Although Sump H had been sized by McIntosh using the Kern County Methodology to retain a volume of 2.86 MCF, the "Non-LID" volume in SWMM will be used for purposes of a consistent comparison. This difference is likely caused by the explicit routing within SWMM vs. the Kern County method.

Several "Explicit LID" scenarios were run in SWMM incorporating various combinations of the LID facilities discussed in Section 3.9, and Sump H was reduced in size to account for the offset volume requirements attributable to the distributed facilities. Depending on the LID options modeled, these scenarios estimate a required Sump H capacity ranging from 0.64 to 1.42 MCF. These volumes are approximately 64 to 21% less than the "Non-LID" scenario volume, respectively. Table 5 presents the Sump H results for these scenarios. It should be noted that in some cases the peak flow in the "Explicit LID" scenario is minimally lower than the peak flow in the "Non-LID" scenario. This is due to 1) the size of the distributed BMPs, which are sized for 80% capture, not the design event, and 2) the fact that the design storm produces several smaller events before the peak, thereby "filling up" the distributed BMPs before the peak arrives.

Table 5 – Modeled Sump H Capacity and Depth for Design Storm Analysis

Scenario	Scenario Type	Bioretention	Downspout Disconnect	Swale Application Scenario				Total Runoff Volume to Sump (MCF)	Peak Inflow Rate to Sump (cfs)	Required Sump Capacity (MCF)	Difference in Required Sump Capacity from Non-LID (%)	Max Depth in Sump (ft)	Difference in Max Depth in Sump from Non-LID (ft)
				A	B	C	D						
N/A	McIntosh Design *							N/A	N/A	2.864	N/A	10.0	N/A
01	Non-LID							2.911	183.3	1.797	N/A	6.00	N/A
02	Explicit LID	Yes						1.800	178.7	1.425	-20.7	4.80	-1.2
03	Explicit LID	Yes	Yes					1.105	120.2	0.763	-57.5	2.62	-3.38
04	Explicit LID	Yes		Yes				1.847	178.7	1.417	-21.1	4.78	-1.22
05	Explicit LID	Yes			Yes			1.755	177.6	1.360	-24.3	4.59	-1.41
06	Explicit LID	Yes				Yes		1.753	177.9	1.372	-23.6	4.63	-1.37
07	Explicit LID	Yes					Yes	1.640	177.2	1.276	-29.0	4.32	-1.68
08	Explicit LID	Yes	Yes	Yes				1.088	119.9	0.747	-58.4	2.56	-3.44
09	Explicit LID	Yes	Yes		Yes			1.047	119.2	0.712	-60.4	2.45	-3.55
10	Explicit LID	Yes	Yes			Yes		1.132	119.5	0.740	-58.8	2.54	-3.46
11	Explicit LID	Yes	Yes				Yes	0.978	115.9	0.643	-64.2	2.21	-3.79

Swale A: Full swale infiltration on arterial only; Swale B: Full swale infiltration on all roads (driveway bridges); Swale C: Partial swale infiltration on all roads (driveway culverts); Swale D: Off-line swales modeled as storage units on all roads

* McIntosh Design has been included for reference only. This design used the Kern County design storm methodology, which is not directly comparable to the design storm methodology in SWMM.

4.2 Impervious Cover Parameter Adjustment

Upon completion of the "Explicit LID" scenario to estimate a potential reduced required size for Sump H, Geosyntec investigated adjustments to the effective impervious cover (IC) parameter in the SWMM model to mimic the performance of modeling the distributed LID BMPs directly. A reduction in IC was selected to result in the same capacity in Sump H to capture all of the 10-year, 5-day design storm volume as the explicit SWMM model LID scenario.

In general, decreasing impervious cover results in an increase in infiltration and evapotranspiration volumes but does not accurately represent the delay in time of concentration or peak flow rate shaving that an explicit LID storage unit provides.

The 10-year, 5-day design storm was simulated for both the ten explicit LID scenarios and the ten adjusted impervious cover scenarios with no distributed storage units. The impervious cover was reduced by a uniform percentage for all land use types that are to be routed to decentralized LID facilities. For example, the "Capacity IC Adjustment to Simulate LID" scenario for bioretention only (Scenario 12), a total reduction in impervious cover of 19.5% was determined to produce an equivalent total runoff volume and duration as the explicit LID scenario model. Table 6 presents the original impervious cover for each land use, based on the values originally used to size Sump H from the Kern County Hydrology Manual, as well as the adjusted IC values for a range of parameter adjustment scenarios to represent distributed LID impacts – including 1) bioretention (BR) alone (Scenario 12), 2) BR plus disconnected downspouts (DD) (Scenario 13), and 3) BR, DD, and the partial swale (SW) option C (Scenario 20).

Table 6 – Land Use Adjusted Impervious Cover Values to Represent LID

Land Use	Original IC (%)	Capacity IC Adjustment LID (BR) (%)	Capacity IC Adjustment LID (BR, DD) (%)	Capacity IC Adjustment LID (BR, DD, SW) (%)
Freeway Retail	90	74.7	46.1	45.0
Light Industrial	90	74.7	46.1	45.0
Office R&D	90	74.7	46.1	45.0
Parks	15	12.5	7.69	7.50
Residential	50	41.5	25.6	25.0
Schools	50	41.5	25.6	25.0
Roadways	95	78.9	48.7	47.5
Village Commercial	90	74.7	46.1	45.0
Village Residential	77.5	64.3	39.7	38.8
Water Quality*	100	100	100	100
Overall IC Adjustment	N/A	17.0	48.8	50.0

* Water quality land uses do not have a planned distributed LID option.

IC = Impervious Cover, BR = Bioretention, DD = Disconnected downspouts, SW = Swale

Table 7 presents the same information as Table 5 but also includes the results for the IC-adjustment additional scenarios. Figure 3 depicts the maximum storage volume in Sump H for each of the following seven scenarios:

- Scenario 01: Non-LID
- Scenario 02: Explicit LID with bioretention
- Scenario 03: Explicit LID with bioretention and disconnected downspouts
- Scenario 10: Explicit LID with bioretention, disconnected downspouts, and the partial swale option C
- Scenario 12: “Capacity IC Adjustment to Simulate LID” with bioretention
- Scenario 13: “Capacity IC Adjustment to Simulate LID” with bioretention and disconnected downspouts
- Scenario 18: “Capacity IC Adjustment to Simulate LID” with bioretention, disconnected downspouts, and the partial swale option C

Figure 4 shows the total inflow hydrograph to Sump H for each of these seven scenarios. As expected, the scenarios with more BMP implementation and a higher IC adjustment (or reduction), show a greater dampening of peak flows.

A comparison between the explicit distributed LID representation and the parallel parameter adjustment distributed LID representations suggests that the “Explicit LID” scenario is more effective at reducing the smaller, more frequent events. This is expected due to the storage unit being designed to detain small runoff events and slowly infiltrate the captured runoff volumes. The “Capacity IC Adjustment to Simulate LID” has a decreased imperviousness in the watershed, which effectively decreases the volume of runoff and increases the conveyance time of water reaching Sump H as compared to the “Non-LID” scenario.

Table 7 – Modeled Sump H Capacity and Depth for Design Storm Analysis

Scenario	Scenario Type	Bio-retention	Downspout Disconnect	Swale Application Scenario				Total Runoff Volume to Sump (MCF)	Peak Inflow Rate to Sump (cfs)	Required Sump Capacity (MCF)	Difference in Required Sump Capacity from Non-LID (%)	Max Depth in Sump (ft)	Difference in Max Depth in Sump from Non-LID (ft)
				A	B	C	D						
N/A	McIntosh Design*							N/A	N/A	2.864	N/A	10.0	N/A
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06	Explicit LID	Yes				Yes		1.753	177.9	1.372	-23.6	4.63	-1.37
07	Explicit LID	Yes					Yes	1.640	177.2	1.276	-29.0	4.32	-1.68
08	Explicit LID	Yes	Yes	Yes				1.088	119.9	0.747	-58.4	2.56	-3.44
09	Explicit LID	Yes	Yes		Yes			1.047	119.2	0.712	-60.4	2.45	-3.55
10	Explicit LID	Yes	Yes			Yes		1.132	119.5	0.740	-58.8	2.54	-3.46
11	Explicit LID	Yes	Yes				Yes	0.978	115.9	0.643	-64.2	2.21	-3.79
12	IC Adjust = 17.0%	Yes						2.444	155.5	1.425	-20.7	4.80	-1.20
13	IC Adjust 48.8%	Yes	Yes					1.576	101.5	0.763	-57.5	2.62	-3.38
14	IC Adjust = 18.3%**	Yes		Yes				2.435	154.7	1.417	-21.1	4.78	-1.22
15	IC Adjust = 20.0%	Yes			Yes			2.362	150.5	1.359	-24.3	4.59	-1.41
16	IC Adjust = 19.5%	Yes				Yes		2.376	151.3	1.370	-23.7	4.62	-1.38
17	IC Adjust = 23.8%	Yes					Yes	2.260	144.2	1.278	-28.9	4.32	-1.68
18	IC Adjust = 52.3%**	Yes	Yes	Yes				1.553	99.5	0.747	-58.4	2.56	-3.44
19	IC Adjust = 51.5%	Yes	Yes		Yes			1.501	96.8	0.712	-60.4	2.44	-3.56
20	IC Adjust = 50.0%	Yes	Yes			Yes		1.542	99.4	0.740	-58.8	2.54	-3.46
21	IC Adjust = 55.3%	Yes	Yes				Yes	1.398	90.3	0.641	-64.3	2.21	-3.79

Swale A: Full swale infiltration on arterial only; Swale B: Full swale infiltration on all roads (driveway bridges); Swale C: Partial swale infiltration on all roads (driveway culverts); Swale D: Off-line swales modeled as storage units on all roads

* McIntosh Design has been included for reference only. This design used the Kern County design storm methodology, which is not directly comparable to the design storm methodology in SWMM.

** IC adjustment was not applied to non-arterial roads for this scenario.

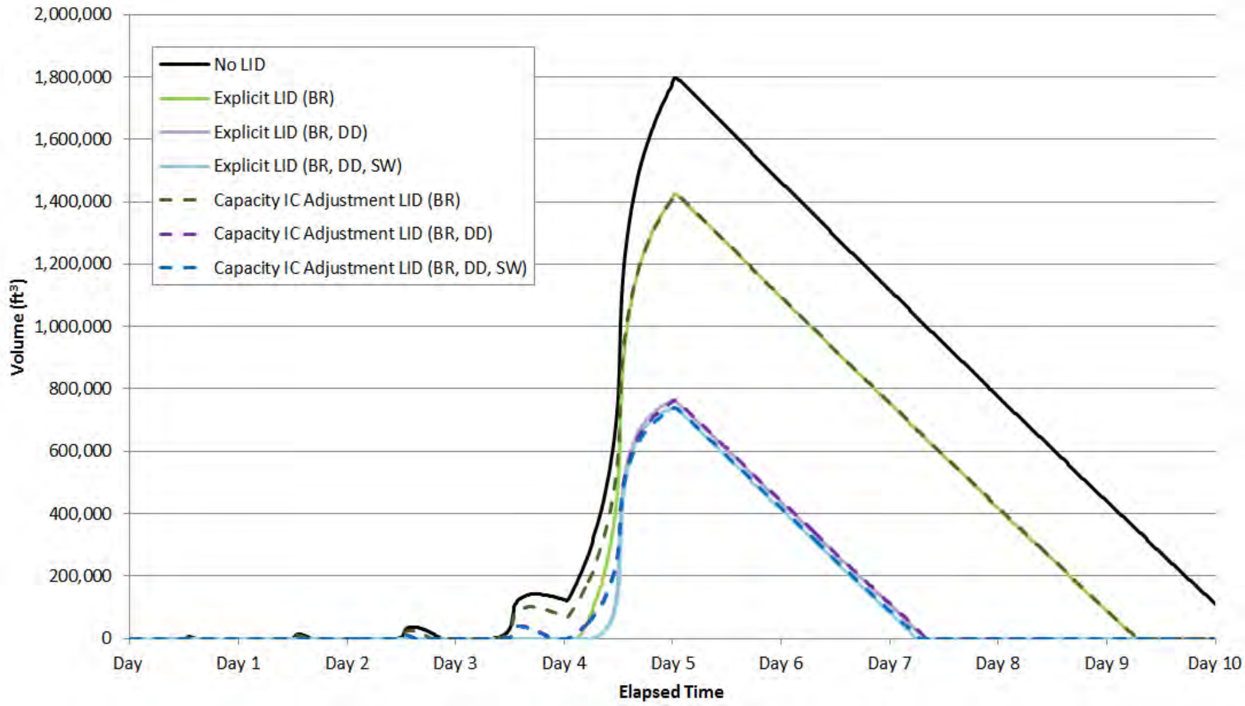

Figure 3 – Design Storm Sump H Storage Volume for Seven Selected Scenarios

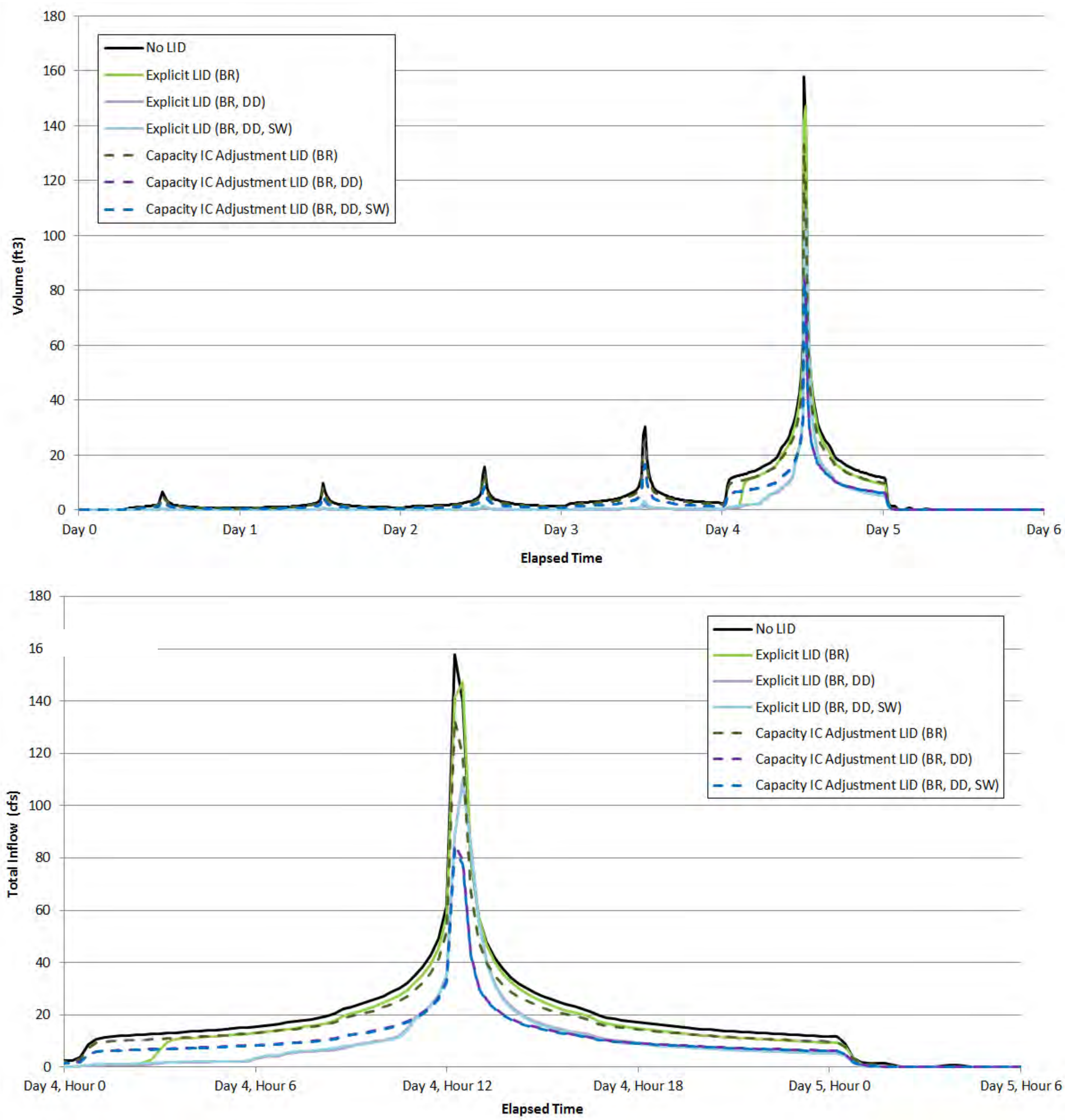

Figure 4 – Design Storm Inflow Hydrograph at Sump H for the Seven Selected Scenarios (Top: 5-day Event; Bottom: Day 4-5 Inset)

4.3 Design Storm Summary

Analysis of the design storm models indicate that explicit representation of the distributed LID facilities, depending on level of LID implemented, could result in up to a 64% reduction in required sump capacity and 3.8-ft reduction in depth for the Sump H design when compared to the non-LID scenario. This result assumes that bioretention, disconnected downspouts, and off-line road-side swales are implemented along all roads. Looking at incremental benefits based on level of LID implementation, the following observations can be made:

- The model predicts a 21% decrease in flood basin size due to use of bioretention LID features only.
- Bioretention plus disconnected downspouts approximates a decrease in flood basin size of 56%, so a 35% reduction can be roughly attributed to disconnected downspouts alone.
- Bioretention in combination with swales approximates a decrease in flood basin size of 21% to 29%, depending on the swale configuration, so a 0.4 to 8% reduction can be roughly attributed to swales alone.
- Of the swale configurations, swales on arterial streets alone have the least impact on basin size, and off-line swales on all roads result in the largest percent reduction.
- If bioretention, downspout disconnects, and offline swales are all implemented, that could reduce the flood basin size by approximately 64%. In that case the impervious cover values would be adjusted by 50% in the Kern County method to match the SWMM modeling results.

As expected, the “Capacity IC Adjustment to Simulate LID” scenarios produce similar results for sump modifications because the capacity of Sump H was used as a basis for selecting the IC reduction factors.

4.4 Continuous Simulation

A long-term continuous simulation run was conducted for the explicit LID scenario using the NCDC Bakersfield Airport Rain Gauge hourly record between water years 1949-2013. These simulations accounted for evaporation from the sumps, to more accurately mirror realistic conditions. Over this 64-year period, the capacity of Sump H in the “Explicit LID” scenario (sump volume = 0.74 MCF), including bioretention, disconnected downspouts, and the partial swale option (Scenario 20), was exceeded on eight occasions as summarized in Table 8. Three of these eight events had total rainfall depths more than the 10-year, 5-day rainfall depth of 4.33-inches, with five events measuring less than the design storm depth. Of the events that did not exceed the design depth, the event with the longest duration occurred in November of 1960.

Figure 5 shows the hyetograph for this event. This event had a rainfall depth of 3.98 inches within 45 hours, whereas the design event duration is 120 hours. The 1960 event also exceeds the 15-year frequency, 4-day duration design event depth, according to the NOAA Atlas 14. For these reasons, we do not believe that this abnormal event, nor the events with even shorter frequencies (ranging from five to 30 hours), should negate the functionality of the adjusted basin with respect to capturing the design event.

Results are similar for the “Capacity IC Adjustment to Simulate LID” scenarios, which demonstrate that the Sump H capacity would be exceeded for events which have either a larger total rainfall depth, or a shorter duration, as compared to the 10-year, 5-day design depth. This is also consistent with the results of the “Non-LID” scenario. One additional scenario was run evaluating the long-term condition in which LID facilities have only ½ of the infiltration rate due to sedimentation and reduced functionality. This scenario also showed that Sump H capacity would be exceeded for events which have either a larger total rainfall depth, or a shorter duration, as compared to the 10-year, 5-day design depth.

Table 8 – Explicit LID Scenario, Events Exceeding Sump H Capacity, 1949-2013

Dates Volume Exceeded	Sump Capacity (MCF)	Total Rainfall (in.)	Rainfall Duration (hr)	Exceed Design Depth?	Peak Rainfall Intensity (in/hr)	NOAA Atlas 14 Design Event
10/6/1956	0.90	2.40	10	No	1.32	200-yr, 5-hr
11/5/1960	0.98	3.98	45	No	0.56	15-yr, 4-d
6/7/1972	0.80	2.18	5	No	1.34	1000-yr, 2-hr
10/2/1974	0.89	2.24	5	No	1.64	600-yr, 3-hr
2/9/1978	2.54	7.64	70	Yes	0.64	200-yr, 5-d
8/18/1983	0.77	2.16	30	No	1.72	300-yr, 3-hr
1/24/1999	1.65	5.66	50	Yes	0.44	65-yr, 6-d
12/18/2010	1.97	9.00	125	Yes	0.58	250-yr, 4-d

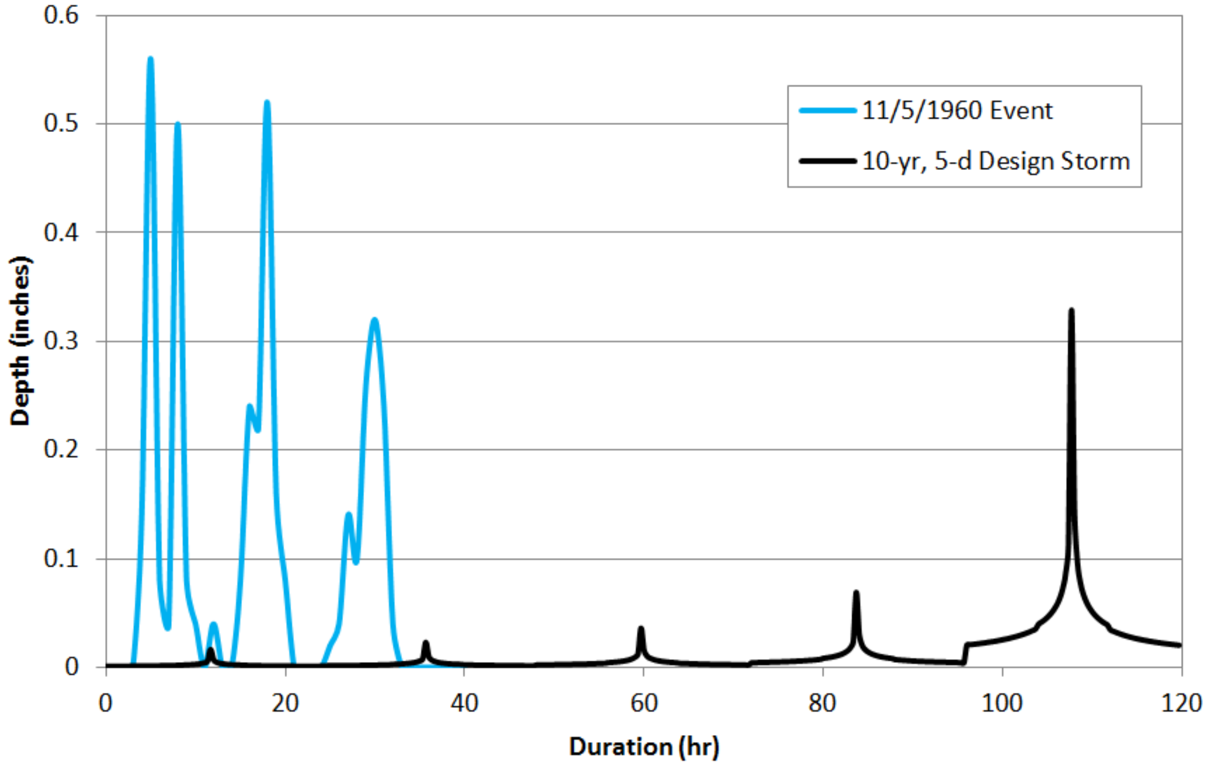

Figure 5 – Rainfall Distribution for November 1960 Event and 10-year, 5-day Design Storm

5. CONCLUSIONS

The baseline SWMM scenario modeled without distributed LID BMPs to size Sump H for the 10-year, 5-day design storm results in a smaller required capacity than the design provided by McIntosh using guidance in the Kern County Hydrology Manual. The Kern County design methodology is based on the runoff volume from all impervious areas and does not account for the timing or routing of flows or the potential infiltration and evaporation of runoff from the impervious areas in the watershed while runoff is being conveyed to the sump. For this reason, the SWMM distributed LID scenarios were compared to the SWMM non-distributed LID scenario as opposed to the McIntosh design that resulted from the Kern County design methodology.

Each representation of distributed LID BMPs produces different results with respect to runoff rates and volumes due to nuances in the representations of the treatment facilities. It is expected that the explicit distributed LID representation is the most appropriate due to the specific unit processes which occur, such as detention, peak flow rate shaving, infiltration, and unmodified land use properties. The LID facilities were sized to have an average annual capture efficiency of 80%, which is the volume-based sizing criterion for stormwater features assumed in the EIR analysis. Explicit distributed LID modeling of bioretention, disconnected downspouts, and partial swales in combination, suggests that the capacity of Sump H can be reduced by up to approximately 64% to account for the benefits of decentralized LID facilities constructed throughout the catchment area (assuming bioretention, downspouts disconnections, and partial swales are implemented) without increasing flooding risks.

A simplified parameter adjustment for impervious cover can be used to approximately represent distributed LID BMPs for specific design storm events. Based on the Sump H catchment results, assuming bioretention, disconnected downspouts, and swales are implemented, Geosyntec recommends decreasing the effective impervious cover by 50% throughout the Grapevine Specific Plan for the land uses with proposed decentralized LID facilities as modeled in the "Capacity IC Adjustment to Simulate LID" scenario. An impervious cover reduction of 50% results in approximately a 64% reduction in required Sump H capacity as compared to the baseline "Non-LID" scenario for the 10-year, 5-day design storm and is the most conservative adjustment determined from the analyses. Using the guidance in the Kern County Hydrology Manual, this specified reduction in impervious cover would result in roughly a 50% reduction in required Sump H capacity for the design storm when compared to the original sump sizing provided by McIntosh. Therefore, using this parameter adjustment together with the Kern County guidance, the resulting reduction in sump capacity will conservatively simulate expected LID facilities with 80% average annual capture efficiency.

In summary, LID practices provide multiple benefits including: groundwater recharge, reduced use of potable water for irrigation, and water quality improvements, among others. Additionally, LID implementation is becoming more common in California, as demonstrated by the Kern County and other local MS4 Permits. Therefore, it is our recommendation that LID practices be implemented within the Grapevine Project, and that the Kern County methodology for flood control basin sizing allow for credit for the volume offset attributable to the LID features.

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* * * * *

Appendix M

Master Drainage Study

MASTER DRAINAGE STUDY
Grapevine Project

Submitted to

Tejon Ranch Company

Submitted by

Geosyntec consultants

engineers | scientists | innovators

August 2015

Geosyntec consultants

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1. INTRODUCTION

The proposed Grapevine project (proposed project) is a phased, master-planned community comprised of 8,010 acres in the west-central portion of the 270,000-acre Tejon Ranch (the Ranch), privately held by Tejon Ranchcorp (TRC). The proposed project area is located entirely within unincorporated Kern County at the southern end of the San Joaquin Valley, just south of the junction of Interstate 5 (I-5) and State Route 99 (SR-99). The proposed project site would act as a southern gateway to the Central Valley and would be accessed from I-5 by the Grapevine Road (south access) and Laval Road (north access) interchanges. The I-5 freeway and California Aqueduct (Aqueduct) serve as a north-south and an east-west proposed project divide, respectively.

The proposed project is comprised of eleven (11) Special Plan Areas (SPA) totaling 8,010 acres (Figure 1-1) and is proposed to feature a variety of different developed land uses, including mixed use residential communities, village mixed use commercial/industrial centers, chiefly industrial areas, and undeveloped areas. A breakdown of the developed and undeveloped project areas per the Land Use Program Summary (KenKay, 2014) and this Master Drainage Study (MDS) is shown in Table 1-1. Approximately 60% (4,813 acres) is identified by the Land Use Program Summary as developed area, which includes both the proposed project development (4,771 acres) and the I-5 freeway ramps (42 acres). The remaining 40% (3,197 acres) would be designated as undeveloped agriculture and used predominately for open space or grazing. For the purposes of this MDS, a larger portion of the total proposed project was identified as developed area (63%; 5,085 total acres– 5,043 acres project plus 42 acres freeway ramps), which includes areas that require stormwater management (e.g., sumps areas not included in the Land Use Program Summary and other graded areas draining to the sumps); the remaining 37% (2,925 acres) is undeveloped agriculture (open space or grazing; Figure 1-1). This additional amount of MDS developed area included (3%, 272 acres) was originally designated in the Land Use Program Summary as undeveloped agriculture and now has been included in this MDS as follows:

- Designated as sump area (133 acres)
- Open space within sump tributary area boundaries and draining to sump (34 acres)
- Outside sump tributary area boundaries and draining to sump (105 acres); this area may be graded for trails and was thus added to the developed area as a conservative measure

The mixed use residential areas would include offices, commercial, and light industrial/warehouse uses. This proposed project would feature a series of compact, higher density neighborhoods linked by bicycle and pedestrian trails that could conveniently provide access to retail stores, professional services, schools, and parks. Additionally, multipurpose trails are proposed along Grapevine Creek, Cattle Creek, the southern foothills, and the open space adjacent to the California Aqueduct and at other locations throughout the proposed project site, some of which would connect to public streets.

1.1 Goals and Objectives

Stormwater retention basins (basins that would retain and infiltrate stormwater runoff, hereinafter referred to as "sumps") are required for the proposed project to protect residents, wildlife and property from flood waters and to maintain public and emergency vehicle road access to the proposed project property (Kern County, 2010). The objectives of this MDS are to provide conceptual sump sizing calculations and designs to meet two different sizing method requirements: 1) the Kern County Approach and 2) the Impervious Cover (IC) Adjustment Approach (Section 2.3). The two approaches provide a range of anticipated sump sizes, from the largest required sump capacities of the traditional, community-scale Kern County approach to smaller required sump capacities using an alternative approach with distributed low impact development (LID) BMPs to reduce the effective (directly connected) imperviousness.

The LID approach would include upstream best management practices (BMPs) with various stormwater controls (e.g., detention, peak flow rate shaving, infiltration, and unmodified land use) that would maximize environmental and social-economic benefits (e.g., groundwater recharge, wildlife habitat, heat island effect, public health, beautification) while minimizing downstream stormwater facility infrastructure, including pipe and sump sizes. This MDS provides conceptual sump designs and layouts that may be altered later based on a determination of the combination of final LID features are incorporated into the design at the tract mapping phase of development.

2. STORMWATER DRAINAGE

2.1 Existing Drainage

The existing grades of the proposed project range in elevation from approximately 900 feet for the northernmost SPA (SPA 6a) to over 1,700 feet for the southwestern SPA (SPA 1). The southern end of the site is bordered by the Tranverse Range (east-west) San Emidgio and Tehachapi Mountains. The proposed project generally slopes downward from the mountains in a northeasterly direction. Stormwater runoff from the proposed project area discharges to three main receiving waters: 1) a 7-mile lined drainage canal (850 Canal) located north of the proposed project that flows to a 12-acre reservoir located just northwest of Tejon Reservoir No. 1 (WRMWSD, 2015), 2) Pastoria Creek and the Live Oak Creek and Cattle Creek tributaries that are located along the east side of the proposed project, and 3) Grapevine Creek located near the middle of the proposed project and bordering the east side of SPAs 3, 6a, 6d, and 6e (Figure 2-1).

2.2 Proposed Drainage

The proposed drainage plan for the proposed project includes both distributed LID BMPs (e.g., bioretention, infiltration trenches, stormwater planter boxes, flow dispersion of roof and driveway runoff) and community-scale sumps based on the proposed project land use. Table 2-1 summarizes the treatment provided for each land use type. The goals of the proposed project are to keep developed areas as natural as possible and retain their existing hydrologic and hydraulic functions. To the extent practicable, natural areas would be enhanced, stormwater conveyance would be improved, and wildlife habitat would be increased with a variety of thoughtfully planned LID BMPs. Outflow and bypass from the LID BMPs located within the sump tributary areas are routed to the sumps.

The locations of the 29 proposed sumps and their tributary areas are shown in Figure 2-2. Table 2-2 and Figure 2-3 provide a breakdown of the proposed project and sump tributary areas, identifying on-site (within the proposed project), off-site (both associated and not associated with the proposed project for stormwater management), developed and undeveloped areas that were used to develop the sump sizing (Section 2.3).

As shown in Figure 2-3, there is an on-site 105.1-acre undeveloped open space area that may be graded for trails that is tributary area to Sump D (within SPA 1). Additionally, there are off-site areas that are outside of, but adjacent to, the SPA boundaries that are either (1) open space that is naturally sloped toward the proposed project and not associated with the proposed project or (2) developed roadway area (i.e., roundabout and connector road between SPA 3 and 6a) that are associated with the proposed project and therefore would be routed to the on-site sumps.

For Caltrans projects, both within the proposed project area and nearby, Caltrans would design and manage stormwater runoff, and meet Kern County and other applicable stormwater regulatory requirements on their property/rights-of-way. These Caltrans projects include (1) the I-5 freeway ramp areas (42 total acres) located within the proposed project area and (2) the proposed relocated southbound I-5 Commercial Vehicle Enforcement Facility (CVEF, a.k.a. weigh station) located northwest of the proposed project. The CVEF, which is currently in the conceptual design phase, would be relocated approximately 4 miles north of its current I-5 location on the east side of SPA 2, near proposed Sump H.

2.3 Sump Sizing

Two separate sizing method requirements of the community-scale infiltration sumps were developed to determine the estimated largest and smallest sump facility sizes that could be designed as part of the development condition using the (1) Kern County Approach (Section 2.3.1) and the (2) IC Adjustment Approach (Section 2.3.2). Section 2.3.3 describes the design storm depth evaluation methodology and Section 2.3.4 describes the sump calculations.

2.3.1 Kern County Approach

The Kern County Approach follows the Kern County Development Standards Engineering Bulletin 11-02 (Kern County, 2011) sump volume requirements where the required sump capacity is based on runoff generated by the Intermediate Storm Design Discharge (ISDD) 10-year, 5-day storm event. The required sump capacity is computed using the following equation:

$$Required\ Sump\ Capacity = [(D_{10yr\text{-}5day})/12]*(IC)*(Area)$$

Where:

$D_{10yr\text{-}5day}$ = *ISDD 10-year, 5-day storm depth*
IC = percent impervious cover
Area = total sump tributary area

The total sump tributary areas and associated land uses within each tributary area are shown in Table 2-3. The percent impervious cover (imperviousness) assumed for each land use (Table 2-4) was a conservative estimate based on the imperviousness range for developed areas provided in the Kern County Hydrology Manual (Hromadka, 1992) and was typically the recommended value for the average conditions for the closest representative land use.

2.3.2 Impervious Cover (IC) Adjustment Approach

In effort to optimize the environmental and socio-economic benefits of the proposed project, Geosyntec Consultants (Geosyntec) analyzed potential adjustments to the Kern County Approach to account for the hydrologic and hydraulic effects of small-scale, distributed water quality and hydromodification control infrastructure (Geosyntec, 2014a; Appendix A). Continuous simulation modeling was conducted to estimate the reduction in effective impervious cover, which is the amount of impervious cover that would have direct hydraulic connection to storm sewer drainage to the sumps, through implementation of distributed LID BMPs per the proposed drainage plan (Section 2.2). An IC adjustment of 48.8% was selected to reflect the implementation of the distributed LID BMPs, which is representative of the modeled bioretention and disconnected downspouts to reduce runoff volume (via infiltration) and peak flow rate (via detention). The percent impervious cover in the Kern County sump capacity equation presented in Section 2.3.1 is multiplied by the IC adjustment (48.8%) to estimate the smaller sump size for each sump tributary area to account for the LID BMP effects on runoff.

2.3.3 Design Storm Depth

Table 2-5 summarizes the ISDD storm depth by SPA and detailed rainfall data and calculations can be found in Appendix B. The ISDD for the proposed project was obtained from the National

Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 6, Version 2.0. For each of the SPAs, the following procedure was used to determine the ISDD:

1. The latitude and longitude representative of each SPA was entered into the NOAA Atlas 14 Point Precipitation Frequency Estimator: (http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca).
2. The data type (*precipitation depth*), units (*English*), and time series type (*partial duration*) was specified.
3. The 10-year, 4-day and 10-year, 7-day point rainfall depths (inches) were identified from the tabular precipitation frequency estimate output (90% confidence intervals).
4. These two points were plotted on a log-log scale plot for storm duration (days) versus point rainfall (inches).
5. The 10-year, 5-day depth of rainfall was interpolated from the graphed values.

2.3.4 Sump Sizing Calculations

The sump sizing calculations for both the Kern County Approach and the IC Adjustment Approach can be found in Appendix C. Separate worksheets are provided for each approach with three distinct subsections, as described below.

Provided Sump Capacity

This subsection of the sizing worksheets presents the sump design information for each approach, including the design water depth, the freeboard provided above the design water depth, the total sump depth (with freeboard) and the corresponding top and bottom elevations, the elevation-area-volume (stage-storage) relationship for the sump, and the total provided sump capacity.

Required Sump Capacity

This subsection of the sizing worksheets presents the required sump capacity as determined by either the Kern County Approach or the IC Adjustment Approach. For both approaches, the design storm depth, the total sump tributary area, and the original percent impervious cover are provided. For the IC Adjustment Approach, the adjusted IC resulting from a 48.8% reduction (Section 2.3.2) is also provided and subsequently used to determine the required sump capacity.

Sump Tributary Area

This subsection for the Kern County Approach provides the breakdown of land uses within each sump tributary area, with a classification and total of the off-site or on-site land use areas. This subsection reports the total acreage, impervious cover percentage for each land use (based upon Table 2-4), and the impervious acreage for each respective land use.

2.4 Sump Design

2.4.1 Sump Infiltration

The sumps would be designed as fully infiltrating facilities to drain the sump within seven days as required by Kern County (Kern County, 2010). Infiltration testing was conducted by Geosyntec in January 2014 at 11 locations throughout the proposed project (Geosyntec, 2014b). Each SPA, with the exception of SPA 6b and 6c contained at least one testing location; SPA 2 and SPA 5a contained two testing locations. The infiltration rate measured in SPA 6a was assumed to be representative for the sumps located in additional SPAs 6b and 6c as it is the most conservative rate measured in the nearby soils of similar composition. To conservatively adjust for the measured general (not sump-specific) infiltration rates, a design infiltration rate used to estimate the drawdown time within each basin was obtained by applying a factor of safety (FOS) of 2.5 to the rate measured in the applicable SPA, in accordance with the Ventura County Technical Guidance Manual (LWA and Geosyntec, 2011). The FOS calculation and a summary of the measured and design infiltration rates are presented in Table 2-6 and Table 2-7, respectively. The boring locations for the boring numbers listed in Table 2-7 are shown in Figure 2-4. Once sump-specific infiltration rates are measured at the intended depth of the basin for each proposed sump, this FOS may no longer be necessary.

The design water depths of the sumps have been selected to allow for the sumps to completely drain within seven days based on the design infiltration rates. When using the most conservative design infiltration rate for the SPA, the sumps located in SPA 2 (Sumps E through I) and SPA 5b (Sump W) have a maximum sump depth of 7 and 3.5 feet, respectively, to meet this seven-day drawdown time. The sumps located in the remaining SPAs have a depth of eight feet, which is the maximum allowable depth before a slope stability analysis is required (Kern County, 2010). Sump grading is discussed in detail below in Section 2.4.2. In extreme events, any stormwater to the proposed project that overflows the sumps would be routed and discharged safely to downstream receiving waters in a manner that meets the Kern County development standards.

2.4.2 Sump Grading

Conceptual drainage plans in Appendix D show the extent of the sump grading footprint (all contours from sump bottom to existing ground surface) and provides a summary table per each SPA of the sump depth, capacities and footprints for the Kern County and IC Adjustment Approaches. Table 2-8 summarizes this information for all proposed project sumps, including totals for the required sump capacities and footprint areas. There are four sets of sumps (B and C; K and L; O,P and Q; and T and U) that are analyzed together in this MDS for the required sump capacity as routing of runoff from their tributary areas has not been divided up at the current level of planning; the tributary area to sump E/F was combined in previous documentation and is now considered one area. Additionally, two sumps (H and X) cannot provide the required capacity for their respective tributary areas and therefore convey the remaining runoff volume requiring capture to downstream sumps. These downstream sumps include Sump I that receives the surplus flows from Sump H and Sump Y that receives the surplus flows from Sump X.

The sumps were sized and configured in accordance with the Kern County retention basin design standards and standard detail plates (Kern County, 1995a; 1995b; 2010). For both approaches, sumps were generally configured to provide the smallest possible footprint as constrained by the standard sizing configurations and as practicable to minimize costs that would be incurred for additional slope stability analysis and/or conveyance infrastructure for drawdown timeframe exceedances. Specifically, design considerations for the conceptual sizing and configuration of the sumps included:

- Providing the sump capacity (design volume) entirely in cut.
- A minimum bottom dimension of 20 feet to accommodate maintenance equipment.
- One (1) foot of freeboard from the design water level with the exception of Sump B/C and Sump W which are shallower at 1.5 feet and 3.5 feet design water depths, respectively, and therefore require only 6 inches of freeboard to meet requirements.
- Sump side slopes at 2H:1V maximum.
- Design water depths to the lesser of the following for each sump: 1) eight (8) feet to eliminate the need for a slope stability analysis or 2) the maximum depth to provide a drawdown of seven (7) days or less using measured infiltration rates (Section 2.4.1), which affected sumps in Special Plan Area 2 (designed at a 7-foot maximum depth) and Sump W (designed at a 3.5-foot maximum depth).
- Setback for required fencing and maintenance access at 5 feet for sumps with less than a 4-foot design water depth, including Sump B/C (1.5 feet deep) and Sump W (3.5 feet deep), and 10 feet for all other sumps
- Providing a slightly oversized design volume to accommodate ramp requirements to the sump bottom, with ramps at maximum slopes of 20 and 15% for less than and greater than 4-foot design water depths, respectively. For simplicity and ease of access, Sump B/C, which has only a 1.5-feet deep design water depth, was designed with 5H:1V (20%) side slopes all around the sump.

2.4.3 Potential Sump Design Modifications

The required sump capacities determined through the sump sizing calculations (Section 2.3) would not be altered if the tributary areas and impervious cover within each tributary area remains unchanged. However, the locations and configurations of the sumps, may be modified in later design stages to accommodate project changes. Additionally, if the sumps are to be maintained by the Grapevine development, not Kern County, design requirements may be more flexible and could allow for these sump areas to serve as multipurpose facilities with additional community uses, such as soccer or baseball fields. Some of the anticipated potential design modifications that may occur moving forward from this MDS conceptual sump design through the proposed project final design and tract mapping phases include the following:

- Sump locations and configurations may be modified due to potential regulatory floodplain requirements or documented floodplain revisions which would either constrain or provide greater sump design flexibility based on water level elevations.
- Sump-specific infiltration rates used in future stages of detailed sump design, as well as modified FOS values, may result in modified allowable sump depths and/or sump footprints.
- Actual effective impervious cover (versus impervious cover based on general land uses) and the level of LID BMP implementation may result in modifications to the required sump capacities, potentially altering downstream sump sizes.
- Proposed project phasing may result in modified sump locations to provide cost-efficiencies and practicalities for design and construction.
- Existing features within the development, such as ephemeral streams and areas of natural storage may be preserved to retain the original conveyance capacity and habitat, which could further reduce downstream sump sizes. Enhancements to these features, as allowed by applicable regulatory authorities, could include stream bouldering, planting of drought-tolerant native vegetation, inclusion of on-line or off-line connected storage and habitat features, restoration of side channels and flow regime, and/or check dams to increase infiltration potential.
- The use of the sumps as multipurpose facilities could result in spreading out the sump footprint, increasing the percentage of impervious cover due to increased water surface, potentially altering required sump capacities and configurations.

3. SUMMARY

Proper drainage design that ensures that stormwater is effectively routed, stored, infiltrated, and maintained is essential to the livelihood and protection of the proposed project communities. The MDS conceptual sump design and layout has been designed in harmony with the existing drainage patterns to collect and retain runoff within the proposed project boundaries per the Kern County design standards and as modified by the IC Adjustment Approach. The results of the MDS sump sizing totals show that the IC Adjustment Approach provides an approximately 49% reduction in required sump volume and corresponding 53% reduction in the design sump footprint area compared with the Kern County Approach. This indicates that allowing credit for the incorporation of distributed LID BMPs for upstream runoff control would be a more efficient stormwater management design, with smaller downstream flood control sumps (and potential alternative development use of the saved space). Efficiencies would be gained due to the distributed LID BMPs that would be providing a portion of the sump functions within the developed areas.

The current sump designs would be subject to potential modification in detailed design stages due to a variety of factors, including mapped floodplain extent and considerations, sump-specific infiltration rates, actual impervious cover, project phasing or other project changes affecting sumps, potential multipurpose sump use, and the final level and types of LID BMP implementation. However, regardless of the potential sump modifications, the sump design results in this MDS indicate the effectiveness of a carefully planned and distributed an LID BMP approach in terms of hydrologic and hydraulic management in addition to the already proven environmental and socio-economic benefits of LID.

4. REFERENCES

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TABLES

Table 1-1. Project Areas

SPA	Developed (ac)		Undeveloped (ac)		Freeway Ramps (ac)	Total SPA Area (ac)
	Land Use Program Summary	MDS	Land Use Program Summary	MDS		
1	456	561	578	473	7	1,041
2	908	908	19	19	13	939
3	696	790	363	269	22	1,081
4	694	744	126	76	0	820
5a	541	559	1,090	1,072	0	1,631
5b	103	108	872	867	0	975
6a	511	511	109	109	0	620
6b	322	322	0	0	0	322
6c	193	193	0	0	0	193
6d	177	177	17	17	0	194
6e	171	171	23	23	0	194
Total	**4,771**	**5,043**	**3,197**	**2,925**	**42**	**8,010**

Table 2-1. Project Treatment by Land Use

Treatment Type	Land Uses Treated
Distributed LID BMPs	Village Commercial, Village Residential, Office R & D, Residential, Parks, Schools, Light Industrial, Roadways
Community-scale Infiltration Sumps	Agriculture (on-site and off-site areas routed to sumps)
No Treatment	Undeveloped, Freeway Ramps (managed by Caltrans)

Table 2-2. Project and Sump Tributary Areas

Sump Tributary Area	SPA	On-site Freeway Ramp[1] (ac)	On-site Developed Area to Sump (ac)	On-site Undeveloped Graded Area to Sump (ac)	Off-site Area to Sump (ac)	Total Project Area (ac)	Total Area to Sump[2] (ac)
		A	**B**	**C**	**D**	**A+B+C**	**B+C+D**
A	1		76.2			**76.2**	**76.2**
B,C	1		15.8			**15.8**	**15.8**
D	1	7.1	342.9	105.1	6.1	**455.2**	**454.1**
E/F	2		88.3		91.8	**88.3**	**180.1**
G	2		261.7		3.1	**261.7**	**264.8**
H	2	12.5	261.3		4.5	**273.8**	**265.8**
I	2		317.5		21.5	**317.5**	**339.0**
J	3	6.0	107.4		9.2	**113.4**	**116.5**
K,L	3	8.0	451.3			**459.3**	**451.3**
M	3	8.1	228.4			**236.5**	**228.4**
Local	4		32.2			**32.2**	**32.2**
N	4		87.7			**87.7**	**87.7**
O, P, Q	4		625.7			**625.7**	**625.7**
R	5a		81.1			**81.1**	**81.1**
S	5a		31.4			**31.4**	**31.4**
T,U	5a		287.6			**287.6**	**287.6**
V	5a		163.2			**163.2**	**163.2**
W	5b		103.6		0.1	**103.6**	**103.7**
X	6a		102.1		2.4	**102.1**	**104.5**
Y	6a		176.6			**176.6**	**176.6**
Z	6a		101.0		0.2	**101.0**	**101.2**
AA	6a		132.0			**132.0**	**132.0**
BB	6b		80.6			**80.6**	**80.6**
CC	6b		90.6			**90.6**	**90.6**
DD	6b		72.0			**72.0**	**72.0**
EE	6b		78.5			**78.5**	**78.5**
FF	6c		192.9			**192.9**	**192.9**
GG	6d		177.0			**177.0**	**177.0**
HH	6e		171.0			**171.0**	**171.0**
Grand Total		**41.7**	**4,937.6**	**105.1**	**138.8**	**5,084.4**	**5,181.5**

1. On-site freeway ramp areas would be managed by Caltrans and are not directed to sumps.
2. Total tributary area to sumps includes on-site developed area (which does not include freeway ramps but does include the sump area), on-site undeveloped area, and off-site areas.

Geosyntec consultants

Table 2-3. SPA Land Uses

SPA	Agriculture (ac)	Commercial (ac)	Freeway Ramp (ac)	Light Industrial (ac)	Parks (ac)	Residential (ac)	Schools (ac)	Sump Area (ac)	Roadways (ac)	Village Commercial (ac)	Village Residential (ac)	Total (acres)
1	578	65	7	28	0	277	0	23	32	8	23	**1,041**
2	19	56	13	76	58	456	30	48	55	30	98	**939**
3	281	171	22	55	5	281	5	112	55	20	74	**1,081**
4	84	0		0	56	468	30	66	45	15	57	**820**
5a	1,086	0		0	5	424	5	29	44	5	33	**1,631**
5b	868	0		0	0	92	0	4	11	0	0	**975**
6a	109	21		187	3	145	5	26	29	20	75	**620**
6b	0	0		305	0	0	0	17	0	0	0	**322**
6c	0	0		180	0	0	0	10	3	0	0	**193**
6d	17	0		165	0	0	0	9	3	0	0	**194**
6e	23	0		163	0	0	0	8	0	0	0	**194**
Off-site Area to Sump	138	0	0	0	0	0	0	0	1	0	0	**139**
Total	**3,203**	**313**	**42**	**1,160**	**128**	**2,143**	**75**	**351**	**277**	**98**	**359**	**8,149**

Table 2-4. Land Uses and Impervious Cover

Land Use	Impervious Cover (%)[1]
Agriculture	0
Commercial	90
Light Industrial	90
Parks	15
Residential	50
Schools	50
Roadways	95
Village Commercial	90
Village Residential	77.5
Sump Area	100

1. Conservative estimate based on the imperviousness range for developed areas provided in the Kern County Hydrology Manual (Hromadka, 1992); typically the recommended value for the average conditions for the closest representative land use.

Table 2-5. ISDD Rainfall Depth (10-year, 5-day Storm Depth) by SPA

SPA	10-year, 5-day Storm Depth (in)
1	4.66
2	4.33
3	4.33
4	4.47
5a	4.45
5b	4.55
6a	4.03
6b	3.65
6c	3.77
6d	3.72
6e	3.52

Source: NOAA Atlas 14, Volume 6, Version 2.0. See Appendix B for rainfall data and calculations.

Table 2-6. Factor of Safety Calculation

Factor Category	Factor Description	Assigned Weight	Factor Value	Product
Suitability Assessment	Soil assessment methods	0.25	3[1]	0.75
	Predominant soil texture	0.25	3[2]	0.75
	Soil site variability	0.25	3[3]	0.75
	Depth to groundwater	0.25	1[4]	0.25
			Total Factor of Safety	2.5

1. High concern. Soil survey maps and texture analysis were primarily used to determine infiltration rates. Direct measurements of rates was not conducted for >20% of the area.
2. High concern. The lowest found infiltration rate based on soil texture, used as a conservative estimate, increases clogging potential.
3. High concern. Site soils are highly variable and limited soil boring information is available.
4. Low concern. The groundwater table is located >700 feet below the ground surface.

Source: LWA and Geosyntec, 2011.

Table 2-7. Measured and Design Project Infiltration Rates

Boring Number	SPA	Measured Infiltration Rate (in/hr)[1]	Design Infiltration Rate (FOS=2.5) (in/hr)[3]
B-1	1	2.34	0.94
B-2	2	2.21	0.89
B-3	2	1.42	0.57
B-4	3	2.12	0.85
B-5	4	2.49	0.99
B-6	5a	1.90	0.76
B-7	5a	4.10	1.64
B-8	5b	0.64	0.25
B-9	6a	1.73	0.69
--	6b	1.73[2]	0.69
--	6c	1.73[2]	0.69
B-11	6d	3.06	1.23
B-12	6e	2.78	1.11

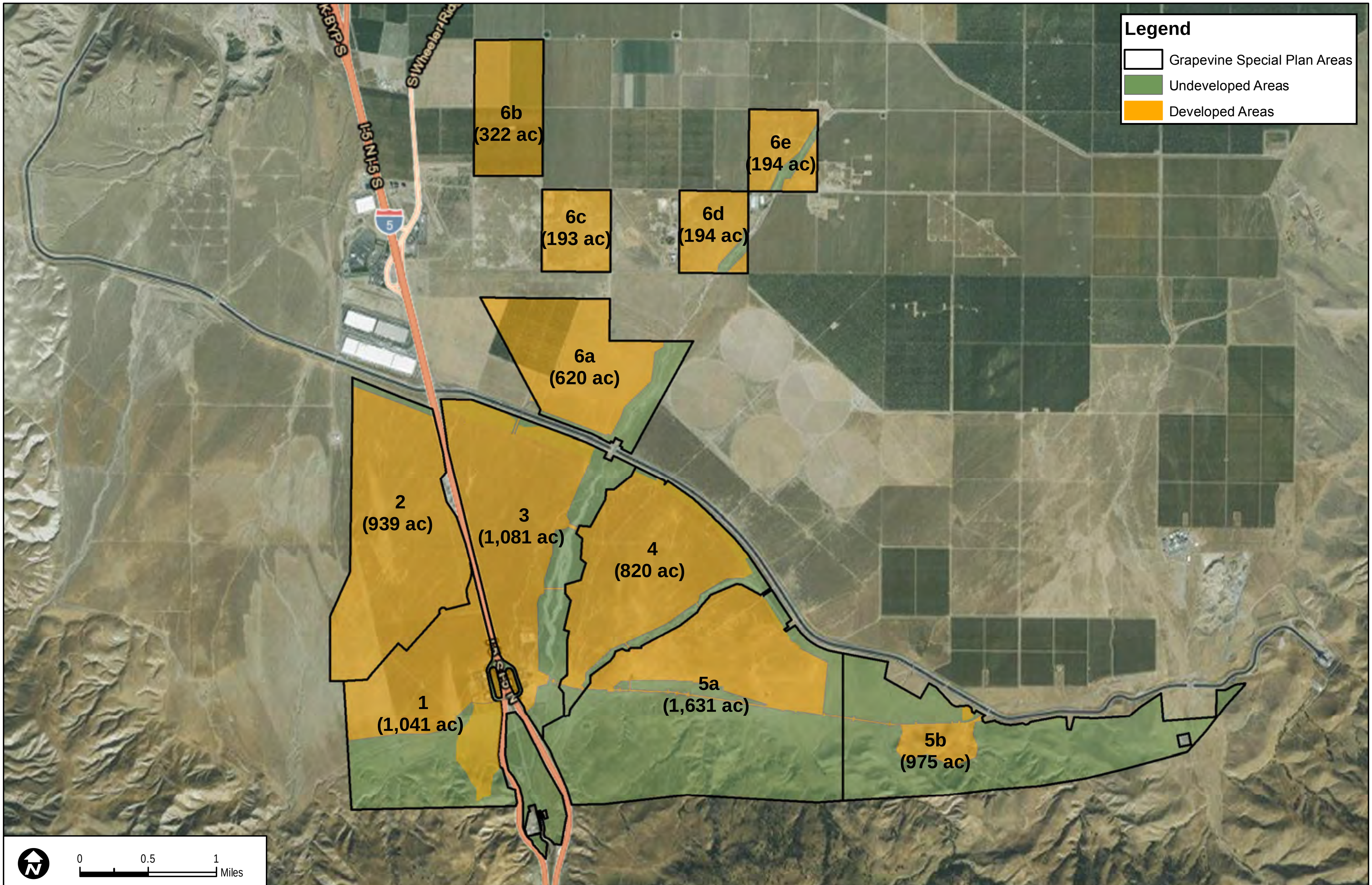
1. Geosyntec, 2014b.
2. Assumed to be representative of infiltration rates in SPA 6b and 6c due to proximity and similar composition of soils.
3. A factor of safety of 2.5 was used to obtain design infiltration rates.

Table 2-8. Sump Configuration Summary

Sump	SPA	Design Water Depth/ Freeboard (ft)	Kern County Required Capacity (ac-ft)	Kern County Provided Capacity (ac-ft)	Kern County Provided Footprint (ac)	IC Adjustment Required Capacity (ac-ft)	IC Adjustment Provided Capacity (ac-ft)	IC Adjustment Provided Footprint (ac)
A	1	8.0/1.0	16.0	16.3	2.7	7.8	8.5	1.4
B,C	1	1.5/0.5	4.2	4.5	5.3	2.1	2.4	2.5
D	1	8.0/1.0	89.1	89.5	13.8	43.5	44.0	6.6
E/F	2	7.0/1.0	17.0	17.4	3.8	8.3	9.0	2.0
G	2	7.0/1.0	53.0	53.5	10.6	25.9	26.6	6.0
H[1]	2	7.0/1.0	67.2	49.1	8.9	32.8	33.5	6.1
I[2]	2	7.0/1.0	76.9	95.8	16.4	37.5	38.0	7.2
J	3	8.0/1.0	27.8	28.6	4.4	13.6	14.1	2.4
K,L	3	8.0/1.0	118.0	118.9	18.3	57.6	58.1	10.0
M	3	8.0/1.0	64.9	65.4	9.9	31.7	32.7	5.0
Local	4	8.0/1.0	5.0	5.2	0.9	2.4	2.9	0.6
N	4	8.0/1.0	16.9	17.7	2.9	8.2	8.8	1.6
O,P,Q	4	8.0/1.0	136.0	136.7	21.6	66.4	67.1	11.3
R	5a	8.0/1.0	16.4	16.7	3.1	8.0	8.4	1.6
S	5a	8.0/1.0	7.1	7.7	1.4	3.5	4.0	0.7
T,U	5a	8.0/1.0	63.0	63.8	10.5	30.7	31.1	5.7
V	5a	8.0/1.0	32.2	32.8	5.3	15.7	16.2	2.7
W	5b	3.5/0.5	21.7	22.2	11.1	10.6	11.4	5.7
X[1]	6a	8.0/1.0	22.1	6.8	1.2	10.8	0	N/A
Y[2]	6a	8.0/1.0	51.2	67.2	11.5	25.0	36.6	7.4
Z	6a	8.0/1.0	18.6	18.9	3.1	9.1	9.6	1.7
AA	6a	8.0/1.0	40.2	40.9	6.4	19.6	20.1	3.3
BB	6b	8.0/1.0	22.2	22.4	3.5	10.8	11.4	2.0
CC	6b	8.0/1.0	25.0	25.7	4.0	12.2	12.8	2.2
DD	6b	8.0/1.0	19.8	20.1	3.2	9.7	10.3	1.7
EE	6b	8.0/1.0	21.6	22.0	3.4	10.6	11.1	1.8
FF	6c	8.0/1.0	54.9	55.3	8.6	26.8	27.4	4.7
GG	6d	8.0/1.0	49.7	50.3	7.6	24.3	24.8	3.9
HH	6e	8.0/1.0	45.4	45.7	7.0	22.1	22.6	3.5
Grand Total			**1,203.1**	**1,217.1**	**210.4**	**587.3**	**603.5**	**111.3**

1. Required capacity may not be provided entirely within the sump; remaining required capacity is routed downstream to secondary receiving sump.
2. Secondary receiving sump that may receive flows from upstream sump.

FIGURES

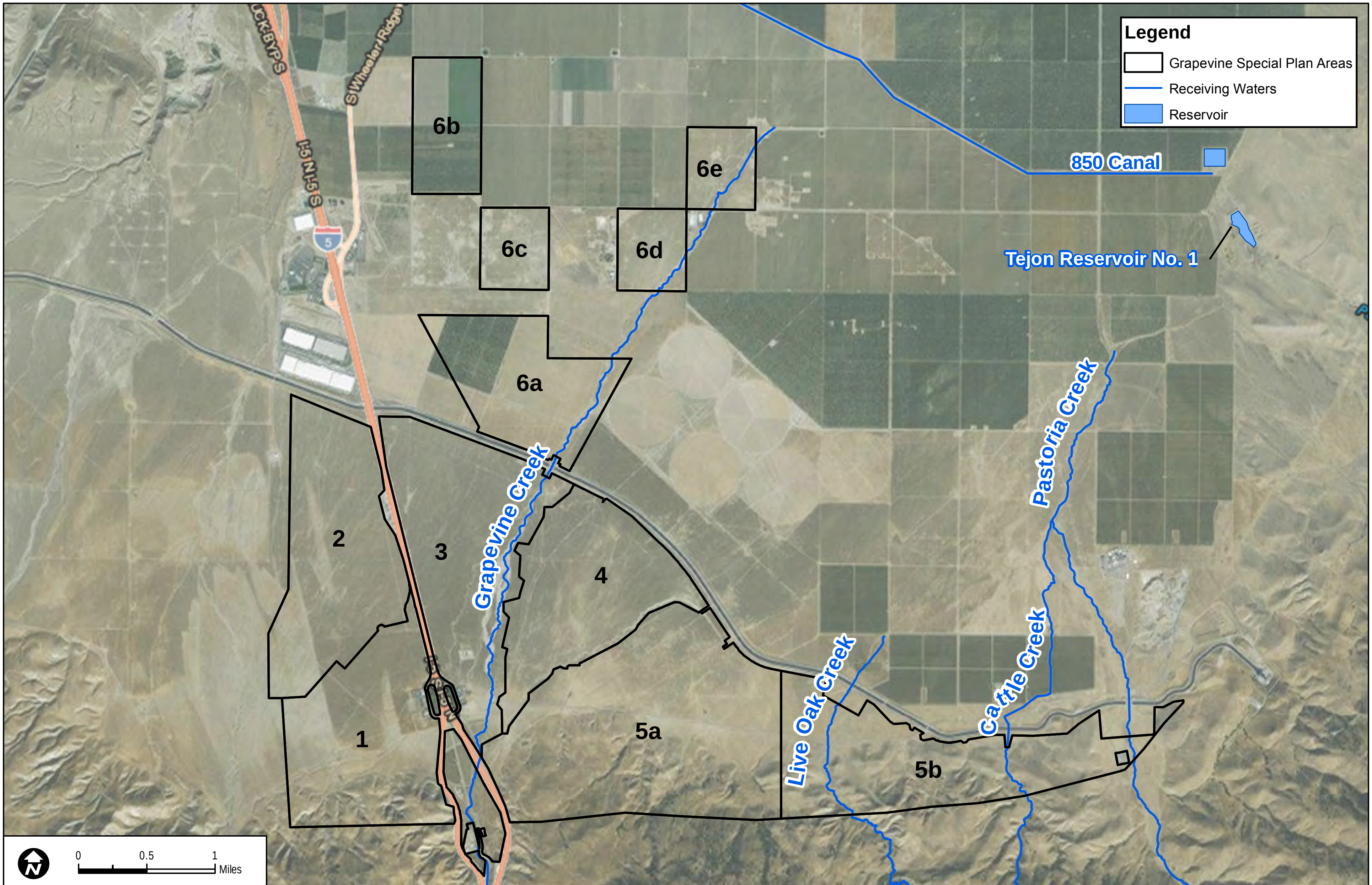


SOURCES: USGS, ESRI

FIGURE 1-1

Project Layout

GRAPEVINE PROJECT

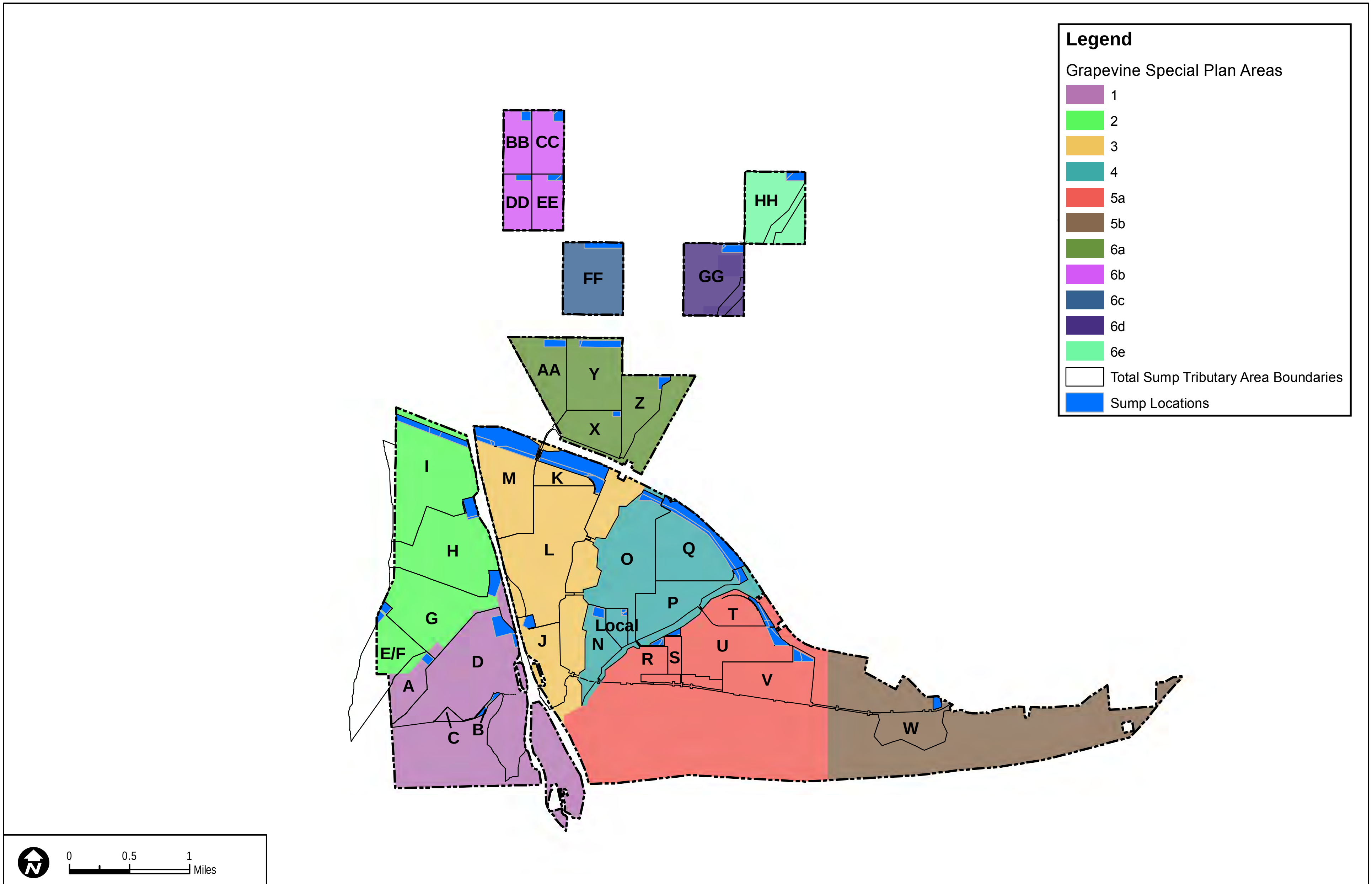


SOURCES: USGS, ESRI

FIGURE 2-1

Receiving Waters

GRAPEVINE PROJECT

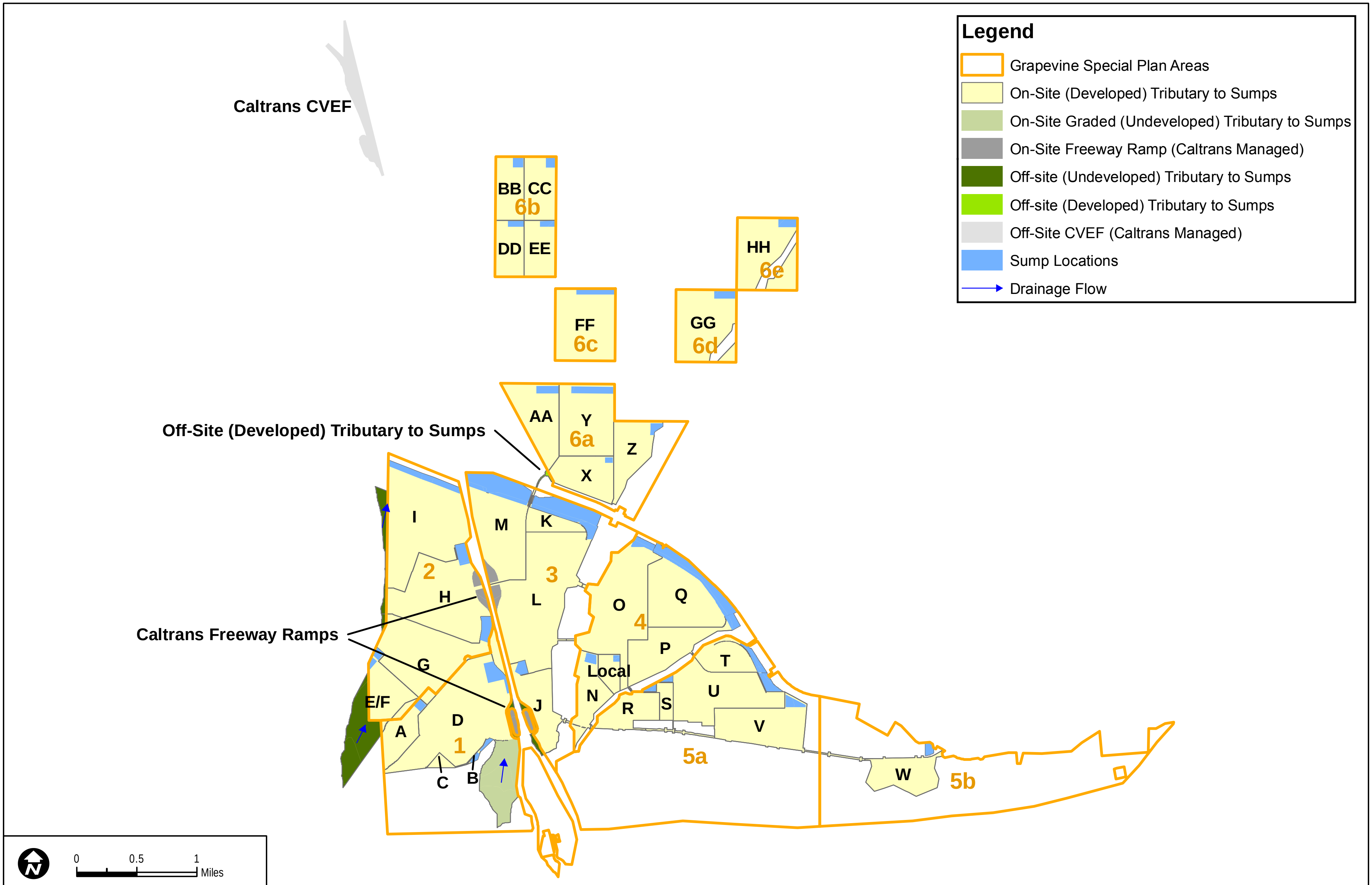


SOURCES: USGS, ESRI

FIGURE 2-2

Sump Tributary Areas and Locations

GRAPEVINE PROJECT

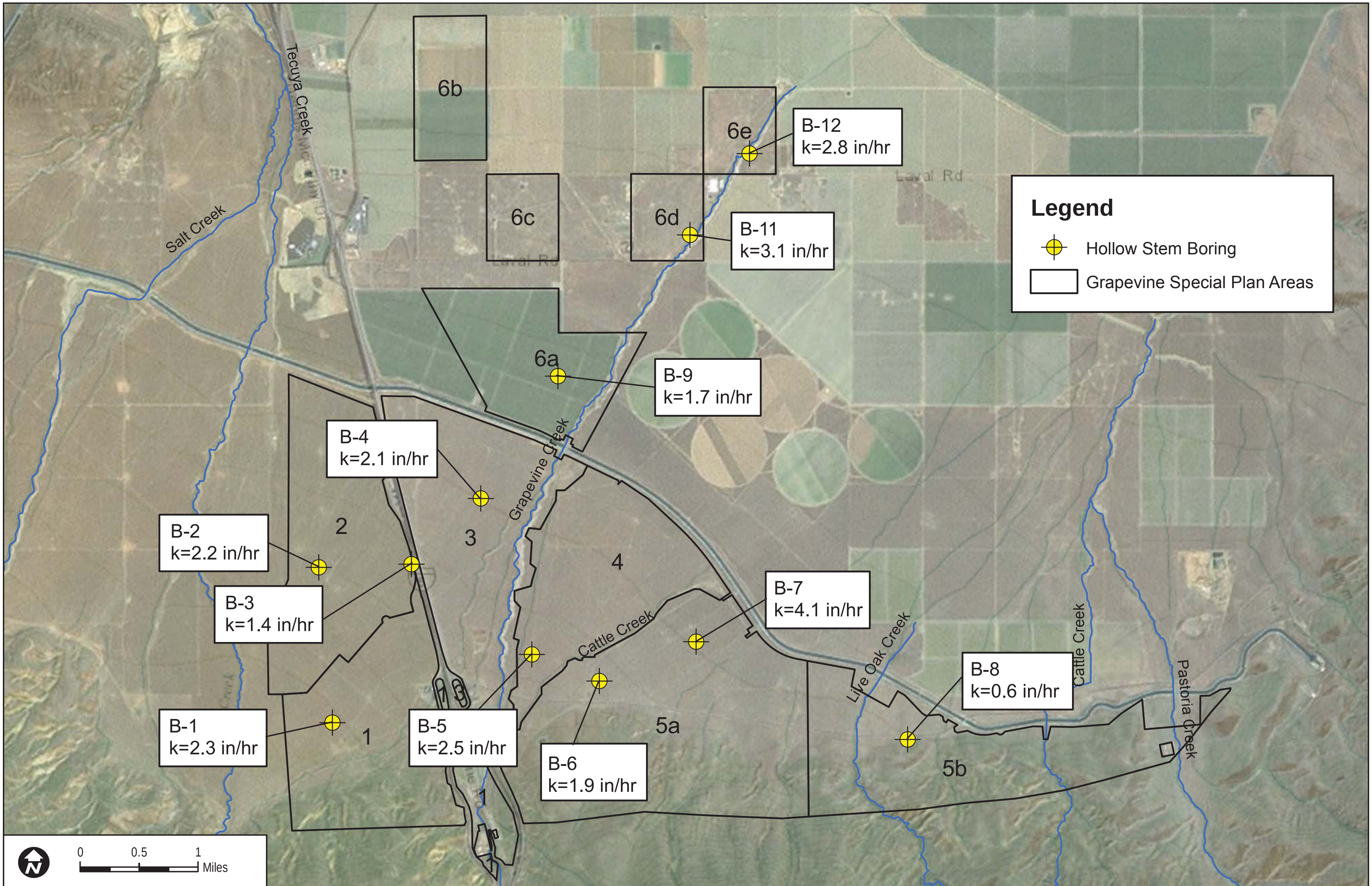


SOURCES: USGS, ESRI

FIGURE 2-3

On-site and Off-site Tributary Areas

GRAPEVINE PROJECT



SOURCES: ESRI

NOTE: Infiltration rates shown have been approximated assuming the field infiltration rate equals the hydraulic conductivity for each boring (gradient = 1).

FIGURE 2-4

Boring Locations

GRAPEVINE PROJECT

APPENDICES

APPENDIX A

IC ADJUSTMENT MEMORANDUM

Geosyntec consultants

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Memorandum

Date: 29 September 2014

To: Diana Hurlbert and Derek Abbott, Tejon Ranch Company

Copies to: Sean Reed, McIntosh & Associates

From: Eric Strecker, Principal; Megan Otto, Project Engineer; Brandon Klenzendorf, Engineer; Raina Dwivedi, Senior Staff Engineer

Subject: Task 2: Results of Test Catchment for Assessment of Parameter Adjustments
Geosyntec Project Number: PNW0184

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1. INTRODUCTION

Geosyntec Consultants (Geosyntec) is providing water quality and hydrology technical support to the Tejon Ranch Company (TRC), in support of the environmental documents for the Grapevine Development Area Project (Grapevine). This memo provides additional technical information with regards to how to better integrate flood control with water quality and hydromodification control infrastructure to optimize the environmental benefits and land uses of the project.

Geosyntec is producing a draft water quality and hydromodification technical appendix for use by Kern County in development of the Environmental Impact Report (EIR) based upon the Land Plan for the Grapevine Development Area (GDA), hydrologic analyses completed by McIntosh and Associates. McIntosh produced a Master Drainage Study dated June 5, 2014 utilizing the standard Kern County Hydrology Manual sizing procedure. This procedure does not allow for direct consideration of low impact development (LID) features and how they would affect meeting flood control requirements, specifically the resulting size and extent of flood conveyance and detention systems. At a meeting held with Kern County, staff indicated that they would consider potential adaptations to the method, specifically the representation of the "effective impervious area" contributing to the runoff ultimately reaching the flood control facilities. In addition to the runoff coefficient, LID features would also impact the time of concentration as they tend to slow flows down. TRC has requested that Geosyntec prepare a study plan to develop recommendations regarding adaption of the flood control procedure that then could be presented and discussed with the County. The goal would be to result in appropriately sized LID, flood conveyance, and detention systems that integrate the multiple objectives, minimize duplicative infrastructure, and maximize environmental benefits. As the project areas have soils that are conducive to infiltration, it is likely that flood control facilities sized using a method that does not account for the planned LID project design features would be significantly over sized.

There are also many benefits to incorporating LID into the Grapevine Project beyond the potential for downsized flood control facilities. Groundwater recharge over a more distributed area, as compared to the sumps, would be a benefit to the community with respect to water supply. Additional environmental benefits include improved water quality through the filtering of stormwater runoff through soils and vegetation, enhanced habitat for native birds and other animals (using native and drought-tolerant plants), reduction of the urban heat island effect, improved air quality (USEPA, 2010). The USEPA's *Green Infrastructure in Arid and Semi-Arid Climates* (2010) also describes social benefits (e.g., improved public health due to cooler temperatures and cleaner air, traffic calming, neighborhood beautification, etc.) and economic benefits (e.g., reduces landscape maintenance costs, increased groundwater resources, reduced water imports, and reduced energy use) to LID implementation.

Lastly, the City of Bakersfield and County of Kern Municipal Separate Storm Sewer System (MS4) Permit (Order No. R5-2013-0153) (Central Valley Water Board, 2013), although not applicable to the Grapevine Project, encourages the use of LID:

> *Low Impact Development (LID) is a storm water management strategy concerned with maintaining or restoring the natural hydrologic functions of a site to achieve natural resource protection objectives and fulfill environmental regulatory requirements. LID employs a variety of natural and built features that reduce the rate of runoff, filter out its pollutants, and facilitate the infiltration of water into the ground. By reducing water pollution and increasing groundwater recharge, LID helps to improve the quality of receiving surface waters and stabilize the flow rates of nearby streams.* ***Therefore, LID design concepts should be promoted for new developments and significant redevelopments.***

In summary, this analysis serves to assess the potential for adjustments to the Kern County Flood Control Basin sizing methodology to account for the hydrological and hydraulic effects of upstream LID facilities, which would provide multiple environmental, social, and economic benefits.

2. SCOPE OF WORK

For this memo, Geosyntec reviewed drainage information and flood control procedure data developed by McIntosh to identify a representative basin and catchment area that could be used to conduct a pilot analysis of potential flood control procedure parameter adjustments. Geosyntec recommended Catchment H to be used in the analysis in a memorandum dated July 22, 2014.

Following identification of the representative catchment, Geosyntec developed a planning level United States Environmental Protection Agency (USEPA) Stormwater Management Model (SWMM) of the selected catchment that includes the planned land uses, conceptual layout of streets, LID BMP features, and the drainage system, including piping and detention systems designed by McIntosh in their analysis. Geosyntec developed the following SWMM model scenarios:

- The original development conditions as analyzed by McIntosh without consideration/incorporation of LID features;
- Several distributed LID scenarios, where the LID features were represented as explicit storage units; and
- A proposed adjusted Kern County method, where the retention achieved by LID features in the watershed is represented through modifying the effective impervious cover based upon modeling results from the above scenario.

Long-term continuous simulations were modeled for specific scenarios (non-LID, explicit LID, explicit LID with the infiltration rate reduced by half, and the adjusted Kern County method implementing distributed LID).

3. SWMM INPUT PARAMETERS AND MODEL DEVELOPMENT

The Master Drainage Study (June 5, 2014) was provided by McIntosh and Associates (McIntosh) and incorporated into this analysis to reflect the most current data available. Additional input data that has been used for water quality modeling as part of the EIR analyses for the Grapevine Project was also incorporated into this analysis for consistency. The following provides a summary of the significant input parameters applied to the SWMM model.

1. **Precipitation:** The SWMM simulations were run with two precipitation scenarios: a 10-year frequency, 5-day duration design storm event and the 64 year long-term simulation based on a modified precipitation record as described below.

a. The 10-year, 5-day design storm event was chosen to correspond with the previous analysis conducted by McIntosh as described in the Master Drainage Study, consistent with the Kern County Development Standards for retention basin sizing (2011). McIntosh identified the 10-year, 5-day rainfall depth for Sump H from NOAA Atlas 14 as 4.33 inches. This total depth was used in the SWMM model for a 5-day simulation with the rainfall hyetograph developed using guidance from the Kern County Hydrology Manual. The Kern County Manual indicates that for multiday design storms, successive day storms are developed and added in the front of the previously developed design storm patterns. Each of the 24-hour storm patterns are construction by a simple scaling of the peak 24-hour design pattern according to the ratios provided in Table 1 (from Table B.1 in the Kern County Hydrology Manual). The rainfall depth for each day of the 10-year, 5-day storm for Catchment H was scaled using these rations to maintain the total rainfall depth of 4.33 inches (Table 1).

Table 1 – Multiday Rainfall Mass Ratios for Kern County

Rainfall Duration	Ratio to Peak 24-Hours	Catchment H Rainfall Depths (in)
Day 1	0.05	0.15
Day 2	0.07	0.21
Day 3	0.11	0.33
Day 4	0.21	0.63
Day 5	1.0	3.01
Total	N/A	4.33

b. The long-term continuous simulation precipitation records were modified from 64 years (water years 1949-2013) of hourly precipitation data measured at the National Climatic Data Center (NCDC) Bakersfield Airport gauge (35 miles from the site; closest long-term hourly precipitation record) that was scaled by the Western Regional Climate Center Tejon Rancho weather station (11 miles from site) to better represent the weather patterns and average annual rainfall totals characteristic of the project. This procedure is described in further detail in Appendix E of the Water Quality Technical Report.

2. **Evaporation:** Average monthly evapotranspiration (ET) values were used in the SWMM simulations as shown in Table 2 below. ET was only incorporated into the continuous simulations, not the design event runs. The evaporation data was obtained from the

California Department of Water Resources ETo Map (CIMIS, 1999) that contains reference ET values by Zone in California. The Grapevine Project is located in Zone 14 and a scaling factor of 0.60 was applied to the reference ET values to reflect partially shaded conditions, semi-arid vegetation, dry crops, and bare soil that are expected to be present in the developed condition.

Table 2 – Monthly Evaporation Values in Inches per Day

January	February	March	April	May	June
0.030	0.048	0.072	0.102	0.132	0.156
July	**August**	**September**	**October**	**November**	**December**
0.168	0.150	0.114	0.078	0.042	0.030

3. **Topography:** Elevation contours were provided in GIS on January 29, 2013 by Dudek for existing topographic conditions at five foot intervals. The existing contours were used to approximate the proposed development conditions elevations for roadways, pond elevations, pipe elevations, etc. The average slope across the entire Sump H catchment was approximately 3.5%. This value was used as the slope for all modeled subcatchments.

4. **Land Use:** Land use information was provided by Dudek on July 4, 2014 for the proposed development revised plan. Subcatchment impervious cover values were assigned based on the land use types defined in Table 3 and which correspond with the assumptions made by McIntosh in their Master Drainage Study. Also included is the assumed rooftop impervious areas per gross land use area as provided by Ken Kay Associates on August 13, 2014. The rooftop areas are used to model downspout disconnections as described below.

Table 3 – Land Use Impervious Cover Values

Land Use	Impervious Cover (%)	Rooftop Impervious Area per Gross Area (%)
Freeway Retail	90.0	18
Light Industrial	90.0	30
Office R&D	90.0	15
Parks	15.0	10
Residential	50.0	20
Schools	50.0	20
Roadways	95.0	0
Village Commercial	90.0	15
Village Residential	77.5	50
Water Quality	100.0	0

5. **Soils Information and Infiltration Parameters:** Soil textures were obtained from the Natural Resources Conservation Service (NRCS) Web Soil Survey. The majority of the soils within the Sump H catchment correspond to sandy loam or very gravelly sandy loam soils. The Green-Ampt model was used to simulate infiltration with the following infiltration parameters: suction head = 8 inches, hydraulic conductivity = 0.6 in/hr, and initial moisture deficit = 0.33. The hydraulic conductivity is reflective of infiltration conditions for sandy loam and sandy gravelly sandy loam soils as estimated in the 2014 Infiltration Report, with an additional reduction of 25% of the reported values to account for potential compaction during construction in the developed condition (See Appendix E of the Draft WQTR for additional details). Infiltration was assumed in the roadside swales for several of the LID option scenarios.

6. **Subcatchment Hydrologic Properties:** Subcatchments to each sump were delineated based on the provided land use designations and the proposed locations of streets shown in the Master Drainage Study provided by McIntosh. Professional judgment was used when selecting other hydrologic properties of the subcatchments such as depression storage and roughness for both pervious and impervious areas. Subcatchment width was selected based on scaling of the delineated subcatchments while considering that the expected flow path length will generally not exceed 500 feet before an interior conveyance structure (i.e., curb and gutter, drainage ditch, etc.) is reached in developed conditions. Figure 1 below shows the subcatchment delineations represented in SWMM.

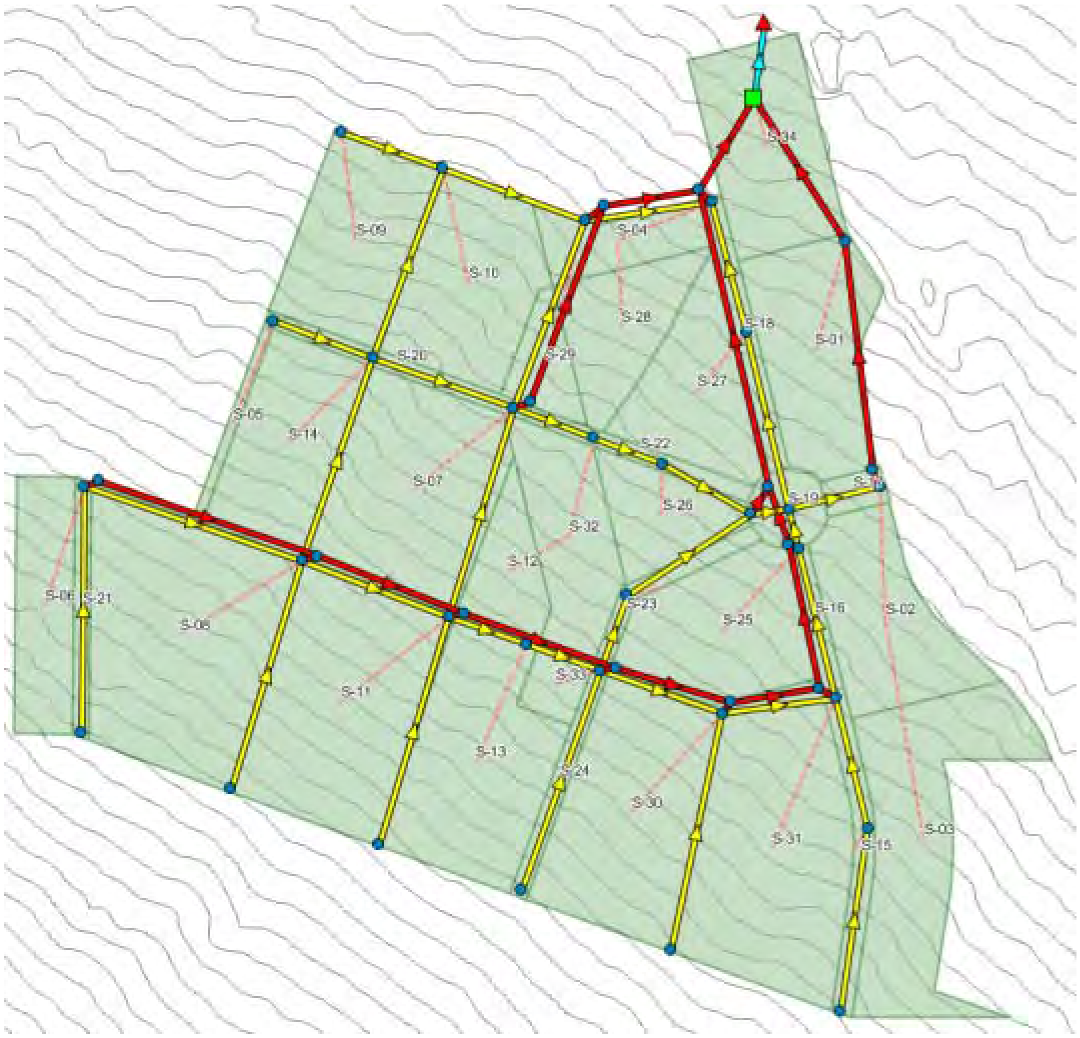

Figure 1 – Subcatchment Delineation in SWMM Model
(yellow conduits are roads/swales and red conduits are pipes)

7. **Conduits:** Two conduit types were simulated in the SWMM model: storm drain pipes and streets with roadside swales.

   a. The storm drain pipe sizes were obtained from the Master Drainage Study provided by McIntosh. The storm drain pipes were modeled to have slopes based on the existing contours provided and depths maintaining six feet of cover. Conduits directly connected to the storm drain inlet structures were modeled with depths of three feet of cover at the inlet structure. A roughness value of 0.011 was selected to represent concrete pipes (Chow, 1959).

b. The street and surface conduits were modeled with an irregular cross-section shown in Figure 2. Roadside ditches on either side of the roads were modeled as trapezoidal channels two feet deep with a bottom width of three feet and 3:1 (horizontal:vertical) side slopes. A flat area five feet wide divides the ditch from the roadway. The roadway was modeled with a six inch curb and a six inch crown on the road. The roadway width and number of lanes was taken from the "Street Section Coordination" document dated August 12, 2014. A roughness value of 0.027 was selected for the conduits representing straight channels lined with short grass (Chow, 1959). Although the roadway surface is expected to have a smaller roughness value (representative of asphalt or concrete), the majority of the flow occurs within the swales, justifying the larger roughness value. In addition, a larger roughness value conservatively represents the entire conduit roughness.

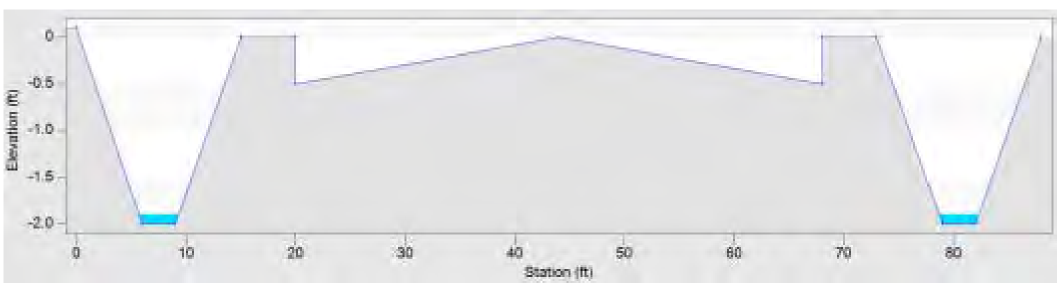

Figure 2 – Cross-Section for Modeling Streets with Trapezoidal Ditches

8. Sump H Design: The Sump H (flood control/ infiltration basin) design was modeled using a surface area-depth relationship developed by McIntosh. The total depth of Sump H is modeled as ten feet which corresponds to a provided capacity of 3.09 million cubic feet (MCF) as indicated in the Master Drainage Study. For the SWMM analysis, the area-depth relationship was not altered when modeling Sump H. However, the total depth of ten feet is not required to contain the 10-year, 5-day design storm runoff volume modeled in SWMM. Due to the differences in the methodology for calculating runoff volumes using the SWMM model versus guidance in the Kern County Hydrology Manual, a new Sump H capacity was calculated in SWMM for comparison with the LID scenarios. Results of the Sump H capacity and LID scenario SWMM models are presented below.

The Sump H capacity calculated in SWMM is based on the maximum depth needed to contain the design storm runoff volume using the area-depth relationship developed by

McIntosh. This methodology assumes a constant footprint area for Sump H with a variable required depth needed for complete capture. An alternative methodology for calculating the required Sump H capacity would be to maintain a constant design depth at ten feet and vary the sump footprint to achieve the necessary capacity. This method would reduce the area available for infiltration, but would have higher average depths (head) to increase infiltration in the reduced areas and has not been investigated for this analysis.

9. **LID Facilities:** Table 4 reflects the planned and optional BMP concepts for each land use type, as included in the Draft WQTR. An in-depth analysis for siting the LID facilities throughout the catchment area was not conducted for this modeling effort. Instead, an explicit storage unit was modeled for each subcatchment to represent the aggregate LID BMP volume placed within the planned distributed LID concepts based upon BMP sizing proposed for the project.

   This methodology resulted in a total of 33 explicit distributed LID storage units. The aggregate storage units represent the cumulative capture volumes and potential infiltration for all the planned distributed LID facilities throughout each subcatchment, such as bioretention, infiltration trenches, stormwater planter boxes, and flow dispersion of roof and driveway runoff. The explicit representation of these facilities allows for both runoff volume reduction (through infiltration processes) and peak flow rate reduction (through detention and peak shaving processes). The total volume of modeled LID facilities is 355,307 CF.

   The distributed LID facilities were sized for an average annual capture efficiency of 80% to meet volume-based sizing criteria, which results in 20% bypass or overflow of the LID facility on an average annual basis. The storage units were sized using a functional relationship between the area and depth of the facility. A simple square footprint shape was assumed with typical 3:1 side slopes to develop the functional relationship. The storage units provided in the LID features were sized using an iterative approach on the long-term rainfall record to find the functional relationship which results in 80% capture efficiency[1]. The modeled distributed LID total percent loss, representing the total

[1] In order to reduce computational times during this iterative process, the rainfall record for only the 1980 decade was used. The 1980 rainfall record was selected by analyzing rainfall statistics for each decade and comparing to the total rainfall record (i.e., 64 year) statistics. The 64 year rainfall record has an average monthly rainfall of 0.97 inches, resulting in an average annual rainfall of 11.67 inches. The 1980 decade closely matched the 64 year

computed percent loss due to infiltration and evaporation during the simulation, is expected to correspond to the capture efficiency of the facility.

Simulations were also established to assess the incremental benefits of bioretention, downspout disconnects, and swales. Swale scenarios included: on-line swales on arterial streets only, on-line swales along all roads including under driveways (i.e., driveway bridges), on-line swales along all roads excluding under driveways (culverts assumed), and off-line swales along all roads (off-line swales do not have outlets). Downspout disconnects were modeled by routing the portion of the impervious area attributed to rooftops (as shown in Table 3 above) to the down gradient pervious areas to allow for additional infiltration and runoff volume reduction.

The maintenance responsibility associated with the proposed LID features on private and communal private property is assumed to lie with the homeowners' associations (HOAs). The maintenance responsibility associated with the proposed LID features in the public right of way, including the flood control basins, would be negotiated with the County with the intent to develop joint use facilities (e.g., parks, recreational fields, etc.) to the greatest extent feasible.

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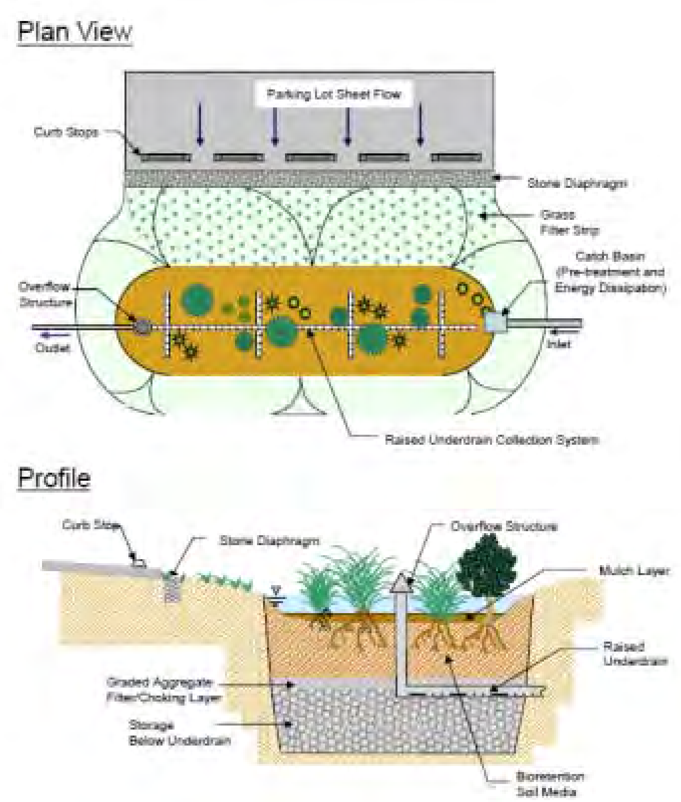
average with an average monthly rainfall of 0.966 inches and average annual rainfall of 11.60 inches. Therefore, the 1980 decade was selected for the iterative approach used for sizing the LID storage unit model elements.

Table 4 – Planned and Optional BMP Concepts

Land Use	Planned BMP Concepts	Optional BMP Concepts
Single-family residential	• Bioretention in landscaping for runoff from roofs and local impervious areas (requires 5-ft building setback from buildings) • Flow dispersion of roof and driveway runoff into landscaped areas (no formal bioretention) (requires 5-ft building setback) • Infiltration trenches in landscaping for runoff from roofs and local impervious area (requires 5-ft building setback) • Stormwater planter boxes for rooftop runoff when landscape area is limited • Community-scale system (see below) • Combinations of the above, potentially with "neighborhood-scale" combinations (i.e., shared common area locations for bioretention for example)	• Permeable pavement for driveways, surface parking, and walkways
Village (multi-family) residential	• Same options as for single-family residential (but advantage of landscaped areas being in common areas for O&M)	• Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing
Commercial, schools, and parks	• Bioretention in courtyards and stormwater planter boxes for roof top runoff • Bioretention or infiltration trenches in landscaped areas for local impervious areas • Community-scale system (see below) • Combinations of the above	• Permeable pavement for walkways and courtyards • Permeable asphalt for parking lots • Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing
Industrial	• Bioretention in courtyards and stormwater planter boxes for roof top runoff	• Permeable pavement for walkways and courtyards • Permeable asphalt for

Land Use	Planned BMP Concepts	Optional BMP Concepts
	• Bioretention or infiltration trenches in landscaped areas for local impervious areas • Community-scale system (see below)	parking lots • Underground cisterns for stormwater collection and reuse for landscape irrigation and/or toilet flushing
Local streets and public access ways	• Bioretention in roadway bulbouts, or in place of some parking spaces (standing water must drain within 48 hours) • Vegetated swale in roadways for treatment/infiltration of roadway runoff and adjacent development where feasible • Vegetated swale adjacent to roadway • Community-scale system (see below) • Combinations of the above	• Permeable pavement for walkways and bikeways • Drain low gradient trails directly to edge for sheet flow dispersion
Relocated interchange	• Community-scale system (see below)	• Vegetated swale in roadways for treatment/infiltration of roadway runoff and adjacent development where feasible • Vegetated swale adjacent to roadway • Bioretention/infiltration basin island in traffic turnabout
Community-scale systems	• Infiltration facilities • Community-scale vegetated detention basin(s) where infiltration rates are limiting	• Vegetated swales route runoff to community-scale infiltration basin(s) • Infiltration trenches or bioretention along riverbanks

Bioretention



Bioretention facilities (see figure to the right) are vegetated (i.e., landscaped) shallow depressions that provide storage, infiltration, and evapotranspiration. Bioretention facilities also remove pollutants by filtering stormwater through an engineered soil mix and plants adapted to the local climate and soil moisture conditions. In bioretention facilities, pore spaces, microbes, and organic material in the engineered soils help to retain water in the form of soil moisture and to promote the adsorption of pollutants (e.g., dissolved metals and petroleum hydrocarbons) into the soil matrix. Plants utilize soil moisture and promote the drying of the soil through transpiration. A bio*infiltration* facility includes the same pollutant removal processes and design components as a bioretention facility, but also incorporates a raised underdrain above a gravel storage area to promote increased infiltration. If no underdrain is provided, deeper percolation of the stored runoff into the underlying soils occurs at a rate dependent on the infiltration rate associated with the underlying soils.

Maintenance requirements associated with bioretention facilities are typical landscape care procedures and may include irrigation (varies depending on plant palette), trash removal, removal of fine sediments and/or debris if infiltration is inhibited, clearing of inlet, outlet, and flow spreaders, and any major structural repairs as-needed.

Photographs of examples of bioretention facilities are provided below.


LEFT: Parking lot bioretention in Manteca, CA (San Joaquin Valley Stormwater Quality Partnership)
RIGHT: Parking lot bioretention in El Monte, CA (LID Center, LID Manual for Southern California, 2010)

ABOVE: Bioretention in commercial parking lot (CASQA)


LEFT: Bioretention in community space (San Francisco Better Streets)
RIGHT: Chino, CA. Bioretention in parking lot, native vegetation.

LEFT: Mission Valley, CA (San Diego County LID Handbook, 2007)
RIGHT: Bioretention in bulb-out (Portland Bureau of Environmental Services)

Disconnected Downspouts

Flow dispersion involves redirecting channeled flow to vegetated areas to maximize the infiltration potential and provide volume reduction. The most common use of flow dispersion involves disconnecting downspouts from buildings that collect roof runoff. The flow from the downspout is then directed by a shallow channel or overland flow conveyance towards a vegetated area for infiltration into the underlying soil. Buried rock trenches may be incorporated to promote storage of the dispersed runoff while being infiltrated. In addition to promoting volume reduction through infiltration, flow dispersion also attenuates peak flows that would be entering the storm drain network. Other flow dispersion opportunities, such as directing roadway runoff towards vegetated medians, may be incorporated that also intercept existing drainage patterns and promote infiltration.

Required maintenance activities for disconnected downspouts are expected to be very minimal. Activities beyond those required for typical downspouts (e.g., clearing roof inlet of debris) would likely only include clearing or re-setting of the splash pad to reduce erosion at the point of discharge.

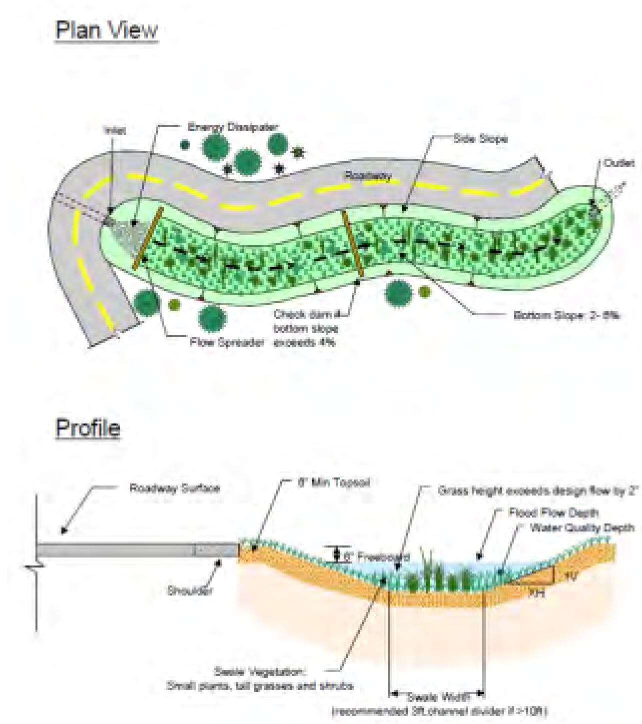
Photographs of examples of disconnected downspouts are provided below.

LEFT: Prince George's County, MD (MD Department of Environmental Resources)
RIGHT: Downspout disconnection with concrete splash pad.

LEFT: Disconnected downspout with rip-rap splash pad.
RIGHT: Close-up of disconnected downspout.

Swales

Swales (see figure on next page) are open, shallow channels with low-lying vegetation covering the side slopes and bottom that collect and slowly convey runoff to downstream discharge points. Vegetated swales achieve pollutant removal through settling and filtration in the vegetation (native grasses and small plants) lining the channels, provide the opportunity for volume reduction through infiltration and evapotranspiration, and reduce the flow velocity in addition to conveying stormwater runoff. Swales are most effective when longitudinal slopes are small (two to six percent) and where water depths are less than the vegetation height. The effectiveness of swales with longitudinal slopes of more than 2% can be enhanced by adding check dams at approximately 50 foot increments along their length. These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Typical stormwater



conveyance infrastructure can often be reduced in size due to the volume and flow reductions attributable to swales.

Although maintenance activities associated with swales will vary based on the swale design (e.g., grassy vs. rock swale), typical routine activities are expected to include: removal of excess sediment and trash/debris, resetting flow spreaders to restore original function, removal of visual contamination (e.g., oil and grease), stabilization of observed erosion, and clearing of inlet and outlet structures. Less frequent maintenance activities may include regarding of the swale bottom to mitigate ponding and re-vegetation of bare patches, as needed.

Photographs of examples of swales are provided below.

LEFT, BOTH: Roadside swales in Tucson, AZ (Watershed Management Group, 2010)
RIGHT: Curb cut to roadside swale in Playa Vista, CA (LID Center)

LEFT: Planted swale in Downey, CA (Source: Jessica Hall)
RIGHT: Rock swale at Scripps Institute of Oceanography (KTU+A)

LEFT: Bioswale along roadside, planted with grasses
RIGHT: Parking lot bioswale

4. MODELED LID PERFORMANCE RESULTS

The 10-year, 5-day design storm simulation was conducted for the non-distributed LID scenario, explicit distributed LID scenarios, and parameter (effective impervious areas) adjusted scenarios. The maximum capacity and depth of Sump H necessary to capture the design storm for each of the model variations are discussed below. The Sump H design provided by McIntosh, developed from guidance provided in the Kern County Hydrology Manual, is also discussed for comparison.

4.1 Sump H Sizing

The 10-year, 5-day design storm in SWMM was estimated to produce 2.91 MCF of runoff in the "Non-LID", or baseline, scenario. The necessary retention volume for Sump H, or the required sump capacity (capacity that prevents overflow at any time from the basin) for the design event, was determined to be 1.80 MCF. Although Sump H had been sized by McIntosh using the Kern County Methodology to retain a volume of 2.86 MCF, the "Non-LID" volume in SWMM will be used for purposes of a consistent comparison. This difference is likely caused by the explicit routing within SWMM vs. the Kern County method.

Several "Explicit LID" scenarios were run in SWMM incorporating various combinations of the LID facilities discussed in Section 3.9, and Sump H was reduced in size to account for the offset volume requirements attributable to the distributed facilities. Depending on the LID options modeled, these scenarios estimate a required Sump H capacity ranging from 0.64 to 1.42 MCF. These volumes are approximately 64 to 21% less than the "Non-LID" scenario volume, respectively. Table 5 presents the Sump H results for these scenarios. It should be noted that in some cases the peak flow in the "Explicit LID" scenario is minimally lower than the peak flow in the "Non-LID" scenario. This is due to 1) the size of the distributed BMPs, which are sized for 80% capture, not the design event, and 2) the fact that the design storm produces several smaller events before the peak, thereby "filling up" the distributed BMPs before the peak arrives.

Table 5 – Modeled Sump H Capacity and Depth for Design Storm Analysis

Scenario	Scenario Type	Bioretention	Downspout Disconnect	Swale Application Scenario				Total Runoff Volume to Sump (MCF)	Peak Inflow Rate to Sump (cfs)	Required Sump Capacity (MCF)	Difference in Required Sump Capacity from Non-LID (%)	Max Depth in Sump (ft)	Difference in Max Depth in Sump from Non-LID (ft)
				A	B	C	D						
N/A	McIntosh Design *							N/A	N/A	2.864	N/A	10.0	N/A
01	Non-LID							2.911	183.3	1.797	N/A	6.00	N/A
02	Explicit LID	Yes						1.800	178.7	1.425	-20.7	4.80	-1.2
03	Explicit LID	Yes	Yes					1.105	120.2	0.763	-57.5	2.62	-3.38
04	Explicit LID	Yes		Yes				1.847	178.7	1.417	-21.1	4.78	-1.22
05	Explicit LID	Yes			Yes			1.755	177.6	1.360	-24.3	4.59	-1.41
06	Explicit LID	Yes				Yes		1.753	177.9	1.372	-23.6	4.63	-1.37
07	Explicit LID	Yes					Yes	1.640	177.2	1.276	-29.0	4.32	-1.68
08	Explicit LID	Yes	Yes	Yes				1.088	119.9	0.747	-58.4	2.56	-3.44
09	Explicit LID	Yes	Yes		Yes			1.047	119.2	0.712	-60.4	2.45	-3.55
10	Explicit LID	Yes	Yes			Yes		1.132	119.5	0.740	-58.8	2.54	-3.46
11	Explicit LID	Yes	Yes				Yes	0.978	115.9	0.643	-64.2	2.21	-3.79

Swale A: Full swale infiltration on arterial only; Swale B: Full swale infiltration on all roads (driveway bridges); Swale C: Partial swale infiltration on all roads (driveway culverts); Swale D: Off-line swales modeled as storage units on all roads

* McIntosh Design has been included for reference only. This design used the Kern County design storm methodology, which is not directly comparable to the design storm methodology in SWMM.

4.2 Impervious Cover Parameter Adjustment

Upon completion of the "Explicit LID" scenario to estimate a potential reduced required size for Sump H, Geosyntec investigated adjustments to the effective impervious cover (IC) parameter in the SWMM model to mimic the performance of modeling the distributed LID BMPs directly. A reduction in IC was selected to result in the same capacity in Sump H to capture all of the 10-year, 5-day design storm volume as the explicit SWMM model LID scenario.

In general, decreasing impervious cover results in an increase in infiltration and evapotranspiration volumes but does not accurately represent the delay in time of concentration or peak flow rate shaving that an explicit LID storage unit provides.

The 10-year, 5-day design storm was simulated for both the ten explicit LID scenarios and the ten adjusted impervious cover scenarios with no distributed storage units. The impervious cover was reduced by a uniform percentage for all land use types that are to be routed to decentralized LID facilities. For example, the "Capacity IC Adjustment to Simulate LID" scenario for bioretention only (Scenario 12), a total reduction in impervious cover of 19.5% was determined to produce an equivalent total runoff volume and duration as the explicit LID scenario model. Table 6 presents the original impervious cover for each land use, based on the values originally used to size Sump H from the Kern County Hydrology Manual, as well as the adjusted IC values for a range of parameter adjustment scenarios to represent distributed LID impacts – including 1) bioretention (BR) alone (Scenario 12), 2) BR plus disconnected downspouts (DD) (Scenario 13), and 3) BR, DD, and the partial swale (SW) option C (Scenario 20).

Table 6 – Land Use Adjusted Impervious Cover Values to Represent LID

Land Use	Original IC (%)	Capacity IC Adjustment LID (BR) (%)	Capacity IC Adjustment LID (BR, DD) (%)	Capacity IC Adjustment LID (BR, DD, SW) (%)
Freeway Retail	90	74.7	46.1	45.0
Light Industrial	90	74.7	46.1	45.0
Office R&D	90	74.7	46.1	45.0
Parks	15	12.5	7.69	7.50
Residential	50	41.5	25.6	25.0
Schools	50	41.5	25.6	25.0
Roadways	95	78.9	48.7	47.5
Village Commercial	90	74.7	46.1	45.0
Village Residential	77.5	64.3	39.7	38.8
Water Quality*	100	100	100	100
Overall IC Adjustment	N/A	17.0	48.8	50.0

* Water quality land uses do not have a planned distributed LID option.

IC = Impervious Cover, BR = Bioretention, DD = Disconnected downspouts, SW = Swale

Table 7 presents the same information as Table 5 but also includes the results for the IC-adjustment additional scenarios. Figure 3 depicts the maximum storage volume in Sump H for each of the following seven scenarios:

- Scenario 01: Non-LID
- Scenario 02: Explicit LID with bioretention
- Scenario 03: Explicit LID with bioretention and disconnected downspouts
- Scenario 10: Explicit LID with bioretention, disconnected downspouts, and the partial swale option C
- Scenario 12: “Capacity IC Adjustment to Simulate LID” with bioretention
- Scenario 13: “Capacity IC Adjustment to Simulate LID” with bioretention and disconnected downspouts
- Scenario 18: “Capacity IC Adjustment to Simulate LID” with bioretention, disconnected downspouts, and the partial swale option C

Figure 4 shows the total inflow hydrograph to Sump H for each of these seven scenarios. As expected, the scenarios with more BMP implementation and a higher IC adjustment (or reduction), show a greater dampening of peak flows.

A comparison between the explicit distributed LID representation and the parallel parameter adjustment distributed LID representations suggests that the “Explicit LID” scenario is more effective at reducing the smaller, more frequent events. This is expected due to the storage unit being designed to detain small runoff events and slowly infiltrate the captured runoff volumes. The “Capacity IC Adjustment to Simulate LID” has a decreased imperviousness in the watershed, which effectively decreases the volume of runoff and increases the conveyance time of water reaching Sump H as compared to the “Non-LID” scenario.

Table 7 – Modeled Sump H Capacity and Depth for Design Storm Analysis

Scenario	Scenario Type	Bio-retention	Downspout Disconnect	Swale Application Scenario				Total Runoff Volume to Sump (MCF)	Peak Inflow Rate to Sump (cfs)	Required Sump Capacity (MCF)	Difference in Required Sump Capacity from Non-LID (%)	Max Depth in Sump (ft)	Difference in Max Depth in Sump from Non-LID (ft)
				A	B	C	D						
N/A	McIntosh Design*							N/A	N/A	2.864	N/A	10.0	N/A
01	Non-LID							2.911	183.3	1.797	N/A	6.00	N/A
02	Explicit LID	Yes						1.800	178.7	1.425	-20.7	4.80	-1.20
03	Explicit LID	Yes	Yes					1.105	120.2	0.763	-57.5	2.62	-3.38
04	Explicit LID	Yes		Yes				1.847	178.7	1.417	-21.1	4.78	-1.22
05	Explicit LID	Yes			Yes			1.755	177.6	1.360	-24.3	4.59	-1.41
06	Explicit LID	Yes				Yes		1.753	177.9	1.372	-23.6	4.63	-1.37
07	Explicit LID	Yes					Yes	1.640	177.2	1.276	-29.0	4.32	-1.68
08	Explicit LID	Yes	Yes	Yes				1.088	119.9	0.747	-58.4	2.56	-3.44
09	Explicit LID	Yes	Yes		Yes			1.047	119.2	0.712	-60.4	2.45	-3.55
10	Explicit LID	Yes	Yes			Yes		1.132	119.5	0.740	-58.8	2.54	-3.46
11	Explicit LID	Yes	Yes				Yes	0.978	115.9	0.643	-64.2	2.21	-3.79
12	IC Adjust = 17.0%	Yes						2.444	155.5	1.425	-20.7	4.80	-1.20
13	IC Adjust 48.8%	Yes	Yes					1.576	101.5	0.763	-57.5	2.62	-3.38
14	IC Adjust = 18.3%**	Yes		Yes				2.435	154.7	1.417	-21.1	4.78	-1.22
15	IC Adjust = 20.0%	Yes			Yes			2.362	150.5	1.359	-24.3	4.59	-1.41
16	IC Adjust = 19.5%	Yes				Yes		2.376	151.3	1.370	-23.7	4.62	-1.38
17	IC Adjust = 23.8%	Yes					Yes	2.260	144.2	1.278	-28.9	4.32	-1.68
18	IC Adjust = 52.3%**	Yes	Yes	Yes				1.553	99.5	0.747	-58.4	2.56	-3.44
19	IC Adjust = 51.5%	Yes	Yes		Yes			1.501	96.8	0.712	-60.4	2.44	-3.56
20	IC Adjust = 50.0%	Yes	Yes			Yes		1.542	99.4	0.740	-58.8	2.54	-3.46
21	IC Adjust = 55.3%	Yes	Yes				Yes	1.398	90.3	0.641	-64.3	2.21	-3.79

Swale A: Full swale infiltration on arterial only; Swale B: Full swale infiltration on all roads (driveway bridges); Swale C: Partial swale infiltration on all roads (driveway culverts); Swale D: Off-line swales modeled as storage units on all roads

* McIntosh Design has been included for reference only. This design used the Kern County design storm methodology, which is not directly comparable to the design storm methodology in SWMM.

** IC adjustment was not applied to non-arterial roads for this scenario.

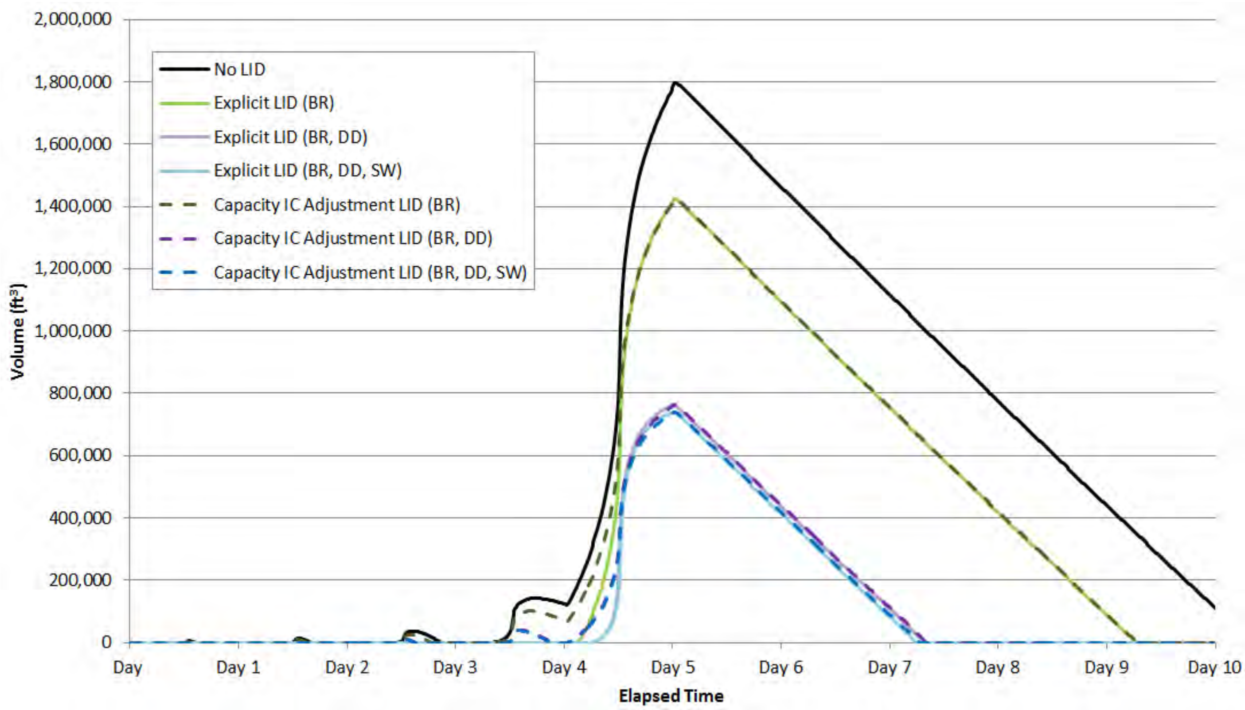


Figure 3 – Design Storm Sump H Storage Volume for Seven Selected Scenarios

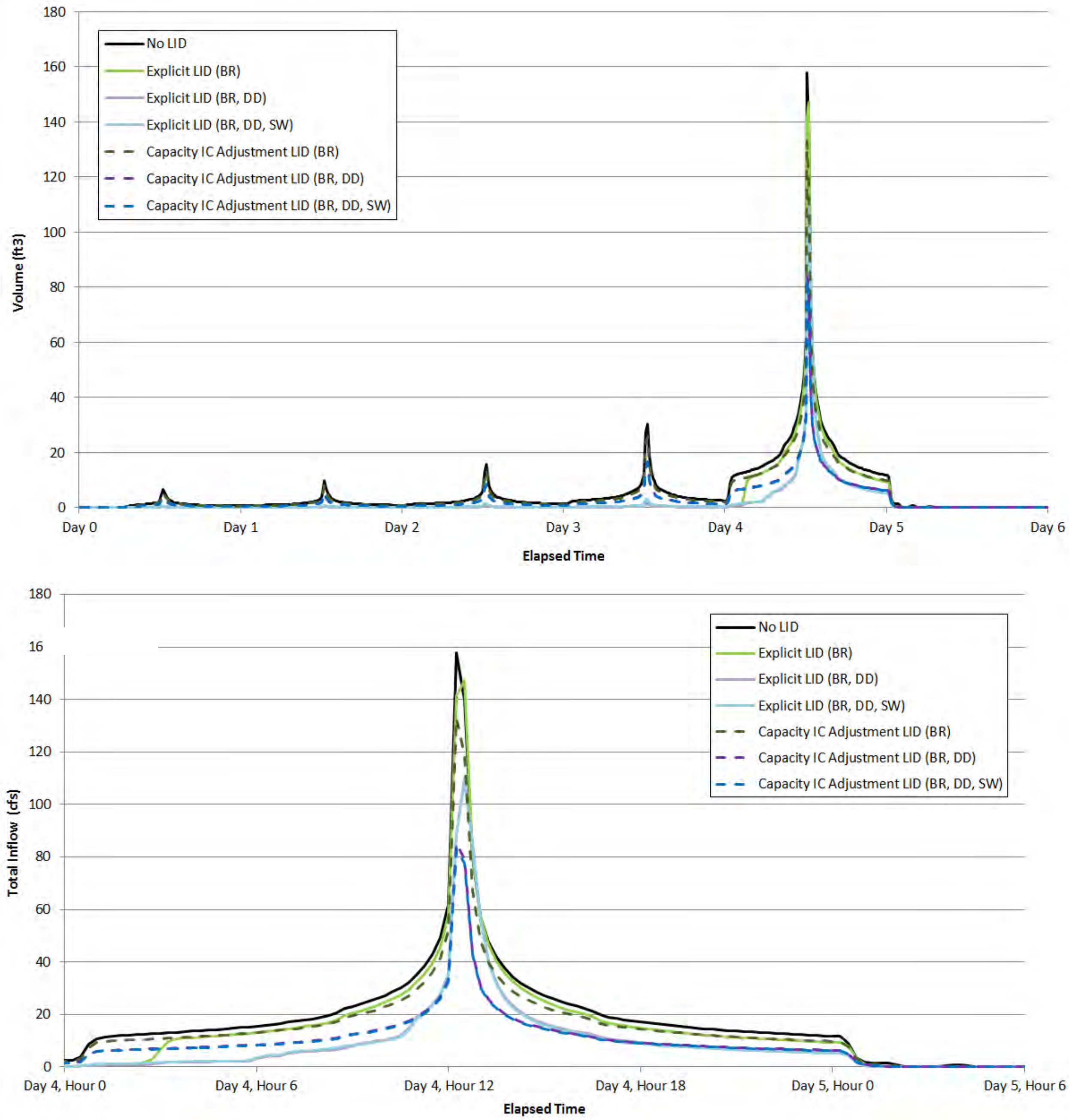


Figure 4 – Design Storm Inflow Hydrograph at Sump H for the Seven Selected Scenarios (Top: 5-day Event; Bottom: Day 4-5 Inset)

4.3 Design Storm Summary

Analysis of the design storm models indicate that explicit representation of the distributed LID facilities, depending on level of LID implemented, could result in up to a 64% reduction in required sump capacity and 3.8-ft reduction in depth for the Sump H design when compared to the non-LID scenario. This result assumes that bioretention, disconnected downspouts, and off-line road-side swales are implemented along all roads. Looking at incremental benefits based on level of LID implementation, the following observations can be made:

- The model predicts a 21% decrease in flood basin size due to use of bioretention LID features only.
- Bioretention plus disconnected downspouts approximates a decrease in flood basin size of 56%, so a 35% reduction can be roughly attributed to disconnected downspouts alone.
- Bioretention in combination with swales approximates a decrease in flood basin size of 21% to 29%, depending on the swale configuration, so a 0.4 to 8% reduction can be roughly attributed to swales alone.
- Of the swale configurations, swales on arterial streets alone have the least impact on basin size, and off-line swales on all roads result in the largest percent reduction.
- If bioretention, downspout disconnects, and offline swales are all implemented, that could reduce the flood basin size by approximately 64%. In that case the impervious cover values would be adjusted by 50% in the Kern County method to match the SWMM modeling results.

As expected, the “Capacity IC Adjustment to Simulate LID” scenarios produce similar results for sump modifications because the capacity of Sump H was used as a basis for selecting the IC reduction factors.

4.4 Continuous Simulation

A long-term continuous simulation run was conducted for the explicit LID scenario using the NCDC Bakersfield Airport Rain Gauge hourly record between water years 1949-2013. These simulations accounted for evaporation from the sumps, to more accurately mirror realistic conditions. Over this 64-year period, the capacity of Sump H in the “Explicit LID” scenario (sump volume = 0.74 MCF), including bioretention, disconnected downspouts, and the partial swale option (Scenario 20), was exceeded on eight occasions as summarized in Table 8. Three of these eight events had total rainfall depths more than the 10-year, 5-day rainfall depth of 4.33-inches, with five events measuring less than the design storm depth. Of the events that did not exceed the design depth, the event with the longest duration occurred in November of 1960.

Figure 5 shows the hyetograph for this event. This event had a rainfall depth of 3.98 inches within 45 hours, whereas the design event duration is 120 hours. The 1960 event also exceeds the 15-year frequency, 4-day duration design event depth, according to the NOAA Atlas 14. For these reasons, we do not believe that this abnormal event, nor the events with even shorter frequencies (ranging from five to 30 hours), should negate the functionality of the adjusted basin with respect to capturing the design event.

Results are similar for the "Capacity IC Adjustment to Simulate LID" scenarios, which demonstrate that the Sump H capacity would be exceeded for events which have either a larger total rainfall depth, or a shorter duration, as compared to the 10-year, 5-day design depth. This is also consistent with the results of the "Non-LID" scenario. One additional scenario was run evaluating the long-term condition in which LID facilities have only ½ of the infiltration rate due to sedimentation and reduced functionality. This scenario also showed that Sump H capacity would be exceeded for events which have either a larger total rainfall depth, or a shorter duration, as compared to the 10-year, 5-day design depth.

Table 8 – Explicit LID Scenario, Events Exceeding Sump H Capacity, 1949-2013

Dates Volume Exceeded	Sump Capacity (MCF)	Total Rainfall (in.)	Rainfall Duration (hr)	Exceed Design Depth?	Peak Rainfall Intensity (in/hr)	NOAA Atlas 14 Design Event
10/6/1956	0.90	2.40	10	No	1.32	200-yr, 5-hr
11/5/1960	0.98	3.98	45	No	0.56	15-yr, 4-d
6/7/1972	0.80	2.18	5	No	1.34	1000-yr, 2-hr
10/2/1974	0.89	2.24	5	No	1.64	600-yr, 3-hr
2/9/1978	2.54	7.64	70	Yes	0.64	200-yr, 5-d
8/18/1983	0.77	2.16	30	No	1.72	300-yr, 3-hr
1/24/1999	1.65	5.66	50	Yes	0.44	65-yr, 6-d
12/18/2010	1.97	9.00	125	Yes	0.58	250-yr, 4-d

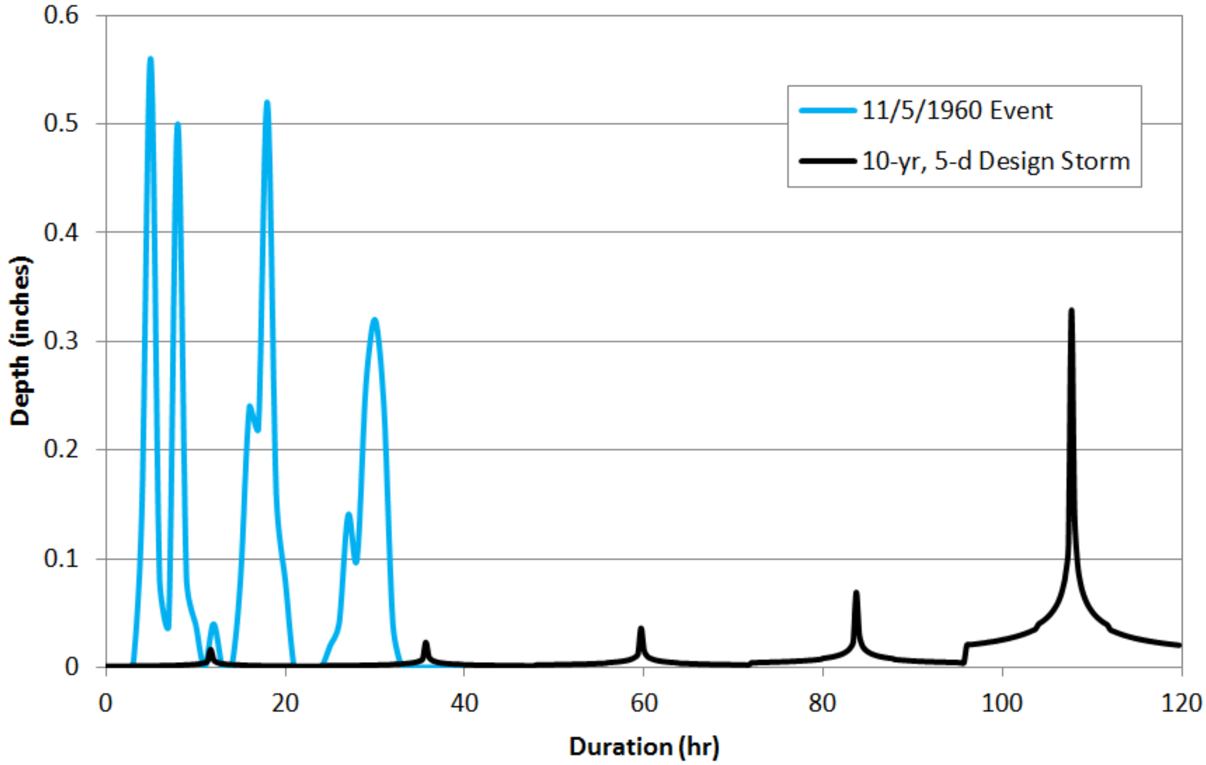


Figure 5 – Rainfall Distribution for November 1960 Event and 10-year, 5-day Design Storm

5. CONCLUSIONS

The baseline SWMM scenario modeled without distributed LID BMPs to size Sump H for the 10-year, 5-day design storm results in a smaller required capacity than the design provided by McIntosh using guidance in the Kern County Hydrology Manual. The Kern County design methodology is based on the runoff volume from all impervious areas and does not account for the timing or routing of flows or the potential infiltration and evaporation of runoff from the impervious areas in the watershed while runoff is being conveyed to the sump. For this reason, the SWMM distributed LID scenarios were compared to the SWMM non-distributed LID scenario as opposed to the McIntosh design that resulted from the Kern County design methodology.

Each representation of distributed LID BMPs produces different results with respect to runoff rates and volumes due to nuances in the representations of the treatment facilities. It is expected that the explicit distributed LID representation is the most appropriate due to the specific unit processes which occur, such as detention, peak flow rate shaving, infiltration, and unmodified land use properties. The LID facilities were sized to have an average annual capture efficiency of 80%, which is the volume-based sizing criterion for stormwater features assumed in the EIR analysis. Explicit distributed LID modeling of bioretention, disconnected downspouts, and partial swales in combination, suggests that the capacity of Sump H can be reduced by up to approximately 64% to account for the benefits of decentralized LID facilities constructed throughout the catchment area (assuming bioretention, downspouts disconnections, and partial swales are implemented) without increasing flooding risks.

A simplified parameter adjustment for impervious cover can be used to approximately represent distributed LID BMPs for specific design storm events. Based on the Sump H catchment results, assuming bioretention, disconnected downspouts, and swales are implemented, Geosyntec recommends decreasing the effective impervious cover by 50% throughout the Grapevine Specific Plan for the land uses with proposed decentralized LID facilities as modeled in the "Capacity IC Adjustment to Simulate LID" scenario. An impervious cover reduction of 50% results in approximately a 64% reduction in required Sump H capacity as compared to the baseline "Non-LID" scenario for the 10-year, 5-day design storm and is the most conservative adjustment determined from the analyses. Using the guidance in the Kern County Hydrology Manual, this specified reduction in impervious cover would result in roughly a 50% reduction in required Sump H capacity for the design storm when compared to the original sump sizing provided by McIntosh. Therefore, using this parameter adjustment together with the Kern County guidance, the resulting reduction in sump capacity will conservatively simulate expected LID facilities with 80% average annual capture efficiency.

In summary, LID practices provide multiple benefits including: groundwater recharge, reduced use of potable water for irrigation, and water quality improvements, among others. Additionally, LID implementation is becoming more common in California, as demonstrated by the Kern County and other local MS4 Permits. Therefore, it is our recommendation that LID practices be implemented within the Grapevine Project, and that the Kern County methodology for flood control basin sizing allow for credit for the volume offset attributable to the LID features.

6. REFERENCES

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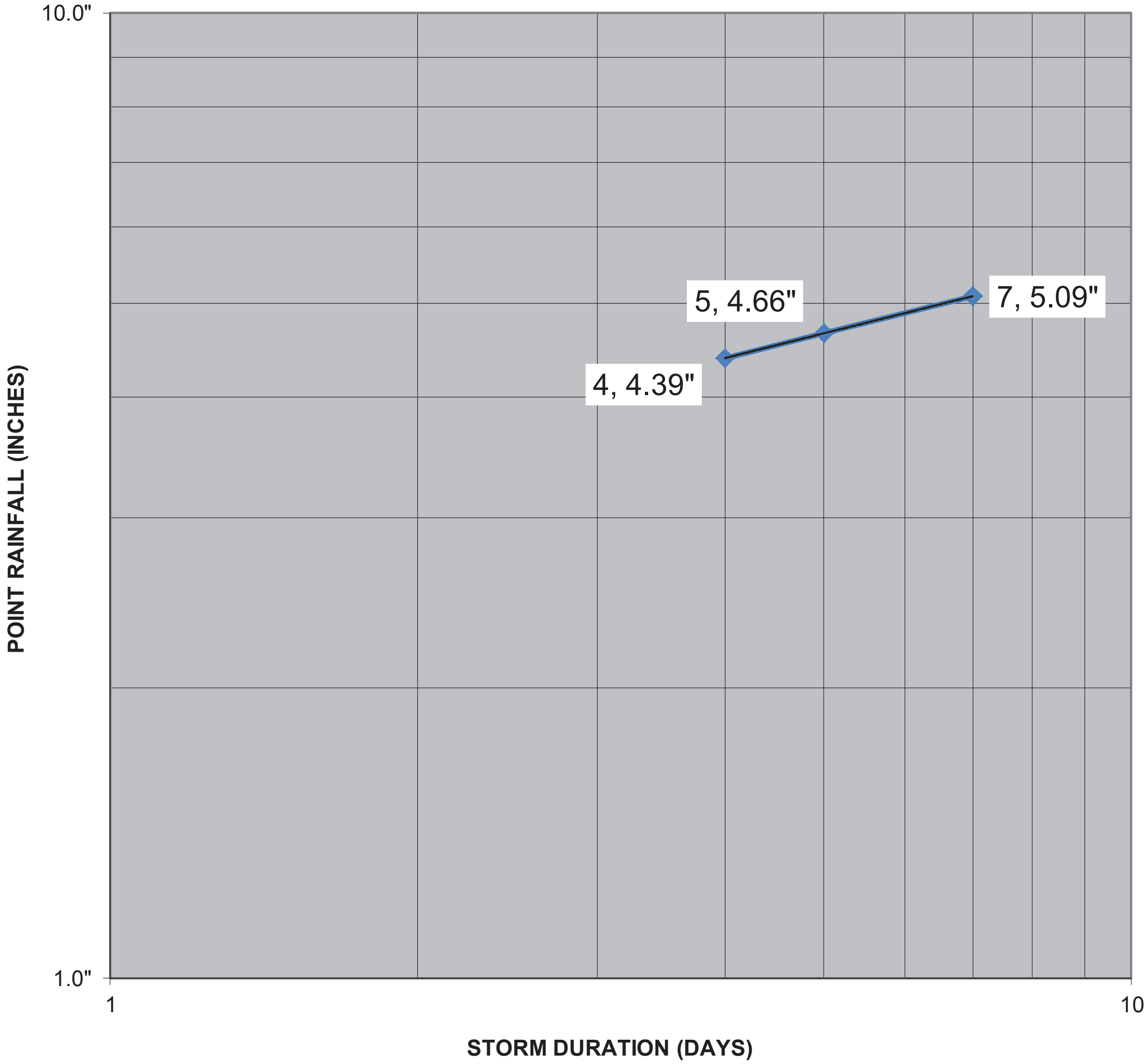
* * * * *

APPENDIX B

NOAA ATLAS 14 RAINFALL DATA AND CALCULATIONS



Rainfall Event:

10yr	4 day	4.39"
10yr	5 day	4.66"
10yr	7 day	5.09"

RAINFALL PLOTTING SHEET

MASTER DRAINAGE STUDY
SPA 1

NOAA Atlas 14, Volume 6, Version 2
Location name: Lebec, California, US*
Coordinates: 34.9405, -118.9393
Elevation: 1571 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.073 (0.060–0.090)	0.098 (0.080–0.121)	0.133 (0.108–0.164)	0.162 (0.131–0.202)	0.205 (0.161–0.264)	0.239 (0.184–0.315)	0.276 (0.207–0.372)	0.315 (0.230–0.437)	0.371 (0.260–0.536)	0.417 (0.282–0.622)
10-min	0.105 (0.086–0.129)	0.141 (0.115–0.173)	0.190 (0.155–0.235)	0.232 (0.188–0.290)	0.293 (0.230–0.378)	0.343 (0.263–0.451)	0.396 (0.297–0.533)	0.452 (0.330–0.626)	0.532 (0.373–0.768)	0.598 (0.405–0.892)
15-min	0.127 (0.104–0.156)	0.170 (0.139–0.210)	0.230 (0.188–0.285)	0.281 (0.228–0.351)	0.355 (0.278–0.457)	0.415 (0.318–0.545)	0.478 (0.359–0.644)	0.547 (0.399–0.757)	0.644 (0.451–0.929)	0.723 (0.489–1.08)
30-min	0.182 (0.149–0.224)	0.244 (0.200–0.301)	0.330 (0.270–0.409)	0.404 (0.327–0.503)	0.510 (0.399–0.657)	0.595 (0.457–0.783)	0.687 (0.515–0.925)	0.785 (0.573–1.09)	0.924 (0.647–1.33)	1.04 (0.703–1.55)
60-min	0.268 (0.220–0.331)	0.360 (0.294–0.444)	0.487 (0.397–0.602)	0.594 (0.481–0.741)	0.750 (0.588–0.967)	0.877 (0.673–1.15)	1.01 (0.758–1.36)	1.16 (0.843–1.60)	1.36 (0.953–1.96)	1.53 (1.04–2.28)
2-hr	0.410 (0.336–0.506)	0.544 (0.445–0.671)	0.725 (0.592–0.897)	0.875 (0.709–1.09)	1.09 (0.852–1.40)	1.25 (0.963–1.65)	1.43 (1.07–1.92)	1.61 (1.17–2.23)	1.86 (1.30–2.68)	2.06 (1.39–3.07)
3-hr	0.521 (0.427–0.642)	0.688 (0.563–0.848)	0.910 (0.743–1.13)	1.09 (0.886–1.36)	1.35 (1.06–1.74)	1.55 (1.19–2.04)	1.75 (1.31–2.36)	1.97 (1.43–2.72)	2.25 (1.58–3.25)	2.47 (1.68–3.69)
6-hr	0.756 (0.619–0.931)	0.993 (0.813–1.23)	1.31 (1.07–1.62)	1.56 (1.27–1.95)	1.91 (1.50–2.46)	2.18 (1.67–2.86)	2.45 (1.84–3.30)	2.73 (1.99–3.77)	3.10 (2.17–4.47)	3.38 (2.29–5.04)
12-hr	1.02 (0.835–1.26)	1.35 (1.11–1.67)	1.79 (1.46–2.21)	2.14 (1.73–2.67)	2.61 (2.05–3.36)	2.97 (2.28–3.90)	3.33 (2.50–4.48)	3.69 (2.69–5.11)	4.17 (2.92–6.02)	4.53 (3.07–6.76)
24-hr	1.33 (1.18–1.52)	1.79 (1.59–2.05)	2.39 (2.12–2.74)	2.86 (2.52–3.32)	3.50 (2.98–4.20)	3.99 (3.32–4.89)	4.47 (3.62–5.63)	4.96 (3.90–6.43)	5.60 (4.22–7.59)	6.08 (4.41–8.55)
2-day	1.59 (1.42–1.81)	2.17 (1.94–2.49)	2.94 (2.61–3.37)	3.56 (3.14–4.12)	4.39 (3.73–5.26)	5.01 (4.17–6.15)	5.64 (4.57–7.10)	6.27 (4.94–8.14)	7.11 (5.36–9.64)	7.74 (5.62–10.9)
3-day	1.73 (1.55–1.98)	2.40 (2.14–2.75)	3.29 (2.93–3.78)	4.01 (3.54–4.65)	4.98 (4.24–5.98)	5.73 (4.76–7.02)	6.47 (5.25–8.15)	7.24 (5.70–9.39)	8.26 (6.22–11.2)	9.04 (6.56–12.7)
4-day	1.86 (1.66–2.12)	2.59 (2.31–2.97)	3.58 (3.19–4.11)	4.39 (3.87–5.08)	5.48 (4.67–6.58)	6.32 (5.26–7.76)	7.18 (5.82–9.03)	8.05 (6.34–10.4)	9.24 (6.95–12.5)	10.1 (7.36–14.3)
7-day	2.08 (1.86–2.37)	2.95 (2.63–3.37)	4.12 (3.66–4.73)	5.09 (4.49–5.89)	6.42 (5.47–7.71)	7.46 (6.20–9.15)	8.51 (6.90–10.7)	9.59 (7.55–12.4)	11.1 (8.33–15.0)	12.2 (8.86–17.1)
10-day	2.20 (1.96–2.51)	3.14 (2.80–3.60)	4.43 (3.94–5.09)	5.51 (4.86–6.38)	7.00 (5.96–8.40)	8.17 (6.80–10.0)	9.37 (7.59–11.8)	10.6 (8.35–13.8)	12.3 (9.27–16.7)	13.6 (9.90–19.2)
20-day	2.59 (2.31–2.96)	3.75 (3.35–4.29)	5.38 (4.78–6.17)	6.76 (5.96–7.83)	8.73 (7.43–10.5)	10.3 (8.57–12.6)	12.0 (9.69–15.0)	13.7 (10.8–17.7)	16.1 (12.1–21.8)	18.0 (13.0–25.2)
30-day	3.03 (2.71–3.47)	4.40 (3.92–5.03)	6.34 (5.64–7.28)	8.02 (7.07–9.28)	10.4 (8.89–12.5)	12.4 (10.3–15.2)	14.5 (11.7–18.2)	16.7 (13.1–21.6)	19.7 (14.9–26.7)	22.2 (16.1–31.1)
45-day	3.63 (3.24–4.15)	5.23 (4.67–5.99)	7.54 (6.70–8.65)	9.55 (8.42–11.1)	12.5 (10.6–15.0)	15.0 (12.4–18.3)	17.5 (14.2–22.1)	20.3 (16.0–26.3)	24.2 (18.2–32.8)	27.4 (19.9–38.5)
60-day	4.16 (3.72–4.76)	5.94 (5.30–6.80)	8.53 (7.59–9.79)	10.8 (9.54–12.5)	14.2 (12.1–17.0)	17.0 (14.2–20.9)	20.0 (16.2–25.2)	23.3 (18.3–30.2)	27.9 (21.0–37.8)	31.6 (22.9–44.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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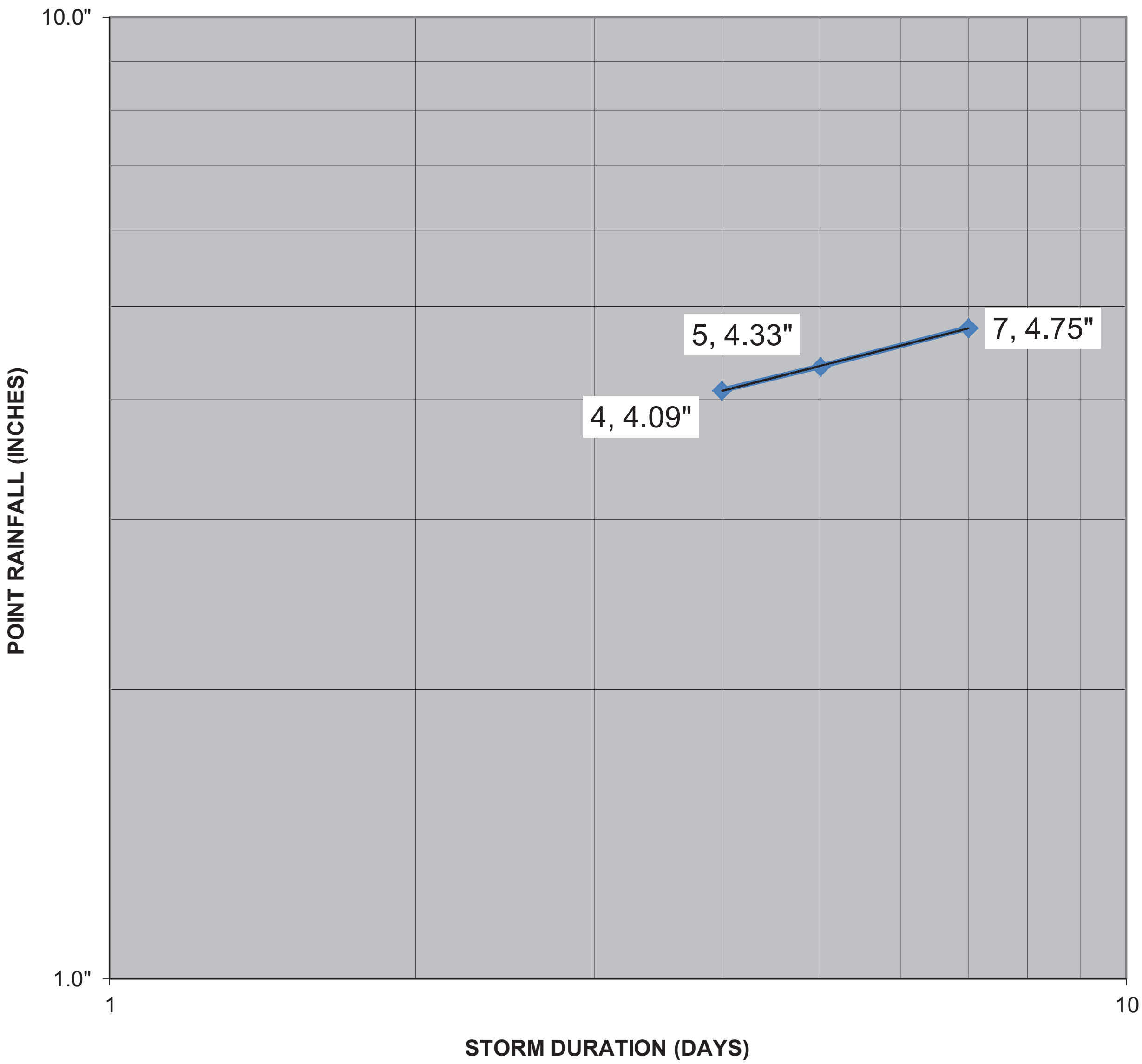
PF graphical



Rainfall Event:

10yr	4 day	4.09"
10yr	5 day	4.33"
10yr	7 day	4.75"

RAINFALL PLOTTING SHEET

MASTER DRAINAGE STUDY
SPA 2

NOAA Atlas 14, Volume 6, Version 2
Location name: Lebec, California, US*
Coordinates: 34.9619, -118.9458
Elevation: 1388 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.070** (0.057–0.086)	**0.093** (0.076–0.115)	**0.125** (0.102–0.155)	**0.153** (0.124–0.191)	**0.193** (0.151–0.250)	**0.226** (0.173–0.298)	**0.261** (0.196–0.352)	**0.299** (0.218–0.414)	**0.352** (0.246–0.508)	**0.395** (0.268–0.590)
10-min	**0.100** (0.082–0.123)	**0.133** (0.109–0.165)	**0.180** (0.147–0.223)	**0.220** (0.177–0.274)	**0.277** (0.217–0.358)	**0.324** (0.249–0.427)	**0.374** (0.280–0.505)	**0.428** (0.312–0.593)	**0.504** (0.353–0.728)	**0.567** (0.384–0.846)
15-min	**0.121** (0.099–0.149)	**0.161** (0.131–0.199)	**0.217** (0.177–0.269)	**0.265** (0.215–0.332)	**0.335** (0.262–0.433)	**0.392** (0.301–0.516)	**0.453** (0.339–0.610)	**0.517** (0.377–0.717)	**0.610** (0.427–0.880)	**0.685** (0.464–1.02)
30-min	**0.174** (0.143–0.215)	**0.233** (0.190–0.288)	**0.315** (0.256–0.390)	**0.384** (0.311–0.480)	**0.485** (0.380–0.626)	**0.567** (0.435–0.747)	**0.655** (0.491–0.883)	**0.749** (0.546–1.04)	**0.883** (0.618–1.27)	**0.992** (0.671–1.48)
60-min	**0.257** (0.210–0.317)	**0.343** (0.280–0.424)	**0.464** (0.378–0.575)	**0.566** (0.458–0.707)	**0.715** (0.560–0.923)	**0.836** (0.641–1.10)	**0.965** (0.723–1.30)	**1.10** (0.804–1.53)	**1.30** (0.911–1.88)	**1.46** (0.989–2.18)
2-hr	**0.393** (0.321–0.485)	**0.519** (0.424–0.642)	**0.690** (0.562–0.855)	**0.833** (0.673–1.04)	**1.03** (0.809–1.33)	**1.19** (0.916–1.57)	**1.36** (1.02–1.83)	**1.53** (1.12–2.13)	**1.77** (1.24–2.56)	**1.96** (1.33–2.93)
3-hr	**0.497** (0.407–0.614)	**0.654** (0.534–0.809)	**0.864** (0.704–1.07)	**1.04** (0.839–1.30)	**1.28** (1.00–1.65)	**1.47** (1.13–1.94)	**1.66** (1.25–2.25)	**1.87** (1.36–2.59)	**2.14** (1.50–3.09)	**2.35** (1.59–3.51)
6-hr	**0.713** (0.584–0.881)	**0.935** (0.764–1.16)	**1.23** (1.00–1.52)	**1.47** (1.19–1.83)	**1.79** (1.40–2.31)	**2.04** (1.57–2.69)	**2.30** (1.72–3.10)	**2.56** (1.87–3.55)	**2.91** (2.04–4.20)	**3.17** (2.15–4.73)
12-hr	**0.953** (0.780–1.18)	**1.26** (1.03–1.56)	**1.67** (1.36–2.07)	**2.00** (1.61–2.49)	**2.44** (1.91–3.15)	**2.77** (2.13–3.65)	**3.11** (2.33–4.19)	**3.45** (2.51–4.78)	**3.89** (2.72–5.62)	**4.22** (2.86–6.30)
24-hr	**1.24** (1.11–1.41)	**1.67** (1.49–1.91)	**2.23** (1.98–2.55)	**2.68** (2.36–3.09)	**3.27** (2.79–3.92)	**3.73** (3.10–4.57)	**4.17** (3.39–5.25)	**4.63** (3.64–6.00)	**5.22** (3.93–7.08)	**5.66** (4.11–7.96)
2-day	**1.47** (1.32–1.68)	**2.02** (1.81–2.31)	**2.74** (2.44–3.14)	**3.32** (2.93–3.84)	**4.09** (3.48–4.90)	**4.67** (3.89–5.73)	**5.25** (4.26–6.61)	**5.84** (4.60–7.58)	**6.61** (4.98–8.96)	**7.19** (5.22–10.1)
3-day	**1.61** (1.44–1.84)	**2.24** (2.00–2.56)	**3.07** (2.73–3.52)	**3.75** (3.30–4.33)	**4.65** (3.96–5.57)	**5.34** (4.44–6.54)	**6.03** (4.89–7.59)	**6.74** (5.30–8.73)	**7.68** (5.78–10.4)	**8.39** (6.09–11.8)
4-day	**1.72** (1.54–1.97)	**2.41** (2.15–2.76)	**3.34** (2.97–3.83)	**4.09** (3.61–4.73)	**5.11** (4.35–6.12)	**5.89** (4.90–7.22)	**6.68** (5.41–8.40)	**7.49** (5.89–9.71)	**8.57** (6.45–11.6)	**9.40** (6.82–13.2)
7-day	**1.93** (1.72–2.20)	**2.74** (2.44–3.13)	**3.84** (3.42–4.40)	**4.75** (4.19–5.49)	**5.99** (5.10–7.18)	**6.95** (5.79–8.52)	**7.93** (6.43–9.97)	**8.93** (7.03–11.6)	**10.3** (7.74–13.9)	**11.3** (8.22–15.9)
10-day	**2.04** (1.83–2.33)	**2.93** (2.61–3.35)	**4.14** (3.69–4.75)	**5.15** (4.55–5.96)	**6.56** (5.58–7.86)	**7.65** (6.36–9.37)	**8.76** (7.11–11.0)	**9.92** (7.80–12.9)	**11.5** (8.65–15.6)	**12.7** (9.22–17.9)
20-day	**2.41** (2.15–2.75)	**3.51** (3.13–4.01)	**5.05** (4.50–5.79)	**6.36** (5.61–7.36)	**8.23** (7.01–9.87)	**9.73** (8.10–11.9)	**11.3** (9.15–14.2)	**12.9** (10.2–16.7)	**15.2** (11.4–20.5)	**16.9** (12.3–23.8)
30-day	**2.82** (2.52–3.22)	**4.11** (3.67–4.70)	**5.95** (5.30–6.83)	**7.55** (6.66–8.73)	**9.86** (8.40–11.8)	**11.7** (9.76–14.4)	**13.7** (11.1–17.2)	**15.7** (12.4–20.4)	**18.6** (14.0–25.2)	**20.9** (15.2–29.4)
45-day	**3.38** (3.02–3.86)	**4.90** (4.38–5.60)	**7.10** (6.32–8.14)	**9.03** (7.96–10.4)	**11.9** (10.1–14.2)	**14.2** (11.8–17.4)	**16.7** (13.5–21.0)	**19.3** (15.2–25.0)	**23.0** (17.3–31.2)	**26.0** (18.8–36.5)
60-day	**3.87** (3.46–4.42)	**5.56** (4.96–6.35)	**8.04** (7.15–9.21)	**10.2** (9.03–11.8)	**13.5** (11.5–16.2)	**16.2** (13.5–19.8)	**19.1** (15.5–24.0)	**22.1** (17.4–28.7)	**26.5** (20.0–35.9)	**30.0** (21.8–42.2)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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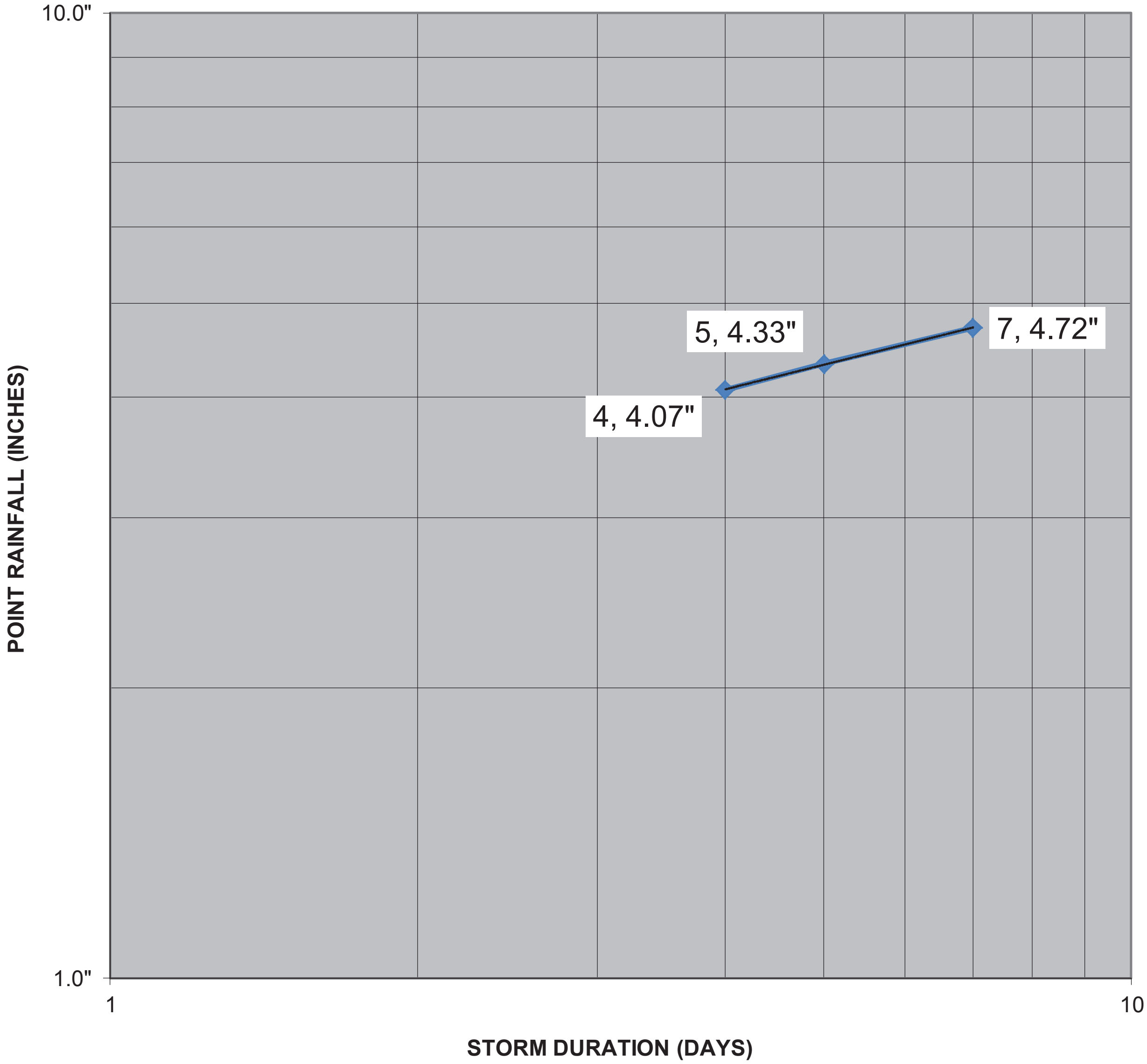
PF graphical



Rainfall Event:

10yr	4 day	4.07"
10yr	5 day	4.33"
10yr	7 day	4.72"

RAINFALL PLOTTING SHEET

MASTER DRAINAGE STUDY
SPA 3

NOAA Atlas 14, Volume 6, Version 2
Location name: Lebec, California, US*
Coordinates: 34.9598, -118.9285
Elevation: 1328 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.070 (0.057–0.086)	0.093 (0.076–0.114)	0.125 (0.102–0.154)	0.152 (0.124–0.190)	0.192 (0.151–0.247)	0.225 (0.173–0.295)	0.259 (0.194–0.349)	0.296 (0.216–0.410)	0.349 (0.244–0.503)	0.392 (0.265–0.584)
10-min	0.100 (0.082–0.123)	0.133 (0.109–0.164)	0.179 (0.146–0.221)	0.218 (0.177–0.272)	0.275 (0.216–0.355)	0.322 (0.247–0.423)	0.371 (0.279–0.500)	0.424 (0.310–0.587)	0.500 (0.350–0.721)	0.561 (0.380–0.838)
15-min	0.121 (0.099–0.148)	0.161 (0.132–0.198)	0.217 (0.177–0.268)	0.264 (0.214–0.329)	0.333 (0.261–0.429)	0.389 (0.299–0.511)	0.449 (0.337–0.605)	0.513 (0.374–0.710)	0.605 (0.424–0.872)	0.679 (0.460–1.01)
30-min	0.174 (0.143–0.214)	0.232 (0.190–0.286)	0.313 (0.255–0.386)	0.381 (0.309–0.475)	0.481 (0.377–0.619)	0.562 (0.432–0.738)	0.648 (0.486–0.873)	0.741 (0.541–1.03)	0.873 (0.611–1.26)	0.980 (0.663–1.46)
60-min	0.256 (0.210–0.315)	0.341 (0.280–0.421)	0.460 (0.376–0.569)	0.561 (0.455–0.700)	0.708 (0.556–0.912)	0.827 (0.636–1.09)	0.955 (0.716–1.29)	1.09 (0.796–1.51)	1.29 (0.900–1.85)	1.44 (0.977–2.15)
2-hr	0.391 (0.321–0.482)	0.516 (0.423–0.636)	0.685 (0.560–0.846)	0.826 (0.670–1.03)	1.03 (0.804–1.32)	1.18 (0.909–1.55)	1.35 (1.01–1.81)	1.52 (1.11–2.10)	1.76 (1.23–2.53)	1.94 (1.32–2.90)
3-hr	0.495 (0.406–0.609)	0.650 (0.533–0.801)	0.857 (0.700–1.06)	1.03 (0.834–1.28)	1.27 (0.995–1.63)	1.46 (1.12–1.92)	1.65 (1.24–2.22)	1.85 (1.35–2.56)	2.12 (1.49–3.06)	2.33 (1.58–3.48)
6-hr	0.710 (0.582–0.874)	0.929 (0.761–1.15)	1.22 (0.996–1.51)	1.46 (1.18–1.81)	1.78 (1.40–2.29)	2.03 (1.56–2.67)	2.28 (1.71–3.07)	2.54 (1.85–3.52)	2.89 (2.02–4.17)	3.15 (2.13–4.70)
12-hr	0.949 (0.779–1.17)	1.26 (1.03–1.55)	1.66 (1.36–2.05)	1.98 (1.61–2.47)	2.42 (1.90–3.12)	2.76 (2.12–3.62)	3.09 (2.32–4.16)	3.43 (2.50–4.74)	3.87 (2.71–5.58)	4.20 (2.84–6.26)
24-hr	1.23 (1.10–1.41)	1.66 (1.48–1.90)	2.22 (1.97–2.55)	2.66 (2.35–3.08)	3.26 (2.77–3.91)	3.71 (3.08–4.55)	4.15 (3.37–5.23)	4.60 (3.62–5.97)	5.20 (3.91–7.04)	5.64 (4.09–7.92)
2-day	1.47 (1.31–1.68)	2.01 (1.79–2.30)	2.73 (2.42–3.13)	3.30 (2.91–3.82)	4.06 (3.46–4.88)	4.64 (3.86–5.70)	5.22 (4.23–6.57)	5.81 (4.57–7.53)	6.57 (4.95–8.90)	7.14 (5.19–10.0)
3-day	1.61 (1.43–1.84)	2.23 (1.98–2.55)	3.05 (2.71–3.51)	3.72 (3.28–4.31)	4.62 (3.93–5.55)	5.31 (4.41–6.51)	6.00 (4.86–7.55)	6.70 (5.27–8.68)	7.63 (5.75–10.3)	8.34 (6.06–11.7)
4-day	1.71 (1.53–1.96)	2.40 (2.14–2.75)	3.32 (2.95–3.81)	4.07 (3.58–4.71)	5.08 (4.32–6.09)	5.85 (4.87–7.18)	6.64 (5.38–8.36)	7.44 (5.85–9.65)	8.52 (6.42–11.5)	9.34 (6.79–13.1)
7-day	1.92 (1.71–2.19)	2.72 (2.43–3.12)	3.81 (3.39–4.38)	4.72 (4.15–5.46)	5.95 (5.06–7.14)	6.90 (5.74–8.47)	7.87 (6.38–9.91)	8.87 (6.98–11.5)	10.2 (7.69–13.8)	11.2 (8.16–15.8)
10-day	2.04 (1.82–2.33)	2.92 (2.60–3.34)	4.12 (3.66–4.73)	5.12 (4.51–5.94)	6.52 (5.54–7.82)	7.60 (6.32–9.33)	8.71 (7.06–11.0)	9.85 (7.75–12.8)	11.4 (8.60–15.5)	12.6 (9.17–17.7)
20-day	2.41 (2.15–2.76)	3.51 (3.12–4.01)	5.04 (4.48–5.79)	6.34 (5.59–7.35)	8.21 (6.98–9.85)	9.69 (8.06–11.9)	11.2 (9.10–14.1)	12.9 (10.1–16.7)	15.1 (11.4–20.4)	16.8 (12.2–23.6)
30-day	2.82 (2.52–3.23)	4.11 (3.66–4.71)	5.95 (5.29–6.83)	7.54 (6.64–8.73)	9.84 (8.37–11.8)	11.7 (9.72–14.3)	13.6 (11.0–17.2)	15.7 (12.3–20.3)	18.6 (14.0–25.1)	20.8 (15.1–29.2)
45-day	3.39 (3.03–3.88)	4.91 (4.37–5.62)	7.10 (6.31–8.15)	9.02 (7.95–10.5)	11.8 (10.1–14.2)	14.2 (11.8–17.4)	16.6 (13.5–20.9)	19.2 (15.1–24.9)	22.9 (17.3–31.0)	25.8 (18.8–36.3)
60-day	3.88 (3.46–4.44)	5.57 (4.96–6.38)	8.05 (7.15–9.24)	10.2 (9.02–11.9)	13.5 (11.5–16.2)	16.2 (13.4–19.8)	19.0 (15.4–23.9)	22.1 (17.4–28.6)	26.4 (19.9–35.8)	29.9 (21.7–42.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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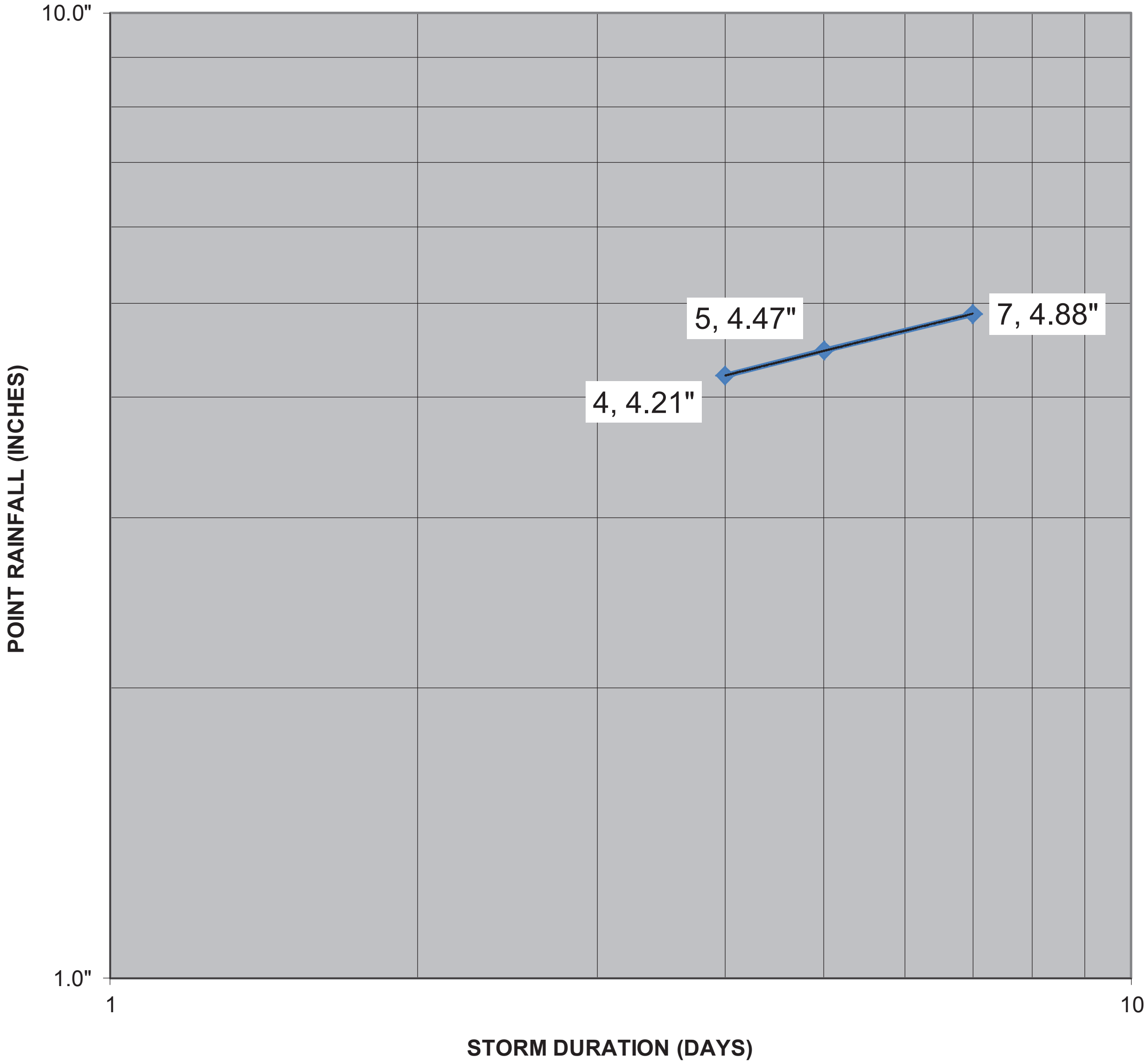
PF graphical



Rainfall Event:

10yr	4 day	4.21"
10yr	5 day	4.47"
10yr	7 day	4.88"

RAINFALL PLOTTING SHEET

MASTER DRAINAGE STUDY
SPA 4

NOAA Atlas 14, Volume 6, Version 2
Location name: Lebec, California, US*
Coordinates: 34.9538, -118.9148
Elevation: 1345 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.071 (0.059‑0.088)	0.095 (0.078‑0.117)	0.129 (0.105‑0.159)	0.157 (0.127‑0.195)	0.197 (0.155‑0.254)	0.230 (0.177‑0.302)	0.266 (0.199‑0.357)	0.303 (0.221‑0.419)	0.357 (0.250‑0.514)	0.400 (0.271‑0.597)
10-min	0.102 (0.084‑0.126)	0.137 (0.112‑0.168)	0.184 (0.151‑0.227)	0.225 (0.182‑0.279)	0.283 (0.222‑0.364)	0.330 (0.254‑0.433)	0.381 (0.286‑0.512)	0.434 (0.317‑0.601)	0.511 (0.358‑0.737)	0.574 (0.388‑0.856)
15-min	0.124 (0.102‑0.152)	0.165 (0.136‑0.203)	0.223 (0.183‑0.275)	0.272 (0.221‑0.338)	0.342 (0.269‑0.440)	0.399 (0.307‑0.524)	0.460 (0.346‑0.619)	0.525 (0.384‑0.727)	0.618 (0.433‑0.891)	0.694 (0.470‑1.04)
30-min	0.178 (0.146‑0.219)	0.237 (0.195‑0.292)	0.320 (0.262‑0.395)	0.390 (0.317‑0.485)	0.492 (0.386‑0.632)	0.574 (0.441‑0.753)	0.661 (0.497‑0.889)	0.755 (0.551‑1.04)	0.888 (0.622‑1.28)	0.997 (0.675‑1.49)
60-min	0.262 (0.215‑0.321)	0.349 (0.287‑0.429)	0.471 (0.386‑0.580)	0.574 (0.466‑0.713)	0.723 (0.568‑0.929)	0.844 (0.649‑1.11)	0.972 (0.731‑1.31)	1.11 (0.811‑1.54)	1.31 (0.916‑1.88)	1.47 (0.993‑2.19)
2-hr	0.400 (0.329‑0.491)	0.528 (0.433‑0.649)	0.701 (0.574‑0.864)	0.845 (0.687‑1.05)	1.05 (0.824‑1.35)	1.21 (0.930‑1.59)	1.38 (1.03‑1.85)	1.55 (1.13‑2.14)	1.79 (1.26‑2.58)	1.98 (1.34‑2.95)
3-hr	0.506 (0.416‑0.622)	0.666 (0.547‑0.818)	0.878 (0.719‑1.08)	1.05 (0.857‑1.31)	1.30 (1.02‑1.67)	1.49 (1.15‑1.96)	1.69 (1.27‑2.27)	1.89 (1.38‑2.62)	2.17 (1.52‑3.13)	2.39 (1.62‑3.56)
6-hr	0.730 (0.601‑0.897)	0.957 (0.786‑1.18)	1.26 (1.03‑1.55)	1.50 (1.22‑1.86)	1.83 (1.44‑2.36)	2.09 (1.61‑2.74)	2.35 (1.77‑3.16)	2.62 (1.91‑3.62)	2.97 (2.08‑4.29)	3.24 (2.20‑4.84)
12-hr	0.981 (0.807‑1.21)	1.30 (1.07‑1.60)	1.72 (1.41‑2.12)	2.05 (1.67‑2.55)	2.50 (1.97‑3.22)	2.85 (2.19‑3.74)	3.19 (2.40‑4.29)	3.54 (2.59‑4.90)	4.00 (2.80‑5.76)	4.34 (2.94‑6.48)
24-hr	1.28 (1.14‑1.46)	1.72 (1.53‑1.97)	2.30 (2.04‑2.64)	2.76 (2.42‑3.20)	3.37 (2.86‑4.05)	3.84 (3.19‑4.71)	4.30 (3.48‑5.41)	4.76 (3.75‑6.18)	5.38 (4.05‑7.29)	5.84 (4.24‑8.20)
2-day	1.52 (1.36‑1.74)	2.08 (1.86‑2.39)	2.82 (2.50‑3.24)	3.41 (3.00‑3.96)	4.21 (3.57‑5.05)	4.80 (3.99‑5.90)	5.40 (4.38‑6.81)	6.01 (4.73‑7.80)	6.81 (5.13‑9.22)	7.40 (5.38‑10.4)
3-day	1.66 (1.48‑1.90)	2.31 (2.05‑2.64)	3.16 (2.81‑3.63)	3.85 (3.39‑4.47)	4.78 (4.06‑5.74)	5.49 (4.56‑6.74)	6.21 (5.03‑7.82)	6.94 (5.46‑9.00)	7.91 (5.96‑10.7)	8.65 (6.29‑12.2)
4-day	1.78 (1.59‑2.04)	2.49 (2.21‑2.85)	3.44 (3.05‑3.95)	4.21 (3.70‑4.88)	5.26 (4.47‑6.31)	6.06 (5.04‑7.44)	6.88 (5.57‑8.66)	7.71 (6.07‑10.0)	8.84 (6.66‑12.0)	9.70 (7.05‑13.6)
7-day	1.99 (1.78‑2.28)	2.82 (2.51‑3.24)	3.95 (3.50‑4.54)	4.88 (4.29‑5.66)	6.15 (5.23‑7.39)	7.14 (5.94‑8.77)	8.14 (6.60‑10.3)	9.18 (7.22‑11.9)	10.6 (7.97‑14.3)	11.7 (8.47‑16.4)
10-day	2.11 (1.88‑2.42)	3.02 (2.69‑3.46)	4.26 (3.78‑4.90)	5.29 (4.66‑6.14)	6.73 (5.72‑8.08)	7.85 (6.52‑9.63)	8.99 (7.28‑11.3)	10.2 (8.01‑13.2)	11.8 (8.89‑16.0)	13.1 (9.48‑18.3)
20-day	2.50 (2.23‑2.86)	3.63 (3.23‑4.16)	5.20 (4.62‑5.98)	6.54 (5.75‑7.58)	8.45 (7.18‑10.1)	9.97 (8.29‑12.2)	11.6 (9.36‑14.6)	13.2 (10.4‑17.2)	15.5 (11.7‑21.0)	17.3 (12.6‑24.3)
30-day	2.93 (2.62‑3.36)	4.26 (3.79‑4.88)	6.14 (5.45‑7.06)	7.77 (6.84‑9.01)	10.1 (8.60‑12.2)	12.0 (9.99‑14.8)	14.0 (11.4‑17.7)	16.1 (12.7‑20.9)	19.1 (14.4‑25.8)	21.4 (15.6‑30.1)
45-day	3.52 (3.14‑4.03)	5.08 (4.52‑5.82)	7.32 (6.50‑8.42)	9.28 (8.17‑10.8)	12.2 (10.3‑14.6)	14.5 (12.1‑17.9)	17.0 (13.8‑21.5)	19.7 (15.5‑25.6)	23.5 (17.7‑31.8)	26.5 (19.3‑37.2)
60-day	4.03 (3.60‑4.62)	5.77 (5.14‑6.61)	8.30 (7.37‑9.54)	10.5 (9.27‑12.2)	13.8 (11.8‑16.6)	16.6 (13.8‑20.3)	19.5 (15.8‑24.6)	22.6 (17.8‑29.3)	27.0 (20.4‑36.6)	30.6 (22.2‑43.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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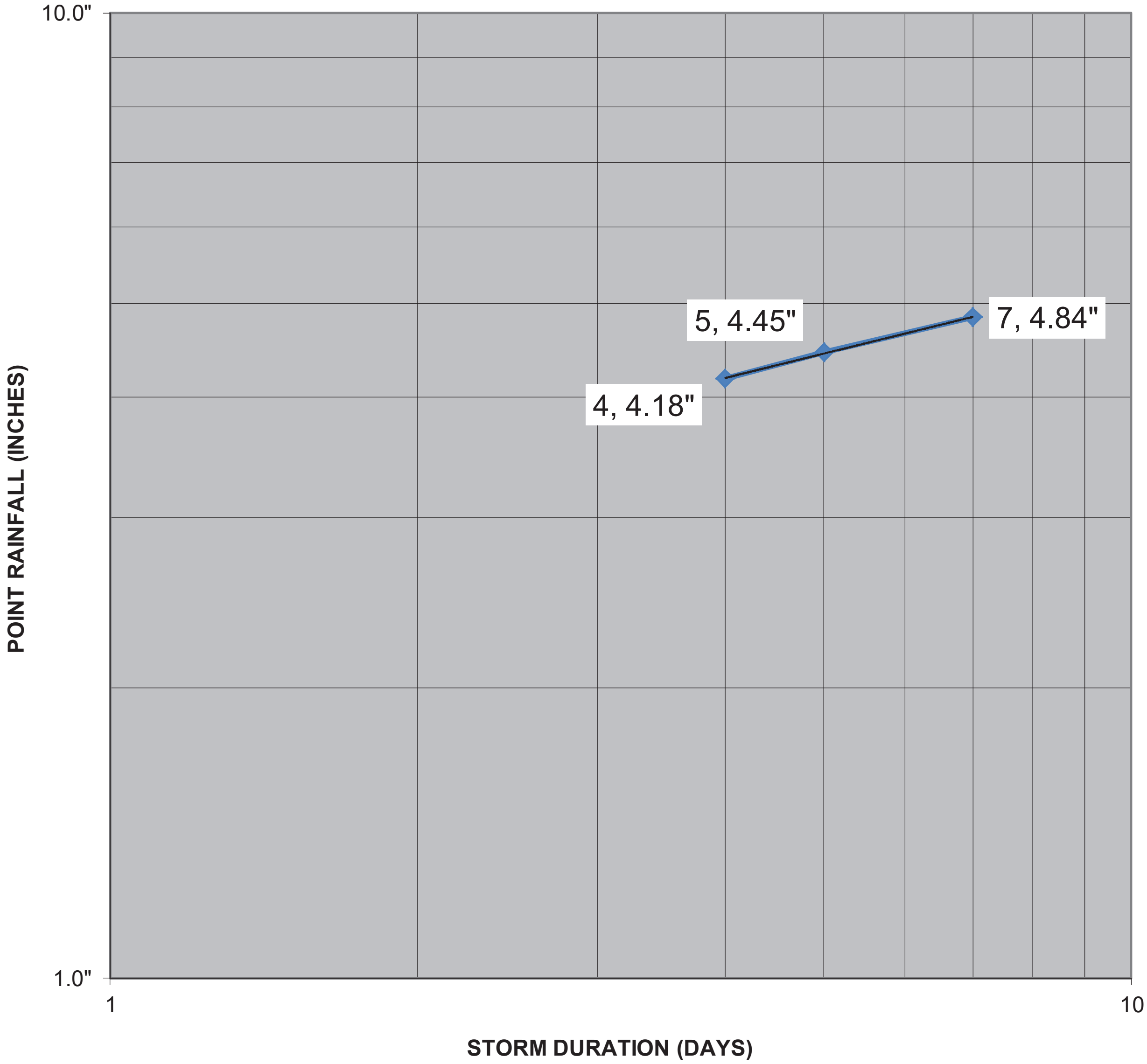
PF graphical



Rainfall Event:

10yr	4	day	4.18"
10yr	5	day	4.45"
10yr	7	day	4.84"

RAINFALL PLOTTING SHEET

MASTER DRAINAGE STUDY
SPA 5a

NOAA Atlas 14, Volume 6, Version 2
Location name: Lebec, California, US*
Coordinates: 34.9478, -118.9000
Elevation: 1302 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	**2**	**5**	**10**	**25**	**50**	**100**	**200**	**500**	**1000**
5-min	**0.072** (0.059–0.088)	**0.096** (0.079–0.117)	**0.129** (0.106–0.158)	**0.157** (0.128–0.194)	**0.197** (0.155–0.253)	**0.230** (0.177–0.301)	**0.265** (0.199–0.355)	**0.302** (0.221–0.417)	**0.355** (0.249–0.512)	**0.399** (0.270–0.594)
10-min	**0.103** (0.085–0.126)	**0.137** (0.113–0.168)	**0.184** (0.151–0.227)	**0.225** (0.183–0.278)	**0.282** (0.222–0.362)	**0.329** (0.254–0.431)	**0.379** (0.285–0.509)	**0.433** (0.317–0.598)	**0.509** (0.357–0.733)	**0.571** (0.387–0.852)
15-min	**0.124** (0.103–0.152)	**0.166** (0.137–0.203)	**0.223** (0.183–0.274)	**0.272** (0.221–0.337)	**0.342** (0.269–0.438)	**0.398** (0.307–0.522)	**0.459** (0.345–0.616)	**0.524** (0.383–0.723)	**0.616** (0.432–0.887)	**0.691** (0.468–1.03)
30-min	**0.178** (0.147–0.218)	**0.237** (0.195–0.290)	**0.319** (0.262–0.392)	**0.388** (0.316–0.481)	**0.488** (0.384–0.626)	**0.569** (0.439–0.745)	**0.655** (0.493–0.880)	**0.748** (0.547–1.03)	**0.880** (0.617–1.27)	**0.987** (0.668–1.47)
60-min	**0.261** (0.215–0.320)	**0.348** (0.287–0.427)	**0.468** (0.384–0.575)	**0.570** (0.464–0.706)	**0.717** (0.565–0.919)	**0.836** (0.645–1.10)	**0.963** (0.724–1.29)	**1.10** (0.804–1.52)	**1.29** (0.906–1.86)	**1.45** (0.982–2.16)
2-hr	**0.398** (0.329–0.488)	**0.525** (0.432–0.644)	**0.696** (0.572–0.856)	**0.839** (0.683–1.04)	**1.04** (0.818–1.33)	**1.20** (0.924–1.57)	**1.36** (1.03–1.83)	**1.54** (1.12–2.12)	**1.78** (1.25–2.56)	**1.96** (1.33–2.93)
3-hr	**0.505** (0.416–0.618)	**0.662** (0.545–0.812)	**0.872** (0.717–1.07)	**1.05** (0.853–1.30)	**1.29** (1.02–1.65)	**1.48** (1.14–1.94)	**1.68** (1.26–2.25)	**1.88** (1.37–2.59)	**2.16** (1.51–3.10)	**2.37** (1.61–3.53)
6-hr	**0.727** (0.600–0.891)	**0.952** (0.784–1.17)	**1.25** (1.02–1.53)	**1.49** (1.21–1.85)	**1.82** (1.43–2.33)	**2.07** (1.60–2.72)	**2.33** (1.76–3.13)	**2.60** (1.90–3.59)	**2.96** (2.07–4.26)	**3.22** (2.18–4.81)
12-hr	**0.977** (0.806–1.20)	**1.29** (1.07–1.59)	**1.71** (1.40–2.10)	**2.04** (1.66–2.53)	**2.49** (1.96–3.19)	**2.83** (2.18–3.71)	**3.17** (2.39–4.26)	**3.52** (2.57–4.86)	**3.97** (2.79–5.72)	**4.32** (2.92–6.43)
24-hr	**1.27** (1.13–1.46)	**1.71** (1.52–1.97)	**2.29** (2.03–2.63)	**2.74** (2.41–3.19)	**3.35** (2.85–4.03)	**3.82** (3.17–4.69)	**4.28** (3.46–5.39)	**4.74** (3.73–6.15)	**5.35** (4.03–7.25)	**5.81** (4.22–8.15)
2-day	**1.51** (1.35–1.74)	**2.07** (1.84–2.38)	**2.80** (2.48–3.23)	**3.39** (2.98–3.94)	**4.18** (3.55–5.02)	**4.77** (3.96–5.86)	**5.37** (4.35–6.76)	**5.97** (4.69–7.74)	**6.76** (5.09–9.16)	**7.35** (5.35–10.3)
3-day	**1.65** (1.47–1.90)	**2.29** (2.04–2.63)	**3.14** (2.78–3.61)	**3.83** (3.36–4.44)	**4.75** (4.03–5.71)	**5.45** (4.53–6.70)	**6.16** (4.99–7.77)	**6.89** (5.42–8.94)	**7.86** (5.92–10.6)	**8.59** (6.25–12.1)
4-day	**1.77** (1.57–2.03)	**2.47** (2.20–2.84)	**3.41** (3.02–3.93)	**4.18** (3.67–4.85)	**5.22** (4.43–6.27)	**6.02** (5.00–7.39)	**6.83** (5.53–8.60)	**7.66** (6.02–9.93)	**8.78** (6.61–11.9)	**9.63** (7.00–13.5)
7-day	**1.98** (1.76–2.27)	**2.80** (2.49–3.22)	**3.92** (3.47–4.51)	**4.84** (4.25–5.62)	**6.11** (5.18–7.34)	**7.08** (5.88–8.70)	**8.08** (6.54–10.2)	**9.10** (7.16–11.8)	**10.5** (7.91–14.2)	**11.6** (8.40–16.2)
10-day	**2.11** (1.87–2.42)	**3.01** (2.67–3.45)	**4.24** (3.75–4.88)	**5.26** (4.62–6.11)	**6.68** (5.67–8.03)	**7.79** (6.47–9.57)	**8.92** (7.23–11.2)	**10.1** (7.94–13.1)	**11.7** (8.82–15.9)	**13.0** (9.42–18.2)
20-day	**2.50** (2.23–2.87)	**3.62** (3.22–4.16)	**5.19** (4.60–5.97)	**6.52** (5.72–7.57)	**8.41** (7.14–10.1)	**9.92** (8.24–12.2)	**11.5** (9.31–14.5)	**13.2** (10.3–17.1)	**15.4** (11.6–20.9)	**17.2** (12.5–24.2)
30-day	**2.94** (2.61–3.37)	**4.26** (3.78–4.89)	**6.13** (5.43–7.06)	**7.75** (6.81–9.00)	**10.1** (8.57–12.1)	**12.0** (9.95–14.7)	**14.0** (11.3–17.6)	**16.1** (12.6–20.8)	**19.0** (14.3–25.7)	**21.3** (15.5–29.9)
45-day	**3.53** (3.14–4.04)	**5.08** (4.52–5.83)	**7.32** (6.49–8.43)	**9.27** (8.15–10.8)	**12.1** (10.3–14.6)	**14.5** (12.0–17.8)	**17.0** (13.8–21.4)	**19.6** (15.4–25.5)	**23.4** (17.6–31.7)	**26.4** (19.2–37.0)
60-day	**4.05** (3.60–4.64)	**5.78** (5.14–6.64)	**8.31** (7.36–9.57)	**10.5** (9.26–12.2)	**13.8** (11.7–16.6)	**16.5** (13.7–20.3)	**19.4** (15.7–24.5)	**22.5** (17.7–29.2)	**26.9** (20.3–36.5)	**30.5** (22.2–42.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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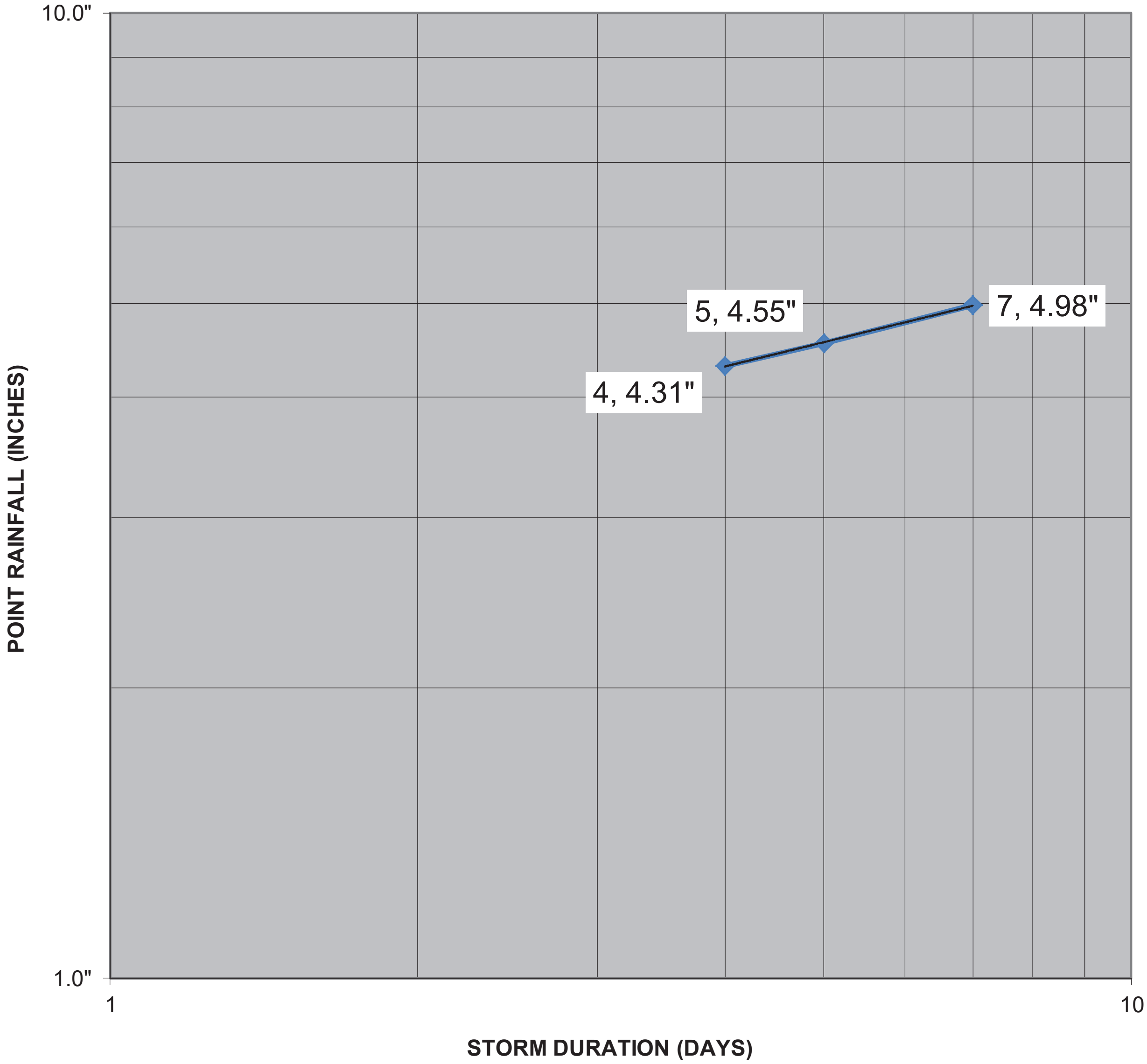
PF graphical



Rainfall Event:

10yr	4 day	4.31"
10yr	5 day	4.55"
10yr	7 day	4.98"

RAINFALL PLOTTING SHEET

MASTER DRAINAGE STUDY
SPA 5b

NOAA Atlas 14, Volume 6, Version 2
Location name: Lebec, California, US*
Coordinates: 34.9381, -118.8732
Elevation: 1276 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.075 (0.062–0.091)	0.099 (0.082–0.121)	0.133 (0.110–0.163)	0.162 (0.132–0.200)	0.203 (0.161–0.260)	0.237 (0.183–0.309)	0.272 (0.205–0.365)	0.310 (0.227–0.427)	0.364 (0.256–0.524)	0.408 (0.277–0.608)
10-min	0.107 (0.089–0.131)	0.142 (0.118–0.174)	0.191 (0.158–0.234)	0.232 (0.190–0.287)	0.291 (0.230–0.373)	0.339 (0.262–0.443)	0.390 (0.294–0.522)	0.444 (0.326–0.613)	0.522 (0.366–0.751)	0.585 (0.396–0.872)
15-min	0.129 (0.107–0.158)	0.172 (0.142–0.210)	0.231 (0.191–0.283)	0.281 (0.230–0.347)	0.352 (0.278–0.451)	0.410 (0.317–0.536)	0.472 (0.356–0.632)	0.537 (0.394–0.741)	0.631 (0.443–0.908)	0.707 (0.479–1.05)
30-min	0.184 (0.152–0.224)	0.244 (0.202–0.298)	0.328 (0.270–0.402)	0.398 (0.326–0.492)	0.500 (0.395–0.639)	0.582 (0.450–0.760)	0.669 (0.504–0.896)	0.762 (0.558–1.05)	0.895 (0.628–1.29)	1.00 (0.680–1.50)
60-min	0.268 (0.222–0.328)	0.357 (0.295–0.436)	0.479 (0.395–0.587)	0.583 (0.476–0.720)	0.731 (0.577–0.935)	0.851 (0.658–1.11)	0.978 (0.738–1.31)	1.12 (0.817–1.54)	1.31 (0.919–1.88)	1.47 (0.994–2.19)
2-hr	0.408 (0.338–0.498)	0.537 (0.444–0.656)	0.711 (0.586–0.871)	0.856 (0.700–1.06)	1.06 (0.837–1.36)	1.22 (0.944–1.59)	1.39 (1.05–1.86)	1.56 (1.15–2.15)	1.81 (1.27–2.60)	2.00 (1.35–2.98)
3-hr	0.517 (0.428–0.631)	0.678 (0.561–0.829)	0.893 (0.736–1.09)	1.07 (0.875–1.32)	1.32 (1.04–1.68)	1.51 (1.17–1.97)	1.71 (1.29–2.29)	1.92 (1.40–2.64)	2.20 (1.54–3.16)	2.42 (1.64–3.60)
6-hr	0.749 (0.620–0.914)	0.980 (0.810–1.20)	1.28 (1.06–1.57)	1.53 (1.25–1.89)	1.87 (1.48–2.39)	2.13 (1.65–2.79)	2.40 (1.81–3.21)	2.67 (1.96–3.68)	3.04 (2.13–4.37)	3.32 (2.25–4.95)
12-hr	1.01 (0.836–1.23)	1.34 (1.10–1.63)	1.76 (1.45–2.16)	2.10 (1.72–2.60)	2.57 (2.03–3.28)	2.92 (2.26–3.81)	3.27 (2.47–4.39)	3.63 (2.66–5.01)	4.10 (2.88–5.90)	4.46 (3.02–6.64)
24-hr	1.32 (1.17–1.52)	1.78 (1.58–2.04)	2.37 (2.09–2.73)	2.84 (2.49–3.30)	3.47 (2.94–4.18)	3.95 (3.27–4.85)	4.42 (3.58–5.57)	4.90 (3.85–6.36)	5.53 (4.17–7.49)	6.01 (4.37–8.42)
2-day	1.57 (1.39–1.80)	2.14 (1.90–2.46)	2.89 (2.56–3.34)	3.50 (3.07–4.07)	4.31 (3.65–5.19)	4.92 (4.08–6.05)	5.54 (4.48–6.98)	6.16 (4.84–7.99)	6.98 (5.26–9.45)	7.60 (5.53–10.7)
3-day	1.71 (1.52–1.97)	2.37 (2.10–2.72)	3.24 (2.86–3.74)	3.94 (3.46–4.59)	4.90 (4.15–5.89)	5.62 (4.67–6.92)	6.36 (5.15–8.02)	7.11 (5.59–9.23)	8.12 (6.12–11.0)	8.89 (6.47–12.5)
4-day	1.83 (1.63–2.10)	2.55 (2.26–2.94)	3.52 (3.11–4.06)	4.31 (3.78–5.01)	5.38 (4.56–6.48)	6.20 (5.15–7.63)	7.04 (5.70–8.88)	7.91 (6.22–10.3)	9.07 (6.84–12.3)	9.97 (7.25–14.0)
7-day	2.05 (1.82–2.36)	2.90 (2.57–3.33)	4.04 (3.57–4.66)	4.98 (4.37–5.80)	6.28 (5.33–7.56)	7.29 (6.05–8.96)	8.31 (6.73–10.5)	9.37 (7.37–12.2)	10.8 (8.15–14.6)	11.9 (8.68–16.7)
10-day	2.19 (1.94–2.51)	3.11 (2.76–3.57)	4.36 (3.86–5.03)	5.41 (4.75–6.30)	6.87 (5.82–8.27)	8.00 (6.64–9.84)	9.17 (7.42–11.6)	10.4 (8.16–13.5)	12.0 (9.08–16.3)	13.3 (9.70–18.7)
20-day	2.60 (2.31–2.99)	3.75 (3.33–4.32)	5.35 (4.73–6.18)	6.71 (5.89–7.81)	8.64 (7.33–10.4)	10.2 (8.45–12.5)	11.8 (9.55–14.9)	13.5 (10.6–17.5)	15.8 (11.9–21.4)	17.7 (12.9–24.8)
30-day	3.06 (2.72–3.52)	4.42 (3.92–5.08)	6.34 (5.61–7.31)	7.99 (7.01–9.30)	10.4 (8.80–12.5)	12.3 (10.2–15.1)	14.3 (11.6–18.1)	16.5 (12.9–21.4)	19.5 (14.7–26.3)	21.8 (15.9–30.6)
45-day	3.68 (3.27–4.22)	5.28 (4.68–6.07)	7.56 (6.69–8.73)	9.56 (8.38–11.1)	12.5 (10.6–15.0)	14.9 (12.3–18.3)	17.4 (14.1–21.9)	20.1 (15.8–26.1)	23.9 (18.0–32.4)	27.0 (19.6–37.9)
60-day	4.23 (3.75–4.86)	6.01 (5.33–6.92)	8.60 (7.61–9.92)	10.9 (9.53–12.6)	14.2 (12.0–17.1)	17.0 (14.1–20.9)	19.9 (16.1–25.1)	23.0 (18.1–29.9)	27.5 (20.8–37.3)	31.2 (22.7–43.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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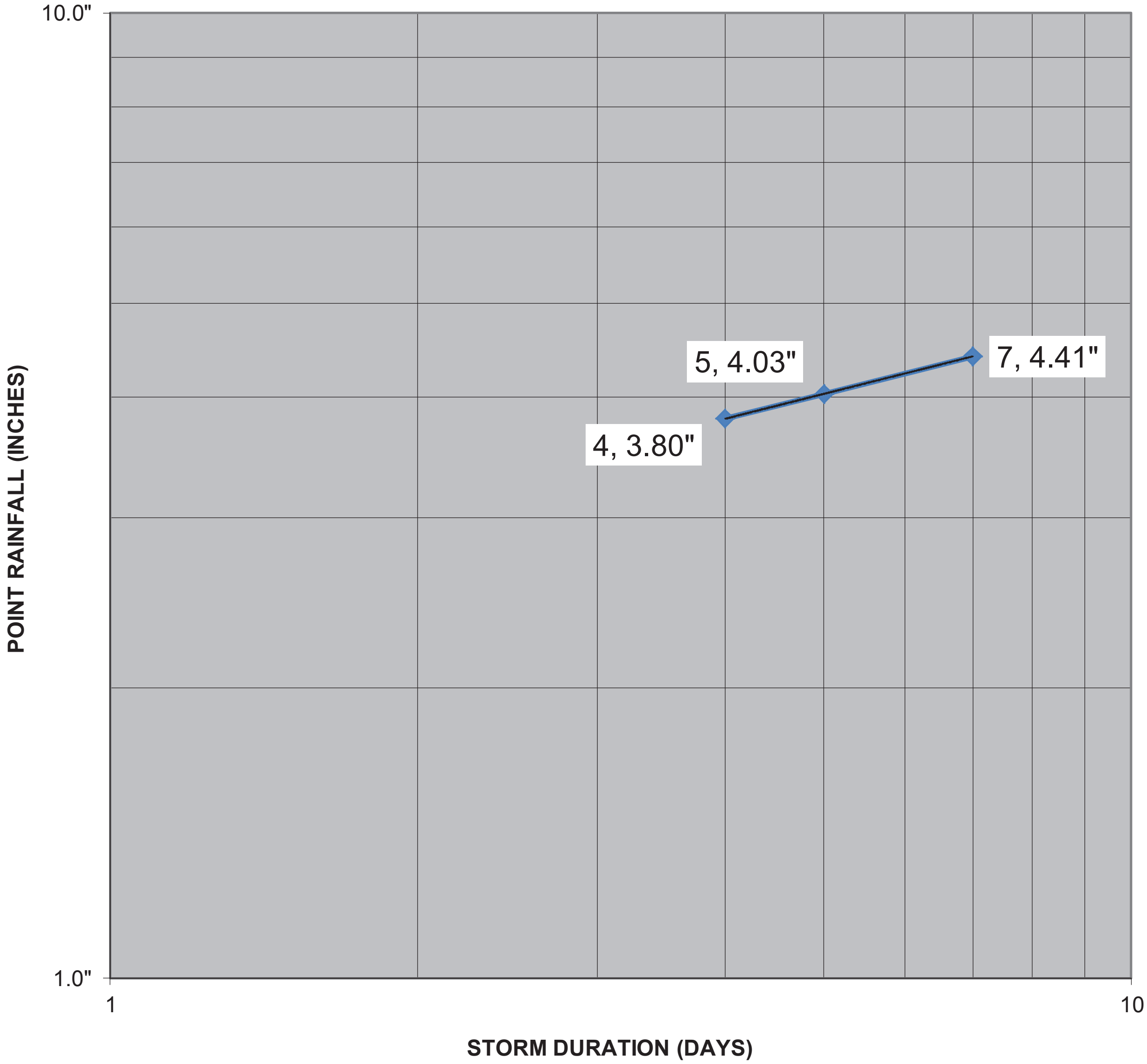
PF graphical



Rainfall Event:

10yr	4 day	3.80"
10yr	5 day	4.03"
10yr	7 day	4.41"

RAINFALL PLOTTING SHEET

MASTER DRAINAGE STUDY
SPA 6a

NOAA Atlas 14, Volume 6, Version 2
Location name: Arvin, California, US*
Coordinates: 34.9729, -118.9250
Elevation: 1196 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.067** (0.055–0.082)	**0.089** (0.072–0.109)	**0.119** (0.097–0.148)	**0.145** (0.118–0.181)	**0.183** (0.144–0.237)	**0.214** (0.165–0.282)	**0.248** (0.186–0.334)	**0.284** (0.207–0.393)	**0.335** (0.234–0.483)	**0.376** (0.255–0.562)
10-min	**0.096** (0.078–0.118)	**0.127** (0.104–0.157)	**0.171** (0.139–0.212)	**0.208** (0.169–0.260)	**0.263** (0.206–0.339)	**0.307** (0.236–0.405)	**0.355** (0.266–0.479)	**0.406** (0.296–0.563)	**0.480** (0.336–0.692)	**0.539** (0.365–0.805)
15-min	**0.116** (0.095–0.143)	**0.153** (0.126–0.190)	**0.207** (0.169–0.256)	**0.252** (0.204–0.314)	**0.318** (0.249–0.410)	**0.372** (0.285–0.489)	**0.430** (0.322–0.579)	**0.492** (0.358–0.681)	**0.580** (0.406–0.837)	**0.652** (0.442–0.973)
30-min	**0.168** (0.137–0.207)	**0.222** (0.182–0.275)	**0.300** (0.244–0.371)	**0.365** (0.296–0.456)	**0.461** (0.361–0.594)	**0.539** (0.414–0.709)	**0.623** (0.467–0.840)	**0.713** (0.520–0.987)	**0.841** (0.589–1.21)	**0.946** (0.640–1.41)
60-min	**0.247** (0.202–0.304)	**0.327** (0.268–0.404)	**0.441** (0.360–0.546)	**0.537** (0.435–0.671)	**0.678** (0.531–0.875)	**0.793** (0.609–1.04)	**0.917** (0.687–1.24)	**1.05** (0.765–1.45)	**1.24** (0.867–1.79)	**1.39** (0.942–2.08)
2-hr	**0.376** (0.308–0.464)	**0.494** (0.404–0.610)	**0.655** (0.534–0.811)	**0.789** (0.639–0.985)	**0.979** (0.767–1.26)	**1.13** (0.868–1.49)	**1.29** (0.966–1.74)	**1.46** (1.06–2.02)	**1.69** (1.18–2.43)	**1.87** (1.26–2.79)
3-hr	**0.475** (0.389–0.586)	**0.621** (0.508–0.767)	**0.817** (0.666–1.01)	**0.980** (0.793–1.22)	**1.21** (0.947–1.56)	**1.39** (1.07–1.83)	**1.57** (1.18–2.12)	**1.77** (1.29–2.45)	**2.03** (1.42–2.93)	**2.23** (1.51–3.33)
6-hr	**0.674** (0.552–0.831)	**0.879** (0.719–1.09)	**1.15** (0.938–1.42)	**1.37** (1.11–1.71)	**1.68** (1.31–2.16)	**1.91** (1.47–2.52)	**2.15** (1.61–2.90)	**2.40** (1.75–3.32)	**2.73** (1.91–3.94)	**2.98** (2.01–4.44)
12-hr	**0.893** (0.731–1.10)	**1.18** (0.965–1.46)	**1.56** (1.27–1.93)	**1.86** (1.51–2.32)	**2.27** (1.78–2.93)	**2.59** (1.98–3.40)	**2.90** (2.17–3.91)	**3.21** (2.34–4.45)	**3.63** (2.54–5.23)	**3.94** (2.66–5.87)
24-hr	**1.16** (1.03–1.32)	**1.56** (1.39–1.78)	**2.08** (1.85–2.39)	**2.50** (2.20–2.89)	**3.06** (2.60–3.67)	**3.48** (2.90–4.27)	**3.90** (3.16–4.91)	**4.32** (3.40–5.60)	**4.87** (3.67–6.60)	**5.28** (3.83–7.42)
2-day	**1.37** (1.22–1.56)	**1.88** (1.68–2.15)	**2.55** (2.27–2.93)	**3.09** (2.72–3.57)	**3.80** (3.24–4.56)	**4.34** (3.61–5.33)	**4.88** (3.96–6.14)	**5.42** (4.27–7.03)	**6.13** (4.62–8.31)	**6.65** (4.83–9.35)
3-day	**1.50** (1.34–1.71)	**2.08** (1.86–2.38)	**2.86** (2.54–3.28)	**3.48** (3.07–4.03)	**4.32** (3.68–5.18)	**4.96** (4.13–6.08)	**5.60** (4.54–7.05)	**6.25** (4.92–8.10)	**7.11** (5.36–9.64)	**7.76** (5.64–10.9)
4-day	**1.60** (1.43–1.83)	**2.24** (2.00–2.56)	**3.10** (2.76–3.56)	**3.80** (3.35–4.40)	**4.75** (4.04–5.69)	**5.46** (4.55–6.70)	**6.19** (5.02–7.80)	**6.94** (5.46–9.00)	**7.93** (5.97–10.8)	**8.69** (6.31–12.2)
7-day	**1.79** (1.60–2.04)	**2.54** (2.26–2.90)	**3.56** (3.17–4.09)	**4.41** (3.89–5.10)	**5.57** (4.74–6.67)	**6.46** (5.37–7.92)	**7.35** (5.96–9.26)	**8.28** (6.51–10.7)	**9.52** (7.17–12.9)	**10.5** (7.59–14.7)
10-day	**1.90** (1.70–2.17)	**2.73** (2.43–3.12)	**3.86** (3.44–4.43)	**4.81** (4.24–5.56)	**6.12** (5.21–7.34)	**7.13** (5.94–8.75)	**8.17** (6.62–10.3)	**9.24** (7.27–12.0)	**10.7** (8.05–14.5)	**11.8** (8.57–16.6)
20-day	**2.26** (2.02–2.58)	**3.29** (2.94–3.77)	**4.75** (4.23–5.45)	**5.99** (5.28–6.94)	**7.76** (6.61–9.31)	**9.17** (7.63–11.3)	**10.6** (8.62–13.4)	**12.2** (9.58–15.8)	**14.3** (10.7–19.3)	**15.9** (11.5–22.3)
30-day	**2.64** (2.36–3.02)	**3.86** (3.44–4.41)	**5.61** (4.99–6.44)	**7.13** (6.28–8.25)	**9.32** (7.93–11.2)	**11.1** (9.23–13.6)	**12.9** (10.5–16.3)	**14.9** (11.7–19.3)	**17.6** (13.2–23.8)	**19.7** (14.3–27.7)
45-day	**3.18** (2.84–3.63)	**4.62** (4.12–5.29)	**6.72** (5.98–7.71)	**8.56** (7.55–9.91)	**11.3** (9.59–13.5)	**13.5** (11.2–16.6)	**15.8** (12.8–19.9)	**18.3** (14.4–23.8)	**21.8** (16.4–29.6)	**24.6** (17.8–34.6)
60-day	**3.63** (3.25–4.15)	**5.24** (4.68–6.00)	**7.62** (6.78–8.74)	**9.72** (8.57–11.3)	**12.8** (10.9–15.4)	**15.4** (12.8–18.9)	**18.2** (14.7–22.9)	**21.1** (16.6–27.3)	**25.2** (19.0–34.2)	**28.5** (20.7–40.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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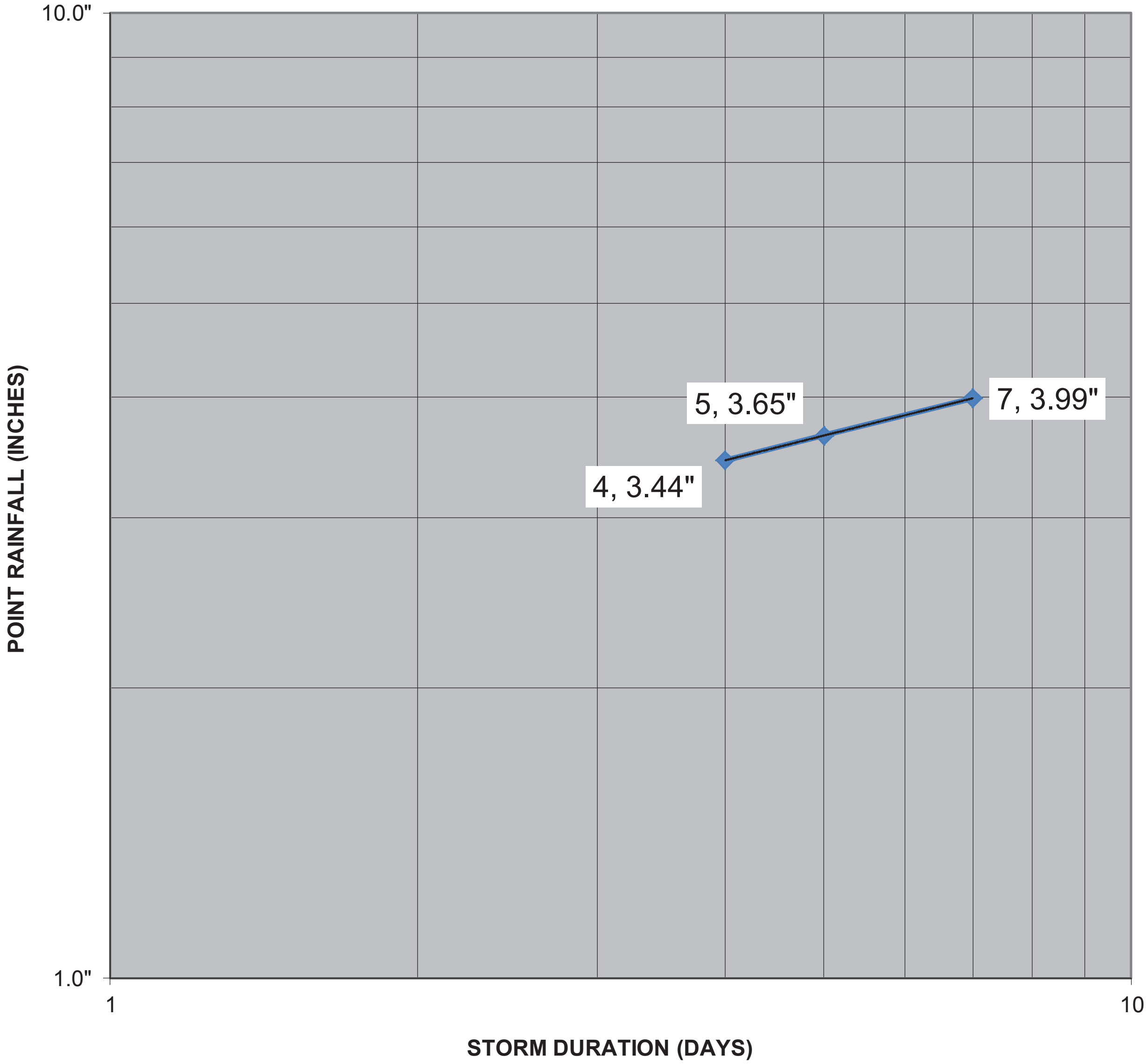
PF graphical



Rainfall Event:

10yr	4 day	3.44"
10yr	5 day	3.65"
10yr	7 day	3.99"

RAINFALL PLOTTING SHEET

MASTER DRAINAGE STUDY
SPA 6b

NOAA Atlas 14, Volume 6, Version 2
Location name: Arvin, California, US*
Coordinates: 35.0018, -118.9311
Elevation: 957 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.064 (0.052–0.079)	0.085 (0.069–0.105)	0.114 (0.092–0.141)	0.139 (0.112–0.174)	0.175 (0.137–0.227)	0.205 (0.157–0.271)	0.237 (0.178–0.321)	0.272 (0.198–0.378)	0.322 (0.225–0.465)	0.363 (0.245–0.541)
10-min	0.092 (0.075–0.114)	0.121 (0.099–0.150)	0.163 (0.132–0.203)	0.199 (0.160–0.249)	0.251 (0.196–0.325)	0.294 (0.225–0.388)	0.340 (0.254–0.460)	0.390 (0.284–0.542)	0.462 (0.323–0.667)	0.520 (0.352–0.776)
15-min	0.111 (0.090–0.137)	0.147 (0.119–0.182)	0.197 (0.160–0.245)	0.240 (0.194–0.301)	0.304 (0.237–0.393)	0.356 (0.272–0.469)	0.412 (0.308–0.556)	0.472 (0.343–0.655)	0.558 (0.390–0.806)	0.629 (0.425–0.939)
30-min	0.161 (0.131–0.200)	0.213 (0.173–0.264)	0.286 (0.233–0.356)	0.349 (0.281–0.438)	0.441 (0.345–0.571)	0.517 (0.395–0.682)	0.598 (0.447–0.808)	0.686 (0.499–0.952)	0.811 (0.567–1.17)	0.913 (0.618–1.36)
60-min	0.236 (0.192–0.292)	0.311 (0.254–0.386)	0.418 (0.340–0.520)	0.510 (0.411–0.639)	0.645 (0.503–0.834)	0.755 (0.578–0.997)	0.874 (0.653–1.18)	1.00 (0.729–1.39)	1.19 (0.829–1.71)	1.34 (0.903–1.99)
2-hr	0.358 (0.292–0.443)	0.467 (0.381–0.580)	0.618 (0.502–0.768)	0.745 (0.600–0.933)	0.925 (0.722–1.20)	1.07 (0.818–1.41)	1.22 (0.912–1.65)	1.38 (1.00–1.92)	1.60 (1.12–2.31)	1.77 (1.20–2.65)
3-hr	0.449 (0.366–0.556)	0.584 (0.475–0.724)	0.766 (0.622–0.953)	0.919 (0.741–1.15)	1.13 (0.885–1.47)	1.30 (0.998–1.72)	1.48 (1.11–2.00)	1.66 (1.21–2.31)	1.91 (1.34–2.76)	2.11 (1.42–3.14)
6-hr	0.626 (0.510–0.775)	0.812 (0.661–1.01)	1.06 (0.861–1.32)	1.27 (1.02–1.59)	1.55 (1.21–2.00)	1.76 (1.35–2.33)	1.99 (1.48–2.68)	2.21 (1.61–3.07)	2.52 (1.76–3.64)	2.75 (1.86–4.10)
12-hr	0.816 (0.666–1.01)	1.08 (0.877–1.34)	1.42 (1.15–1.77)	1.70 (1.37–2.13)	2.07 (1.62–2.68)	2.36 (1.81–3.12)	2.65 (1.98–3.58)	2.93 (2.14–4.07)	3.31 (2.31–4.78)	3.58 (2.42–5.35)
24-hr	1.05 (0.940–1.20)	1.42 (1.27–1.62)	1.90 (1.69–2.17)	2.28 (2.01–2.63)	2.79 (2.38–3.34)	3.17 (2.64–3.89)	3.55 (2.88–4.47)	3.93 (3.10–5.10)	4.43 (3.34–6.01)	4.79 (3.48–6.74)
2-day	1.24 (1.11–1.41)	1.70 (1.52–1.94)	2.31 (2.06–2.65)	2.80 (2.47–3.23)	3.45 (2.94–4.13)	3.94 (3.28–4.82)	4.42 (3.59–5.56)	4.90 (3.86–6.36)	5.53 (4.16–7.50)	5.99 (4.34–8.42)
3-day	1.35 (1.21–1.54)	1.88 (1.68–2.14)	2.59 (2.31–2.96)	3.16 (2.79–3.64)	3.91 (3.34–4.69)	4.49 (3.74–5.50)	5.06 (4.11–6.36)	5.64 (4.44–7.31)	6.40 (4.82–8.67)	6.97 (5.05–9.80)
4-day	1.44 (1.29–1.64)	2.02 (1.80–2.30)	2.80 (2.50–3.21)	3.44 (3.04–3.97)	4.29 (3.66–5.14)	4.94 (4.11–6.05)	5.59 (4.54–7.03)	6.25 (4.92–8.10)	7.13 (5.37–9.66)	7.79 (5.65–11.0)
7-day	1.60 (1.43–1.82)	2.28 (2.04–2.61)	3.22 (2.87–3.69)	3.99 (3.53–4.61)	5.04 (4.30–6.04)	5.85 (4.87–7.16)	6.65 (5.40–8.37)	7.48 (5.89–9.69)	8.57 (6.45–11.6)	9.39 (6.81–13.2)
10-day	1.71 (1.53–1.94)	2.46 (2.20–2.81)	3.50 (3.12–4.01)	4.37 (3.86–5.04)	5.57 (4.75–6.67)	6.49 (5.41–7.95)	7.43 (6.03–9.34)	8.39 (6.60–10.9)	9.69 (7.29–13.1)	10.7 (7.74–15.0)
20-day	2.03 (1.81–2.31)	2.98 (2.67–3.40)	4.34 (3.87–4.96)	5.49 (4.85–6.34)	7.14 (6.08–8.55)	8.44 (7.04–10.3)	9.80 (7.95–12.3)	11.2 (8.82–14.5)	13.1 (9.87–17.8)	14.6 (10.6–20.5)
30-day	2.36 (2.11–2.69)	3.48 (3.12–3.98)	5.11 (4.56–5.85)	6.53 (5.77–7.54)	8.58 (7.32–10.3)	10.2 (8.52–12.5)	11.9 (9.69–15.0)	13.7 (10.8–17.8)	16.2 (12.2–22.0)	18.1 (13.1–25.5)
45-day	2.85 (2.55–3.24)	4.18 (3.74–4.77)	6.14 (5.48–7.03)	7.87 (6.95–9.09)	10.4 (8.89–12.5)	12.5 (10.4–15.4)	14.7 (12.0–18.5)	17.0 (13.4–22.1)	20.3 (15.3–27.5)	22.8 (16.5–32.1)
60-day	3.25 (2.91–3.70)	4.74 (4.24–5.41)	6.97 (6.21–7.98)	8.95 (7.91–10.3)	11.9 (10.1–14.2)	14.3 (11.9–17.6)	16.9 (13.7–21.3)	19.7 (15.5–25.5)	23.5 (17.7–31.8)	26.5 (19.2–37.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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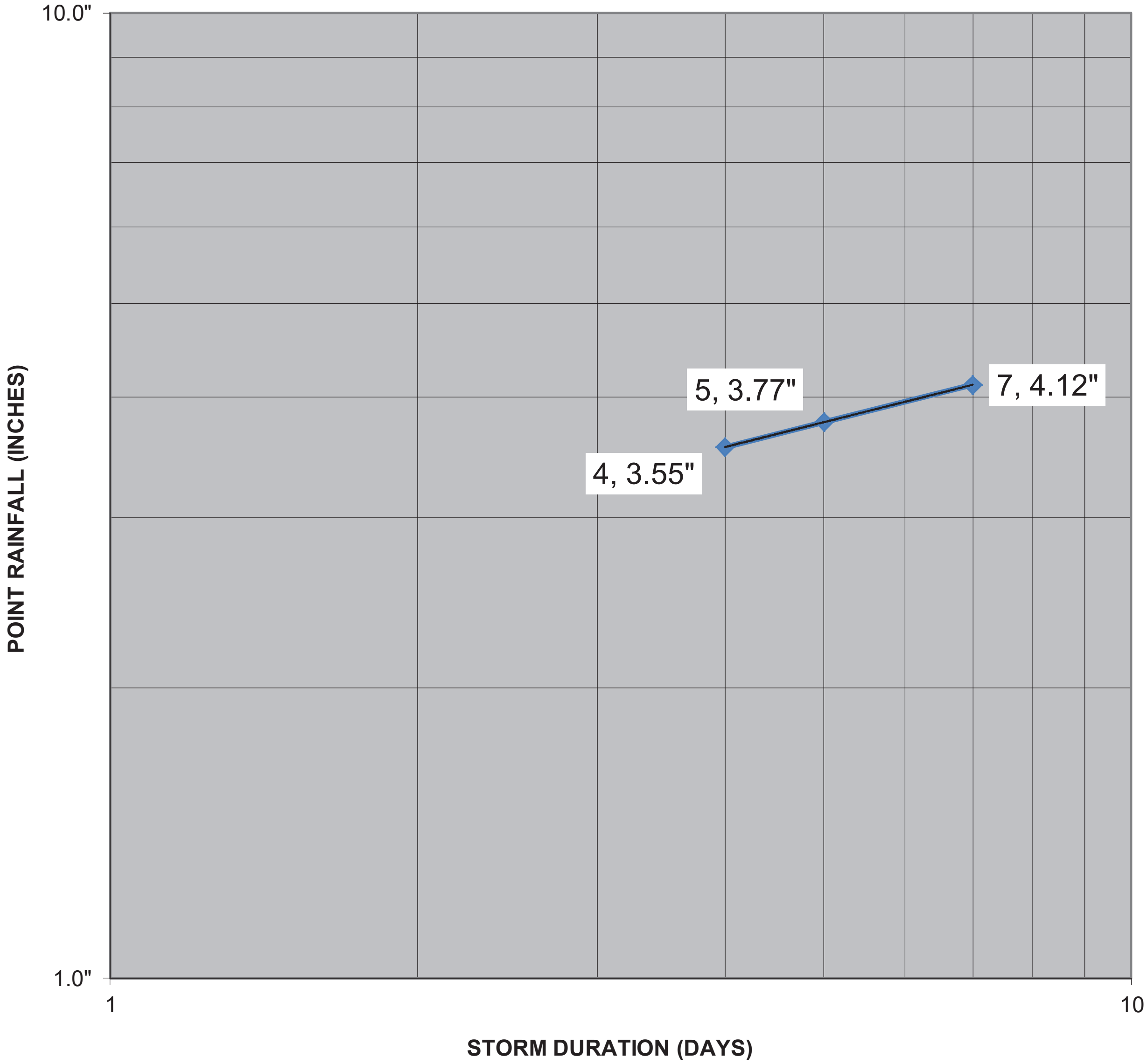
PF graphical



Rainfall Event:

10yr	4 day	3.55"
10yr	5 day	3.77"
10yr	7 day	4.12"

RAINFALL PLOTTING SHEET

MASTER DRAINAGE STUDY
SPA 6c

NOAA Atlas 14, Volume 6, Version 2
Location name: Arvin, California, US*
Coordinates: 34.9887, -118.9044
Elevation: 1037 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	**2**	**5**	**10**	**25**	**50**	**100**	**200**	**500**	**1000**
5-min	**0.064** (0.053–0.079)	**0.085** (0.069–0.105)	**0.114** (0.093–0.141)	**0.139** (0.112–0.173)	**0.175** (0.137–0.225)	**0.205** (0.157–0.269)	**0.237** (0.178–0.319)	**0.272** (0.198–0.376)	**0.322** (0.225–0.464)	**0.363** (0.246–0.541)
10-min	**0.092** (0.076–0.114)	**0.122** (0.100–0.150)	**0.163** (0.133–0.202)	**0.199** (0.161–0.248)	**0.251** (0.197–0.323)	**0.294** (0.225–0.386)	**0.340** (0.255–0.458)	**0.390** (0.284–0.539)	**0.461** (0.323–0.665)	**0.520** (0.352–0.776)
15-min	**0.112** (0.091–0.138)	**0.147** (0.120–0.181)	**0.197** (0.161–0.244)	**0.240** (0.194–0.300)	**0.303** (0.238–0.391)	**0.355** (0.273–0.467)	**0.411** (0.308–0.554)	**0.471** (0.344–0.652)	**0.558** (0.391–0.804)	**0.629** (0.426–0.938)
30-min	**0.162** (0.133–0.200)	**0.214** (0.175–0.263)	**0.286** (0.234–0.354)	**0.349** (0.282–0.435)	**0.440** (0.345–0.567)	**0.515** (0.396–0.678)	**0.597** (0.447–0.804)	**0.684** (0.499–0.947)	**0.810** (0.567–1.17)	**0.913** (0.618–1.36)
60-min	**0.237** (0.194–0.292)	**0.313** (0.256–0.386)	**0.419** (0.342–0.519)	**0.510** (0.413–0.637)	**0.645** (0.505–0.831)	**0.755** (0.579–0.993)	**0.874** (0.655–1.18)	**1.00** (0.731–1.39)	**1.19** (0.830–1.71)	**1.34** (0.905–1.99)
2-hr	**0.361** (0.296–0.444)	**0.470** (0.385–0.580)	**0.620** (0.506–0.767)	**0.746** (0.604–0.931)	**0.926** (0.726–1.19)	**1.07** (0.823–1.41)	**1.22** (0.917–1.65)	**1.38** (1.01–1.92)	**1.61** (1.13–2.32)	**1.78** (1.21–2.66)
3-hr	**0.453** (0.371–0.558)	**0.588** (0.481–0.725)	**0.770** (0.629–0.953)	**0.923** (0.748–1.15)	**1.14** (0.892–1.47)	**1.31** (1.01–1.72)	**1.49** (1.11–2.00)	**1.67** (1.22–2.32)	**1.93** (1.35–2.78)	**2.12** (1.44–3.17)
6-hr	**0.634** (0.520–0.782)	**0.822** (0.673–1.01)	**1.07** (0.875–1.33)	**1.28** (1.04–1.59)	**1.56** (1.23–2.01)	**1.78** (1.37–2.34)	**2.01** (1.51–2.70)	**2.24** (1.63–3.10)	**2.55** (1.79–3.68)	**2.78** (1.89–4.15)
12-hr	**0.832** (0.682–1.03)	**1.10** (0.897–1.35)	**1.44** (1.18–1.79)	**1.72** (1.40–2.15)	**2.11** (1.65–2.71)	**2.40** (1.84–3.15)	**2.69** (2.02–3.62)	**2.98** (2.17–4.13)	**3.36** (2.36–4.85)	**3.65** (2.47–5.44)
24-hr	**1.08** (0.959–1.23)	**1.45** (1.29–1.66)	**1.93** (1.72–2.22)	**2.32** (2.05–2.69)	**2.84** (2.42–3.41)	**3.23** (2.69–3.97)	**3.62** (2.93–4.56)	**4.01** (3.15–5.20)	**4.52** (3.40–6.12)	**4.89** (3.55–6.87)
2-day	**1.27** (1.13–1.45)	**1.74** (1.55–1.99)	**2.36** (2.10–2.71)	**2.86** (2.52–3.31)	**3.51** (2.99–4.22)	**4.01** (3.34–4.92)	**4.51** (3.65–5.67)	**5.00** (3.94–6.49)	**5.65** (4.25–7.65)	**6.12** (4.44–8.60)
3-day	**1.38** (1.23–1.58)	**1.92** (1.71–2.20)	**2.64** (2.35–3.03)	**3.22** (2.83–3.72)	**3.99** (3.39–4.79)	**4.57** (3.80–5.61)	**5.16** (4.18–6.50)	**5.75** (4.53–7.46)	**6.54** (4.92–8.86)	**7.13** (5.18–10.0)
4-day	**1.47** (1.31–1.68)	**2.06** (1.84–2.36)	**2.86** (2.54–3.28)	**3.50** (3.09–4.06)	**4.37** (3.72–5.25)	**5.03** (4.19–6.17)	**5.70** (4.62–7.18)	**6.38** (5.02–8.27)	**7.29** (5.49–9.87)	**7.96** (5.78–11.2)
7-day	**1.65** (1.47–1.88)	**2.34** (2.08–2.68)	**3.29** (2.92–3.77)	**4.06** (3.58–4.71)	**5.13** (4.36–6.15)	**5.95** (4.95–7.30)	**6.77** (5.49–8.52)	**7.61** (5.99–9.87)	**8.74** (6.58–11.8)	**9.58** (6.96–13.5)
10-day	**1.76** (1.57–2.01)	**2.52** (2.25–2.89)	**3.58** (3.18–4.11)	**4.45** (3.92–5.16)	**5.67** (4.82–6.80)	**6.61** (5.49–8.10)	**7.56** (6.13–9.52)	**8.54** (6.72–11.1)	**9.86** (7.43–13.4)	**10.9** (7.89–15.3)
20-day	**2.11** (1.88–2.41)	**3.08** (2.74–3.52)	**4.45** (3.96–5.11)	**5.62** (4.95–6.51)	**7.28** (6.20–8.74)	**8.61** (7.16–10.6)	**9.98** (8.09–12.6)	**11.4** (8.98–14.8)	**13.3** (10.1–18.1)	**14.8** (10.8–20.9)
30-day	**2.47** (2.20–2.82)	**3.61** (3.22–4.13)	**5.27** (4.68–6.05)	**6.70** (5.90–7.76)	**8.78** (7.47–10.5)	**10.4** (8.69–12.8)	**12.2** (9.87–15.3)	**14.0** (11.0–18.2)	**16.5** (12.4–22.4)	**18.5** (13.4–25.9)
45-day	**2.98** (2.66–3.40)	**4.34** (3.87–4.97)	**6.34** (5.63–7.27)	**8.09** (7.13–9.37)	**10.7** (9.08–12.8)	**12.8** (10.6–15.7)	**15.0** (12.2–18.9)	**17.4** (13.7–22.5)	**20.6** (15.5–27.9)	**23.2** (16.8–32.6)
60-day	**3.41** (3.04–3.89)	**4.94** (4.40–5.65)	**7.20** (6.40–8.27)	**9.21** (8.12–10.7)	**12.2** (10.4–14.6)	**14.7** (12.2–18.0)	**17.3** (14.0–21.7)	**20.0** (15.8–26.0)	**23.9** (18.0–32.4)	**26.9** (19.6–37.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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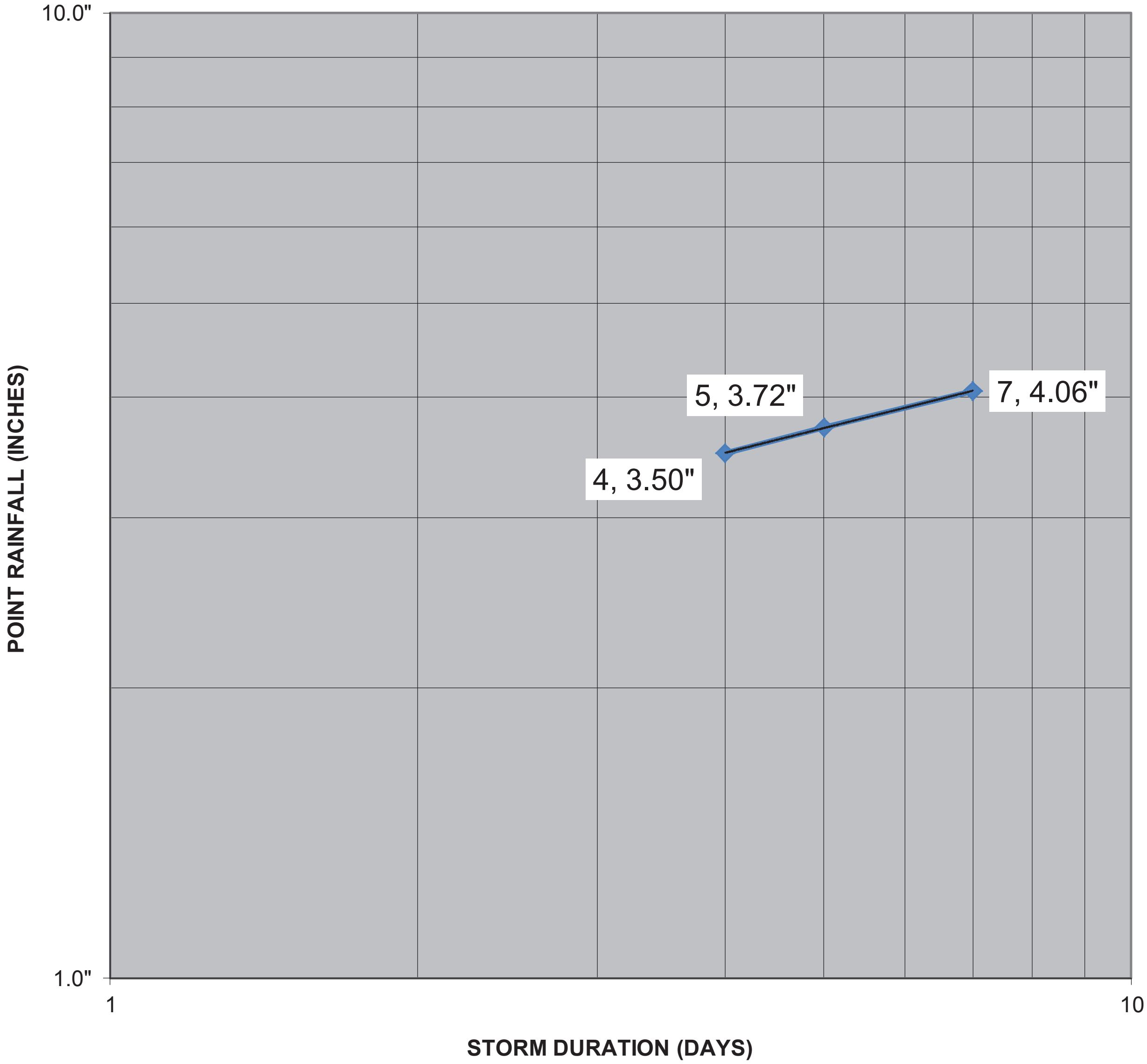
PF graphical



Rainfall Event:

10yr	4 day	3.50"
10yr	5 day	3.72"
10yr	7 day	4.06"

RAINFALL PLOTTING SHEET

MASTER DRAINAGE STUDY
SPA 6d

NOAA Atlas 14, Volume 6, Version 2
Location name: Arvin, California, US*
Coordinates: 34.9976, -118.8956
Elevation: 957 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.063 (0.052–0.078)	0.083 (0.068–0.102)	0.111 (0.091–0.138)	0.136 (0.110–0.169)	0.172 (0.135–0.221)	0.202 (0.155–0.266)	0.235 (0.176–0.316)	0.270 (0.197–0.374)	0.322 (0.226–0.465)	0.365 (0.247–0.545)
10-min	0.091 (0.075–0.112)	0.119 (0.098–0.147)	0.160 (0.131–0.197)	0.195 (0.158–0.242)	0.247 (0.194–0.317)	0.290 (0.223–0.381)	0.337 (0.253–0.453)	0.388 (0.283–0.536)	0.462 (0.324–0.666)	0.523 (0.354–0.781)
15-min	0.110 (0.090–0.135)	0.144 (0.118–0.177)	0.193 (0.158–0.238)	0.235 (0.191–0.293)	0.298 (0.234–0.384)	0.350 (0.269–0.460)	0.407 (0.306–0.548)	0.469 (0.342–0.649)	0.559 (0.391–0.805)	0.633 (0.428–0.944)
30-min	0.158 (0.130–0.194)	0.208 (0.170–0.256)	0.278 (0.228–0.343)	0.339 (0.275–0.422)	0.430 (0.337–0.553)	0.505 (0.388–0.663)	0.586 (0.440–0.789)	0.675 (0.493–0.934)	0.804 (0.564–1.16)	0.911 (0.617–1.36)
60-min	0.231 (0.189–0.284)	0.303 (0.248–0.373)	0.406 (0.332–0.501)	0.495 (0.401–0.616)	0.627 (0.492–0.806)	0.736 (0.566–0.967)	0.855 (0.642–1.15)	0.985 (0.719–1.36)	1.17 (0.822–1.69)	1.33 (0.900–1.98)
2-hr	0.349 (0.287–0.430)	0.453 (0.372–0.558)	0.597 (0.489–0.738)	0.720 (0.584–0.896)	0.896 (0.704–1.15)	1.04 (0.799–1.37)	1.19 (0.893–1.60)	1.35 (0.986–1.87)	1.58 (1.10–2.27)	1.76 (1.19–2.62)
3-hr	0.438 (0.359–0.538)	0.566 (0.464–0.697)	0.740 (0.606–0.914)	0.888 (0.721–1.11)	1.10 (0.862–1.41)	1.27 (0.973–1.66)	1.44 (1.08–1.94)	1.63 (1.19–2.25)	1.88 (1.32–2.71)	2.08 (1.41–3.10)
6-hr	0.609 (0.500–0.749)	0.787 (0.645–0.969)	1.02 (0.838–1.27)	1.22 (0.991–1.52)	1.50 (1.17–1.92)	1.71 (1.31–2.24)	1.93 (1.45–2.59)	2.15 (1.57–2.98)	2.46 (1.72–3.55)	2.69 (1.82–4.02)
12-hr	0.794 (0.652–0.977)	1.04 (0.856–1.29)	1.37 (1.12–1.70)	1.64 (1.33–2.04)	2.00 (1.57–2.58)	2.28 (1.75–3.00)	2.56 (1.92–3.44)	2.84 (2.07–3.93)	3.21 (2.25–4.62)	3.48 (2.35–5.19)
24-hr	1.03 (0.915–1.17)	1.38 (1.23–1.58)	1.84 (1.64–2.12)	2.21 (1.95–2.56)	2.70 (2.30–3.25)	3.08 (2.56–3.77)	3.44 (2.79–4.33)	3.81 (3.00–4.94)	4.29 (3.23–5.81)	4.64 (3.37–6.51)
2-day	1.20 (1.07–1.37)	1.65 (1.47–1.89)	2.23 (1.98–2.57)	2.70 (2.38–3.13)	3.33 (2.83–4.00)	3.80 (3.16–4.66)	4.26 (3.45–5.37)	4.73 (3.72–6.14)	5.34 (4.02–7.23)	5.78 (4.20–8.11)
3-day	1.31 (1.16–1.49)	1.81 (1.61–2.08)	2.49 (2.21–2.87)	3.04 (2.68–3.52)	3.77 (3.20–4.53)	4.32 (3.59–5.31)	4.88 (3.95–6.14)	5.43 (4.28–7.05)	6.17 (4.65–8.36)	6.73 (4.89–9.45)
4-day	1.39 (1.24–1.59)	1.95 (1.73–2.23)	2.70 (2.40–3.10)	3.31 (2.91–3.84)	4.13 (3.51–4.96)	4.75 (3.95–5.83)	5.38 (4.36–6.78)	6.02 (4.74–7.81)	6.87 (5.18–9.31)	7.51 (5.46–10.5)
7-day	1.55 (1.39–1.78)	2.21 (1.96–2.53)	3.10 (2.75–3.56)	3.83 (3.38–4.45)	4.84 (4.11–5.81)	5.61 (4.66–6.88)	6.38 (5.17–8.03)	7.16 (5.64–9.29)	8.22 (6.19–11.1)	9.00 (6.54–12.6)
10-day	1.67 (1.49–1.91)	2.39 (2.13–2.74)	3.39 (3.01–3.89)	4.22 (3.71–4.89)	5.37 (4.56–6.44)	6.25 (5.19–7.67)	7.15 (5.79–9.00)	8.06 (6.34–10.5)	9.31 (7.01–12.6)	10.2 (7.44–14.4)
20-day	2.02 (1.80–2.31)	2.95 (2.63–3.38)	4.27 (3.79–4.90)	5.38 (4.74–6.24)	6.97 (5.92–8.37)	8.23 (6.84–10.1)	9.54 (7.73–12.0)	10.9 (8.57–14.1)	12.7 (9.59–17.2)	14.1 (10.3–19.9)
30-day	2.37 (2.12–2.72)	3.47 (3.09–3.98)	5.06 (4.49–5.82)	6.44 (5.66–7.46)	8.43 (7.16–10.1)	10.0 (8.33–12.3)	11.7 (9.46–14.7)	13.4 (10.6–17.4)	15.8 (11.9–21.4)	17.6 (12.8–24.8)
45-day	2.88 (2.56–3.29)	4.20 (3.74–4.81)	6.12 (5.43–7.03)	7.81 (6.87–9.05)	10.3 (8.75–12.4)	12.3 (10.3–15.1)	14.5 (11.7–18.2)	16.7 (13.1–21.7)	19.8 (14.9–26.8)	22.2 (16.2–31.2)
60-day	3.30 (2.94–3.77)	4.78 (4.26–5.48)	6.97 (6.19–8.02)	8.92 (7.85–10.3)	11.8 (10.0–14.2)	14.2 (11.8–17.4)	16.7 (13.5–21.0)	19.3 (15.2–25.1)	23.0 (17.3–31.2)	25.9 (18.8–36.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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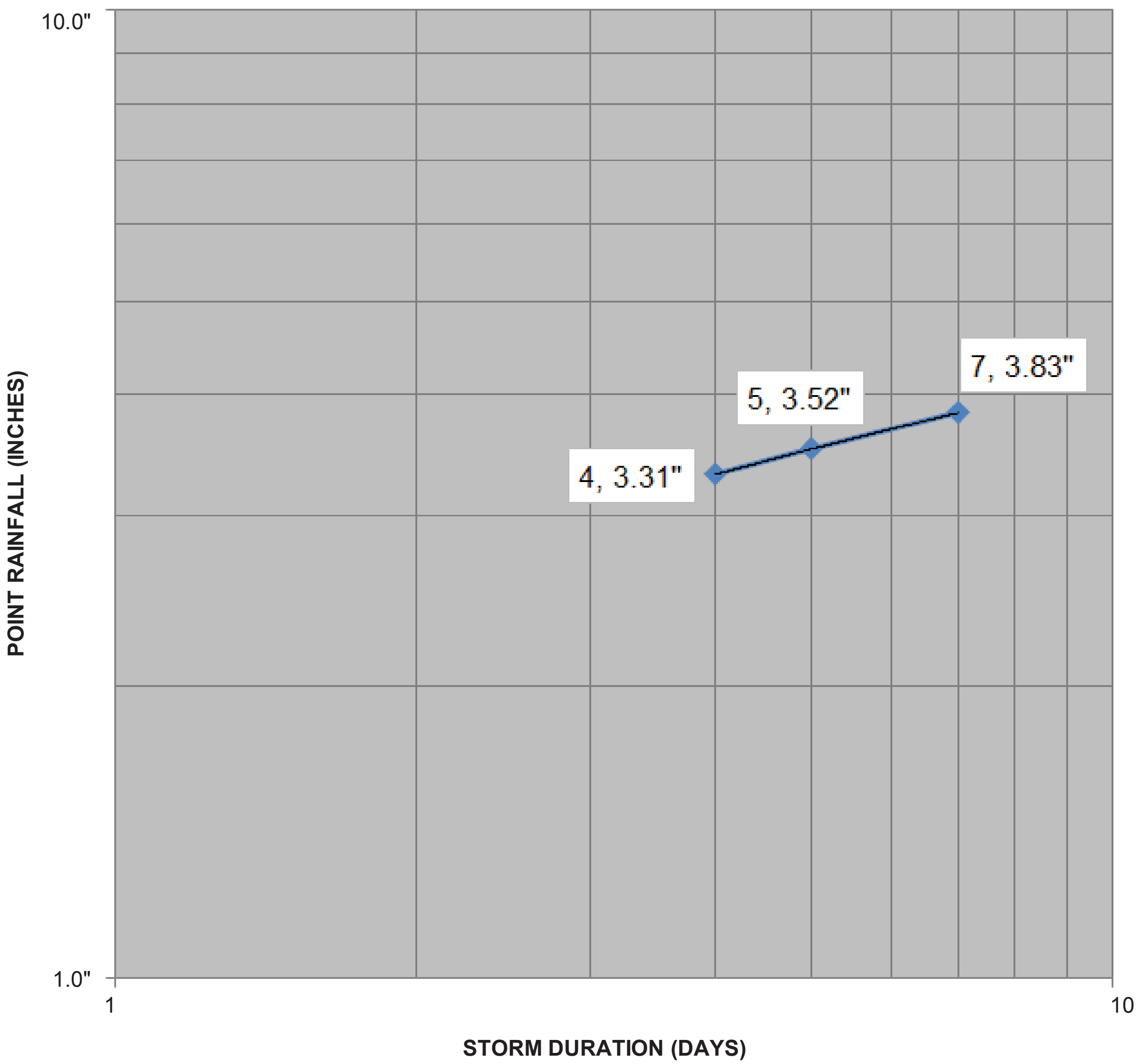
PF graphical



Rainfall Event:

10yr	4 day	3.31"
10yr	5 day	3.52"
10yr	7 day	3.83"

RAINFALL PLOTTING SHEET

MASTER DRAINAGE STUDY
SPA 6e

NOAA Atlas 14, Volume 6, Version 2
Location name: Arvin, California, US*
Latitude: 34.9978°, Longitude: -118.8901°
Elevation: 936 ft*
* source: Google Maps

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PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.063 (0.052-0.078)	0.083 (0.068-0.102)	0.111 (0.091-0.138)	0.136 (0.110-0.169)	0.172 (0.135-0.221)	0.202 (0.155-0.266)	0.235 (0.176-0.316)	0.270 (0.197-0.374)	0.322 (0.226-0.465)	0.365 (0.247-0.545)
10-min	0.091 (0.075-0.112)	0.119 (0.098-0.147)	0.160 (0.131-0.197)	0.195 (0.158-0.242)	0.247 (0.194-0.317)	0.290 (0.223-0.381)	0.337 (0.253-0.453)	0.388 (0.283-0.536)	0.462 (0.324-0.666)	0.523 (0.354-0.781)
15-min	0.110 (0.090-0.135)	0.144 (0.118-0.177)	0.193 (0.158-0.238)	0.235 (0.191-0.293)	0.298 (0.234-0.384)	0.350 (0.269-0.460)	0.407 (0.306-0.548)	0.469 (0.342-0.649)	0.559 (0.391-0.805)	0.633 (0.428-0.944)
30-min	0.158 (0.130-0.194)	0.208 (0.170-0.256)	0.278 (0.228-0.343)	0.339 (0.275-0.422)	0.430 (0.337-0.553)	0.505 (0.388-0.663)	0.586 (0.440-0.789)	0.675 (0.493-0.934)	0.804 (0.564-1.16)	0.911 (0.617-1.36)
60-min	0.231 (0.189-0.284)	0.303 (0.248-0.373)	0.406 (0.332-0.501)	0.495 (0.401-0.616)	0.627 (0.492-0.806)	0.736 (0.566-0.967)	0.855 (0.642-1.15)	0.985 (0.719-1.36)	1.17 (0.822-1.69)	1.33 (0.900-1.98)
2-hr	0.349 (0.287-0.430)	0.453 (0.372-0.558)	0.597 (0.489-0.738)	0.720 (0.584-0.896)	0.896 (0.704-1.15)	1.04 (0.799-1.36)	1.19 (0.893-1.60)	1.35 (0.986-1.87)	1.58 (1.10-2.27)	1.76 (1.19-2.62)
3-hr	0.438 (0.359-0.538)	0.566 (0.464-0.697)	0.740 (0.606-0.914)	0.888 (0.721-1.11)	1.10 (0.862-1.41)	1.27 (0.973-1.66)	1.44 (1.08-1.94)	1.63 (1.19-2.25)	1.88 (1.32-2.71)	2.08 (1.41-3.10)
6-hr	0.609 (0.500-0.749)	0.787 (0.645-0.969)	1.02 (0.838-1.26)	1.22 (0.991-1.52)	1.50 (1.17-1.92)	1.71 (1.31-2.24)	1.93 (1.45-2.59)	2.15 (1.57-2.98)	2.46 (1.72-3.55)	2.69 (1.82-4.02)
12-hr	0.794 (0.652-0.977)	1.04 (0.856-1.28)	1.37 (1.12-1.70)	1.64 (1.33-2.04)	2.00 (1.57-2.58)	2.28 (1.75-3.00)	2.56 (1.92-3.44)	2.84 (2.07-3.93)	3.21 (2.25-4.62)	3.48 (2.35-5.19)
24-hr	1.03 (0.915-1.17)	1.38 (1.23-1.58)	1.84 (1.64-2.12)	2.21 (1.95-2.56)	2.70 (2.30-3.25)	3.08 (2.56-3.77)	3.44 (2.79-4.33)	3.81 (3.00-4.94)	4.29 (3.23-5.81)	4.64 (3.37-6.51)
2-day	1.20 (1.07-1.37)	1.65 (1.47-1.89)	2.23 (1.98-2.57)	2.70 (2.38-3.13)	3.33 (2.83-4.00)	3.80 (3.16-4.66)	4.26 (3.45-5.37)	4.73 (3.72-6.13)	5.33 (4.02-7.23)	5.78 (4.20-8.11)
3-day	1.30 (1.16-1.49)	1.81 (1.61-2.08)	2.49 (2.21-2.87)	3.04 (2.68-3.52)	3.77 (3.20-4.53)	4.32 (3.59-5.30)	4.88 (3.95-6.14)	5.43 (4.28-7.05)	6.17 (4.65-8.36)	6.72 (4.88-9.45)
4-day	1.39 (1.24-1.59)	1.95 (1.73-2.23)	2.70 (2.40-3.10)	3.31 (2.91-3.84)	4.13 (3.51-4.96)	4.75 (3.95-5.83)	5.38 (4.36-6.78)	6.02 (4.74-7.81)	6.87 (5.18-9.31)	7.51 (5.46-10.5)
7-day	1.55 (1.39-1.78)	2.21 (1.96-2.53)	3.10 (2.75-3.56)	3.83 (3.38-4.45)	4.84 (4.11-5.81)	5.61 (4.66-6.88)	6.38 (5.17-8.03)	7.16 (5.64-9.29)	8.21 (6.19-11.1)	9.00 (6.54-12.6)
10-day	1.67 (1.49-1.91)	2.39 (2.13-2.74)	3.39 (3.01-3.89)	4.21 (3.71-4.89)	5.37 (4.56-6.44)	6.25 (5.19-7.67)	7.14 (5.79-9.00)	8.06 (6.34-10.5)	9.30 (7.01-12.6)	10.2 (7.44-14.4)
20-day	2.02 (1.80-2.31)	2.95 (2.63-3.38)	4.26 (3.79-4.90)	5.38 (4.74-6.24)	6.97 (5.92-8.37)	8.23 (6.84-10.1)	9.54 (7.73-12.0)	10.9 (8.57-14.1)	12.7 (9.59-17.2)	14.1 (10.3-19.9)
30-day	2.37 (2.12-2.72)	3.47 (3.09-3.98)	5.06 (4.49-5.82)	6.43 (5.66-7.46)	8.43 (7.16-10.1)	10.0 (8.33-12.3)	11.7 (9.46-14.7)	13.4 (10.6-17.4)	15.8 (11.9-21.4)	17.6 (12.8-24.8)
45-day	2.88 (2.56-3.29)	4.20 (3.74-4.81)	6.12 (5.43-7.03)	7.81 (6.87-9.05)	10.3 (8.75-12.4)	12.3 (10.3-15.1)	14.5 (11.7-18.2)	16.7 (13.1-21.7)	19.8 (14.9-26.8)	22.2 (16.2-31.2)
60-day	3.30 (2.94-3.77)	4.78 (4.25-5.48)	6.97 (6.19-8.02)	8.92 (7.85-10.3)	11.8 (10.0-14.2)	14.2 (11.8-17.4)	16.7 (13.5-21.0)	19.3 (15.2-25.1)	23.0 (17.3-31.2)	25.9 (18.8-36.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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APPENDIX C

SUMP SIZING CALCULATIONS

SPECIAL PLAN AREA 1 - SUMP A - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)=	**1.0**	**Top Sump Elev =**	**1606**
Design Water Depth (ft)=	**8.0**	**Bottom Sump Elev =**	**1597**
Total Sump Depth (ft)=	**9.0**		

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1597.0	1598.0	79,090	81,463	80,277
1598.0	1599.0	81,463	83,861	82,662
1599.0	1600.0	83,861	86,283	85,072
1600.0	1601.0	86,283	88,731	87,507
1601.0	1602.0	88,731	91,204	89,968
1602.0	1603.0	91,204	93,703	92,453
1603.0	1604.0	93,703	96,226	94,964
1604.0	1605.0	96,226	98,774	97,500

Bottom Area	Top Area	Average Volume
Acres		ac-ft
1.82	1.87	1.84
1.87	1.93	1.90
1.93	1.98	1.95
1.98	2.04	2.01
2.04	2.09	2.07
2.09	2.15	2.12
2.15	2.21	2.18
2.21	2.27	2.24

Provided Sump Capacity = 710,403 CU-FT OR 16.3 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.66 inches
IC = percent impervious cover	54%
Area = total sump tributary area	76.2 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area)= 16.0 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Residential	69.9	50	35.0
Roadways	2.6	95	2.4
Sump Area	3.7	100	3.7
TOTAL SUMP A	**76.2**	**54%**	**41.1**

SPECIAL PLAN AREA 1 - SUMP A - IC ADJUSTMENT APPROACH
Provided Sump Capacity

Freeboard (ft)=	**1.0**	**Top Sump Elev =**	**1606**
Design Water Depth (ft)=	**8.0**	**Bottom Sump Elev =**	**1597**
Total Sump Depth (ft)=	**9.0**		

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1597	1598	39,444	41,055	40,249
1598	1599	41,055	42,691	41,873
1599	1600	42,691	44,351	43,521
1600	1601	44,351	46,037	45,194
1601	1602	46,037	47,748	46,893
1602	1603	47,748	49,485	48,616
1603	1604	49,485	51,246	50,365
1604	1605	51,246	53,032	52,139

Bottom Area	Top Area	Average Volume
Acres		ac-ft
0.91	0.94	0.92
0.94	0.98	0.96
0.98	1.02	1.00
1.02	1.06	1.04
1.06	1.10	1.08
1.10	1.14	1.12
1.14	1.18	1.16
1.18	1.22	1.20

Provided Sump Capacity = 368,851 CU-FT OR 8.5 AC-FT

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day)	4.66 inches
Original IC= original percent impervious cover	54%
Adj. IC = adjusted percent impervious cover- Original x 48.8%	26%
Area = total sump tributary area	76.2 Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area)= 7.8 AC-FT

SPECIAL PLAN AREA 1 - SUMP B,C - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **0.5**
Design Water Depth (ft)= **1.5**
Total Sump Depth (ft)= **2.0**

Top Sump Elev = **1554.5**
Bottom Sump Elev = **1552.0**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1552.0	1552.5	125,577	129,372	63,737
1552.5	1553.0	129,372	133,206	65,644
1553.0	1553.5	133,206	137,079	67,571

Bottom Area	Top Area	Average Volume
Acres		ac-ft
2.88	2.97	1.46
2.97	3.06	1.51
3.06	3.15	1.55

Provided Sump Capacity = **196,952** **CU-FT** **OR** **4.5 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.66	inches
IC = percent impervious cover	69%	
Area = total sump tributary area	15.8	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area)= **4.2** **AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Residential	9.5	50	4.8
Roadways	2.5	95	2.3
Sump Area	3.8	100	3.8
TOTAL SUMP B,C	**15.8**	**69%**	**10.9**

SPECIAL PLAN AREA 1 - SUMP B,C - IC ADJUSTMENT APPROACH
Provided Sump Capacity

Freeboard (ft)= 0.5
Design Water Depth (ft)= 1.5
Total Sump Depth (ft)= 2.0

Top Sump Elev = 1554.5
Bottom Sump Elev = 1552.0

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1552.0	1552.5	64,491	67,045	32,884
1552.5	1553.0	67,045	69,638	34,171
1553.0	1553.5	69,638	72,270	35,477

Bottom Area	Top Area	Average Volume
Acres		ac-ft
1.48	1.54	0.75
1.54	1.60	0.78
1.60	1.66	0.81

Provided Sump Capacity = 102,532 CU-FT OR 2.4 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.66	inches
Original IC= original percent impervious cover	69%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	34%	
Area = total sump tributary area	15.8	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area)= 2.1 AC-FT

SPECIAL PLAN AREA 1 - SUMP D - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1472**
Bottom Sump Elev = **1463**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1463.0	1464.0	460,006	466,775	463,391
1464.0	1465.0	466,775	473,569	470,172
1465.0	1466.0	473,569	480,387	476,978
1466.0	1467.0	480,387	487,229	483,808
1467.0	1468.0	487,229	494,095	490,662
1468.0	1469.0	494,095	500,986	497,540
1469.0	1470.0	500,986	507,900	504,443
1470.0	1471.0	507,900	514,838	511,369

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
10.56	10.72	10.64
10.72	10.87	10.79
10.87	11.03	10.95
11.03	11.19	11.11
11.19	11.34	11.26
11.34	11.50	11.42
11.50	11.66	11.58
11.66	11.82	11.74

Provided Sump Capacity = **3,898,364 CU-FT** **OR** **89.5 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.66	inches
IC = percent impervious cover	51%	
Area = total sump tributary area	454.1	Acres

Required Sump Capacity = [(D10yr-5Day)/12](IC)(Area)= **89.1** **AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture (Graded)	105.1	0	0.0
Agriculture (Off-site)	6.1	0	0.0
Light Industrial	11.9	90	10.7
Commercial	65.4	90	58.9
Residential	197.7	50	98.8
Roadways	22.2	95	21.1
Village Commercial	7.6	90	6.8
Village Residential	22.6	78	17.5
Sump Area	15.6	100	15.6
On-site Sump D	448.1	51%	229.4
TOTAL SUMP D	**454.1**	**51%**	**229.4**

SPECIAL PLAN AREA 1 - SUMP D - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)=	**1.0**	**Top Sump Elev =**	**1472**
Design Water Depth (ft)=	**8.0**	**Bottom Sump Elev =**	**1463**
Total Sump Depth (ft)=	**9.0**		

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1463	1464	224,257	228,045	226,151
1464	1465	228,045	231,859	229,952
1465	1466	231,859	235,698	233,779
1466	1467	235,698	239,562	237,630
1467	1468	239,562	243,451	241,507
1468	1469	243,451	247,365	245,408
1469	1470	247,365	251,304	249,335
1470	1471	251,304	255,268	253,286

Bottom Area	Top Area	Average Volume
Acres		ac-ft
5.15	5.24	5.19
5.24	5.32	5.28
5.32	5.41	5.37
5.41	5.50	5.46
5.50	5.59	5.54
5.59	5.68	5.63
5.68	5.77	5.72
5.77	5.86	5.81

Provided Sump Capacity = 1,917,048 CU-FT OR 44.0 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.66	inches
Original IC= original percent impervious cover	51%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	25%	
Area = total sump tributary area	454.1	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area)= 43.5 AC-FT

SPECIAL PLAN AREA 2 - SUMP E/F - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **7.0**
Total Sump Depth (ft)= **8.0**

Top Sump Elev = **1580**
Bottom Sump Elev = **1572**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1572.0	1573.0	96,635	99,900	98,267
1573.0	1574.0	99,900	103,189	101,544
1574.0	1575.0	103,189	106,504	104,847
1575.0	1576.0	106,504	109,843	108,174
1576.0	1577.0	109,843	113,208	111,525
1577.0	1578.0	113,208	116,597	114,902
1578.0	1579.0	116,597	120,011	118,304

Bottom Area	Top Area	Average Volume
Acres		ac-ft
2.22	2.29	2.26
2.29	2.37	2.33
2.37	2.44	2.41
2.44	2.52	2.48
2.52	2.60	2.56
2.60	2.68	2.64
2.68	2.76	2.72

Provided Sump Capacity = 757,564 CU-FT OR 17.4 AC-FT

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day) 4.33 inches
IC = percent impervious cover 26%
Area = total sump tributary area 180.0 Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area)= 17.0 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture (Off-site)	91.8	0	0.0
Residential	82.1	50	41.1
Sump Area	6.1	100	6.1
On-site Sump E/F	88.3	53%	47.2
TOTAL SUMP E/F	**180.0**	**26%**	**47.2**

SPECIAL PLAN AREA 2 - SUMP E/F - IC ADJUSTMENT METHOD
Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **7.0**
Total Sump Depth (ft)= **8.0**

Top Sump Elev = **1580**
Bottom Sump Elev = **1572**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1572.0	1573.0	47,861	50,088	48,975
1573.0	1574.0	50,088	52,341	51,215
1574.0	1575.0	52,341	54,619	53,480
1575.0	1576.0	54,619	56,922	55,771
1576.0	1577.0	56,922	59,250	58,086
1577.0	1578.0	59,250	61,604	60,427
1578.0	1579.0	61,604	63,982	62,793

Bottom Area	Top Area	Average Volume
Acres		ac-ft
1.10	1.15	1.12
1.15	1.20	1.18
1.20	1.25	1.23
1.25	1.31	1.28
1.31	1.36	1.33
1.36	1.41	1.39
1.41	1.47	1.44

Provided Sump Capacity = **390,746** **CU-FT** **OR** **9.0** **AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.33 inches
Original IC= original percent impervious cover 26%
Adj. IC = adjusted percent impervious cover- Original x 48.8% 13%
Area = total sump tributary area 180.0 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area)= **8.3** **AC-FT**

SPECIAL PLAN AREA 2 - SUMP G - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **7.0**
Total Sump Depth (ft)= **8.0**

Top Sump Elev = **1420**
Bottom Sump Elev = **1409**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1412	1413	314,138	319,415	316,777
1413	1414	319,415	324,717	322,066
1414	1415	324,717	330,045	327,381
1415	1416	330,045	335,397	332,721
1416	1417	335,397	340,774	338,085
1417	1418	340,774	346,177	343,475
1418	1419	346,177	351,604	348,890

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
7.21	7.33	7.27
7.33	7.45	7.39
7.45	7.58	7.52
7.58	7.70	7.64
7.70	7.82	7.76
7.82	7.95	7.89
7.95	8.07	8.01

Provided Sump Capacity = **2,329,395** **CU-FT** **OR** **53.5** **AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.33 inches
IC = percent impervious cover 55%
Area = total sump tributary area 264.8 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area)= **53.0** **AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture (Off-site)	3.1	0	0.0
Light Industrial	27.4	90	24.7
Parks	46.8	15	7.0
Residential	111.6	50	55.8
Roadways	20.2	95	19.2
Schools	20.1	50	10.0
Village Residential	24.2	78	18.8
Sump Area	11.5	100	11.5
On-site Sump G	261.7	56%	146.9
TOTAL SUMP G	**264.8**	**55%**	**146.9**

SPECIAL PLAN AREA 2 - SUMP G - IC ADJUSTMENT METHOD

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **7.0**
Total Sump Depth (ft)= **8.0**

Top Sump Elev = **1420**
Bottom Sump Elev = **1409**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1412	1413	149,671	154,118	151,895
1413	1414	154,118	158,591	156,354
1414	1415	158,591	163,088	160,839
1415	1416	163,088	167,610	165,349
1416	1417	167,610	172,157	169,883
1417	1418	172,157	176,729	174,443
1418	1419	176,729	181,327	179,028

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
3.44	3.54	3.49
3.54	3.64	3.59
3.64	3.74	3.69
3.74	3.85	3.80
3.85	3.95	3.90
3.95	4.06	4.00
4.06	4.16	4.11

Provided Sump Capacity = **1,157,792 CU-FT** **OR** **26.6** **AC-FT**

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day)	4.33	inches
Original IC= original percent impervious cover	55%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	27%	
Area = total sump tributary area	264.8	Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area)= **25.9** **AC-FT**

SPECIAL PLAN AREA 2 - SUMP H - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **7.0**
Total Sump Depth (ft)= **8.0**

Top Sump Elev = **1356**
Bottom Sump Elev = **1348**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1348	1349	289,630	294,102	291,866
1349	1350	294,102	298,600	296,351
1350	1351	298,600	303,123	300,861
1351	1352	303,123	307,671	305,397
1352	1353	307,671	312,244	309,957
1353	1354	312,244	316,842	314,543
1354	1355	316,842	321,465	319,153

Bottom Area	Top Area	Average Volume
Acres		ac-ft
6.65	6.75	6.70
6.75	6.85	6.80
6.85	6.96	6.91
6.96	7.06	7.01
7.06	7.17	7.12
7.17	7.27	7.22
7.27	7.38	7.33

Provided Sump Capacity = **2,138,129 CU-FT** **OR** **49.1 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.33 inches
IC = percent impervious cover 70%
Area = total sump tributary area 265.8 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **67.2** **AC-FT**
Bypass to Sump I = **18.2** **AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture (Off-site)	4.5	0	0.0
Commercial	24.9	90	22.4
Light Industrial	14.4	90	12.9
Parks	0.9	15	0.1
Residential	100.7	50	50.4
Roadways	21.7	95	20.6
Schools	10.0	50	5.0
Village Commercial	30.5	90	27.4
Village Residential	47.5	78	36.8
Sump Area	10.7	100	10.7
On-site Sump H	261.3	71%	186.4
TOTAL SUMP H	**265.8**	**70%**	**186.4**

SPECIAL PLAN AREA 2 - SUMP H - IC ADJUSTMENT METHOD

Provided Sump Capacity

Freeboard (ft)= 1.0
Design Water Depth (ft)= 7.0
Total Sump Depth (ft)= 8.0

Top Sump Elev = 1356
Bottom Sump Elev = 1348

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1348	1349	195,351	198,989	197,170
1349	1350	198,989	202,652	200,821
1350	1351	202,652	206,341	204,497
1351	1352	206,341	210,054	208,198
1352	1353	210,054	213,793	211,924
1353	1354	213,793	217,557	215,675
1354	1355	217,557	221,346	219,451

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
4.48	4.57	4.53
4.57	4.65	4.61
4.65	4.74	4.69
4.74	4.82	4.78
4.82	4.91	4.87
4.91	4.99	4.95
4.99	5.08	5.04

Provided Sump Capacity = 1,457,735 CU-FT OR 33.5 AC-FT

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day)	4.33	inches
Original IC= original percent impervious cover	70%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	34%	
Area = total sump tributary area	265.8	Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area)= 32.8 AC-FT

SPECIAL PLAN AREA 2 - SUMP I - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= 1.0
Design Water Depth (ft)= 7.0
Total Sump Depth (ft)= 8.0

Top Sump Elev = 1274
Bottom Sump Elev = 1263

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1,266	1,267	553,853	565,899	559,876
1,267	1,268	565,899	577,969	571,934
1,268	1,269	577,969	590,064	584,016
1,269	1,270	590,064	602,184	596,124
1,270	1,271	602,184	614,329	608,256
1,271	1,272	614,329	626,499	620,414
1,272	1,273	626,499	638,693	632,596

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
12.71	12.99	12.85
12.99	13.27	13.13
13.27	13.55	13.41
13.55	13.82	13.69
13.82	14.10	13.96
14.10	14.38	14.24
14.38	14.66	14.52

Provided Sump Capacity = 4,173,216 CU-FT OR 95.8 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.33 inches
IC = percent impervious cover 63%
Area = total sump tributary area 339.0 Acres

Sump I Required Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 76.9 AC-FT
Additional required capacity from Sump H = 18.2 AC-FT
Total Required Sump Capacity = 95.0 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture (Off-site)	21.5	0	0.0
Light Industrial	50.1	90	45.1
Commercial	31.7	90	28.5
Parks	10.1	15	1.5
Residential	161.6	50	80.8
Roadways	17.9	95	17.0
Village Residential	26.5	78	20.5
Sump Area	19.6	100	19.6
On-site Sump I	317.4	67%	213.0
TOTAL SUMP I	**339.0**	**63%**	**213.0**

SPECIAL PLAN AREA 2 - SUMP I - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **7.0**
Total Sump Depth (ft)= **8.0**

Top Sump Elev = **1274**
Bottom Sump Elev = **1266**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1,266	1,267	202,067	211,800	206,933
1,267	1,268	211,800	221,558	216,679
1,268	1,269	221,558	231,341	226,449
1,269	1,270	231,341	241,149	236,245
1,270	1,271	241,149	250,982	246,065
1,271	1,272	250,982	260,840	255,911
1,272	1,273	260,840	270,723	265,781

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
4.64	4.86	4.75
4.86	5.09	4.97
5.09	5.31	5.20
5.31	5.54	5.42
5.54	5.76	5.65
5.76	5.99	5.87
5.99	6.21	6.10

Provided Sump Capacity = **1,654,064 CU-FT** **OR** **38.0 AC-FT**

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day) 4.33 inches
Original IC= original percent impervious cover 63%
Adj. IC = adjusted percent impervious cover- Original x 48.8% 31%
Area = total sump tributary area 339.0 Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area)= **37.5** **AC-FT**

SPECIAL PLAN AREA 3 - SUMP J - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= 1.0
Design Water Depth (ft)= 8.0
Total Sump Depth (ft)= 9.0

Top Sump Elev = 1442
Bottom Sump Elev = 1433

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1433	1434	143,580	146,578	145,079
1434	1435	146,578	149,602	148,090
1435	1436	149,602	152,651	151,126
1436	1437	152,651	155,725	154,188
1437	1438	155,725	158,824	157,274
1438	1439	158,824	161,948	160,386
1439	1440	161,948	165,097	163,522
1440	1441	165,097	168,271	166,684

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
3.30	3.36	3.33
3.36	3.43	3.40
3.43	3.50	3.47
3.50	3.57	3.54
3.57	3.65	3.61
3.65	3.72	3.68
3.72	3.79	3.75
3.79	3.86	3.83

Provided Sump Capacity = 1,246,348 CU-FT OR 28.6 AC-FT

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day) 4.33 inches
IC = percent impervious cover 66%
Area = total sump tributary area 116.5 Acres

Required Sump Capacity = [($D_{10-5Day}$)/12] (IC) (Area) = 27.8 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture	12.0	0	0.0
Agriculture (Graded)	2.7	0	0.0
Agriculture (Off-site)	6.4	0	0.0
Commercial	56.1	90	50.5
Residential	24.6	50	12.3
Roadways	8.8	95	8.4
Sump Area	5.8	100	5.8
On-site Sump J	107.4	72%	77.0
TOTAL SUMP J	**116.5**	**66%**	**77.0**

SPECIAL PLAN AREA 3 - SUMP J - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1442**
Bottom Sump Elev = **1433**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1433	1434	67,110	69,451	68,281
1434	1435	69,451	71,818	70,635
1435	1436	71,818	74,209	73,014
1436	1437	74,209	76,626	75,418
1437	1438	76,626	79,067	77,847
1438	1439	79,067	81,534	80,301
1439	1440	81,534	84,026	82,780
1440	1441	84,026	86,542	85,284

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
1.54	1.59	1.57
1.59	1.65	1.62
1.65	1.70	1.68
1.70	1.76	1.73
1.76	1.82	1.79
1.82	1.87	1.84
1.87	1.93	1.90
1.93	1.99	1.96

Provided Sump Capacity = **613,557 CU-FT** **OR** **14.1 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.33 inches
Original IC= original percent impervious cover 66%
Adj. IC = adjusted percent impervious cover- Original x 48.8% 32%
Area = total sump tributary area 116.5 Acres

Required Sump Capacity = [($D_{10\text{-}5Day}$)/12] (IC) (Area) = **13.6** **AC-FT**

SPECIAL PLAN AREA 3 - SUMP K,L - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1244**
Bottom Sump Elev = **1235**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1235	1236	595,466	608,407	601,936
1236	1237	608,407	621,372	614,889
1237	1238	621,372	634,363	627,868
1238	1239	634,363	647,378	640,871
1239	1240	647,378	660,419	653,899
1240	1241	660,419	673,484	666,951
1241	1242	673,484	686,574	680,029
1242	1243	686,574	699,690	693,132

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
4.01	4.10	4.06
4.10	4.20	4.15
4.20	4.29	4.24
4.29	4.38	4.34
4.38	4.48	4.43
4.48	4.57	4.52
4.57	4.67	4.62
4.67	4.76	4.71

Provided Sump Capacity = **5,179,575 CU-FT** **OR** **118.9 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.33	inches
IC = percent impervious cover	72%	
Area = total sump tributary area	451.3	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **118.0** **AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Freeway Retail	87.0	90	78.3
Parks	5.3	15	0.8
Residential	181.8	50	90.9
Roadways	36.5	95	34.7
Schools	5.0	50	2.5
Village Commercial	19.9	90	17.9
Village Residential	62.0	78	48.0
Sump Area	53.9	100	53.9
TOTAL SUMP K,L	**451.3**	**72%**	**327.0**

SPECIAL PLAN AREA 3 - SUMP K,L - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)=	**1.0**	**Top Sump Elev =**	**1244**
Design Water Depth (ft)=	**8.0**	**Bottom Sump Elev =**	**1235**
Total Sump Depth (ft)=	**9.0**		

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1235	1236	271,105	282,358	276,732
1236	1237	282,358	293,636	287,997
1237	1238	293,636	304,939	299,287
1238	1239	304,939	316,266	310,602
1239	1240	316,266	327,619	321,943
1240	1241	327,619	338,996	333,308
1241	1242	338,996	350,399	344,698
1242	1243	350,399	361,826	356,112

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
4.01	4.10	4.06
4.10	4.20	4.15
4.20	4.29	4.24
4.29	4.38	4.34
4.38	4.48	4.43
4.48	4.57	4.52
4.57	4.67	4.62
4.67	4.76	4.71

Provided Sump Capacity = 2,530,679 CU-FT OR 58.1 AC-FT

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day)	4.33	inches
Original IC= original percent impervious cover	72%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	35%	
Area = total sump tributary area	451.3	Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area) = 57.6 AC-FT

SPECIAL PLAN AREA 3 - SUMP M - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1246**
Bottom Sump Elev = **1237**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1237	1238	332,732	338,562	335,647
1238	1239	338,562	344,416	341,489
1239	1240	344,416	350,295	347,355
1240	1241	350,295	356,199	353,247
1241	1242	356,199	362,129	359,164
1242	1243	362,129	368,083	365,106
1243	1244	368,083	374,063	371,073
1244	1245	374,063	380,068	377,065

Bottom Area	Top Area	Average Volume
Acres		ac-ft
7.64	7.77	7.71
7.77	7.91	7.84
7.91	8.04	7.97
8.04	8.18	8.11
8.18	8.31	8.25
8.31	8.45	8.38
8.45	8.59	8.52
8.59	8.73	8.66

Provided Sump Capacity = **2,850,147 CU-FT** **OR** **65.4 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.33	inches
IC = percent impervious cover	79%	
Area = total sump tributary area	228.4	Acres

Required Sump Capacity = [($D_{10\text{-}5Day}$)/12] (IC) (Area) = **64.9** **AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture	0.03	0	0.0
Commercial	27.4	90	24.7
Light Industrial	55.0	90	49.5
Residential	74.6	50	37.3
Roadways	7.2	95	6.9
Village Residential	11.5	78	8.9
Sump Area	52.6	100	52.6
TOTAL SUMP M	**228.4**	**79%**	**179.9**

SPECIAL PLAN AREA 3 - SUMP M - IC ADJUSTMENT METHOD

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1246**
Bottom Sump Elev = **1237**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1237	1238	162,874	166,551	164,713
1238	1239	166,551	170,253	168,402
1239	1240	170,253	173,980	172,117
1240	1241	173,980	177,732	175,856
1241	1242	177,732	181,509	179,621
1242	1243	181,509	185,312	183,410
1243	1244	185,312	189,139	187,225
1244	1245	189,139	192,991	191,065

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
3.74	3.82	3.78
3.82	3.91	3.87
3.91	3.99	3.95
3.99	4.08	4.04
4.08	4.17	4.12
4.17	4.25	4.21
4.25	4.34	4.30
4.34	4.43	4.39

Provided Sump Capacity = **1,422,409 CU-FT** **OR** **32.7 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.33	inches
Original IC= original percent impervious cover	79%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	38%	
Area = total sump tributary area	228.4	Acres

Required Sump Capacity = [($D_{10\text{-}5Day}$)/12] (IC) (Area) = **31.7** **AC-FT**

SPECIAL PLAN AREA 4 - SUMP LOCAL - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= 1.0 **Top Sump Elev =** 1394

Design Water Depth (ft)= 8.0 **Bottom Sump Elev =** 1385

Total Sump Depth (ft)= 9.0

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1385	1386	22,839	24,132	23,485
1386	1387	24,132	25,450	24,791
1387	1388	25,450	26,793	26,121
1388	1389	26,793	28,161	27,477
1389	1390	28,161	29,554	28,857
1390	1391	29,554	30,972	30,263
1391	1392	30,972	32,416	31,694
1392	1393	32,416	33,885	33,150

Bottom Area	Top Area	Average Volume
Acres		ac-ft
0.52	0.55	0.54
0.55	0.58	0.57
0.58	0.62	0.60
0.62	0.65	0.63
0.65	0.68	0.66
0.68	0.71	0.69
0.71	0.74	0.73
0.74	0.78	0.76

Provided Sump Capacity = 225,839 CU-FT OR 5.2 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.33 inches

IC = percent impervious cover 43%

Area = total sump tributary area 32.2 Acres

Required Sump Capacity = [($D_{10\text{-}5Day}$)/12] (IC) (Area) = 5.0 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Parks	9.3	15	1.4
Residential	11.8	50	5.9
Schools	9.4	50	4.7
Sump Area	1.8	100	1.8
TOTAL SUMP LOCAL	**32.2**	**43%**	**13.8**

SPECIAL PLAN AREA 4 - SUMP LOCAL - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1394**
Bottom Sump Elev = **1385**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1385	1386	12,069	12,992	12,530
1386	1387	12,992	13,940	13,466
1387	1388	13,940	14,913	14,426
1388	1389	14,913	15,911	15,412
1389	1390	15,911	16,934	16,422
1390	1391	16,934	17,982	17,458
1391	1392	17,982	19,055	18,518
1392	1393	19,055	20,153	19,604

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
0.28	0.30	0.29
0.30	0.32	0.31
0.32	0.34	0.33
0.34	0.37	0.35
0.37	0.39	0.38
0.39	0.41	0.40
0.41	0.44	0.43
0.44	0.46	0.45

Provided Sump Capacity = **127,837 CU-FT** **OR** **2.9 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.33 inches
Original IC= original percent impervious cover 43%
Adj. IC = adjusted percent impervious cover- Original x 48.8% 21%
Area = total sump tributary area 32.2 Acres

Required Sump Capacity = [($D_{10\text{-}5Day}$)/12] (IC) (Area) = **2.4** **AC-FT**

SPECIAL PLAN AREA 4 - SUMP N - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1403**
Bottom Sump Elev = **1394**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1394	1395	86,110	88,587	87,348
1395	1396	88,587	91,088	89,838
1396	1397	91,088	93,615	92,352
1397	1398	93,615	96,167	94,891
1398	1399	96,167	98,744	97,455
1399	1400	98,744	101,346	100,045
1400	1401	101,346	103,973	102,659
1401	1402	103,973	106,625	105,299

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
1.97	2.03	2.00
2.03	2.09	2.06
2.09	2.14	2.12
2.14	2.20	2.17
2.20	2.26	2.23
2.26	2.32	2.29
2.32	2.38	2.35
2.38	2.44	2.41

Provided Sump Capacity = **769,887** **CU-FT** **OR** **17.7 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.47	inches
IC = percent impervious cover	52%	
Area = total sump tributary area	87.7	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **16.9** **AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture	8.0	0	0.0
Residential	67.1	50	33.6
Roadways	7.3	95	7.0
Schools	0.6	50	0.3
Sump Area	4.5	100	4.5
TOTAL SUMP N	**87.7**	**52%**	**45.4**

SPECIAL PLAN AREA 4 - SUMP N - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1403**
Bottom Sump Elev = **1394**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1394	1395	39,269	41,348	40,308
1395	1396	41,348	43,452	42,400
1396	1397	43,452	45,581	44,517
1397	1398	45,581	47,736	46,659
1398	1399	47,736	49,915	48,825
1399	1400	49,915	52,119	51,017
1400	1401	52,119	54,349	53,234
1401	1402	54,349	56,603	55,476

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
0.90	0.95	0.93
0.95	1.00	0.97
1.00	1.05	1.02
1.05	1.10	1.07
1.10	1.15	1.12
1.15	1.20	1.17
1.20	1.25	1.22
1.25	1.30	1.27

Provided Sump Capacity = 382,436 CU-FT OR 8.8 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.47	inches
Original IC= original percent impervious cover	52%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	25%	
Area = total sump tributary area	87.7	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 8.2 AC-FT

SPECIAL PLAN AREA 4 - SUMP O,P,Q - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)=	**1.0**	**Top Sump Elev =**	**1248**
Design Water Depth (ft)=	**8.0**	**Bottom Sump Elev =**	**1239**
Total Sump Depth (ft)=	**9.0**		

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1239	1240	657,003	678,805	667,904
1240	1241	678,805	700,633	689,719
1241	1242	700,633	722,486	711,560
1242	1243	722,486	744,364	733,425
1243	1244	744,364	766,266	755,315
1244	1245	766,266	788,194	777,230
1245	1246	788,194	810,146	799,170
1246	1247	810,146	832,124	821,135

Bottom Area	Top Area	Average Volume
Acres		ac-ft
15.08	15.58	15.33
15.58	16.08	15.83
16.08	16.59	16.34
16.59	17.09	16.84
17.09	17.59	17.34
17.59	18.09	17.84
18.09	18.60	18.35
18.60	19.10	18.85

Provided Sump Capacity = 5,955,458 CU-FT OR 136.7 AC-FT

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day)	4.47	inches
IC = percent impervious cover	58%	
Area = total sump tributary area	625.7	Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area) = 136.0 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Parks	46.9	15	7.0
Residential	388.8	50	194.4
Roadways	38.3	95	36.4
Schools	20.1	50	10.0
Village Commercial	15.0	90	13.5
Village Residential	57.2	77.5	44.3
Sump Area	59.4	100	59.4
TOTAL SUMP O,P,Q	**625.7**	**58%**	**365.1**

SPECIAL PLAN AREA 4 - SUMP O,P,Q - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1248**
Bottom Sump Elev = **1239**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1239	1240	297,888	314,684	306,286
1240	1241	314,684	331,506	323,095
1241	1242	331,506	348,353	339,930
1242	1243	348,353	365,225	356,789
1243	1244	365,225	382,122	373,673
1244	1245	382,122	399,043	390,582
1245	1246	399,043	415,990	407,517
1246	1247	415,990	432,962	424,476

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
6.84	7.22	7.03
7.22	7.61	7.42
7.61	8.00	7.80
8.00	8.38	8.19
8.38	8.77	8.58
8.77	9.16	8.97
9.16	9.55	9.36
9.55	9.94	9.74

Provided Sump Capacity = **2,922,348** **CU-FT** **OR** **67.1 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.47 inches
Original IC= original percent impervious cover 58%
Adj. IC = adjusted percent impervious cover- Original x 48.8% 28%
Area = total sump tributary area 625.7 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **66.4** **AC-FT**

SPECIAL PLAN AREA 5a - SUMP R - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= 1.0 **Top Sump Elev =** 1392

Design Water Depth (ft)= 8.0 **Bottom Sump Elev =** 1383

Total Sump Depth (ft)= 9.0

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1383	1384	80,315	82,958	81,636
1384	1385	82,958	85,627	84,292
1385	1386	85,627	88,321	86,974
1386	1387	88,321	91,040	89,680
1387	1388	91,040	93,784	92,412
1388	1389	93,784	96,553	95,168
1389	1390	96,553	99,347	97,950
1390	1391	99,347	102,167	100,757

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
1.84	1.90	1.87
1.90	1.97	1.94
1.97	2.03	2.00
2.03	2.09	2.06
2.09	2.15	2.12
2.15	2.22	2.18
2.22	2.28	2.25
2.28	2.35	2.31

Provided Sump Capacity = **728,870** **CU-FT** **OR** **16.7 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.45 inches

IC = percent impervious cover 55%

Area = total sump tributary area 81.1 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **16.4 AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture	3.4	0	0.0
Residential	66.2	50	33.1
Roadways	8.8	95	8.4
Sump Area	2.8	100	2.8
TOTAL SUMP R	**81.1**	**55%**	**44.2**

SPECIAL PLAN AREA 5a - SUMP R - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1392**
Bottom Sump Elev = **1383**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1383	1384	38,655	40,388	39,521
1384	1385	40,388	42,146	41,267
1385	1386	42,146	43,929	43,037
1386	1387	43,929	45,737	44,833
1387	1388	45,737	47,569	46,653
1388	1389	47,569	49,427	48,498
1389	1390	49,427	51,310	50,369
1390	1391	51,310	53,218	52,264

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
0.89	0.93	0.91
0.93	0.97	0.95
0.97	1.01	0.99
1.01	1.05	1.03
1.05	1.09	1.07
1.09	1.13	1.11
1.13	1.18	1.16
1.18	1.22	1.20

Provided Sump Capacity = **366,442** **CU-FT** **OR** **8.4 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.45	inches
Original IC= original percent impervious cover	55%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	27%	
Area = total sump tributary area	81.1	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **8.0** **AC-FT**

SPECIAL PLAN AREA 5a - SUMP S - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)=	**1.0**	**Top Sump Elev =**	**1368**
Design Water Depth (ft)=	**8.0**	**Bottom Sump Elev =**	**1359**
Total Sump Depth (ft)=	**9.0**		

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1359	1360	35,140	36,730	35,935
1360	1361	36,730	38,345	37,538
1361	1362	38,345	39,985	39,165
1362	1363	39,985	41,651	40,818
1363	1364	41,651	43,341	42,496
1364	1365	43,341	45,057	44,199
1365	1366	45,057	46,798	45,927
1366	1367	46,798	48,563	47,680

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
0.81	0.84	0.82
0.84	0.88	0.86
0.88	0.92	0.90
0.92	0.96	0.94
0.96	0.99	0.98
0.99	1.03	1.01
1.03	1.07	1.05
1.07	1.11	1.09

Provided Sump Capacity = 333,759 CU-FT OR 7.7 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.45	inches
IC = percent impervious cover	61%	
Area = total sump tributary area	31.4	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 7.1 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture	0.3	0	0.0
Residential	23.2	50	11.6
Roadways	5.2	95	4.9
Sump Area	2.7	100	2.7
TOTAL SUMP S	**31.4**	**61%**	**19.2**

SPECIAL PLAN AREA 5a - SUMP S - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1368**
Bottom Sump Elev = **1359**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1359	1360	17,514	18,530	18,022
1360	1361	18,530	19,571	19,051
1361	1362	19,571	20,637	20,104
1362	1363	20,637	21,729	21,183
1363	1364	21,729	22,845	22,287
1364	1365	22,845	23,986	23,416
1365	1366	23,986	25,153	24,570
1366	1367	25,153	26,344	25,749

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
0.40	0.43	0.41
0.43	0.45	0.44
0.45	0.47	0.46
0.47	0.50	0.49
0.50	0.52	0.51
0.52	0.55	0.54
0.55	0.58	0.56
0.58	0.60	0.59

Provided Sump Capacity = **174,381** **CU-FT** **OR** **4.0 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.45	inches
Original IC= original percent impervious cover	61%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	30%	
Area = total sump tributary area	31.4	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **3.5** **AC-FT**

SPECIAL PLAN AREA 5a - SUMP T,U - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1262**
Bottom Sump Elev = **1253**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1253	1254	307,296	317,223	312,259
1254	1255	317,223	327,175	322,199
1255	1256	327,175	337,153	332,164
1256	1257	337,153	347,155	342,154
1257	1258	347,155	357,183	352,169
1258	1259	357,183	367,236	362,209
1259	1260	367,236	377,313	372,274
1260	1261	377,313	387,416	382,365

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
7.05	7.28	7.17
7.28	7.51	7.40
7.51	7.74	7.63
7.74	7.97	7.85
7.97	8.20	8.08
8.20	8.43	8.32
8.43	8.66	8.55
8.66	8.89	8.78

Provided Sump Capacity = **2,777,794 CU-FT** **OR** **63.8 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.45 inches
IC = percent impervious cover 59%
Area = total sump tributary area 287.6 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **63.0 AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture	0.1	0	0.0
Parks	5.3	15	0.8
Residential	203.7	50	101.9
Roadways	18.7	95	17.8
Schools	5.0	50	2.5
Village Commercial	5.4	90	4.9
Village Residential	32.8	78	25.4
Sump Area	16.6	100	16.6
TOTAL SUMP T,U	287.6	59%	169.9

SPECIAL PLAN AREA 5a - SUMP T,U - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1262**
Bottom Sump Elev = **1253**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1253	1254	139,020	146,611	142,816
1254	1255	146,611	154,228	150,420
1255	1256	154,228	161,869	158,048
1256	1257	161,869	169,535	165,702
1257	1258	169,535	177,227	173,381
1258	1259	177,227	184,943	181,085
1259	1260	184,943	192,685	188,814
1260	1261	192,685	200,451	196,568

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
3.19	3.37	3.28
3.37	3.54	3.45
3.54	3.72	3.63
3.72	3.89	3.80
3.89	4.07	3.98
4.07	4.25	4.16
4.25	4.42	4.33
4.42	4.60	4.51

Provided Sump Capacity = **1,356,833 CU-FT** **OR** **31.1 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.45	inches
Original IC= original percent impervious cover	59%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	29%	
Area = total sump tributary area	287.6	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **30.7** **AC-FT**

SPECIAL PLAN AREA 5a - SUMP V - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)=	1.0	Top Basin Elev =	1247
Ponding Depth (ft)=	8.0	Bottom Basin Elev =	1238
Total Basin Depth (ft)=	9.0		

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1238	1239	161,753	165,845	163,799
1239	1240	165,845	169,963	167,904
1240	1241	169,963	174,105	172,034
1241	1242	174,105	178,273	176,189
1242	1243	178,273	182,466	180,370
1243	1244	182,466	186,684	184,575
1244	1245	186,684	190,928	188,806
1245	1246	190,928	195,196	193,062

Bottom Area	Top Area	Average Volume
Acres		ac-ft
3.71	3.81	3.76
3.81	3.90	3.85
3.90	4.00	3.95
4.00	4.09	4.04
4.09	4.19	4.14
4.19	4.29	4.24
4.29	4.38	4.33
4.38	4.48	4.43

Provided Sump Capacity = 1,426,739 CU-FT OR 32.8 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.45	inches
IC = percent impervious cover	53%	
Area = total sump tributary area	163.2	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 32.2 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture	10.1	0	0.0
Residential	130.8	50	65.4
Roadways	15.4	95	14.7
Sump Area	6.7	100	6.7
TOTAL SUMP V	**163.2**	**53%**	**86.8**

SPECIAL PLAN AREA 5a - SUMP V - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1247**
Bottom Sump Elev = **1238**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1238	1239	77,200	79,944	78,572
1239	1240	79,944	82,713	81,328
1240	1241	82,713	85,507	84,110
1241	1242	85,507	88,326	86,916
1242	1243	88,326	91,170	89,748
1243	1244	91,170	94,040	92,605
1244	1245	94,040	96,934	95,487
1245	1246	96,934	99,854	98,394

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
1.77	1.84	1.80
1.84	1.90	1.87
1.90	1.96	1.93
1.96	2.03	2.00
2.03	2.09	2.06
2.09	2.16	2.13
2.16	2.23	2.19
2.23	2.29	2.26

Provided Sump Capacity = **707,160** **CU-FT** **OR** **16.2 AC-FT**

Required Sump Capacity

$D_{10\text{-}5day}$ = 10 yr 5day depth of rainfall (in.)	4.45	inches
Original IC= original percent impervious cover	53%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	26%	
Area = total sump tributary area	163.2	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **15.7** **AC-FT**

SPECIAL PLAN AREA 5B - SUMP W - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **0.5**
Design Water Depth (ft)= **3.5**
Total Sump Depth (ft)= **4.0**

Top Sump Elev = **1270.0**
Bottom Sump Elev = **1266.0**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1266.0	1266.5	249,697	257,325	126,755
1266.5	1267.0	257,325	264,993	130,579
1267.0	1267.5	264,993	272,699	134,423
1267.5	1268.0	272,699	280,445	138,286
1268.0	1268.5	280,445	288,230	142,169
1268.5	1269.0	288,230	296,054	146,071
1269.0	1269.5	296,054	303,917	149,993

Bottom Area	Top Area	Average Volume
Acres		ac-ft
5.73	5.91	2.91
5.91	6.08	3.00
6.08	6.26	3.09
6.26	6.44	3.17
6.44	6.62	3.26
6.62	6.80	3.35
6.80	6.98	3.44

Provided Sump Capacity = **968,277** **CU-FT** **OR** **22.2 AC-FT**

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day) 4.55 inches
IC = percent impervious cover 55%
Area = total sump tributary area 103.7 Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area) = **21.7 AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture (Off-site)	0.1	0	0.0
Residential	91.9	50	45.9
Roadways	7.7	95	7.3
Sump Area	4.1	100	4.1
Sump W On-site	**103.6**	**55%**	**57.3**
TOTAL SUMP W	**103.7**	**55%**	**57.3**

SPECIAL PLAN AREA 5B - SUMP W - IC ADJUSTMENT APPROACH
Provided Sump Capacity

Freeboard (ft)= **0.5**
Design Water Depth (ft)= **3.5**
Total Sump Depth (ft)= **4.0**

Top Sump Elev = **1270.0**
Bottom Sump Elev = **1266.0**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1266.0	1266.5	123,647	128,828	63,119
1266.5	1267.0	128,828	134,048	65,719
1267.0	1267.5	134,048	139,306	68,339
1267.5	1268.0	139,306	144,604	70,978
1268.0	1268.5	144,604	149,941	73,636
1268.5	1269.0	149,941	155,316	76,314
1269.0	1269.5	155,316	160,731	79,012

Bottom Area	Top Area	Average Volume
Acres		ac-ft
2.84	2.96	1.45
2.96	3.08	1.51
3.08	3.20	1.57
3.20	3.32	1.63
3.32	3.44	1.69
3.44	3.57	1.75
3.57	3.69	1.81

Provided Sump Capacity = **497,116** **CU-FT** **OR** **11.4 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.55 inches
Original IC= original percent impervious cover 55%
Adj. IC = adjusted percent impervious cover- Original x 48.8% 27%
Area = total sump tributary area 103.7 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **10.6** **AC-FT**

SPECIAL PLAN AREA 6a- SUMP X - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= 1.0
Design Water Depth (ft)= 8.0
Total Sump Depth (ft)= 9.0

Top Sump Elev = 1184.0
Bottom Sump Elev = 1175.0

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1175.0	1176.0	30,933	32,444	31,689
1176.0	1177.0	32,444	33,980	33,212
1177.0	1178.0	33,980	35,541	34,760
1178.0	1179.0	35,541	37,127	36,334
1179.0	1180.0	37,127	38,738	37,932
1180.0	1181.0	38,738	40,374	39,556
1181.0	1182.0	40,374	42,036	41,205
1182.0	1183.0	42,036	43,722	42,879

Bottom Area	Top Area	Average Volume
Acres		ac-ft
0.71	0.74	0.73
0.74	0.78	0.76
0.78	0.82	0.80
0.82	0.85	0.83
0.85	0.89	0.87
0.89	0.93	0.91
0.93	0.97	0.95
0.97	1.00	0.98

Provided Sump Capacity = 297,567 CU-FT OR 6.8 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.03 inches
IC = percent impervious cover 63%
Area = total sump tributary area 104.5 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 22.1 AC-FT
Bypass to Sump Y = 15.3 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture (Off-site)	1.8	0	0.0
Parks	3.4	15	0.5
Residential	54.0	50	27.0
Roadways	8.6	95	8.1
Roadways (Off-site)	0.6	95	0.6
Schools	5.0	50	2.5
Village Commercial	19.7	90	17.7
Village Residential	9.6	78	7.4
Sump Area	1.9	100	1.9
Total X On-site	102.1	64%	65.2
TOTAL SUMP X	104.5	63%	65.8

SPECIAL PLAN AREA 6a- SUMP X - IC ADJUSTMENT APPROACH
Provided Sump Capacity

All flows bypassed to Sump Y

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.03	inches
Original IC= original percent impervious cover	63%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	31%	
Area = total sump tributary area	104.5	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) =	**10.8**	**AC-FT**
Bypass to Sump Y =	**10.8**	**AC-FT**

SPECIAL PLAN AREA 6a- SUMP Y - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1114**
Bottom Sump Elev = **1105**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1105	1106	327,885	337,369	332,627
1106	1107	337,369	346,878	342,123
1107	1108	346,878	356,412	351,645
1108	1109	356,412	365,971	361,191
1109	1110	365,971	375,555	370,763
1110	1111	375,555	385,164	380,360
1111	1112	385,164	394,799	389,982
1112	1113	394,799	404,459	399,629

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
7.53	7.74	7.6
7.74	7.96	7.9
7.96	8.18	8.1
8.18	8.40	8.3
8.40	8.62	8.5
8.62	8.84	8.7
8.84	9.06	9.0
9.06	9.29	9.2

Provided Sump Capacity = 2,928,320 CU-FT OR 67.2 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) = 4.03 inches
IC = percent impervious cover = 86%
Area = total sump tributary area = 176.6 Acres

Sump Y Required Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 51.2 AC-FT
Additional required capacity from Sump X = 15.3 AC-FT
Total Required Sump Capacity = 66.5 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Light Industrial	85.1	90	76.5
Commercial	4.2	90	3.8
Roadways	8.9	95	8.4
Village Residential	65.4	78	50.7
Sump Area	13.0	100	13.0
TOTAL SUMP Y	176.6	86%	152.5

SPECIAL PLAN AREA 6a- SUMP Y - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1114**
Bottom Sump Elev = **1105**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1105	1106	162,282	171,467	166,874
1106	1107	171,467	180,677	176,072
1107	1108	180,677	189,913	185,295
1108	1109	189,913	199,173	194,543
1109	1110	199,173	208,459	203,816
1110	1111	208,459	217,770	213,114
1111	1112	217,770	227,105	222,437
1112	1113	227,105	236,466	231,786

Bottom Area	Top Area	Average Volume
Acres		ac-ft
3.73	3.94	3.83
3.94	4.15	4.04
4.15	4.36	4.25
4.36	4.57	4.47
4.57	4.79	4.68
4.79	5.00	4.89
5.00	5.21	5.11
5.21	5.43	5.32

Provided Sump Capacity = **1,593,937** **CU-FT** **OR** **36.6 AC-FT**

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day)	4.03	inches
Original IC= original percent impervious cover	86%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	42%	
Area = total sump tributary area	176.6	Acres

Sump Y Required Capacity = $[(D_{10yr-5Day})/12](IC)(Area)$	=	25.0	AC-FT
Additional required capacity from Sump X	=	10.8	AC-FT
Total Required Sump Capacity	**=**	**35.8**	**AC-FT**

SPECIAL PLAN AREA 6a- SUMP Z - KERN COUNTY APPROACH
Provided Sump Capacity

Freeboard (ft)= **1.0** **Top Sump Elev =** **1135**

Design Water Depth (ft)= **8.0** **Bottom Sump Elev =** **1126**

Total Sump Depth (ft)= **9.0**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1126	1127	90,602	93,592	92,097
1127	1128	93,592	96,608	95,100
1128	1129	96,608	99,649	98,128
1129	1130	99,649	102,715	101,182
1130	1131	102,715	105,806	104,260
1131	1132	105,806	108,922	107,364
1132	1133	108,922	112,063	110,493
1133	1134	112,063	115,230	113,647

Bottom Area	Top Area	Average Volume
Acres		ac-ft
2.08	2.15	2.11
2.15	2.22	2.18
2.22	2.29	2.25
2.29	2.36	2.32
2.36	2.43	2.39
2.43	2.50	2.46
2.50	2.57	2.54
2.57	2.65	2.61

Provided Sump Capacity = **822,271** **CU-FT** **OR** **18.9 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 4.03 inches

IC = percent impervious cover 55%

Area = total sump tributary area 101.2 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **18.6 AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Agriculture (Off-site)	0.2	0	0.0
Residential	90.8	50	45.4
Roadways	5.8	95	5.5
Sump Area	4.4	100	4.4
Total Z On-site	101.0	55%	55.3
TOTAL SUMP Z	101.2	55%	55.3

SPECIAL PLAN AREA 6a- SUMP Z - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1134**
Bottom Sump Elev = **1126**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1126	1127	43,466	45,637	44,551
1127	1128	45,637	47,833	46,735
1128	1129	47,833	50,054	48,944
1129	1130	50,054	52,301	51,178
1130	1131	52,301	54,572	53,437
1131	1132	54,572	56,869	55,721
1132	1133	56,869	59,191	58,030
1133	1134	59,191	61,538	60,364

Bottom Area	Top Area	Average Volume
Acres		ac-ft
1.00	1.05	1.02
1.05	1.10	1.07
1.10	1.15	1.12
1.15	1.20	1.17
1.20	1.25	1.23
1.25	1.31	1.28
1.31	1.36	1.33
1.36	1.41	1.39

Provided Sump Capacity = **418,959** **CU-FT** **OR** **9.6 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.03	inches
Original IC= original percent impervious cover	55%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	27%	
Area = total sump tributary area	101.2	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **9.1** **AC-FT**

SPECIAL PLAN AREA 6a- SUMP AA - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1124**
Bottom Sump Elev = **1115**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1115	1116	205,310	209,569	207,439
1116	1117	209,569	213,853	211,711
1117	1118	213,853	218,162	216,008
1118	1119	218,162	222,497	220,330
1119	1120	222,497	226,856	224,677
1120	1121	226,856	231,241	229,049
1121	1122	231,241	235,651	233,446
1122	1123	235,651	240,086	237,868

Bottom Area	Top Area	Average Volume
Acres		ac-ft
4.71	4.81	4.76
4.81	4.91	4.86
4.91	5.01	4.96
5.01	5.11	5.06
5.11	5.21	5.16
5.21	5.31	5.26
5.31	5.41	5.36
5.41	5.51	5.46

Provided Sump Capacity = **1,780,527** **CU-FT** **OR** **40.9 AC-FT**

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day) 4.03 inches
IC = percent impervious cover 91%
Area = total sump tributary area 132.0 Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area) = **40.2 AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Light Industrial	102.4	90	92.2
Commercial	16.4	90	14.7
Roadways	6.4	95	6.1
Sump Area	6.8	100	6.8
TOTAL SUMP AA	132.0	91%	119.8

SPECIAL PLAN AREA 6a- SUMP AA - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1124**
Bottom Sump Elev = **1115**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1115	1116	97,649	100,608	99,128
1116	1117	100,608	103,592	102,100
1117	1118	103,592	106,602	105,097
1118	1119	106,602	109,636	108,119
1119	1120	109,636	112,696	111,166
1120	1121	112,696	115,781	114,238
1121	1122	115,781	118,891	117,336
1122	1123	118,891	122,026	120,458

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
2.24	2.31	2.28
2.31	2.38	2.34
2.38	2.45	2.41
2.45	2.52	2.48
2.52	2.59	2.55
2.59	2.66	2.62
2.66	2.73	2.69
2.73	2.80	2.77

Provided Sump Capacity = 877,643 CU-FT OR 20.1 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	4.03	inches
Original IC= original percent impervious cover	0.91	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	44%	
Area = total sump tributary area	132.0	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 19.6 AC-FT

SPECIAL PLAN AREA 6b - SUMP BB - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)=	**1.0**	**Top Sump Elev =**	**906**
Design Water Depth (ft)=	**8.0**	**Bottom Sump Elev =**	**897**
Total Sump Depth (ft)=	**9.0**		

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
897	898	110,450	113,285	111,868
898	899	113,285	116,146	114,716
899	900	116,146	119,031	117,588
900	901	119,031	121,942	120,486
901	902	121,942	124,877	123,409
902	903	124,877	127,838	126,357
903	904	127,838	130,823	129,331
904	905	130,823	133,834	132,329

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
2.54	2.60	2.57
2.60	2.67	2.63
2.67	2.73	2.70
2.73	2.80	2.77
2.80	2.87	2.83
2.87	2.93	2.90
2.93	3.00	2.97
3.00	3.07	3.04

Provided Sump Capacity = 976,084 CU-FT OR 22.4 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	3.65	inches
IC = percent impervious cover	91%	
Area = total sump tributary area	80.6	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 22.2 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Light Industrial	76.3	90	68.6
Sump Area	4.3	100	4.3
TOTAL SUMP BB	**80.6**	**91%**	**73.0**

SPECIAL PLAN AREA 6b - SUMP BB - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **906**
Bottom Sump Elev = **897**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
897	898	52,258	54,599	53,429
898	899	54,599	56,966	55,783
899	900	56,966	59,357	58,162
900	901	59,357	61,774	60,566
901	902	61,774	64,216	62,995
902	903	64,216	66,682	65,449
903	904	66,682	69,174	67,928
904	905	69,174	71,691	70,433

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
1.20	1.25	1.23
1.25	1.31	1.28
1.31	1.36	1.34
1.36	1.42	1.39
1.42	1.47	1.45
1.47	1.53	1.50
1.53	1.59	1.56
1.59	1.65	1.62

Provided Sump Capacity = **494,744** **CU-FT** **OR** **11.4 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	3.65	inches
Original IC= original percent impervious cover	91%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	44%	
Area = total sump tributary area	80.6	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **10.8** **AC-FT**

SPECIAL PLAN AREA 6b - SUMP CC - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **900**
Bottom Sump Elev = **891**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
891	892	127,703	130,688	129,195
892	893	130,688	133,698	132,193
893	894	133,698	136,733	135,216
894	895	136,733	139,793	138,263
895	896	139,793	142,879	141,336
896	897	142,879	145,989	144,434
897	898	145,989	149,124	147,557
898	899	149,124	152,285	150,705

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
2.93	3.00	2.97
3.00	3.07	3.03
3.07	3.14	3.10
3.14	3.21	3.17
3.21	3.28	3.24
3.28	3.35	3.32
3.35	3.42	3.39
3.42	3.50	3.46

Provided Sump Capacity = 1,118,899 CU-FT OR 25.7 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 3.65 inches
IC = percent impervious cover 91%
Area = total sump tributary area 90.6 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 25.0 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Light Industrial	85.9	90	77.3
Sump Area	4.8	100	4.8
TOTAL SUMP CC	**90.6**	**91%**	**82.0**

SPECIAL PLAN AREA 6b - SUMP CC - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)=	**1.0**	**Top Sump Elev =**	**900**
Design Water Depth (ft)=	**8.0**	**Bottom Sump Elev =**	**891**
Total Sump Depth (ft)=	**9.0**		

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
891	892	59,665	62,069	60,867
892	893	62,069	64,498	63,284
893	894	64,498	66,953	65,726
894	895	66,953	69,432	68,192
895	896	69,432	71,936	70,684
896	897	71,936	74,466	73,201
897	898	74,466	77,020	75,743
898	899	77,020	79,599	78,310

Bottom Area	Top Area	Average Volume
Acres		ac-ft
1.37	1.42	1.40
1.42	1.48	1.45
1.48	1.54	1.51
1.54	1.59	1.57
1.59	1.65	1.62
1.65	1.71	1.68
1.71	1.77	1.74
1.77	1.83	1.80

Provided Sump Capacity = 556,006 CU-FT OR 12.8 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	3.65	inches
Original IC= original percent impervious cover	91%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	44%	
Area = total sump tributary area	90.6	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 12.2 AC-FT

SPECIAL PLAN AREA 6b - SUMP DD - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= 1.0
Design Water Depth (ft)= 8.0
Total Sump Depth (ft)= 9.0

Top Sump Elev = 963
Bottom Sump Elev = 954

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
954	955	98,495	101,244	99,869
955	956	101,244	104,017	102,630
956	957	104,017	106,815	105,416
957	958	106,815	109,638	108,226
958	959	109,638	112,486	111,062
959	960	112,486	115,359	113,923
960	961	115,359	118,258	116,808
961	962	118,258	121,181	119,719

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
2.26	2.32	2.29
2.32	2.39	2.36
2.39	2.45	2.42
2.45	2.52	2.48
2.52	2.58	2.55
2.58	2.65	2.62
2.65	2.71	2.68
2.71	2.78	2.75

Provided Sump Capacity = 877,654 CU-FT OR 20.1 AC-FT

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day) 3.65 inches
IC = percent impervious cover 91%
Area = total sump tributary area 72.0 Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area) = 19.8 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Light Industrial	68.1	90	61.3
Sump Area	3.9	100	3.9
TOTAL SUMP DD	**72.0**	**91%**	**65.2**

SPECIAL PLAN AREA 6b - SUMP DD - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)=	**1.0**	**Top Sump Elev =**	**963**
Design Water Depth (ft)=	**8.0**	**Bottom Sump Elev =**	**954**
Total Sump Depth (ft)=	**9.0**		

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
954	955	47,846	49,883	48,865
955	956	49,883	51,946	50,915
956	957	51,946	54,033	52,990
957	958	54,033	56,146	55,089
958	959	56,146	58,283	57,214
959	960	58,283	60,446	59,364
960	961	60,446	62,633	61,539
961	962	62,633	64,846	63,739

Bottom Area	Top Area	Average Volume
Acres		ac-ft
1.10	1.15	1.12
1.15	1.19	1.17
1.19	1.24	1.22
1.24	1.29	1.26
1.29	1.34	1.31
1.34	1.39	1.36
1.39	1.44	1.41
1.44	1.49	1.46

Provided Sump Capacity = 449,716 CU-FT OR 10.3 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	3.65	inches
Original IC= original percent impervious cover	91%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	44%	
Area = total sump tributary area	72.0	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 9.7 AC-FT

SPECIAL PLAN AREA 6b - SUMP EE - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Ponding Depth (ft)= **8.0**
Total Basin Depth (ft)= **9.0**

Top Basin Elev = **958**
Bottom Basin Elev = **949**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
949	950	107,881	110,811	109,346
950	951	110,811	113,766	112,289
951	952	113,766	116,747	115,256
952	953	116,747	119,752	118,249
953	954	119,752	122,783	121,268
954	955	122,783	125,839	124,311
955	956	125,839	128,919	127,379
956	957	128,919	132,025	130,472

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
2.48	2.54	2.51
2.54	2.61	2.58
2.61	2.68	2.65
2.68	2.75	2.71
2.75	2.82	2.78
2.82	2.89	2.85
2.89	2.96	2.92
2.96	3.03	3.00

Provided Sump Capacity = **958,570** **CU-FT** **OR** **22.0 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	3.65	inches
IC = percent impervious cover	91%	
Area = total sump tributary area	78.5	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **21.6** **AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Light Industrial	74.5	90	67.1
Sump Area	4.0	100	4.0
TOTAL SUMP EE	**78.5**	**91%**	**71.1**

SPECIAL PLAN AREA 6b - SUMP EE - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **958**
Bottom Sump Elev = **949**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
949	950	51,350	53,543	52,446
950	951	53,543	55,761	54,652
951	952	55,761	58,003	56,882
952	953	58,003	60,271	59,137
953	954	60,271	62,564	61,418
954	955	62,564	64,882	63,723
955	956	64,882	67,226	66,054
956	957	67,226	69,594	68,410

Bottom Area	Top Area	Average Volume
Acres		ac-ft
1.18	1.23	1.20
1.23	1.28	1.25
1.28	1.33	1.31
1.33	1.38	1.36
1.38	1.44	1.41
1.44	1.49	1.46
1.49	1.54	1.52
1.54	1.60	1.57

Provided Sump Capacity = **482,723** **CU-FT** **OR** **11.1 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	3.65	inches
Original IC= original percent impervious cover	91%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	44%	
Area = total sump tributary area	78.5	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **10.6** **AC-FT**

SPECIAL PLAN AREA 6c - SUMP FF - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1020**
Bottom Sump Elev = **1011**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
1011	1012	271,378	278,736	275,057
1012	1013	278,736	286,120	282,428
1013	1014	286,120	293,529	289,824
1014	1015	293,529	300,963	297,246
1015	1016	300,963	308,422	304,692
1016	1017	308,422	315,906	312,164
1017	1018	315,906	323,415	319,660
1018	1019	323,415	330,949	327,182

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
6.23	6.40	6.31
6.40	6.57	6.48
6.57	6.74	6.65
6.74	6.91	6.82
6.91	7.08	6.99
7.08	7.25	7.17
7.25	7.42	7.34
7.42	7.60	7.51

Provided Sump Capacity = **2,408,254** **CU-FT** **OR** **55.3 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 3.77 inches
IC = percent impervious cover 91%
Area = total sump tributary area 192.9 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **54.9 AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Light Industrial	179.9	90	161.9
Roadways	3.1	95	2.9
Sump Area	9.9	100	9.9
TOTAL SUMP FF	**192.9**	**91%**	**174.7**

SPECIAL PLAN AREA 6c - SUMP FF - IC ADJUSTMENT APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **1020**
Bottom Sump Elev = **1011**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
1011	1012	124,985	131,018	128,002
1012	1013	131,018	137,077	134,047
1013	1014	137,077	143,160	140,118
1014	1015	143,160	149,268	146,214
1015	1016	149,268	155,402	152,335
1016	1017	155,402	161,561	158,482
1017	1018	161,561	167,745	164,653
1018	1019	167,745	173,954	170,850

Bottom Area	Top Area	Average Volume
Acres		ac-ft
2.87	3.01	2.94
3.01	3.15	3.08
3.15	3.29	3.22
3.29	3.43	3.36
3.43	3.57	3.50
3.57	3.71	3.64
3.71	3.85	3.78
3.85	3.99	3.92

Provided Sump Capacity = **1,194,701** **CU-FT** **OR** **27.4 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 3.77 inches
Original IC= original percent impervious cover 91%
Adj. IC = adjusted percent impervious cover- Original x 48.8% 44%
Area = total sump tributary area 192.9 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **26.8** **AC-FT**

SPECIAL PLAN AREA 6d - SUMP GG - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **995**
Bottom Sump Elev = **986**

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
986	987	252,792	257,999	255,396
987	988	257,999	263,231	260,615
988	989	263,231	268,488	265,860
989	990	268,488	273,770	271,129
990	991	273,770	279,077	276,423
991	992	279,077	284,409	281,743
992	993	284,409	289,766	287,088
993	994	289,766	295,149	292,457

Bottom Area	Top Area	Average Volume
Acres		ac-ft
5.80	5.92	5.86
5.92	6.04	5.98
6.04	6.16	6.10
6.16	6.28	6.22
6.28	6.41	6.35
6.41	6.53	6.47
6.53	6.65	6.59
6.65	6.78	6.71

Provided Sump Capacity = **2,190,711** **CU-FT** **OR** **50.3 AC-FT**

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day) 3.72 inches
IC = percent impervious cover 91%
Area = total sump tributary area 177.0 Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = **49.7 AC-FT**

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Light Industrial	165.5	90	148.9
Roadways	2.9	95	2.8
Sump Area	8.6	100	8.6
TOTAL SUMP GG	**177.0**	**91%**	**160.3**

SPECIAL PLAN AREA 6d - SUMP GG - IC ADJUSTMENT APPROACH
Provided Sump Capacity

Freeboard (ft)= **1.0**

Design Water Depth (ft)= **8.0**

Total Sump Depth (ft)= **9.0**

Top Sump Elev = **995**

Bottom Sump Elev = **986**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
986	987	121,022	124,474	122,748
987	988	124,474	127,952	126,213
988	989	127,952	131,454	129,703
989	990	131,454	134,981	133,217
990	991	134,981	138,533	136,757
991	992	138,533	142,111	140,322
992	993	142,111	145,713	143,912
993	994	145,713	149,341	147,527

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
2.78	2.86	2.82
2.86	2.94	2.90
2.94	3.02	2.98
3.02	3.10	3.06
3.10	3.18	3.14
3.18	3.26	3.22
3.26	3.35	3.30
3.35	3.43	3.39

Provided Sump Capacity = 1,080,400 CU-FT OR 24.8 AC-FT

Required Sump Capacity

$D_{10yr\text{-}5day}$ = design storm depth (10-yr, 5-day)	3.72	inches
Original IC= original percent impervious cover	91%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	44%	
Area = total sump tributary area	177.0	Acres

Required Sump Capacity = [($D_{10yr\text{-}5Day}$)/12](IC)(Area) = 24.3 AC-FT

SPECIAL PLAN AREA 6e - SUMP HH - KERN COUNTY APPROACH

Provided Sump Capacity

Freeboard (ft)= 1.0
Design Water Depth (ft)= 8.0
Total Sump Depth (ft)= 9.0

Top Sump Elev = 920
Bottom Sump Elev = 911

Bottom Elev	Top Elev	Bottom Area	Top Area	Average Volume
		sq-ft		cu-ft
911	912	231,375	235,716	233,546
912	913	235,716	240,082	237,899
913	914	240,082	244,474	242,278
914	915	244,474	248,890	246,682
915	916	248,890	253,332	251,111
916	917	253,332	257,799	255,566
917	918	257,799	262,291	260,045
918	919	262,291	266,808	264,549

Bottom Area	Top Area	Average Volume
Acres		ac-ft
5.31	5.41	5.36
5.41	5.51	5.46
5.51	5.61	5.56
5.61	5.71	5.66
5.71	5.82	5.76
5.82	5.92	5.87
5.92	6.02	5.97
6.02	6.13	6.07

Provided Sump Capacity = 1,991,676 CU-FT OR 45.7 AC-FT

Required Sump Capacity

$D_{10yr-5day}$ = design storm depth (10-yr, 5-day)	3.52	inches
IC = percent impervious cover	90%	
Area = total sump tributary area	171.0	Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area) = 45.4 AC-FT

Sump Tributary Area

Land Use	Acres	% IC	IC Area
Light Industrial	163.2	90	146.9
Sump Area	7.8	100	7.8
TOTAL SUMP HH	**171.0**	**90%**	**154.7**

SPECIAL PLAN AREA 6e - SUMP HH - IC ADJUSTMENT APPROACH
Provided Sump Capacity

Freeboard (ft)= **1.0**
Design Water Depth (ft)= **8.0**
Total Sump Depth (ft)= **9.0**

Top Sump Elev = **920**
Bottom Sump Elev = **911**

Bottom Elev	Top Elev	Bottom Area (sq-ft)	Top Area (sq-ft)	Average Volume (cu-ft)
911	912	110,870	113,811	112,341
912	913	113,811	116,778	115,295
913	914	116,778	119,770	118,274
914	915	119,770	122,787	121,279
915	916	122,787	125,830	124,308
916	917	125,830	128,897	127,363
917	918	128,897	131,990	130,443
918	919	131,990	135,107	133,549

Bottom Area (Acres)	Top Area (Acres)	Average Volume (ac-ft)
2.55	2.61	2.58
2.61	2.68	2.65
2.68	2.75	2.72
2.75	2.82	2.78
2.82	2.89	2.85
2.89	2.96	2.92
2.96	3.03	2.99
3.03	3.10	3.07

Provided Sump Capacity = 982,851 CU-FT OR 22.6 AC-FT

Required Sump Capacity

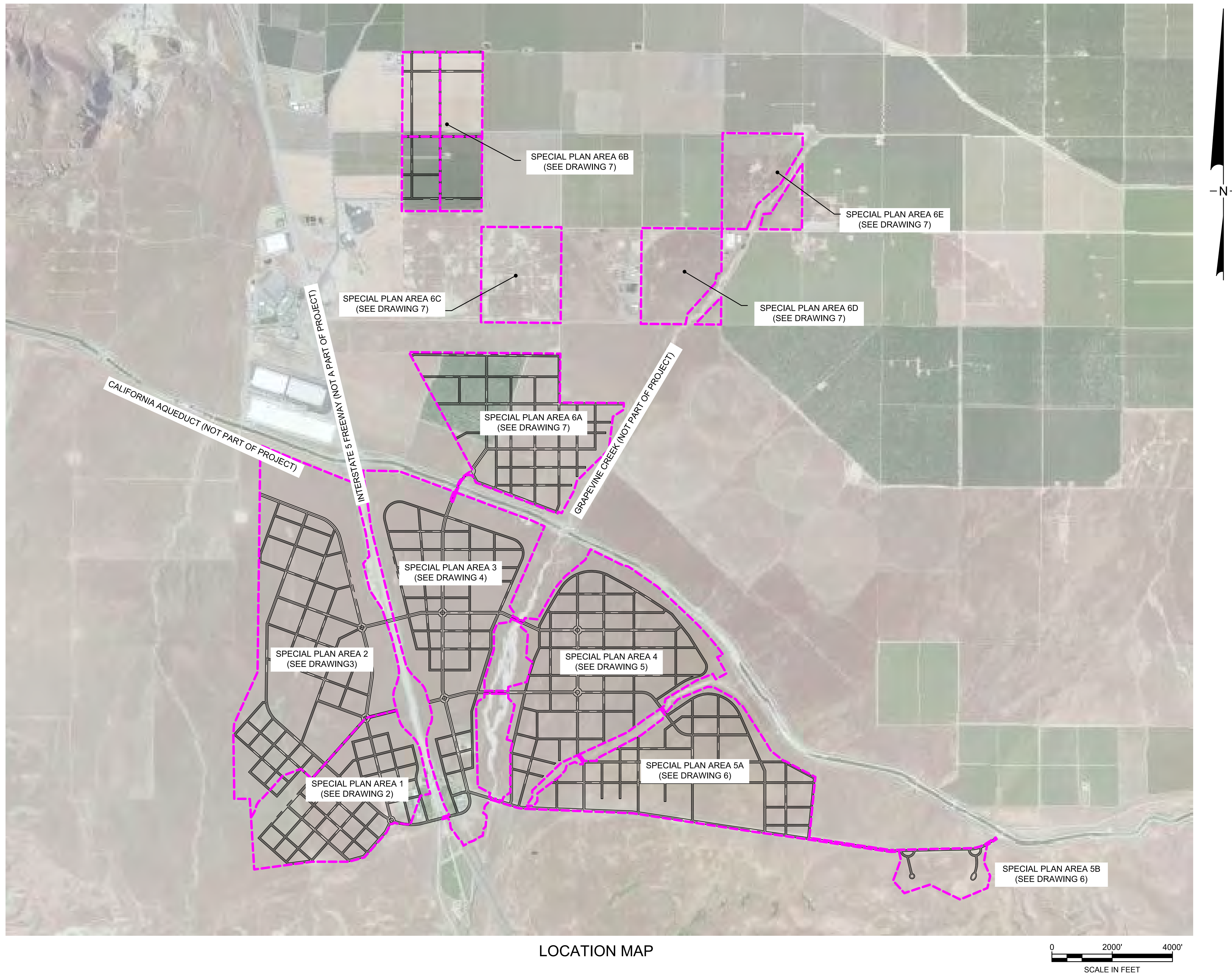
$D_{10yr-5day}$ = design storm depth (10-yr, 5-day)	3.52	inches
Original IC= original percent impervious cover	90%	
Adj. IC = adjusted percent impervious cover- Original x 48.8%	44%	
Area = total sump tributary area	171.0	Acres

Required Sump Capacity = [($D_{10yr-5Day}$)/12](IC)(Area) = 22.1 AC-FT

APPENDIX D

CONCEPTUAL DRAINAGE PLANS

TEJON RANCH COMPANY
MASTER DRAINAGE STUDY
GRAPEVINE PROJECT
GRAPEVINE, CALIFORNIA, KERN COUNTY
FEBRUARY 2015



LOCATION MAP

LIST OF DRAWINGS

DRAWING NO.	DRAWING TITLE
1	TITLE SHEET
2	SPECIAL PLAN AREA 1
3	SPECIAL PLAN AREA 2
4	SPECIAL PLAN AREA 3
5	SPECIAL PLAN AREA 4
6	SPECIAL PLAN AREAS 5A AND 5B
7	SPECIAL PLAN AREA 6A
8	SPECIAL PLAN AREAS 6B, 6C, 6D, AND 6E

GENERAL NOTES:

1. BASE INFORMATION PROVIDED BY MCINTOSH & ASSOCIATES, DATED JULY 2014.
2. REFER TO "MASTER DRAINAGE STUDY" (GEOSYNTEC, FEBRUARY 2015) FOR SUMP CALCULATIONS.

OWNER INFORMATION:

TEJON RANCH

4436 LEBEC ROAD
TEJON RANCH, CALIFORNIA 93243
TELEPHONE: 661-248-3000

PREPARED BY:

Geosyntec consultants

3990 OLD TOWN AVENUE, SUITE A-101
SAN DIEGO, CALIFORNIA 92110
CONTACT: MEGAN OTTO, P.E.
TELEPHONE: 310-957-6112

CONCEPTUAL DRAWINGS
NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
3990 OLD TOWN AVENUE, SUITE A-101
SAN DIEGO, CALIFORNIA 92110
PHONE: 619-297-1530

TITLE: TITLE SHEET

PROJECT: TEJON RANCH COMPANY MASTER DRAINAGE STUDY

SITE: GRAPEVINE PROJECT

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SIGNATURE

DATE

DESIGN BY: S. SAHU	DATE: FEBRUARY 2015
DRAWN BY: R. DILL	PROJECT NO.: PNW0184
CHECKED BY: S. SAHU	FILE: PNW0184-001
REVIEWED BY: M. OTTO	DRAWING NO.: 1 OF 8
APPROVED BY: M. OTTO	

SPECIAL PLAN AREA 1 SUMP SUMMARY							
SUMP	DESIGN WATER DEPTH (FT)	KERN COUNTY REQUIRED CAPACITY (AC-FT)	KERN COUNTY PROVIDED CAPACITY (AC-FT)	KERN COUNTY PROVIDED FOOTPRINT (AC)	IC ADJUSTMENT REQUIRED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED FOOTPRINT (AC)
A	8.0	16.0	16.3	2.7	7.8	8.5	1.4
B,C	1.5	4.2	4.5	5.3	2.1	2.4	2.5
D	8.0	89.1	89.5	13.8	43.5	44.0	6.6

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REV	DATE	DESCRIPTION	DRN	APP

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3990 OLD TOWN AVENUE, SUITE A-101
SAN DIEGO, CALIFORNIA 92110
PHONE: 619-297-1530

TITLE: SPECIAL PLAN AREA 1

PROJECT: TEJON RANCH COMPANY MASTER DRAINAGE STUDY

SITE: GRAPEVINE PROJECT

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DATE

DESIGN BY: S. SAHU	DATE: FEBRUARY 2015
DRAWN BY: R. DILL	PROJECT NO.: PNW0184
CHECKED BY: S. SAHU	FILE: PNW0184-002
REVIEWED BY: M. OTTO	DRAWING NO.: 2 OF 8
APPROVED BY: M. OTTO	

NOTES:

1. REQUIRED CAPACITY MANY NOT BE PROVIDED ENTIRELY WITHIN THE SUMP. REMAINING CAPACITY IS ROUTED DOWNSTREAM TO SECONDARY RECEIVING SUMP.
2. SUMP RECEIVES FLOWS FROM UPSTREAM SUMP.

SPECIAL PLAN AREA 2 SUMP SUMMARY

SUMP	DESIGN WATER DEPTH (FT)	KERN COUNTY REQUIRED CAPACITY (AC-FT)	KERN COUNTY PROVIDED CAPACITY (AC-FT)	KERN COUNTY PROVIDED FOOTPRINT (AC)	IC ADJUSTMENT REQUIRED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED FOOTPRINT (AC)
E,F	7.0	17.0	17.4	3.8	8.3	9.0	2.0
G	7.0	53.0	53.5	10.6	25.9	26.6	6.0
H (NOTE 1)	7.0	67.2	49.1	8.9	32.8	33.5	6.1
I (NOTE 2)	7.0	76.9	95.8	16.4	37.5	38.0	7.2

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3990 OLD TOWN AVENUE, SUITE A-101
SAN DIEGO, CALIFORNIA 92110
PHONE: 619-297-1530

TITLE: SPECIAL PLAN AREA 2

PROJECT: TEJON RANCH COMPANY MASTER DRAINAGE STUDY

SITE: GRAPEVINE PROJECT

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DESIGN BY: S. SAHU	DATE: FEBRUARY 2015
DRAWN BY: R. DILL	PROJECT NO.: PNW0184
CHECKED BY: S. SAHU	FILE: PNW0184-003
REVIEWED BY: M. OTTO	DRAWING NO.:
APPROVED BY: M. OTTO	3 OF 8

SPECIAL PLAN AREA 3 SUMP SUMMARY

SUMP	DESIGN WATER DEPTH (FT)	KERN COUNTY REQUIRED CAPACITY (AC-FT)	KERN COUNTY PROVIDED CAPACITY (AC-FT)	KERN COUNTY PROVIDED FOOTPRINT (AC)	IC ADJUSTMENT REQUIRED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED FOOTPRINT (AC)
J	8.0	27.8	28.6	4.4	13.6	14.1	2.4
K, L	8.0	118.0	118.9	18.3	57.6	58.1	10.0
M	8.0	64.9	65.4	9.9	31.7	32.7	5.0

CONCEPTUAL DRAWINGS
NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
3990 OLD TOWN AVENUE, SUITE A-101
SAN DIEGO, CALIFORNIA 92110
PHONE: 619-297-1530

TITLE: SPECIAL PLAN AREA 3

PROJECT: TEJON RANCH COMPANY MASTER DRAINAGE STUDY

SITE: GRAPEVINE PROJECT

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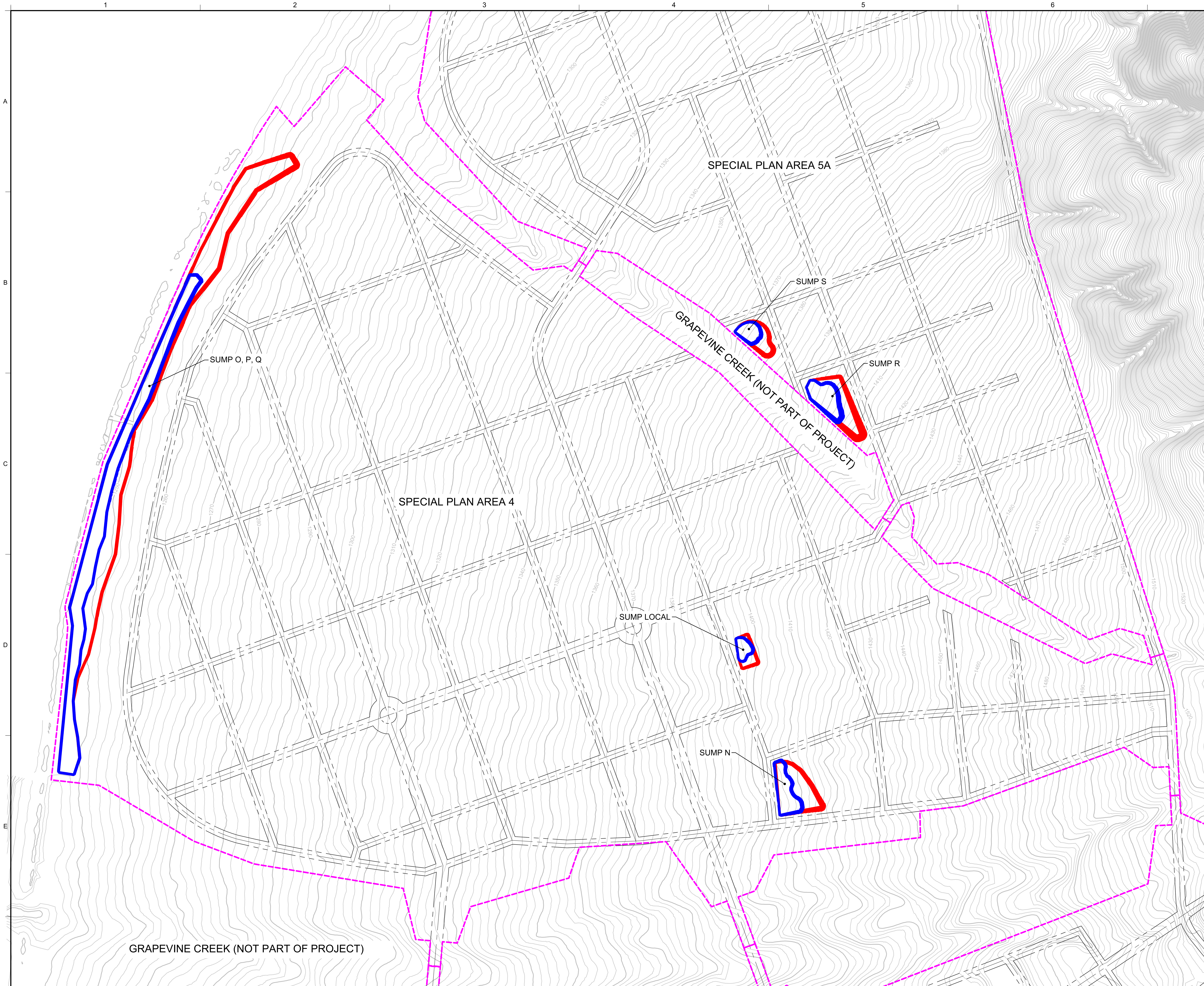
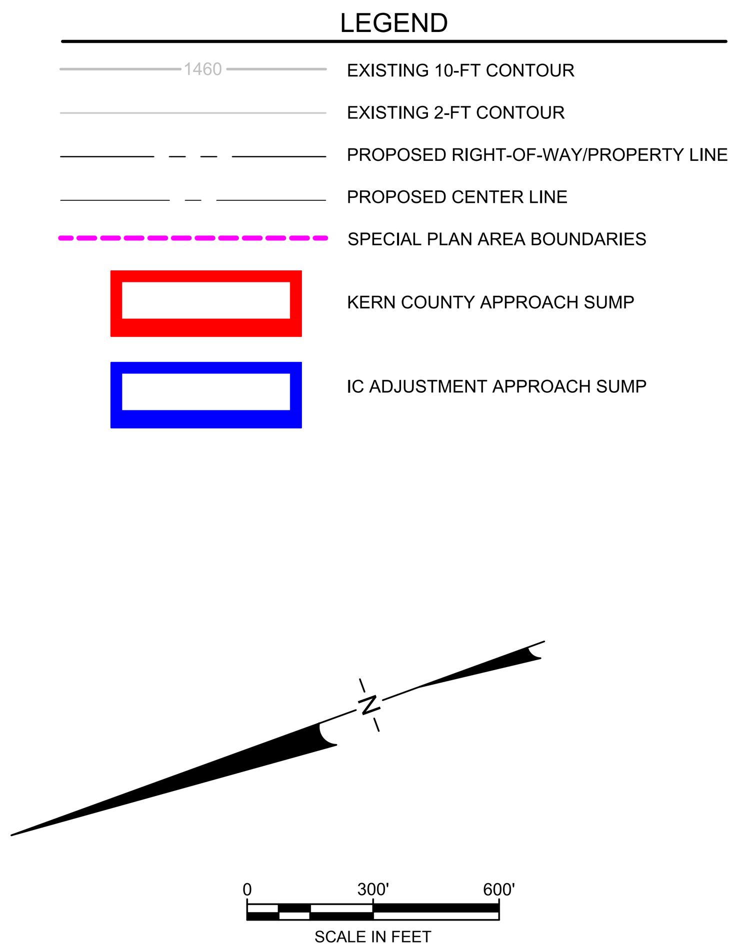
DESIGN BY: S. SAHU	DATE: FEBRUARY 2015
DRAWN BY: R. DILL	PROJECT NO.: PNW0184
CHECKED BY: S. SAHU	FILE: PNW0184-004
REVIEWED BY: M. OTTO	DRAWING NO.:
APPROVED BY: M. OTTO	4 OF 8





SPECIAL PLAN AREA 4 SUMP SUMMARY

SUMP	DESIGN WATER DEPTH (FT)	KERN COUNTY REQUIRED CAPACITY (AC-FT)	KERN COUNTY PROVIDED CAPACITY (AC-FT)	KERN COUNTY PROVIDED FOOTPRINT (AC)	IC ADJUSTMENT REQUIRED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED FOOTPRINT (AC)
LOCAL	8.0	5.0	5.2	0.9	2.4	2.9	0.6
N	8.0	16.9	17.7	2.9	8.2	8.8	1.6
O, P, Q	8.0	136.0	136.7	21.6	66.4	67.1	11.3

CONCEPTUAL DRAWINGS
NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
3990 OLD TOWN AVENUE, SUITE A-101
SAN DIEGO, CALIFORNIA 92110
PHONE: 619-297-1530

TITLE: SPECIAL PLAN AREA 4

PROJECT: TEJON RANCH COMPANY MASTER DRAINAGE STUDY

SITE: GRAPEVINE PROJECT

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DESIGN BY: S. SAHU	DATE: FEBRUARY 2015
DRAWN BY: R. DILL	PROJECT NO.: PNW0184
CHECKED BY: S. SAHU	FILE: PNW0184-005
REVIEWED BY: M. OTTO	DRAWING NO.:
APPROVED BY: M. OTTO	5 OF 8

SPECIAL PLAN AREAS 5A AND 5B SUMP SUMMARY							
SUMP	DESIGN WATER DEPTH (FT)	KERN COUNTY REQUIRED CAPACITY (AC-FT)	KERN COUNTY PROVIDED CAPACITY (AC-FT)	KERN COUNTY PROVIDED FOOTPRINT (AC)	IC ADJUSTMENT REQUIRED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED FOOTPRINT (AC)
R	8.0	16.4	16.7	3.1	8.0	8.4	1.6
S	8.0	7.1	7.7	1.4	3.5	4.0	0.7
T, U	8.0	63.0	63.8	10.5	30.7	31.1	5.7
V	8.0	32.2	32.8	5.3	15.7	16.2	2.7
W	3.5	21.7	22.2	11.1	10.6	11.4	5.7

CONCEPTUAL DRAWINGS
NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
3990 OLD TOWN AVENUE, SUITE A-101
SAN DIEGO, CALIFORNIA 92110
PHONE: 619-297-1530

TITLE: SPECIAL PLAN AREAS 5A AND 5B

PROJECT: TEJON RANCH COMPANY MASTER DRAINAGE STUDY

SITE: GRAPEVINE PROJECT

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DATE

DESIGN BY: S. SAHU	DATE: FEBRUARY 2015
DRAWN BY: R. DILL	PROJECT NO.: PNW0184
CHECKED BY: S. SAHU	FILE: PNW0184-006
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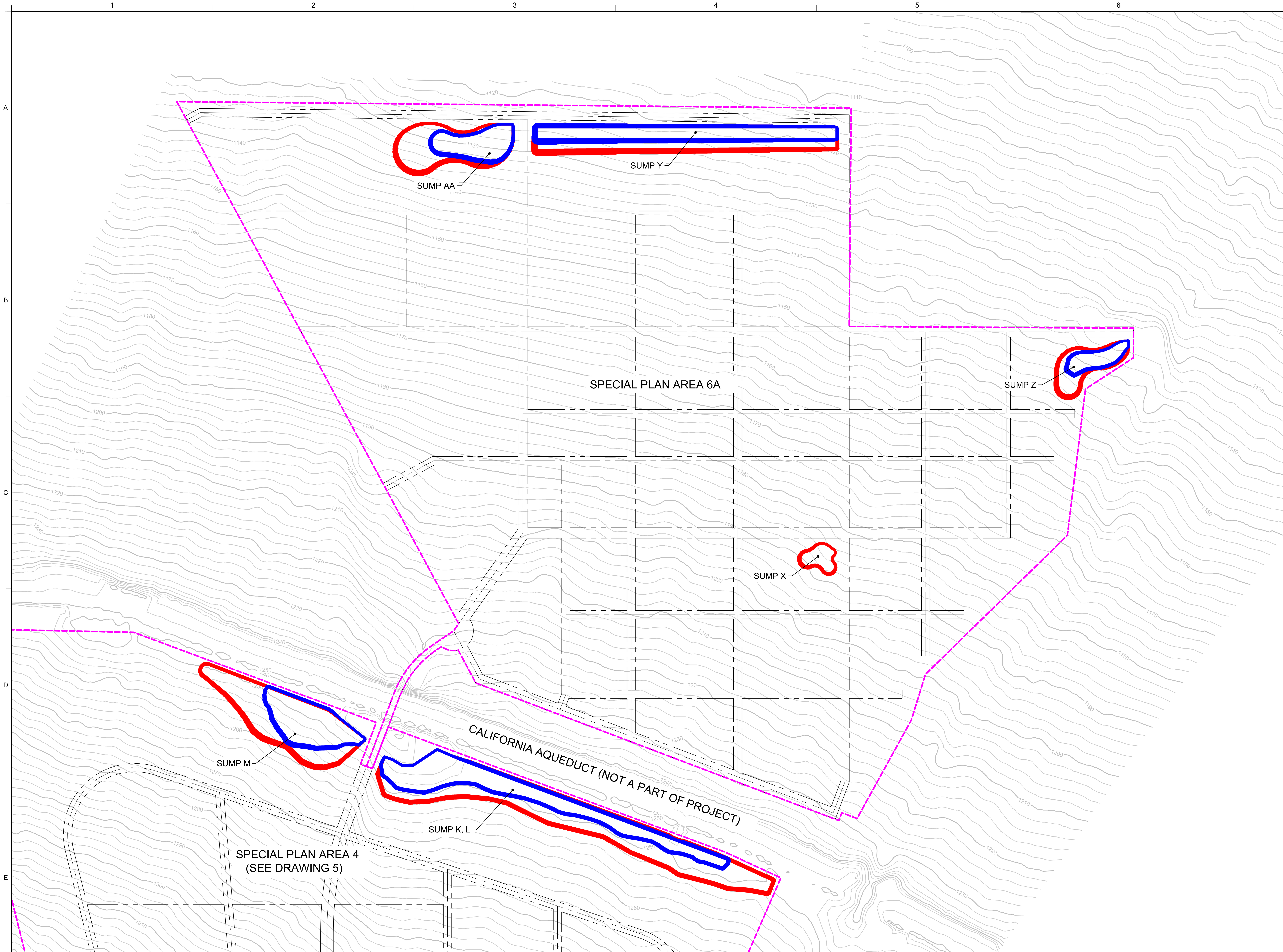

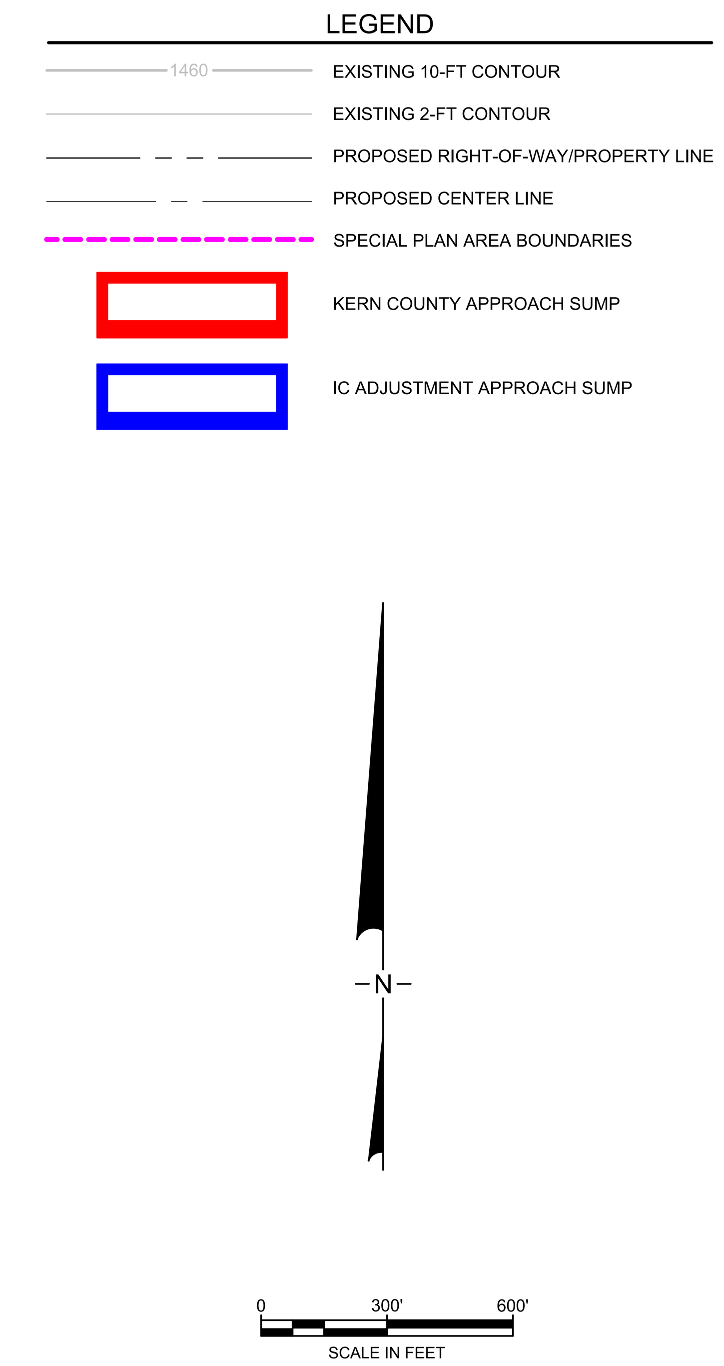

NOTES:

1. REQUIRED CAPACITY MANY NOT BE PROVIDED ENTIRELY WITHIN THE SUMP. REMAINING CAPACITY IS ROUTED DOWNSTREAM TO SECONDARY RECEIVING SUMP.
2. SUMP RECEIVES FLOWS FROM UPSTREAM SUMP.

SPECIAL PLAN AREA 6A SUMP SUMMARY

SUMP	DESIGN WATER DEPTH (FT)	KERN COUNTY REQUIRED CAPACITY (AC-FT)	KERN COUNTY PROVIDED CAPACITY (AC-FT)	KERN COUNTY PROVIDED FOOTPRINT (AC)	IC ADJUSTMENT REQUIRED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED FOOTPRINT (AC)
X (NOTE 1)	8.0	22.1	6.8	1.2	10.8	0.0	N/A
Y (NOTE 2)	8.0	51.2	67.2	11.5	25.0	36.6	7.4
Z	8.0	18.6	18.9	3.1	9.1	9.6	1.7
AA	8.0	40.2	40.9	6.4	19.6	20.1	3.3

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TITLE: SPECIAL PLAN AREA 6A

PROJECT: TEJON RANCH COMPANY MASTER DRAINAGE STUDY

SITE: GRAPEVINE PROJECT

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SIGNATURE

DATE

DESIGN BY: S. SAHU	DATE: FEBRUARY 2015
DRAWN BY: R. DILL	PROJECT NO.: PNW0184
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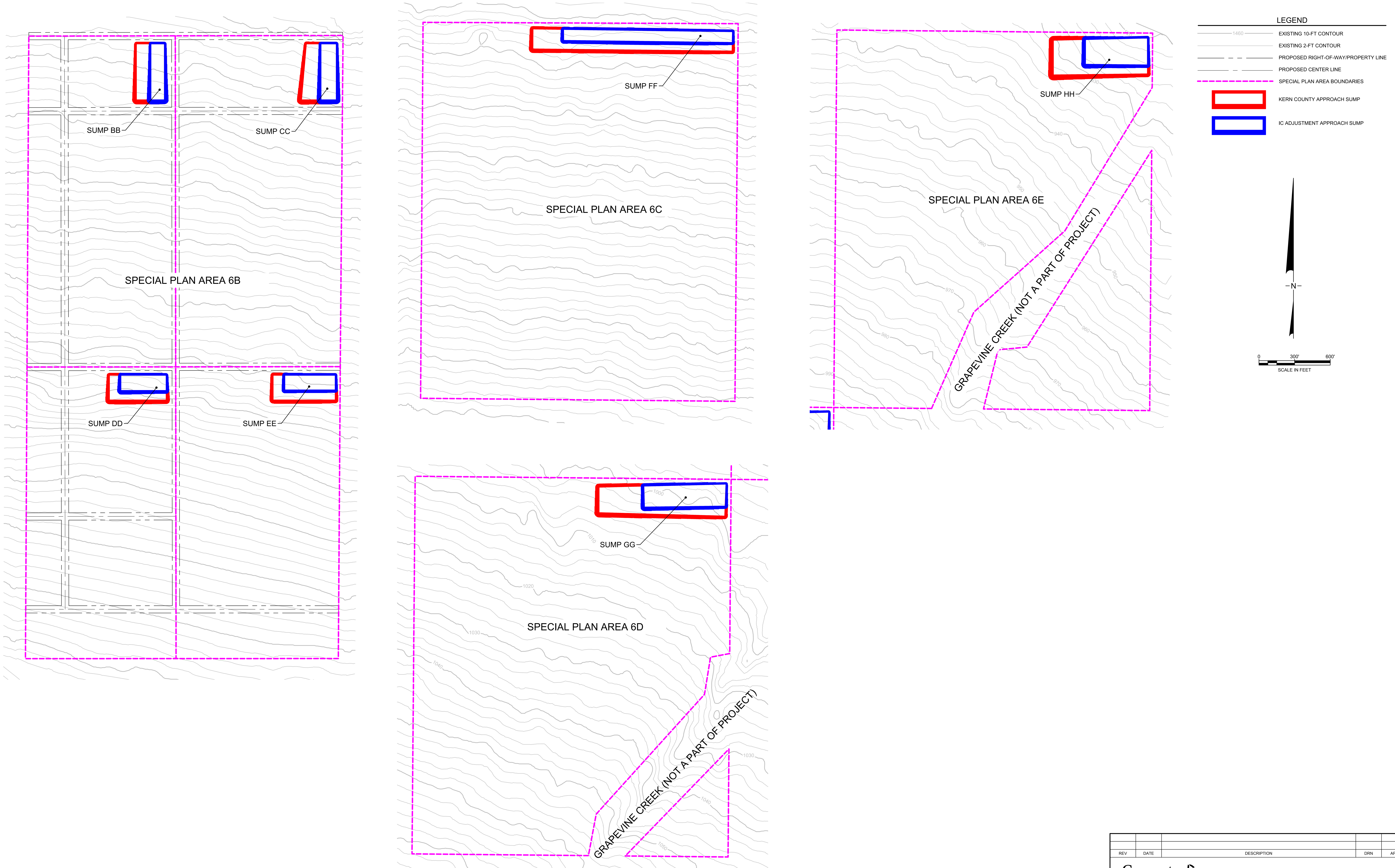
REVIEWED BY: M. OTTO	DRAWING NO.:
APPROVED BY: M. OTTO	7 OF 8



SPECIAL PLAN AREAS 6B, 6C, 6D, AND 6E SUMP SUMMARY							
SUMP	DESIGN WATER DEPTH (FT)	KERN COUNTY REQUIRED CAPACITY (AC-FT)	KERN COUNTY PROVIDED CAPACITY (AC-FT)	KERN COUNTY PROVIDED FOOTPRINT (AC)	IC ADJUSTMENT REQUIRED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED CAPACITY (AC-FT)	IC ADJUSTMENT PROVIDED FOOTPRINT (AC)
BB	8.0	22.2	22.4	3.5	10.8	11.4	2.0
CC	8.0	25.0	25.7	4.0	12.2	12.8	2.2
DD	8.0	19.8	20.1	3.2	9.7	10.3	1.7
EE	8.0	21.6	22.0	3.4	10.6	11.1	1.8
FF	8.0	54.9	55.3	8.6	26.8	27.4	4.7
GG	8.0	49.7	50.3	7.6	24.3	24.8	3.9
HH	8.0	45.4	45.7	7.0	22.1	22.6	3.5

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TITLE: SPECIAL PLAN AREAS 6B, 6C, 6D, AND 6E

PROJECT: TEJON RANCH COMPANY MASTER DRAINAGE STUDY

SITE: GRAPEVINE PROJECT

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SIGNATURE

DATE

DESIGN BY: S. SAHU	DATE: FEBRUARY 2015
DRAWN BY: R. DILL	PROJECT NO.: PNW0184
CHECKED BY: S. SAHU	FILE: PNW0184-008
REVIEWED BY: M. OTTO	DRAWING NO.:
APPROVED BY: M. OTTO	8 OF 8

Appendix N

Evaluation of Potable, Non-Potable, and Recycled Water Demands

EVALUATION OF POTABLE, NON-POTABLE AND RECYCLED WATER DEMANDS

Grapevine Project

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NOVEMBER 2015

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Evaluation of Potable, Non-Potable and Recycled Water Demands Report

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Evaluation of Potable, Non-Potable and Recycled Water Demands Report

1.0 SUMMARY OF GRAPEVINE PROJECT DEMANDS

This engineering report summarizes the estimated potable, non-potable, and recycled water demands for the Grapevine Project in Kern County, California (the project). The demands were estimated for all project elements using well-established methodologies and land use assumptions that are consistent with the Grapevine Specific and Special Plans. The project is also designed to be very water-efficient; specifically, the project's water efficiency standards meet or are more stringent than current regulations and tertiary-treated recycled water is planned to be widely used in order to reduce potable water demands.

1.1 Grapevine Project Description

The 8,010-acre Grapevine Project site is located entirely within unincorporated Kern County, just south of the junction of highways Interstate 5 and State Route 99. The project site is situated within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement that will permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as Interstate 5.

The Grapevine Project, which would include 12,000 residential units and 5.1 million square feet of commercial and light industrial land uses[1], is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside these village cores, the project incorporates a mix of residential uses, office, research and development, regional commercial, and light industrial/warehouse uses. Accordingly, the demands for the project were developed for each of these major land use elements.

1.2 Methodology Used to Estimate Water Use Factors

As described below, the project's average annual water demand was estimated based on: (1) the application of well-established methodologies for estimating indoor and outdoor water use factors on a "per acre" or "per unit" basis, and (2) assumptions regarding water efficiency and the use of recycled water for certain end uses. These project-specific water use factors were then applied to each land use element anticipated by the Grapevine Specific and Special Plans. Additionally, the

[1] The project could include up to 2,000 additional residential units, for a maximum of 14,000 units, through a reduction the commercial and light industrial land uses based on vehicle trip equivalency ratios.

water demand estimates were conservatively increased to account for treatment and distribution system losses and various contingencies.

1.2.1 Residential Indoor Water Use Factors

The residential indoor water use factors were developed using a predictive model of residential water use developed for the United States Environmental Protection Agency (U.S. EPA) and several large water utilities (DeOreo, 2011b). Based on assumptions regarding fixture efficiency, household size, and other key factors, indoor water use factors were estimated for the different housing product types described in the Grapevine Specific and Special Plan. These product types include “Standard Residential” units, which are detached single-family homes, and “Village Center Residential” units, which include higher density and multi-family units.

1.2.2 Commercial, Institutional, and Industrial (CII) Indoor Water Use Factors

The CII indoor water use factors were developed using the data and methodology included in the Pacific Institute’s *Waste Not, Want Not: The Potential for Urban Water Conservation in California* (2003), also called the “Pacific Institute study”. This study correlated indoor water use in a wide range of CII facilities to the number of employees in that facility based on statewide averages of measured data. Per the study, the resultant “employee water use factors” were then updated to reflect water efficiency standards implemented since the study was completed. The CII indoor water use factors for the project were estimated for the assumed mix of specific CII land uses that are contemplated in the Grapevine Specific and Special Plans.

1.2.3 Outdoor Water Use Factors

The outdoor water use factors were estimated using the landscape irrigation demand model described in the recently-updated Model Water Efficient Landscape Ordinance (MWELO; DWR, 2015). The MWELO requires that the annual estimated total water use (ETWU) for landscape irrigation not exceed a Maximum Applied Water Allowance (MAWA). The MAWA is calculated based on the regional reference evapotranspiration rate, an evaporation adjustment factor, the total landscaped area, and the area of “special landscaped area”.[2] For each major land use element within the project (e.g., residential, CII, and community landscaping), a landscape ETWU was estimated based on a combination of four key landscape palettes (e.g., high or low water use

[2] Special Landscaped Area includes areas of the landscape dedicated solely to edible plants, recreational areas, areas irrigated with recycled water, or water features using recycled water.

plantings) and assumptions of recycled or potable water use. In all instances, the ETWU for landscaped areas within the project meet or exceed the efficiency standards of the MWELO.

1.3 Water Demand by Major Sector and End Use

Based on assumptions regarding project land use at build out as described in the Grapevine Specific and Special Plan, and the application of the water demand methodologies described above, the total water demand of the project by major sector and end use was estimated. As described below and shown in Table 1, the total demand of the project development (including contingencies) would be 8,261 acre feet per year (AFY) at full build out. A summary of the water use by sector and the contingencies is provided below.

Land Use Category	Estimated Total Water Use (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Residential	3,637	1,920	1,717
Commercial, Institutional and Industrial	1,180	588	592
Community Landscaping	2,415	-	2,415
Treatment system losses	268	-	-
Distribution system losses	362	125	236
Subtotal Average Annual Water Demand	*7,861*	*2,634*	*4,960*
Contingency	400	-	-
Project Annual Average Water Demand	*8,261*	-	-

Excerpt from Table 1: Estimated Grapevine Project Annual Water Demand

1.3.1 Residential Water Use

Residential water use is comprised of "indoor water use factors" which include water used to shower, wash clothes, and flush toilets, and "outdoor water use factors" which primarily account for landscape irrigation within a residential lot. The project's residential water use was calculated by multiplying the unique water use factors for each housing type by the planned number of units of that type.

Based on application of the U.S. EPA methodology, the average indoor water use factor for the project's residential dwelling units was 0.16 AFY, which multiplied by 12,000 units equated to a total residential indoor water use of approximately 1,920 AFY.

Based on MWELO and the assumed landscaped areas within each residential lot, the outdoor water use factors were estimated as 0.08 AFY/du for Village Center Residential units, and 0.17 AFY/du for Standard Residential units. Multiplied by the respective number of units, the total residential outdoor water use was estimated to be approximately 1,717 AFY.

Total residential water use, therefore, was estimated to be approximately 3,637 AFY (i.e., 1,920 AFY indoor use plus 1,717 AFY outdoor use). It was assumed that potable water would be used to meet all residential demands.

1.3.2 Commercial Industrial and Institutional Water Use

Based on application of the Pacific Institute study methodology, it was estimated that the project's CII indoor water use per employee would range from 53 gallons per day (gpd) for village center offices to 847 gpd for restaurants in the project's high-traffic, highway-serving areas. Based on the assumed distribution and areas of the different CII land uses, it was estimated that total CII indoor use would be approximately 588 AFY. Based on MWELO and the assumed landscaped areas, it was estimated that outdoor water use in the CII portion of the project would be approximately 592 AFY, bringing the total CII water use to approximately 1,180 AFY. It was assumed that recycled or non-potable water would be used for CII landscape irrigation, with the exception of at schools, where potable water would be applied for landscape irrigation.

1.3.3 Community Landscaping Water Use

The project includes significant acreage dedicated to "community landscaping" that includes landscaped areas in parks, roadways, and other community areas. Based on MWELO and the assumed landscaped areas, total community landscaping water use for the project was estimated to be approximately 2,415 AFY. It was assumed that recycled or non-potable water would be used for community landscaping irrigation, with the exception of residential common areas, where potable water would be applied for landscape irrigation.

1.3.4 Treatment and Distribution System Losses

All water treatment and distribution systems experience system losses from drinking water treatment, system maintenance, and leaks. Water treatment and distribution system losses are assumed to be 10% of the total project potable water use and 5% of recycled water use, for a total of 629 AFY. These assumptions are consistent with operation of a new, well-designed and maintained treatment[3] and distribution system[4].

1.3.5 Water Demand Contingency

A water demand contingency of 400 AFY was conservatively added to the overall project water demand to account for unforeseen water uses. Potential uses allowed by the Grapevine Specific include additional housing up to 14,000 total units, urban agriculture, or certain water-intensive industrial land uses.

1.4 Water Demand and Supply By Source

As described below and shown in Table 2, the project's demands will be met by a combination of potable and non-potable water supply sources that will be treated onsite at water and wastewater treatment plants operated by the Tejon-Castac Water District (TCWD) (EKI, 2015a; 2015b).

Water Source	Water Use Category	Estimated Total Water Demand (AFY)
California Aqueduct (Nickel Water)	Potable Water	5,620
	Supplemental Non-Potable Water	258
	Contingency	400
	California Aqueduct Subtotal	*6,278*
Recycled Water	Recycled Non-Potable Water	1,983
Project Average Annual Water Demand		*8,261*

Excerpt from Table 2: Estimated Grapevine Annual Water Demand by Source

1.4.1 Potable Demand and Supply

A total of 5,620 AFY of treated, potable water would be used to meet all indoor demand and residential and school landscaping outdoor demand[5]. The source of this potable supply would be

[3] http://www.pall.com/main/water-treatment/direct-coagulated-water-47223.page

[4] The California standard is 10% allowable water loss in existing water systems (EPA, 2010. *Control and Mitigation of Drinking Water Losses in Distribution Systems*, November 2010). Based on professional experience, we have assumed that the new project water distributions systems will have 5% water loss.

[5] Per the Grapevine Specific and Special Plans recycled water may be used for landscape irrigation throughout the project. However, for purposes of this report we have conservatively assumed that potable water will be used to irrigate residential landscaping.

Nickel Water[6] that is conveyed through the California Aqueduct and treated at the project's potable water treatment plant(s) (EKI, 2015b).

1.4.2 Non-Potable Demand and Supply

A total of 2,241 AFY of non-potable water would be used to meet non-residential, roadway, and selected common area landscape irrigation demand. Approximately 1,983 AFY of recycled water would be generated within the project in an average rainfall year (Attachment A). An additional 258 AFY of supplemental, non-potable water would be used in an average rainfall year to meet selected landscape irrigation demands that exceed the available recycled water supply. The source of this non-potable supply would be Nickel Water that is conveyed through the California Aqueduct, filtered, and delivered into the Grapevine Project's non-potable water distribution system.

1.4.3 Contingency

As discussed above, a water demand contingency of 400 AFY was conservatively added to the estimated project water demand. Depending on its final designated uses, the water demand contingency may be supplied with either fully-treated potable or filtered non-potable Nickel Water (EKI, 2015b). Further, to the extent that the water demand contingency is used to meet additional indoor demands, this would generate additional recycled water that could be used to meet selected non-potable demands within the project (EKI, 2015a).

One potential use of the contingency is to add additional housing up to 14,000 total units consistent with the Grapevine Specific and Special Plans. Water demand estimates for this scenario and the adjusted land use assumptions are included in Attachment B.

[6] Tejon Ranchcorp, an affiliate of the Grapevine Project applicant, has the right to receive 6,693 AFY of water from the Kern County Water Agency (KCWA) through at least 2079 as the assignee of a Kern River water transfer agreement between KCWA and the Nickel Family LLC (the "Nickel Water"). The delivery of Nickel Water is 100 percent reliable on a year-to-year basis and is not subject to hydrological variability, regulatory requirements, or supply constraints that may affect other water sources.

2.0 INTRODUCTION

This engineering report summarizes the estimated potable, non-potable, and recycled water demands for the project based on the proposed housing product mix; commercial, institutional, and industrial (CII) land uses; and landscaping features and palette. This section provides an overview of the Grapevine Project.

2.1 Grapevine Project Description

2.1.1 Project Location

The Grapevine Project is located in the west-central portion of Tejon Ranch (the Ranch). The approximately 270,000-acre Ranch is currently held in private ownership by Tejon Ranchcorp (TRC). The Ranch includes a large portion of the Tehachapi Mountains as well as smaller portions of the San Joaquin and Antelope Valleys. Generally, the Ranch extends from Interstate 5 (I-5) on the western side to State Route 58 (SR 58) on the northern side and SR 138 on the southern side (Figure 1).

The 8,010-acre Grapevine Project site is entirely within unincorporated Kern County, just south of the junction of I-5 and SR 99. Downtown Bakersfield is approximately 25 miles north of the project. The majority of the project is on the east side of I-5, but a smaller portion lies on the west side of I-5. The project site is bisected by the California Aqueduct (Figure 1 and Figure 2).

The Grapevine Project site lies mainly in the Grapevine and Pastoria Creek U.S. Geological Survey (USGS) 7.5-minute quadrangles. There is one parcel and a portion of two other parcels in the project site that lie entirely within the Mettler USGS 7.5-minute quadrangles. The latitude and longitude of the approximate center of the site is 34°57′9″ N and 118°55′39″ W. The Universal Transverse Mercator (UTM) coordinates for the approximate center are UTM Easting (meters) 323999 and UTM Northing (meters) 3869472 in Zone 11.

2.1.2 Project Overview

The 8,010-acre project site is within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement, a landmark agreement reached in 2008 with leading environmental organizations (including the Sierra Club, Natural Resources Defense Council, California Audubon Society, Endangered Habitats League, and Planning and Conservation League) to permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as I-5.

The Grapevine Project site includes approximately 8,010 acres, of which approximately 3,232 acres (or about 40%) would be designated for agriculture (with grazing and open space as the predominant land uses) and approximately 4,778 acres (about 60%) would be developed as a new residential community and employment center. The community would leverage and build upon the economic expansion and job growth that has occurred at Tejon Ranch Commerce Center (Figure 2), located immediately north of the project on I-5. The Grapevine Project would feature a series of compact neighborhoods linked by bicycle and pedestrian trails that provide convenient access to grocery and drugstores, professional services, schools, and parks. The project site is located along I-5, at the gateway to the Central Valley, and is immediately adjacent to the extensive open space that was conserved in the Tejon Ranch Land Use and Conservation Agreement.

The project, which would include 12,000 residential units and 5.1 million square feet of commercial and light industrial land uses[7], is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside the village cores, the Grapevine Project includes a mix of residential uses, office, research and development, regional commercial, freeway-oriented commercial, and light industrial/warehouse uses. Other potential public facilities, including fire stations, a sheriff substation, transit facilities/park-and-rides, and water and wastewater treatment facilities, are proposed throughout the community.

Access to the first phases of the Grapevine community would be from Interstate 5 at the existing Grapevine Road and Laval Road interchanges. During later phases of development, the existing Grapevine Road/ Interstate 5 interchange may be expanded and relocated to the north. To allow for the relocation and replacement of the interchange, an existing Vehicle Enforcement Facility may be relocated to a TRC-owned parcel on the west side of the junction of I-5 and CA-99. The project would also improve an existing TRC agricultural road east of the project area to provide access for truck traffic currently using Edmonston Pumping Plant Road to travel to properties east of the project. The circulation network within the project is composed of primarily two- and four-lane arterials, collector streets, and local streets organized in a grid pattern. All roads within the project site would be public. Multipurpose trails are proposed along Grapevine Creek, Cattle Creek, the southern foothills, and the open space adjacent to the California Aqueduct and at other locations throughout the project site. Some of these trails would connect to on-street, Class 2 bike lanes. Water and sewer service would be provided by TCWD.

[7] The project could include up to 2,000 additional residential units, for a maximum total of 14,000 units, through a reduction of commercial/industrial square footage based on vehicle trip equivalency ratios.

2.1.3 Project Construction Scenario

The project site is divided into six planning areas ranging in size from approximately 450 to 1,400 acres. Development would be phased over a period of 19+ years, starting with the development of Planning Area 6a and/or 3 and continuing with the balance of the planning areas nearest to the initial phase. Buildout of each phase is projected to take approximately 2 to 4 years (Phase 1: 2 years; Phase 2: 4 years; Phase 3: 3 years; Phase 4: 4 years; Phase 5: 4 years; Phase 6: 2 years), with the first phase commencing in 2016. The portions of the site that are proposed to remain in exclusive agriculture/open space are primarily located along the southern edge of the California Aqueduct, along the southern portion of the project site at the foothills of the Tehachapi Mountains, and along Grapevine and Cattle Creeks.

2.1.4 Project Operation Scenario

The project operations are described in the Grapevine Specific and Special Plan, and land uses associated with operations are described in the Grapevine Special Planning District Plan.

2.2 Project Water Demand Estimation

The project's average annual water demand was estimated based on: (1) the application of well-established methodologies for estimating indoor and outdoor water use factors on a "per acre" or "per unit" basis, and (2) assumptions regarding water efficiency and the use of recycled water for certain end uses. These project-specific water use factors were then applied to each land use element anticipated by the Grapevine Specific and Special Plans. Additionally, the water demand estimates were conservatively increased to account for treatment and distribution system losses and various contingencies.

The following sections describe how water the water demands were estimated for the project:

- Section 3.0 - Assumptions Regarding Project Water Efficiency
- Section 4.0 - Indoor Water Use Estimates
- Section 5.0 - Outdoor Water Use Estimates
- Section 6.0 - Projected Water Use By Sector
- Section 7.0 - Assumed Treatment and Distribution System Losses
- Section 8.0 - Additional Factors Impacting Total Water Demand

The following sections then present the results and how water demands will be managed and /or mitigated in the future:

- Section 9.0 - Total Estimated Potable, Non-potable and Recycled Water Demands
- Section 10.0 - Water Conservation Education, Implementation and Enforcement Measures
- Section 11.0 - Offsite and Cumulative Impacts
- Section 12.0 - Mitigation Measures

3.0 ASSUMPTIONS REGARDING PROJECT WATER EFFICIENCY

The project is designed to be water-efficient, and would utilize tertiary-treated recycled water to the maximum extent feasible to reduce potable water demands. The specific water efficiency requirements summarized in the table below and described in Sections 3.1 through 3.3 have been incorporated into the project and are the basis for the water demand estimates presented herein. In all cases the project's water efficiency standards meet or are more stringent than current regulations.

Statue or Regulation	Citation	Description	Applicability to Project
Executive Order (EO) B-29-15	EO B-29-15	• EO B-29-15 was issued on April 1, 2015 with the goal of achieving a statewide reduction in potable urban water usage of 25% relative to water use in 2013.	• Certain EO directives are applicable to the project. • Project meets or exceeds all applicable regulations, see Section 3.4.
California Green Building Standards (CALGreen) Code	CCR Title 24, Part 11 Chapter 17.10 of the Kern County Code of Building Regulations	• Cal Green Code (which Kern County adopts by reference) includes water efficiency requirements for new residential and CII structures.	• Applicable to the planning, design, construction, use, and occupancy of newly-constructed residential and CII buildings. • Project meets or exceeds all applicable water efficiency regulations, see Sections 3.1 and 3.2.
Model Water Efficient Landscape Ordinance (MWELO) July 9, 2015 Final.	CCR Title 23, Division 2, Chapter 2.7	• Establishes an outdoor water budget for new and renovated landscaped areas that are 500 square feet or larger.	• Applicable to all landscaping within the project. • Project meets or exceeds all applicable regulations, see Sections 3.2 and 3.4
CALGreen Code as Adopted by the Building Standards Commission	CCR Title 24, Part 11 Emergency Building Standard DSA-SS EF-02/15	• The Building Standards Commission, which regulates the construction of public schools and community colleges in California, approved a modified version of the MWELO.	• Applicable to public schools and community colleges within the project. • Project meets or exceeds all applicable regulations, see Section 3.2.
Kern County Code of Ordinances – Landscaping Requirements and Water Efficient Landscaping	Title 19, Chapter 19.86, § 19.86.050 and §19.86.060	• Requires that a minimum of five percent (5%) of the total developed lot area shall be landscaped.	• Applicable to landscaping for CII land uses within the project. • Project meets or exceeds the standards in these regulations, see Section 3.2.

Statue or Regulation	Citation	Description	Applicability to Project
Kern County Code of Ordinances – Landscaping Requirements and Water Efficient Landscaping	Title 19, Chapter 19.86, § 065	• The Kern County Code of Ordinances Water Efficient Landscaping section, is currently based on the 2009 version of the MWELO, but is required to be updated to the 2015 version of the MWELO by December 1, 2015.	• Applicable to all landscaping within project. • Project meets or exceeds the standards in these regulations, see Section 3.2.
California Water Code	Division 6, Part 2.10, §10910-10915	• Requires the development of a project-specific Water Supply Assessment.	• Applicable to the project. • Project complies with this regulation, see Section 12.0.

3.1 Indoor Water Use Efficiency

The California Green Building Standards Code, also called the "CALGreen Code,"[8] establishes building requirements for residential and non-residential structures, including water efficiency and conservation requirements. With limited exceptions, the CALGreen Code applies to the planning, design, construction, use, and occupancy of newly-constructed buildings and structures. Chapter 17.10 of the Kern County Code of Building Regulations adopts the CALGreen Code by reference.

For indoor water use, these building codes specify the maximum allowable flowrates for fittings and fixtures consistent with the California Health and Safety Code, California Plumbing Code, and the California Energy Commission's proposed Appliance Efficiency Regulations, including the following standards, which have recently been updated in response to the Governor's Executive Order No. B-29-15:

- Toilets - 1.28 gallons per flush,
- Showers - 2 gallons per minute (gpm) at 80 pounds per square inch (psi) of water pressure,
- Bathroom faucets - 1.2 gpm at 60 psi,
- Kitchen faucets - 1.8 gpm at 60 psi,
- Common area bathroom faucets - 0.5 gpm at 60 psi, and
- Urinals - 0.125 gallons per flush.

[8] California Code of Regulations (CCR) Title 24, Part 11.

The project indoor water demands were estimated based on the following assumptions:

- **Residential Indoor Efficiency.** For residential indoor use, the project would comply with the CALGreen Code standards (CCR Title 24, Part 11) for residential development as implemented by Kern County[9]. Prior to issuance of residential building permits, the applicant shall provide written verification of compliance with these standards.

- **Non-Residential Indoor Efficiency.** For non-residential indoor use, the project would comply with the CALGreen Code standards (CCR Title 24, Part 11) for non-residential development as implemented by Kern County[9]. Prior to issuance of building permits for commercial or industrial development, the applicant shall provide written verification of compliance with these standards.

3.2 Outdoor Water Use Efficiency

The CALGreen Code requires an outdoor water budget that is consistent with the California Department of Water Resources (DWR) Model Water Efficient Landscape Ordinance (MWELO), and requires that automatic irrigation system controllers for landscaping be provided by the builder.

Kern County adopted its own landscaping standards in Chapter 19.86 of the Kern County Zoning Ordinance that guide landscape design criteria and that are largely consistent with the 2009 version of the DWR MWELO. In response to the Governor's Executive Order No. B-29-15, DWR has modified and adopted a revised version of the MWELO that, among other changes, significantly increases the requirements for landscape water use efficiency and broadens its applicability to include new development projects with smaller landscape areas. Local land use agencies (cities and counties) have until December 1, 2015 to adopt the DWR MWELO or adopt their own ordinance, which must be at least as effective in conserving water as the DWR MWELO. We have assumed that, as they did before, Kern County will adopt the 2015 DWR MWELO without revision.

As such, the project outdoor water demands were estimated based on the following assumptions:

- **Residential Landscaping Efficiency.** For residential landscaping, the project would require that a maximum of 40% of each residential lot, not including streets and sidewalks, would be planted and require irrigation. Further, a maximum of 25% of the landscape area (i.e., no more than 10% of the lot) can include high-water use plantings (HWUPs), with

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[9] Chapter 17.10 of the Kern County Code of Building Regulations.

the difference consisting of low-water use plantings (LWUPs). This standard complies with the adopted MWELO. Prior to issuance of residential building permits that include landscaping, the applicant shall provide written verification of compliance with these standards.

- **Non-Residential Landscaping Efficiency.** For non-residential landscaping, the project would require that a maximum of 20% of the land use area, not including streets and sidewalks, would be planted and require irrigation. A maximum of 25% of this landscaped area would consist of HWUPs, with the difference consisting of LWUPs. This standard is more stringent than the requirements of the adopted MWELO. Prior to issuance of building permits for CII development that include landscaping, the applicant shall provide written verification of compliance with this standard.

- **School Landscape Efficiency.** For schools landscaping, the project would require that a maximum of 50% of the land use area, would be planted and require irrigation. A maximum of 50% of the landscaped area would consist of HWUPs, and the difference would consist of LWUPs. This standard is more stringent than the requirements of the adopted MWELO. Prior to issuance of building permits for school developments that include landscaping, the applicant shall provide written verification of compliance with this standard.

- **Parks Landscape Efficiency.** For parks landscaping, the project would limit HWUPs to no more than 45% of the total land use area and maximize the use of native and other low water use trees, shrubs, and groundcover to the extent consistent with the intended land use benefits. This standard is more stringent than the requirements of the adopted MWELO. Prior to issuance of building permits for park improvement plans, the applicant shall provide written verification of compliance with this standard.

- **Buffer Zone Landscaping Efficiency.** In buffer zones and other undeveloped open space within the project, irrigated landscaping plantings would be restricted to sparsely-clustered, moderate water use and native trees and shrubs. This standard is more stringent than the requirements of the adopted MWELO. Prior to approval of residential common area landscape improvement plans, the applicant shall provide written verification of compliance with these standards.

- **Residential Common Area Landscaping Efficiency.** For residential common area landscaping, the project would limit HWUPs to no more than 25% of the total land use area and maximize the use of native and other low water use trees, shrubs, and groundcover to the extent consistent with the intended land use benefits. This standard is more stringent than the requirements of the adopted MWELO. Prior to approval of residential common area landscape improvement plans, the applicant shall provide written verification of compliance with these standards.

- **Roadway Landscaping Efficiency.** Irrigated landscaping along project roadways would be limited to a combination of native and low water use trees, shrubs and groundcover and/or irrigated agricultural. Irrigated landscaping in project round-a-bouts would be limited to native and other low water use shrubs and groundcover. This standard is more stringent than the requirements of the adopted MWELO. Prior to approval of common area landscape improvement plans, the applicant shall provide written verification of compliance with these standards.

- **Golf Course Landscaping Efficiency.** Any golf course constructed as part of the project would be designed as a "links-style" course that would include no more than 40% irrigated turf or other high-water use plantings. This standard is more stringent than the requirements of the adopted MWELO. Prior to issuance of permits for golf-course development, the applicant shall provide written verification of compliance with these standards.
- **Urban Agriculture.** Urban agriculture that may be integrated into the project would be required to have average water uses of 5 AFY/acre or less in order to comply with the adopted MWELO. Prior to approval of urban agriculture improvement plans, the applicant shall provide written verification of compliance with these standards.

The demand estimates for the outdoor residential and non-residential portions of the project are consistent with implementation of the project's water efficiency design standards.

3.3 Recycled Water Use

All wastewater produced by indoor water use within the project would be collected and treated to California Title 22 unrestricted reuse standards (EKI, 2015a). The project would make full use of recycled water for appropriate irrigation and other purposes, consistent with the Grapevine Specific and Special Plans' criteria for recycled water use; this includes the ability to use recycled water for irrigation at residential parcels[10].

[10] Per the Grapevine Specific and Special Plans recycled water may be used for landscape irrigation throughout the project. However, for purposes of this report we have conservatively assumed that potable water will be used to irrigate residential landscaping.

3.4 Compliance with Executive Order B-29-15

In response to the ongoing drought in California, Governor Brown issued Executive Order B-29-15 on April 1, 2015 with the goal of achieving a statewide reduction in potable urban water usage of 25% relative to water use in 2013. The term of the Executive Order currently extends through February 28, 2016, although many of the directives have become permanent water-efficiency standards and requirements. The Executive Order includes specific directives which set strict limits on water usage in the State. The following directives are applicable, directly or indirectly, to the project:

- **Directive 2**. Directs the State Water Resources Control Board (SWRCB) to impose restrictions to reduce urban potable water use by 25%. While not directly applicable, all project design features address this directive by incorporating both indoor and outdoor water efficiency measures into the project design to reduce water demands.

- **Directive 5**. Directs the SWRCB to impose restrictions that commercial, industrial and institutional properties, such as campuses, golf courses, and cemeteries, immediately implement water efficiency measures to reduce potable water usage by 25%. While not directly applicable, the project's water efficiency design standards, described above, address this directive by incorporating both indoor and outdoor water efficiency measures to reduce non-residential water demands.

- **Directive 6**. Directs the SWRCB to prohibit use of potable water to irrigate ornamental turf in public street medians. The project's water efficiency design standards, described above, address this directive directly.

- **Directive 7**. Directs the SWRCB to prohibit use of potable water to irrigate at new homes and buildings that is not delivered by drip or microspray. This directive has been superseded by the revised MWELO (see Directive 11).

- **Directive 11**. Directs DWR to update the MWELO (DWR, 2015). The project's water efficiency design standards, described above, address this directive directly by ensuring that all landscaping meets the requirements that are described in the adopted MWELO.

- **Directive 16**. Directs the California Energy Commission to adopt new water efficiency standards for appliances. The project's water efficiency design standards described above address this directive directly by ensuring that the project complies with the CalGreen Code.

4.0 INDOOR WATER USE ESTIMATES

4.1 Residential Indoor Water Use

Average residential unit water use factors were estimated for the different housing product types described in the Grapevine Specific and Special Plan. These product types include the following dwelling unit classifications: (1) "Standard Residential" units, which are detached single-family homes; and (2) "Village Center Residential" units, which include higher density or multi-family units. Table 3 summarizes the planned number of residential units, median housing density, and household size.

The residential water use factors are comprised of "indoor water use factors" which include water used to shower, wash clothes, and flush toilets, and "outdoor water use factors" which primarily account for landscape irrigation within a residential lot. Indoor water use factors were developed using a predictive model of residential water use developed for the U.S. EPA and several large water utilities (DeOreo, 2011b). The development of the residential outdoor water use factors are discussed in detail in Section 5.0.

4.1.1 Residential Indoor Water Use Methodology

The U.S. EPA and several water utilities funded a detailed study of residential water use in single family homes throughout the United States (DeOreo, 2011b). A predictive model was developed from a statistical analysis of the study data. This model is based on residential indoor water use data collected over the years 2006 through 2010 at 300 single family homes constructed since 2001 in nine American cities, including one city in California.

Because this model reflects actual water use patterns observed in recently-constructed and occupied homes, it represents a sound basis for predicting indoor water use in new developments, which would be required to meet even higher standards of efficiency such as the CALGreen Code. The results of this model also compare well with recent residential per capita data being published for communities throughout California by the SWRCB (2015) and residential water use factors developed by others based on studies conducted in Bakersfield, such as that done by Vaughn Water Company (Vaughn Water Company, 2009).

The predictive model allows the projected total residential indoor use to be calculated from these demographic and water conservation inputs:

$$INDOOR = [71.2 \times RESIDENTS^{0.63} \times (1 + 0.91 \times LEAK) \times (1 - 0.23 \times H.EFF.CW) \times (1 + 0.12 \times SOFTENER)] + 11.8$$

where:

INDOOR =	indoor water use in gallons per home per day
RESIDENTS =	number of residents in household
LEAK =	the fraction of homes with a significant leak greater than 50 gallons per day
H.EFF.CW =	the fraction of homes with a high-efficiency clothes washer that uses less than 30 gallons per load
SOFTENER =	the fraction of homes with a water softening system

4.1.2 Residential Indoor Water Use Estimate

Residential indoor water use factors were developed to reflect the project's water efficiency design standards and the following assumptions:

- A total of 75% of clothes washers installed in residential units would use less than 30 gallons per load.[11]
- Leaks greater than 50 gallons per day would occur in at most 9% of the homes, which represents a conservative assumption (i.e., likely higher than would actually be encountered based on empirical data from existing residential developments, DeOreo, 2011b).
- Based on the most recently available Kern County demographic information, the average project household size is assumed to be 3.2 people.[12]

Based on these assumptions, indoor water use for each residential unit is estimated to be 0.16 acre-feet per year per dwelling unit (AFY/du) and the total residential indoor water use for the project is estimated to be 1,920 AFY (see Table 1 and Table 3).

[11] For context, approximately 39% of existing homes in the United States have clothes washers that use less than 30 gallons per load (DeOreo, 2011b) and the majority of commercially-available home washing machines today use under 30 gallons per load.

[12] http://www.dof.ca.gov/Research/demographic/reports/estimates/e-5/2011-20/view.php

4.2 Commercial, Industrial, and Institutional Indoor Water Use

The CII water use factors were estimated for the CII land uses described in the Grapevine Specific and Special Plans. The CII land uses within the Grapevine Project would encompass a range of facilities, including commercial (retail and restaurant), employment (office, warehouse, light industrial, and research and development), community facilities, schools, and utilities. Though the distribution of these specific CII land uses and facilities will be subject to refinement, the water use factors developed herein and described below are expected to be generally representative of project CII land uses.

The CII water use factors are comprised of "indoor water use factors" which include cooling, selected domestic uses, and industrial processes, and "outdoor water use factors" which primarily account for landscape irrigation within a CII lot. The CII indoor water use factors were primarily derived from the Pacific Institute's *Waste Not, Want Not: The Potential for Urban Water Conservation in California* (2003). In one exception, indoor water use for solar farms was derived from information developed by the Bureau of Land Management (2012). The development of the CII outdoor water use factors are discussed in detail in Section 5.0.

4.2.1 CII Indoor Water Use Methodology

Indoor water use in the CII sector includes showering at gyms and hotels, food preparation, commercial dish washing, laundromats, industrial processes, water fountains, and commercial car washes. Several studies have correlated CII water use with factors such as building area and the number of employees in a facility (Dziegielewski, 1990; Idaho Department of Water Resources, 2001; Santa Monica, 2004; and Soquel Creek Water District, 2013). The primary reference used herein to estimate indoor project CII water use factors is the Pacific Institute's *Waste Not, Want Not: The Potential for Urban Water Conservation in California* (2003), also called the "Pacific Institute study". This study correlated CII water use to the number of employees in a facility based on statewide averages of measured CII water use data during the late 1990s and 2000.

Based on the Pacific Institute study, indoor water use factors were developed for each project CII land use category including commercial facilities such as retail and restaurants; employment-generating uses such as offices, high-tech flex buildings, warehouses, and light industrial uses; community facilities; and schools. Only the demands for the solar farm were calculated separately.

The indoor water use factors developed for each of these CII land uses were generally based on the following parameters[13]:

- The number of employees per area of land use;
- Employee water use factors;
- Water savings from the planned water-efficient design of the CII project land uses; and
- The percentage of total demand allocated to indoor water uses.

Table 4 summarizes the CII land use parameters applied to estimate the CII indoor water use factors. Each of these parameters is discussed in the following sections.

4.2.1.1 Number of Employees

The number of employees for each type of CII land use as shown in Table 4 was estimated using two parameters: (1) the ratio between commercial or institutional floor area to developed land area as obtained from the project land planners; and (2) the average number of employees per floor area by CII category reported by the Federal Energy Information Administration in a 2006 study.[14]

4.2.1.2 Employee Indoor Water Use Factors

The employee water use factors discussed in the Pacific Institute study identified the average indoor water consumption per employee per working day for each type of CII land use and normalized for a 225-day work year. For example, if the applicable employee water use factor is 100 gallons per employee per work day, each employee within the applicable CII land use category would consume 225 multiplied by 100, or 22,500 gallons per year.

[13] For the project's solar farms, an indoor water use factor of 0.0001 AFY/ac was derived using the following the factors from Bureau of Land Management (2012) for photovoltaic solar plants: (a) 80% productive use of the total proposed area, (b) nine acres per megawatt (MW) of power generation, (c) 0.02 full-time equivalents (FTE) employees per MW, and (d) 50 gallons per day per FTE.

[14] Energy Information Administration, 2006. 2003 Commercial Buildings Energy Consumption Survey: Building Characteristics Tables, revised June 2006. The Commercial Buildings Energy Consumption Survey is a comprehensive national survey that collects information on the stock of U.S. commercial buildings, including their energy-related building characteristics, energy usage data, and how many employees there are per square foot for different CII land uses.

It should be noted that the employee water use factors were derived from the Pacific Institute study for comparable facilities based on water use data collected during or prior to the year 2000.[15] The water use efficiency for new CII construction has generally improved since this study was done. As a result, the employee water use factors developed as part of the Pacific Institute study provide a conservative estimate of CII water use for new buildings, a fact that was anticipated in the study and addressed through the development of conservation savings estimates, see Section 4.2.1.3.

For the high-traffic, highway-serving commercial areas along I-5 an escalation factor has been applied to the water use factors provided in the Pacific Institute study and no conservation savings have been assumed; see Section 4.2.1.3. These assumptions reflect the fact that the end uses in the highway-serving commercial areas along I-5 would likely be disproportionately affected by the large and temporary populations that travel the I-5 corridor, such as the fast-food restaurant patrons.

4.2.1.3 *Conservation Savings*

The Pacific Institute study was based on pre-2000 water use data that predate the adoption of the CALGreen Code and other current water efficiency standards that would be implemented by the project. Anticipating these then-impending improvements in water use efficiency, the Pacific Institute study presented logic to support the discounting of the CII water use factors to reflect evolving and ever-more-stringent water efficiency standards. The Pacific Institute study estimated that the implementation of CII water conservation measures, such as those that would be implemented by the project under the CALGreen Code and similar regulations, could reduce measured water demands by 26% to 42% compared with the levels developed in their study, depending on the type of land use. An allowance for this conservation potential has been incorporated into Table 4. The CII water conservation measures discussed in the Pacific Institute study and that would be implemented by the project include:

[15] According to the Pacific Institute study (2003), CII employee water use factors were estimated from data gathered from CII water users around California in several surveys (DWR, 1995 and 2000; Davis et al., 1988; Dziegielewski et al., 1990; and Dziegielewski et al., 2000). To estimate statewide CII water use, these employee water use coefficients were then applied to statewide employment data to project the total water use for each sector. These estimated water usages were then compared with water-delivery data by sector, as reported by nearly 150 water districts across the state. The difference between CII water use estimates developed using these two methods was less than 10 percent.

- Installation of ultra-low flush toilets and urinals, plus low-flow faucet aerators and showerheads[16];
- Improvements to mechanical cooling systems by installation of conductivity controllers, addition of chemical treatments to improve the concentration ratio, and improved energy efficiency of other mechanical components; and
- Other technologies appropriate for kitchens, laundries, and industrial processes such as water-efficient dishwashers and washing machines and industrial water reuse.

Other additional water conservation measures that would be employed for non-residential land uses are discussed in the project's water efficiency design standards in Section 3.0.

As shown in Table 4, the "best potential" water use savings identified in the Pacific Institute study were incorporated into the project demand calculations for all CII categories except for that within high-traffic, highway-serving areas along I-5. As mentioned in Section 4.2.1.2, for these high-traffic areas it was assumed that any conservation savings would be largely negated because the end uses would be disproportionately affected by large and temporary populations. Therefore, no savings from the water use levels identified in the Pacific Institute study are assumed for the project's high-traffic, highway-serving commercial land uses.

4.2.2 CII Indoor Water Use Estimate

Based on the methodology described above, indoor water use factors were estimated for an assumed mix of specific CII land uses and facilities in Table 4. As shown in Table 4, CII indoor water use per employee ranges from 53 gpd for village center offices to 847 gpd for restaurants in the project's high-traffic, highway-serving areas.

The CII indoor water demand results were compared with measured indoor water use at similar CII land uses within the TRCC, a highway-serving commercial area located adjacent to the Grapevine Project.[17] Based on this comparison, a water demand escalation factor was added to the indoor demands calculated for the project's comparable freeway-oriented commercial areas to better match TRCC's indoor water demands. For example, indoor usage at restaurants in the TRCC ranged from 0.75 to 2.4 AFY/1000 square feet of floor area with a median usage of 1.0 AFY/1000

[16] Effective January 2014, only high-efficiency toilets that use 1.28 gallons per flush will be available for purchase in California. The water savings estimates assumed in the Pacific Institute study only reflected installation of 1.6 gallon per flush toilets. Therefore, these CII conservation savings estimates may be conservative (i.e., underestimate the water savings potential).

[17] Monthly water use data per account at the TRCC for the period July 2012 through June 2013 was provided to EKI by the Tejon-Castac Water District in September 2013.

square feet of floor area; the estimated restaurant water usage for the project's freeway-oriented areas would be approximately 1.2 AFY/1000 square feet of floor area with the escalation factor.

Based on these assumptions, the total CII indoor water use for the project is estimated to be 588 AFY.

5.0 OUTDOOR WATER USE ESTIMATES

Outdoor water use factors were estimated for residential units, CII landscaping, and community landscaping using a methodology consistent with the revised MWELO (DWR, 2015). For new development projects, the MWELO requirements apply to lots with landscape areas equal to or greater than 500 square feet. As such, we assume that all project landscaping will need to comply with the MWELO.

In one exception, to address water availability for potential solar farms on industrial zoned land in the project, outdoor use associated with washing the photovoltaic panels was estimated based on water use factors developed by the Bureau of Land Management (2012).

5.1 Landscape Water Use Methodology

Landscaping water use factors were estimated using the landscape irrigation demand model described in the MWELO (DWR, 2015). The MWELO requires that the annual Estimated Total Water Use (ETWU) for landscape irrigation not exceed a calculated Maximum Applied Water Allowance (MAWA). The calculations used to estimate the project's landscaping water use factors (see Table 5) are consistent with the ETWU calculations, and the resulting landscaping water use factors are compared to (and are less than) the MAWAs for each landscaping area (see Table 6, Table 7, and Table 8).

The ETWU is calculated for each planting type and area using the following equation:

ETWU = ETo × ETAF × Area

Where:

ETo = The regional reference evapotranspiration rate[18]

ETAF = Evapotranspiration Adjustment Factor

= For regular landscapes areas =

Plant Factor (PF)[19] ÷ Irrigation Efficiency (IE)

= For Special Landscape Areas (SLA)[20] = 1

Area = Landscape area of the particular planting type

The total site ETWU is the sum of the ETWUs for the area of each planting type.

The MAWA is calculated using the following equation:

MAWA = ETo × [(ETAF x LA) + (1-ETAF) × SLA]

Where:

ETo = The regional reference evapotranspiration rate

ETAF = Evapotranspiration Adjustment Factor

= For residential areas = 0.55

= For non-residential areas = 0.45

= For schools equals = 0.65 (based on amendments to CALGreen Code approved by the Building Standards Commission on July 21, 2015)

LA = Total landscape area (including SLA)

SLA = Special Landscape Area

[18] Evapotranspiration is a measure of the total water evaporated from a plant and surrounding soil, plus the effect of biological processes within plants that result in water loss to the atmosphere.

[19] Plant factors are the ratio between the evapotranspiration of plants and the reference evapotranspiration, which when multiplied by the reference evapotranspiration estimated the amount of water needed by plants. Plant factors vary depending on the species of plantings, the density of plantings, and microclimatic conditions.

[20] The SLA includes areas of the landscape dedicated solely to edible plants, recreational areas, areas irrigated with recycled water, or water features using recycled water.

Each of the factors used in the ETWU and MAWA calculations listed above, as they relate to the project, are described below.

5.1.1 Reference Evapotranspiration

As shown above, location-specific reference evapotranspiration (ETo) data is required for calculating the ETWU and the MAWA. Reference evapotranspiration data were obtained from DWR's California Irrigation Management Information System (CIMIS) Station 125 located in Arvin about 17 miles northeast of the project center.[21] Monthly averages of evapotranspiration were calculated from this data and are shown in Table 5, with a total annual reference evapotranspiration of 60.78 inches.

5.1.2 Plant Factors

As shown in Table 5, the project's anticipated planting types include the following: (1) "high water use plantings," assumed to include turf grass and ornamental landscaping; (2) "low water use plantings," assumed to consist of shrubs and native and drought-tolerant vegetation; (3) "combination plantings," which reflects full canopy tree coverage underlain by low water use plantings; and (4) "buffer zone plantings," which represents a landscaping design of very low water use plants that are sparsely clustered.

Plant factors estimated in the MWELO range from 0.7 to 1.0 for high-water-use plantings; from 0.4 to 0.6 for moderate water use plantings; and from 0.1 to 0.3 for low water use plantings. For this report, plant factors for high and low water use plantings are assumed to be 0.8 and 0.3, respectively.

The plant factors for the anticipated project trees included in the combination plantings, such as oaks, elms, cherry, and pine, ranges from 0.4 to 0.6 (UCCE/DWR, 2014). Because the depth to groundwater is very deep, from about 500 to 1,000 feet below ground surface, it is assumed that trees would need to be irrigated, as their roots would not be able to reach the water table apart from localized perched groundwater that may exist in certain locations. Areas where trees are planted, such as along roadways, would also be planted with low water use plants; the effective plant factor for these "combination plantings" areas is assumed to be 0.7.

[21] The Arvin CIMIS Station is the closest CIMIS station to the Grapevine Project that has a significant historical record of evapotranspiration data, in this case dating back to 1995. The average evapotranspiration measured there is 60.78 inches per year, greater than the Reference Evapotranspiration for Grapevine of 49.5 inches per year that is listed in the MWELO, Appendix A. To be conservative, the higher (CIMIS) data was used to develop the outdoor water use estimates.

Buffer zone plantings would comprise the landscaping within designated, otherwise-undeveloped portions of the project such as along the I-5 corridor; they would generally not be used in residential applications. These areas would be sparsely landscaped with rocks, clusters of trees, and moderate water use plantings. The effective plant factor for "buffer zone plantings" is assumed to be 0.4.

5.1.3 Irrigation Efficiencies

"Irrigation efficiency" refers to the percentage of applied water that can be used by irrigated plants net of evaporation, conveyance, soil infiltration, and other losses. As shown in Table 5, irrigation efficiencies were assumed to be 75% for high water use plantings and 81% for all other planting types, which are the values presented in the MWELO for overhead spray irrigation systems and drip irrigation systems, respectively.

5.1.4 Evapotranspiration Adjustment Factor and Evapotranspiration Rate

The evapotranspiration adjustment factor (ETAF), the plant factor divided by the irrigation efficiency, is calculated for each planting type in Table 5.

The ETAF is multiplied by the reference evapotranspiration in Table 5 to calculate the evapotranspiration rate for each planting type. The evapotranspiration rate is the quantity of water evaporated from adjacent soil and other surfaces and transpired by plants over a specific duration and is assumed to be equivalent to the applied irrigation need. The annual evapotranspiration rate per acre would be approximately 5.40 AFY/ac for high water use plantings; 1.88 AFY/ac for low water use plantings; 4.38 AFY/ac for combination plantings; and 2.50 AFY/ac for buffer zone plantings. The evapotranspiration rates are multiplied by landscape areas for each planting type and for each land use in Table 6, Table 7, and Table 8 to calculate the ETWU for each landscape/planting type.

5.1.5 Regular and Special Landscape Areas

"Regular landscape areas" include most landscape areas irrigated by potable water. "Special landscape areas" include landscaped areas dedicated solely to edible plants, recreational areas, areas irrigated with recycled water, or water features using recycled water. With respect to compliance with the MWELO, the ETAF for special landscape areas is equal to 1, which in effect means that any planting type can be used in these areas and not exceed the MAWA. For the purposes of this report, land-use specific MAWAs were calculated assuming: (1) all regular landscape areas at individual residential lots based on the use of potable water for irrigation, (2) 33% regular landscape areas and 67% special landscape areas at schools based on the use of potable water for irrigation and an assumed percentage of landscaped area used for recreation, and

(3) all special landscape areas for commercial and industrial land uses and community landscaping primarily based on the use of recycled water for irrigation.[22] For the purposes of estimating landscaping water demands, however, the ETWUs for all land use types were conservatively estimated using the equations and factors applicable to regular landscape areas (i.e., we have used ETAFs associated with the actual planting instead of the MAWA to better represent actual anticipated demands).

5.2 Residential Outdoor Water Use Estimate

Residential landscaping would include two planting categories, high water use plantings and low water use plantings. Residential ETWU factors for landscaping were calculated in Table 6 by multiplying the evapotranspiration rates for high and low water use plantings by the total planting area for each landscape category within a residential lot. Residential outdoor water use factors were developed to reflect the project's water efficiency design standards and the following conservative assumptions:

- A maximum of 40% of each residential lot, not including streets and sidewalks, would be planted and require irrigation;
- A maximum of 25% of the landscaped area would consist of high water use plantings, and the difference would consist of low water use plantings (see Table 6);
- In order to account for additional outdoor water use, such as car washing and other ancillary uses, 10% was added to the landscaping water use factor and used for calculating the total annual outdoor water use for residential units; and
- Treated potable water would be used for residential landscape irrigation, although the use of recycled water is not precluded.

[22] Landscaping in residential common areas, a subset of the community landscaping, was assumed to be special landscape area, even though it will be irrigated with potable water, because it was considered a recreational area.

Median residential lot sizes would be 2,810 square feet (sf) for Village Center Residential units and 6,050 sf for Standard Residential units. Applying the above assumptions, the area of landscaping for each residential type is listed in the table below.

Residential Product Type	Median Lot Size	Landscaping Area (LA) (40% of Lot)	Area of HWUP (25% of LA)	Area of LWUP (75% of LA)
Village Center Residential	2,810 sf	1,124 sf	281 sf	843 sf
Standard Residential	6,050 sf	2,420 sf	605 sf	1,815 sf

Based on this methodology and assumptions, and as shown in Table 6, the average residential outdoor water use factors would be 0.07 AFY/du for Village Center Residential lots, and 0.15 AFY/du for Standard Residential lots. The resultant MAWA[23] was calculated for each residential lot type using the ETAF of 0.55 for residential areas and assuming 100% regular landscaping area, based on use of potable water. The MAWA was then compared to each residential landscaping ETWU factor to ensure compliance with the MWELO.

Based on these assumptions, the total residential outdoor water use for the project is estimated to be 1,717 AFY.

5.3 CII Outdoor Water Use Estimate

CII landscaping would include two planting categories, high water use plantings and low water use plantings. CII outdoor water use was calculated in Table 7 by multiplying the evapotranspiration rates for high and low water use plantings by the total planting area for each landscape category within a CII land use. Outdoor CII water use was developed to reflect the project's water efficiency design standards and the following conservative assumptions:

- A maximum of 20% of commercial and industrial land use area, not including streets and sidewalks, would be planted and require irrigation;

[23] The calculation for the MAWA is presented in the MWELO. Total outdoor landscaping water use for each lot must be less than or equal to the MAWA.

- A maximum of 50% of school land use area, would be planted and require irrigation . At schools a maximum of 50% of the landscaped area would consist of high water use plantings, and the difference would consist of low water use plantings (see Table 7); and

- Recycled water would be used for CII landscape irrigation, with the exception of landscaping at schools, which would use treated potable water for landscape irrigation.

The ETWU for each CII land use was compared to the MAWA, which was calculated using the evapotranspiration adjustment factor of 0.45 for commercial areas and assuming 100% special landscape area based on the use of recycled water, to ensure compliance with the MWELO.

School landscaping is assumed to consist of 50% high water use plants and 50% low water use plants. On 21 July 2015, the California Building Commission approved amendments to the CALGreen Code that requires a less stringent ETAF of 0.65 for regular school landscaping when calculating the MAWA. The ETWU for schools was compared to the modified MAWA, which was calculated using the ETAF of 0.65 for schools assuming 33% regular landscape area and 67% special landscape area based on the use of treated potable water and an assumed portion of landscaped recreational areas, which is classified as special landscape area.

For project solar farms, an outdoor water use factor, associated with washing the photovoltaic panels, of 0.0044 AFY/ac was derived using the following the factors from Bureau of Land Management (2012) for photovoltaic solar plants: (1) 80% productive use of the total land area, (2) 9 acres per megawatt (MW) of power generation, and (3) a panel washing water use factor of 0.05 AFY/MW.

Based on these assumptions, the project's total CII outdoor water use is estimated to be 592 AFY.

5.4 Community Landscaping Outdoor Water Use Estimate

Community landscaping would include various landscaping types in parks, roadways, and other community areas within the project. Community landscaping outdoor water use was calculated in Table 8 by multiplying the evapotranspiration rates for each planting type by its planting area within a community landscaping category. No project irrigation is assumed for open space areas that are located outside of the project's development footprint, such as for open space areas or existing agriculture[24], or for the undeveloped portions of Planning Areas 6b through 6e.

[24] Existing agriculture will not be served by the project water systems.

Community landscaping demands were developed to reflect the project's water efficiency design standards and the following assumptions:

- The parklands area would be developed as 45% high water use plantings and 45% low water use plantings. The remaining 10% would include trails, picnic tables, pavement, mulch, or other non-water using features. These estimates do not include assumptions regarding the use of artificial turf for play fields, but they may occur.

- A seven-foot-wide irrigated common area would border each side of all new project roads, along approximately 630,000 total linear feet counting both sides of roadways. In addition, one portion of the central east-west roadway, totaling about 13,450 linear feet, would be developed as a windrow, with up to about 35 feet of landscaping on each side of the road. The project would not include roadway medians, except for the centers of four roundabouts.

- A total of 25% of residential common areas would include high water use plantings and 50% would consist of combination plantings. The remaining 25% of the residential common areas would be hardscape that does not require irrigation.

- Urban agriculture that may be integrated into the project shall use plants with average water uses of 5 AFY/acre or less. Irrigation for the urban agriculture is accounted for in the potential uses for the contingency, as discussed further in Section 8.3.

Irrigation water use factors for landscape plantings are listed in Table 5, with estimated community area irrigation demand summarized in Table 8. It is assumed that recycled or non-potable water would be used for common area landscape irrigation, with the exception of within residential common areas and schools, where potable water would be applied. All landscaped residential common areas, however, would be considered recreational areas or meeting spaces and, as such, would be classified as special landscape areas under the MWELO.

The ETWU for each CII land use was compared to the MAWA, which was calculated assuming 100% Special Landscape Area, to ensure compliance with the MWELO.

As shown in Table 8, total project community area landscaping water use is approximately 2,415 AFY.

6.0 PROJECTED WATER USE BY SECTOR

6.1 Residential Water Use

The total residential indoor water use was calculated by multiplying the indoor water use factor for each housing type by the planned number of units of that type. As discussed above in Section 4.1.2, the average indoor water use factor for all project residential dwelling units is 0.16 AFY which is equivalent to a total residential indoor water use of 1,920 AFY (see Table 3).

The total residential outdoor water was calculated by multiplying each Standard Residential unit by 0.17 AFY, and each Village Residential unit by 0.08 AFY (see Table 3). The total residential outdoor water use would be approximately 1,717 AFY.

Total residential water use would therefore be approximately 3,637 AFY (i.e., 1,920 AFY indoor use plus 1,717 AFY outdoor use). The corresponding average per capita residential water use would be approximately 45 gallons per capita day (gpcd) for indoor uses and 40 gpcd for outdoor uses, for a total of 85 gpcd for the assumed 3.2 persons per residential unit. This level of per capita demand is comparable with the current statewide average (SWRCB, 2015) and with measured water use for similar land uses in the same geographic area (Vaughn Water Company, 2009[25]).

6.2 CII Water Use

As shown in Table 4, total CII water use for the project would be approximately 1,180 AFY, including indoor use of 588 AFY and outdoor use of 592 AFY. It is assumed that recycled or non-potable water would be used for CII landscape irrigation, with the exception of schools, where potable water would be applied for landscape irrigation.

6.3 Community Landscaping Water Use

As shown in Table 8, total community landscaping water use for the project would be approximately 2,415 AFY. It is assumed that recycled or non-potable water would be used for community landscaping irrigation, with the exception of residential common areas, where potable water would be applied for landscape irrigation.

[25] In a 2009 Water Supply Assessment prepared on behalf of the Vaughn Water Company, 2005 water use data was presented by lot size for residential homes in the Rosedale portion of Bakersfield. These data showed that water use decreased as lot size decreased, with a 6,010 sf lot using 0.36 AFY per dwelling unit. This demand is comparable with the water demand estimates for the project's Standard Residential units (0.33 AFY per dwelling unit), which are expected to have an median lot size of 6,050 sf and will meet even higher standard of efficiency that reflect the new CALGreen Code requirements, among other things.

7.0 ASSUMED TREATMENT AND DISTRIBUTION SYSTEM LOSSES

All water treatment and distribution systems experience system losses from drinking water treatment, system maintenance, and leaks. Water treatment and distribution system losses are assumed to be 10% of the total project potable water use and 5% of recycled water use. These assumptions are consistent with operation of a new, well-designed and maintained treatment[26] and distribution system[27].

The total estimate of project water losses does not include losses at the wastewater treatment plants or within the recycled water storage ponds. These losses are accounted for as a reduction in the recycled water supply and not as a recycled water use.

As shown in Table 9, water losses are projected to be about 629 AFY.

[26] http://www.pall.com/main/water-treatment/direct-coagulated-water-47223.page

[27] The California standard is 10% allowable water loss in existing water systems (EPA, 2010. *Control and Mitigation of Drinking Water Losses in Distribution Systems*, November 2010). Based on professional experience, we have assumed that the new project water distributions systems will have 5% water loss.

8.0 ADDITIONAL FACTORS IMPACTING TOTAL PROJECT WATER DEMAND

8.1 Interim and Offsite Uses of Water

8.1.1 Construction Water

During project construction, potable or non-potable Nickel Water would supply construction water for uses such as dust control and soil compaction. As shown in Table A-2 of Attachment A, total estimated construction water use is approximately 8,250 AF, which would be used over the 19+ year buildout period at an average rate of approximately 420 AFY. Prior to full project buildout, project water demands will be a fraction of the project's available Nickel Water supply, and the remaining supply will be available for construction water uses and other interim uses.

8.1.2 Project Phasing

As described in Section 2.1.3, project development would be phased over a period of 19+ years, starting with the development of Planning Area 6a and/or 2 and continuing with the balance of the planning areas (1, 3, 4, 5, and 6b-6e) in numerical order. Buildout of each phase is projected to take approximately 2 to 4 years (Phase 1: 2 years; Phase 2: 4 years; Phase 3: 3 years; Phase 4: 4 years; Phase 5: 4 years; Phase 6: 2 years), with the first phase commencing in 2016. Given this approximate phasing, water demands and the accompanying generation of recycled water will necessarily be incremental, at the approximate volumes shown in Table 10 and Table 11.

8.1.3 California Highway Patrol Weigh Station

A California Highway Patrol weigh station ("weigh station") is currently located south of the California Aqueduct. A new interchange servicing the project is planned for the location of the current weigh station. To accommodate the new interchange, a new weigh station will be constructed north of the TRCC, at the intersection of Interstate 5 and State Route 99. The water and wastewater service to the weigh station is discussed in a 25 November 2014 memorandum, included as Attachment C.

8.2 Recycled Water Availability

A water balance was developed to estimate (1) required recycled water storage, and (2) the volume of recycled water available to meet non-potable irrigation demands during an average-rainfall year. Non-potable irrigation demands would include irrigation of most landscaped areas other than residential areas and schools. Table A-1 of Attachment A presents the preliminary average-year rainfall water balance at project buildout.

The needed recycled water storage volume during an average rainfall year is about 436 acre-feet (AF). As shown in Table 11, it is anticipated that recycled water flows can supply most of the projected non-potable irrigation demand during an average rainfall-year, except for approximately 294 AF that would be made up by untreated[28] Nickel Water that is conveyed to the project site through the California Aqueduct. The needed amount of this supplemental water would vary depending on actual rainfall patterns.

8.3 Water Demand Contingency

As shown in Table 1, a contingency (400 AFY) has been added to all project demands to provide a conservative buffer for unforeseen water uses throughout the project as it is built out over time. This contingent demand is inclusive of all treatment and distribution losses.

The Grapevine Specific and Special Plans allow for building of additional housing, and the use of land for urban agriculture, or certain heavy industrial land uses. The contingency may be used to accommodate the possibility of these additional demands in the future. As an example, a scenario is presented in Attachment B in which a portion of the contingency is used for the construction of 2,000 additional housing units.[29] Attachment B includes water demand estimates and adjusted land use assumptions for this scenario.

The source to meet the complete 400 AFY water demand contingency is assumed to be either fully-treated potable or filtered, non-potable Nickel Water; see Table 2.

[28] The Nickel Water used for non-potable irrigation will be filtered, but will not be fully treated at the water treatment plant. Instead, this supplemental non-potable supply will be co-mingled with the recycled water and served via the recycled water distribution system.

[29] To accommodate the additional 2,000 dwelling units, consistent with the Grapevine Specific and Special Plans, this alternative scenario assumes (1) an increase in parkland, (2) a reduction in retail square footage based on the vehicle trip equivalency ratios of 225 square feet per single-family dwelling unit and 155 square feet per multi-family dwelling unit, (3) and increases in landscape water efficiencies for select land use categories.

9.0 TOTAL ESTIMATED POTABLE, NON-POTABLE AND RECYCLED WATER DEMANDS

Table 1 and Table 2 summarize the Grapevine Project's potable, non-potable, and recycled water demands for residential, CII, and landscaping uses. Water demand calculations are summarized in Table 1. Water demand by source is presented in Table 2.

The total potable and non-potable demand of the Grapevine Project development including the contingency is estimated to be approximately 8,261 AFY at full build out.

The total project potable water demand would be 5,620 AFY.

A total of 1,983 AFY of recycled water would be generated in an average rainfall year and used to help meet non-residential, roadway, and selected common area landscape irrigation demand. An additional 258 AFY of supplemental, non-potable water would be used in an average rainfall year to meet commercial and industrial, roadway, and common area landscape irrigation demand that exceeds the available recycled water supply. The projected 1,983 AFY of recycled water plus the 258 AFY of supplemental, non-potable supply amounts to 2,241 AFY of non-potable supply.

The contingent water demand is assumed to be 400 AFY, which could be supplied with either fully-treated potable or filtered, non-potable Nickel Water that would be conveyed to the project through the California Aqueduct.

10.0 WATER CONSERVATION EDUCATION, IMPLEMENTATION AND ENFORCEMENT MEASURES

Water conservation education, implementation, and enforcement would be key to achieving and maintaining the anticipated project water demand efficiencies. To this end, specific measures would be carried out to educate and incentivize residents and employees regarding water conservation, backed up by enforcement actions where needed. For example, it is anticipated that water usage records would be regularly evaluated by TCWD staff to look for and address patterns of high usage that could indicate inefficiencies or leaks, and water budgets would be developed for all residential and CII customers and enforced through water rates or penalties.

Water conservation and design requirements would also be incorporated into all pre-construction and pre-sale and subsequent re-sale documents and agreements, including development agreements; recorded covenants, conditions, and restrictions that would run with the land; and building and landscaping permits. Drafting of these documents would be coordinated by the Master Developer to reflect the Specific and Community Plan and would incorporate input from the TCWD, Kern County, and other relevant parties. The documents would articulate the responsibilities and mechanisms for implementation and enforcement.

On 1 April 2015, the Governor of California issued Executive Order No. B-29-15, which sets strict limits on water usage in the State. The water demands estimated herein have taken into account the requirements of the executive order. Additionally, as shown in Section 3.0, all future designs and construction will comply with the requirements of the executive order and all other applicable land use and water efficiency regulations.

11.0 OFFSITE AND CUMULATIVE IMPACTS

This section describes the offsite and cumulative impacts of the project as they relate to water demand.

11.1 Offsite Impacts

The offsite land uses that have been identified for this project include:

- Connector and Haul Roads
- California Highway Patrol Weigh Station (see Section 8.1.3)
- California Aqueduct Turnouts
- Expansion of the TRCC East or West Wastewater Treatment Plants
- Interchange (over I-5)

None of these offsite land uses have an accompanying Project water demand; therefore they do not impact the findings and conclusions of this report.

11.2 Cumulative Impacts

The project would be supplied by Nickel Water, that would be conveyed to the project through the California Aqueduct and treated on-site at the project's water treatment plant(s), and by recycled water that is generated at the project's on-site wastewater treatment plants. Because the project water needs would be met by these sources that are not shared with any other entity, there are no cumulative impacts associated with the project water demands.

12.0 MITIGATION MEASURES

Mitigation measures are steps taken to reduce an environmental impact caused by the project. As described in Section 3.0, the project includes many water efficient design standards with the goal to maximize water use efficiency and reduce potable water demand within the project, including the extensive use of recycled water and non-potable water. Implementation of the following mitigation measures would further ensure that individual development projects permitted within the project meet the criteria established in Section 3.0 and that there would be sufficient water supply to meet the demands of those projects in normal and dry years over at least a twenty-year time horizon.

- **Mitigation Measure #1:** Prior to issuance of any building permits or other development approvals, the applicant shall provide written verification of compliance with project-specific water efficiency design standards.

- **Mitigation Measure #2:** Pursuant to California Water Code §10910-10915, a Water Supply Assessment will be prepared by TCWD for any proposed development that meets the definition of "project" per the California Water Code §10910(a) and 10912(a).

- **Mitigation Measure #3:** A Water Supply Verification will be prepared by TCWD, as appropriate, at the tentative map stage per California Government Code §65867.5(a) and 66473.7(a), (b), (i).

13.0 REFERENCES

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Table 1
Estimated Grapevine Project Annual Water Demand
Grapevine Project, Kern County, California

Development Category	**Estimated Total Water Use** (AFY)	**Estimated Indoor Water Use** (AFY)	**Estimated Outdoor Water Use** (AFY)
Residential (a)	3,637	1,920	1,717
Commercial, Institutional and Industrial (b)	1,180	588	592
Community Landscaping (c)	2,415	-	2,415
Treatment system losses (d)	268	-	-
Distribution system losses (d)	362	125	236
Subtotal Average Annual Water Demand (e)	7,861	2,634	4,960
Contingency (f)	400	-	-
Project Average Annual Water Demand	***8,261***	-	-

Abbreviations:
"AFY" = acre-feet per year

Notes:
(a) See Table 3 for estimated residential water uses.
(b) See Tables 4 and 7 for estimated indoor and outdoor water use, respectively, for commercial, institutional, and industrial land uses. Includes 318 AFY of outdoor school water demand.
(c) See Table 8 for estimated parks, roads and common area landscaping water use. Includes 554 AFY of residential common area demand.
(d) See Table 9 for water losses associated with the project treatment and distribution systems. System losses associated with all potable outdoor uses are estimated to be 129 AFY, assumed to be 5% of the total of residential outdoor, outdoor school, and residential common area water demands.
(e) The Project Annual Water Demand is the sum of the estimated water uses for the project, plus the assumed treatment and distribution system losses.
(f) A contingency of 400 AFY was added to project demands. The contingency is inclusive of all losses associated with its treatment and distribution.
(g) Totals may not add exactly due to rounding.

Table 2

Estimated Grapevine Project Annual Water Demand by Source

Grapevine Project, Kern County, California

Water Source	Water Use Category	Estimated Total Water Demand (AFY)
California Aqueduct (Nickel Water)	Potable Water (a)	5,620
	Supplemental Non-Potable Water (b)	258
	Contingency (c)	400
	California Aqueduct Subtotal	*6,278*
Recycled Water	Recycled Non-Potable Water (d)	1,983
Project Average Annual Water Demand		***8,261***

Abbreviations:

"AFY" = acre-feet per year

"CII" = Commercial, Institutional and Industrial

Notes:

(a) Potable water demand is equal to all indoor (2,508 AFY), residential outdoor (1,717 AFY), outdoor school (318 AFY), residential common area (554 AFY), associated indoor and outdoor distribution system loss demands (255 AFY), and treatment system losses (268 AFY). See Tables 1, 7, 8, and 9.

(b) The Supplemental Non-Potable Water is equal to the CII landscaping, selected general common area landscaping minus the projected recycled water production (see Table 11). This demand is assumed to be met with filtered Nickel Water that will be served through the recycled water distribution system.

(c) The Contingency water demand was added to Project Annual Water Demands as shown in Table 1. The contingency is assumed to be met with either fully-treated potable or filtered Nickel Water and is inclusive of all losses associated with its treatment and distribution.

(d) See Table 11 for recycled water production and demand.

(e) Totals may not add exactly due to rounding.

Table 3
Estimated Residential Water Use
Grapevine Project, Kern County, California

Project Development Phase and Housing Product Types	Number of Dwelling Units (a)	Median Density (a) (du/ac)	Household Size (c) (people/du)	Water Use Factor (b)			Subtotal Water Use (e)		
				Indoor (c) (AFY/du)	Outdoor (d) (AFY/du)	Total (AFY/du)	Indoor (AFY)	Outdoor (AFY)	Total (AFY)
Area 1									
Standard Residential Units	1,250	7.2	3.20	0.16	0.17	0.33	200	213	413
Village Center Residential Units	230	15.5	3.20	0.16	0.08	0.24	37	18	55
Subtotal	**1,480**	-	-	-	-	-	**237**	**231**	**468**
Area 2									
Standard Residential Units	1,780	7.2	3.20	0.16	0.17	0.33	285	303	587
Village Center Residential Units	980	15.5	3.20	0.16	0.08	0.24	157	78	235
Subtotal	**2,760**	-	-	-	-	-	**442**	**381**	**823**
Area 3									
Standard Residential Units	1,180	7.2	3.20	0.16	0.17	0.33	189	201	389
Village Center Residential Units	730	15.5	3.20	0.16	0.08	0.24	117	58	175
Subtotal	**1,910**	-	-	-	-	-	**306**	**259**	**565**
Area 4									
Standard Residential Units	1,850	7.2	3.20	0.16	0.17	0.33	296	315	611
Village Center Residential Units	570	15.5	3.20	0.16	0.08	0.24	91	46	137
Subtotal	**2,420**	-	-	-	-	-	**387**	**360**	**747**
Area 5a									
Standard Residential Units	1,730	7.2	3.20	0.16	0.17	0.33	277	294	571
Village Center Residential Units	330	15.5	3.20	0.16	0.08	0.24	53	26	79
Subtotal	**2,060**	-	-	-	-	-	**330**	**321**	**650**
Area 5b									
Standard Residential Units	35	7.2	3.20	0.16	0.17	0.33	6	6	12
Village Center Residential Units	0	15.5	3.20	0.16	0.09	0.25	0	0	0
Subtotal	**35**	-	-	-	-	-	**6**	**6**	**12**
Area 6a									
Standard Residential Units	585	7.2	3.20	0.16	0.17	0.33	94	99	193
Village Center Residential Units	750	15.5	3.20	0.16	0.08	0.24	120	60	180
Subtotal	**1,335**	-	-	-	-	-	**214**	**159**	**373**

Table 3
Estimated Residential Water Use
Grapevine Project, Kern County, California

Project Development Phase and Housing Product Types	Number of Dwelling Units (a)	Median Density (a) (du/ac)	Household Size (c) (people/du)	Water Use Factor (b)			Subtotal Water Use (e)		
				Indoor (c) (AFY/du)	Outdoor (d) (AFY/du)	Total (AFY/du)	Indoor (AFY)	Outdoor (AFY)	Total (AFY)
Area 6b									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6c									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6d									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6e									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
TOTAL	**12,000**	-	-	-	-	-	**1,920**	**1,717**	**3,637**

Abbreviations:
"AFY" = acre-feet per year
"AFY/du" = acre-feet per year per dwelling unit
"du" = dwelling units
"du/ac" = dwelling units per acre

Table 3
Estimated Residential Water Use
Grapevine Project, Kern County, California

Notes:

(a) The residential unit types, median residential densities for each product type, and numbers of residential units are based on the 8 June 2015 Project Land Use Program Summary.

(b) Water use factors, expressed as the annual volume of water consumed for each dwelling unit, have been estimated using models of residential indoor and outdoor water uses as discussed in Notes (c) and (d).

(c) Residential indoor water use factors were estimated using a model of total indoor water use developed in *Analysis of Water Use in* New Single-Family Homes dated 20 July 2011, William DeOreo, P.E., M.S. submitted to Salt lake City Corporation and the United States Environmental Protection Agency. The statistical model is based on single family homes that meet the standards for the Federal Energy Policy Act of 1992. The following assumptions were used for estimating water uses for each housing product type:

1. The average household size (i.e., number of residents per home) for each product type is assumed as 3.2 persons/dwelling unit, according to data for Kern County from: *State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties and the State — January 1, 2011- 2013* . Sacramento, California, May 2013.
2. Home water softening systems (e.g., regenerating ion exchange units or reverse osmosis units) are prohibited.
3. High-efficiency clothes washers that use less than 30 gallons of water per load are installed in 75% of residential homes.
4. Significant leaks (i.e., leaks greater than 50 gallons per day) occur at approximately 9% of homes for each housing product type.

(d) Residential outdoor water use factors were estimated in Table 6.

(e) The subtotal water use for a residential unit type is the number of dwelling units multiplied by the corresponding water use factors.

Table 4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 1											
Village Center Retail	28										
51% Grocery	14	0.18	0.3	1.8	1.1	16	122	1,917	1.3	1.00	2.3
21% Drug store	6	0.18	0.13	0.7	0.8	5	69	324	0.2	0.41	0.6
14% Miscellaneous	4	0.18	0.09	0.5	0.8	3	69	216	0.1	0.28	0.4
7% Restaurant	2	0.18	0.04	0.2	2	4	179	703	0.5	0.14	0.6
7% Bank	2	0.18	0.04	0.2	0.8	2	63	99	0.1	0.14	0.2
Village Center Office	22	0.18	0.5	2.8	2.3	51	53	2,669	1.8	1.5	3.4
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	400										
50% High Tech / Bio Tech	200	0.30	4.6	15	2.3	460	92	42,267	29.2	8.4	37.6
50% Other Office	200	0.30	4.6	15	2.3	460	53	24,268	16.8	8.4	25.2
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**50**	**20**	**70**
Area 2											
Village Center Retail	151										
51% Grocery	77	0.18	1.8	9.8	1.1	85	122	10,337	7.1	5.4	12.6
21% Drug store	32	0.18	0.7	4.0	0.8	25	69	1,745	1.2	2.2	3.4
14% Miscellaneous	21	0.18	0.5	2.7	0.8	17	69	1,163	0.8	1.5	2.3
7% Restaurant	11	0.18	0.2	1.3	2	21	179	3,792	2.6	0.7	3.4
7% Bank	11	0.18	0.2	1.3	0.8	8	63	534	0.4	0.7	1.1
Village Center Office	119	0.18	2.7	15	2.3	274	53	14,439	10.0	8.4	18.3
Regional / Freeway-Oriented Comm.	210										
78.5% Miscellaneous Retail	165	0.18	3.8	21	0.8	132	320	42,256	29.2	11.6	40.8
7.5% Restaurant	16	0.18	0.4	2.0	2	32	847	26,679	18.4	1.1	19.5
7.5% Gas Station	16	0.18	0.4	2.0	0.9	14	320	4,542	3.1	1.1	4.2
6.5% Hotel	14	0.18	0.3	1.7	0.48	7	506	3,315	2.3	1.0	3.2
Office / R&D	780										
62% High Tech / Bio Tech	480	0.30	11.0	37	2.3	1104	92	101,440	70.0	20.3	90.3
38% Medical Center	300	0.30	7	23	2.3	690	80	55,155	38.1	12.7	50.7
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	335										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	36.4	41.0
1 High School	240	0.10	5.5	55	1.3	302	55	16,661	11.5	100.1	111.6
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**199**	**203**	**403**

Table 4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 3											
Village Center Retail	95										
51% Grocery	48	0.18	1.1	6.2	1.1	53	122	6,503	4.5	3.4	7.9
21% Drug store	20	0.18	0.5	2.5	0.8	16	69	1,098	0.8	1.4	2.2
14% Miscellaneous	13	0.18	0.3	1.7	0.8	11	69	732	0.5	0.9	1.4
7% Restaurant	7	0.18	0.2	0.8	2	13	179	2,385	1.6	0.5	2.1
7% Bank	7	0.18	0.2	0.8	0.8	5	63	336	0.2	0.5	0.7
Village Center Office	75	0.18	1.7	10	2.3	173	53	9,100	6.3	5.3	11.6
Regional / Freeway-Oriented Comm.	540										
78.5% Miscellaneous Retail	424	0.18	10	54	0.8	339	320	108,659	75.0	29.8	104.9
7.5% Restaurant	41	0.18	0.9	5.2	2	81	847	68,602	47.4	2.8	50.2
7.5% Gas Station	41	0.18	0.9	5.2	0.9	36	320	11,679	8.1	2.8	10.9
6.5% Hotel	35	0.18	0.8	4.5	0.48	17	506	8,524	5.9	2.5	8.4
Office / R&D	650										
50% High Tech / Bio Tech	325	0.30	7.5	25	2.3	748	92	68,683	47.4	13.7	61.1
50% Other Office	325	0.30	7.5	25	2.3	748	53	39,435	27.2	13.7	40.9
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	96										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	36.4	41.0
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**230**	**114**	**343**
Area 4											
Village Center Retail	67										
51% Grocery	34	0.18	0.8	4.4	1.1	38	122	4,587	3.2	2.4	5.6
21% Drug store	14	0.18	0.3	1.8	0.8	11	69	774	0.5	1.0	1.5
14% Miscellaneous	9	0.18	0.2	1.2	0.8	8	69	516	0.4	0.7	1.0
7% Restaurant	5	0.18	0.11	0.6	2	9	179	1,682	1.2	0.3	1.5
7% Bank	5	0.18	0.11	0.6	0.8	4	63	237	0.2	0.3	0.5
Village Center Office	53	0.18	1.2	6.8	2.3	122	53	6,431	4.4	3.7	8.2
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	192										
2 K-8	192	0.11	4.4	40	1.3	241	55	13,329	9.2	72.8	82.0
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**19**	**81**	**100**

Table 4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 5a											
Village Center Retail	22										
51% Grocery	11	0.18	0.3	1.4	1.1	12	122	1,506	1.0	0.8	1.8
21% Drug store	5	0.18	0.11	0.6	0.8	4	69	254	0.2	0.3	0.5
14% Miscellaneous	3	0.18	0.07	0.4	0.8	2	69	170	0.1	0.2	0.3
7% Restaurant	2	0.18	0.04	0.2	2	3	179	552	0.4	0.1	0.5
7% Bank	2	0.18	0.04	0.2	0.8	1	63	78	0.1	0.1	0.2
Village Center Office	18	0.18	0.4	2.3	2.3	41	53	2,184	1.5	1.3	2.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	96									0	
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	36.4	41.0
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**8**	**39**	**47**
Area 5b											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0**	**0**
Area 6a											
Village Center Retail	84										
51% Grocery	43	0.18	1.0	5.5	1.1	47	122	5,750	4.0	3.0	7.0
21% Drug store	18	0.18	0.4	2.2	0.8	14	69	971	0.7	1.2	1.9
14% Miscellaneous	12	0.18	0.3	1.5	0.8	9	69	647	0.4	0.8	1.3
7% Restaurant	6	0.18	0.1	0.7	2	12	179	2,109	1.5	0.4	1.9
7% Bank	6	0.18	0.1	0.7	0.8	5	63	297	0.2	0.4	0.6
Village Center Office	66	0.18	1.5	8	2.3	152	53	8,008	5.5	4.6	10.2
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	270										
50% High Tech / Bio Tech	135	0.30	3.1	10	2.3	311	92	28,530	19.7	5.7	25.4
50% Other Office	135	0.30	3.1	10	2.3	311	53	16,381	11.3	5.7	17.0
Light Industrial / Warehouse	1,400										
75% Light Industrial / Warehouse	1,050	0.30	24	80	0.43	452	77	34,576	23.9	44.3	68.2
25% Community College	350	0.29	8	28	1.3	441	31	13,607	9.4	15.3	24.7
Schools (i)	96										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	36.4	41.0
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**81**	**118**	**199**

Table 4
Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses
Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 6b											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	50										
Light Industrial / Warehouse	50	0.05	1	23	0.4	22	77	1,646	1.1	12.7	10.4
Solar Farm (j)	--	--	--	266	--	--	--	--	0.03	1.2	1.2
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**13.8**	**11.6**
Area 6c											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	190	--	--	--	--	0.02	0.8	0.9
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.9**
Area 6d											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	173	--	--	--	--	0.02	0.8	0.8
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.8**
Area 6e											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	171	--	--	--	--	0.02	0.8	0.8
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.8**
Total School Water Use (including state-of-the-art water conservation technologies and measures)									39	318	358
Total Commercial, Institutional, and Industrial Water Use (including state-of-the-art water conservation technologies and measures) (k)									**588**	**592**	**1,177**

Table 4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Abbreviations:

"1,000 sf" = 1,000 square feet
"ac" = acre
"ac/ac" = acre per developed acre
"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial
"emp" = employees
"emp/1,000 sf" = employees per 1,000 square feet
"gpd" = gallons per day
"gpd/emp" = gallons per day per employee
"K-8" = kindergarten through eighth grade
"R&D" = research and development
"sf" = square feet
"TRCC" = Tejon Regional Commerce Center

Notes:

(a) The CII land uses and areas are based on the 8 June 2015 project Land Use Program Summary.
(b) The floor area ratio is the ratio between floor area to gross land area. The floor area ratios for the different land use categories are based on the 8 June 2015 project Land Use Program Summary.
(c) The floor area expressed in acres is calculated by dividing the floor area expressed in 1,000 square feet by 43.56. Note that 1 acre is equal to 43,560 square feet.
(d) The area of land use is calculated by dividing the floor area expressed in acres, by the floor area ratio.
(e) The employees per 1,000 square feet were based on the data in Reference 2. The number of employees was estimated by multiplying the floor area, expressed in 1,000 square feet, by the employees per 1,000 square feet.
(f) The employee indoor water use factors, derived from Reference 1, relate the indoor water use for a specific CII land use to the number of employees based on a 225-day work year and a conservation potential, which accounts for current water efficiency standards. The conservation potential is the "best potential" estimate of conservation savings based on the use of water efficient fixtures and efficient water management techniques for each industry. Conservation potential for the Regional/Freeway-Oriented Commercial land uses were assumed to be 0%, due to the high traffic volumes that these businesses are likely to receive (similar to high traffic volumes at the TRCC). Additionally, the employee indoor water use factors for the Regional/Freeway-Oriented Commercial land uses are multiplied by an escalation factor of 3.4 which is the average difference between the project indoor water use factors and actual indoor water use at the TRCC in fiscal year 2012 - 2013, weighted by land use category.
(g) The total average daily water use for each land use is estimated by multiplying the number of employees by the CII-specific indoor employee water use factor.
(h) Average Annual Water Use is calculated by multiplying the Average Daily Water Use, from Column H by the 225-day work year cited in Footnote (f) for the employee indoor water use factors, then dividing by 326,000 gallons per acre-foot.
(i) The floor area for schools is based on 11% of the total acreage for kindergarten through eighth grade and 10% of the total acreage for high schools.
(j) Water use for the solar farms are based on the values for photovoltaic solar plants from Reference 3.
(k) Totals may not add exactly due to rounding.

Reference:

1. Pacific Institute, 2003. *Waste Not, Want Not: The Potential for Urban Water Conservation in California,* November 2003.
2 Energy Information Administration, 2006. *2003 Commercial Buildings Energy Consumption Survey: Building Characteristics Tables*, Revised June 2006.
3 Bureau of Land Management, 2012. *Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States*, Appendix M, July 2012.

Table 5
Irrigation Water Needs Estimated Using the California Department of Water Resources Model Water Efficient Landscape Model
Grapevine Project, Kern County, California

		High Water Use Plantings				Low Water Use Plantings				Combination Tree and Groundcover Plantings				Buffer Zone Plantings			
	[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]	[P]	[Q]
	Reference Evapotranspiration (in)	HWUP Plant Factor	Irrigation Efficiency (Spray Irrigation Systems)	HWUP Evapotranspiration Adjustment Factor (ETAF)	HWUP Evapotranspiration Rate (in)	LWUP Plant Factor	Irrigation Efficiency (Drip Irrigation System)	LWUP Evapotranspiration Adjustment Factor (ETAF)	LWUP Evapotranspiration Rate (in)	TGP Plant Factor	Irrigation Efficiency (Drip Irrigation System)	TGP Evapotranspiration Adjustment Factor (ETAF)	TGP Evapotranspiration Rate (in)	BZP Plant Factor	Irrigation Efficiency (Drip Irrigation System)	BZP Evapotranspiration Adjustment Factor (ETAF)	BZP Evapotranspiration Rate (in)
Month	(a)	(b)	(c)	D = B / C (d)	E = A x D (e)	(f)	(c)	H = F / G (d)	E = A x D (e)	(g)	(c)	D = B / C (d)	M = A x L (e)	(h)	(c)	P = N / O (d)	E = A x P (e)
January	1.45	0.8	75%	1.07	1.54	0.3	81%	0.37	0.54	0.7	81%	1.01	1.25	0.4	81%	0.58	0.71
February	2.22	0.8	75%	1.07	2.36	0.3	81%	0.37	0.82	0.7	81%	1.55	1.92	0.4	81%	0.89	1.09
March	4.03	0.8	75%	1.07	4.30	0.3	81%	0.37	1.49	0.7	81%	2.82	3.48	0.4	81%	1.61	1.99
April	5.49	0.8	75%	1.07	5.86	0.3	81%	0.37	2.03	0.7	81%	3.84	4.74	0.4	81%	2.20	2.71
May	7.63	0.8	75%	1.07	8.13	0.3	81%	0.37	2.82	0.7	81%	5.34	6.59	0.4	81%	3.05	3.77
June	8.63	0.8	75%	1.07	9.20	0.3	81%	0.37	3.19	0.7	81%	6.04	7.45	0.4	81%	3.45	4.26
July	9.14	0.8	75%	1.07	9.75	0.3	81%	0.37	3.38	0.7	81%	6.40	7.90	0.4	81%	3.66	4.51
August	8.55	0.8	75%	1.07	9.12	0.3	81%	0.37	3.17	0.7	81%	5.99	7.39	0.4	81%	3.42	4.22
September	6.18	0.8	75%	1.07	6.59	0.3	81%	0.37	2.29	0.7	81%	4.32	5.34	0.4	81%	2.47	3.05
October	4.06	0.8	75%	1.07	4.33	0.3	81%	0.37	1.50	0.7	81%	2.84	3.51	0.4	81%	1.62	2.00
November	2.01	0.8	75%	1.07	2.14	0.3	81%	0.37	0.74	0.7	81%	1.41	1.74	0.4	81%	0.80	0.99
December	1.41	0.8	75%	1.07	1.51	0.3	81%	0.37	0.52	0.7	81%	0.99	1.22	0.4	81%	0.56	0.70
Total	**60.78**																
Total Annual Evapotranspiration Rate (i)					**64.83 in (5.40 AFY/ac)**				**22.51 in (1.88 AFY/ac)**				**52.53 in (4.38 AFY/ac)**				**30.01 in (2.50 AFY/ac)**

Abbreviations:

"AFY/ac" = acre-feet per year per acre
"ETAF" = Evapotranspiration Adjustment Factor
"HWUP" = high water use plantings
"in" = inches
"LWUP" = low water use plantings
"BZP" = buffer zone plantings
"TGP" = combination tree and groundcover plantings

Table 5

Irrigation Water Needs Estimated Using the California Department of Water Resources Model Water Efficient Landscape Model

Grapevine Project, Kern County, California

Notes:

(a) Reference evapotranspiration data were obtained from the California Irrigation Management Information Services ("CIMIS") station 125 located in Arvin, CA that measured evapotranspiration from grass. Monthly averages were calculated using all available data from this CIMIS station between 1996 and 2012.

(b) The high water use plantings plant factor is based on the middle of the range of high water use plant factors from Reference 2.

(c) The irrigation efficiencies are taken from Reference 2, assuming use of spray irrigation systems (75% efficiency) for the high water use plants and drip irrigation systems (81% efficiency) for all other plant types.

(d) The planting evapotranspiration adjustment factor (ETAF) is calculated by dividing the plant factor by the irrigation efficiency.

(e) The planting evapotranspiration rate is calculated by multiplying the reference evapotranspiration by the ETAF. The evapotranspiration rate is the quantity of water evaporated from adjacent soil and other surfaces and transpired by plants over a specific duration and represents the total irrigation requirements for the plantings.

(f) The low water use plantings plant factor is conservatively based on the high end of the range for plant factors for low water use plants from Reference 2.

(g) The combination trees and groundcover plant factor is based on the high end of the range for plant factors for moderate water use plants from Reference 2, as well as the high end of the range for density coefficients from Reference 1.

(h) The buffer zone plant factor is based on the low end of the range for plant factors for moderate water use plants from Reference 2.

(i) The total annual evapotranspiration rate is how much water use is necessary for an area of plantings over a year. Note that 1 AFY/ac is equal to 12 inches annually.

References:

1 University of California Cooperative Extension and California Department of Water Resources, *A Guide to Irrigation Water Needs of Landscape Plantings in California,* August 2000.

2 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance* , July 9, 2015 Draft.

Table 6
Estimated Residential Outdoor Water Use Factors
Grapevine Project, Kern County, California

Housing Category / Unit Type (a)	[A] **Median Density** (du/ac) (a)	[B] **Median Size of Lot (without streets)** (sq ft/du) B = 43560 / A (b)	[C] **Area of Landscaping Per Lot** (sq ft/du) C = B x 40%	[D] **Percentage of Landscaping Covered in HWUPs** (c)	[E] **Area of HWUPs** (sq ft/du) E = C x D (c)	[F] **Percentage of Landscaping Covered in LWUPs** (d)	[G] **Area of LWUPs** (sq ft/du) G = C × F (d)	[H] **Estimated Total Water Use for HWUPs** (AFY/du) H = E × 5.4 /43560 (e)	[I] **Estimated Total Water Use for LWUPs** (AFY/du) I = G × 1.88 / 43560 (f)	[J] **Estimated Total Water Use (ETWU) for Landscaping** (AFY/du) J = H + I (g)	[K] **Maximum Applied Water Allowance (MAWA)** (AFY/du) (h)	[L] **Additional Outdoor Water Uses** (AFY/du) L = 0.1 × J (i)	[M] **Total Outdoor Water Use Factor** (AFY/du) M = J + L (j)
Area 1													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 2													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 3													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 4													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 5a													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 5b													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Area 6a													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6b													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6c													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6d													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6e													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08

Abbreviations:

"AFY" = Acre feet per year
"AFY/ac" = Acre feet per year per acre
"du/ac" = dwelling units per acre
"ETWU" = estimated total water use
"HWUPs" = high water use plantings
"LWUPs" = low water use plantings
"MAWA" = maximum allowable water allowance
"sq ft" = square feet

Notes:

(a) Residential unit types and median residential density are based on the 8 June 2015 Project Land Use Program Summary.
(b) The size of residential lots, including the area of associated surrounding streets, is calculated by dividing the residential density into 43,560 square feet per acre.
(c) High water use plantings include turf grasses. Percentage of lot covered in high water use plantings is the area of high water use plantings divided by the lot size (without streets).
(d) Low water use plantings include shrubs and native vegetation. Percentage of lot covered in low water use plantings is the area of low water use plantings divided by the lot size (without streets).
(e) The estimated total water use for high water use plantings is the area of high water use plantings, converted to acres (by dividing by 43,560), multiplied by the annual evapotranspiration rate for high water use plantings (5.4 AFY/ac) provided in Table 5.
(f) The estimated total water use for low water use plantings is the area of low water use plantings, converted to acres (by dividing by 43,560), multiplied by the annual evapotranspiration rate for low water use plantings (1.88 AFY/ac) provided in Table 5.
(g) For residential unit landscaping, the Estimated Total Water Use (ETWU) calculation described in Reference 1 is based on 100% regular landscape area, which equals the sum of the estimated total water use for high water use planting and the estimated total water use for low water use planting. This value must be less than or equal to the Maximum Applied Water Allowance (see note h).
(h) The Maximum Applied Water Allowance (MAWA) calculations are described in Reference 1. The MAWA was calculated assuming 100% regular landscaped area and an evaporation adjustment factor of 0.55 for residential areas.
(i) Additional outdoor water uses include miscellaneous outdoor water uses (e.g. car washing, outdoor cleaning, etc.), which are assumed at 10% of the applied irrigation of high and low water use plantings.
(j) The total annual outdoor water use is the sum of the ETWU for landscaping and additional outdoor water uses.

References:

1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance* , July 9, 2015 Draft.

Table 7
Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses
Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] Area of Land Use (acre) (a)	[B] Area of Landscaping (acre) (b)	[C] Percentage of Landscaping Covered in HWUPs (c)	[D] Area of HWUPs (acre) D = B x C (c)	[E] Percentage of Landscaping Covered in LWUPs (d)	[F] Area of LWUPs (acre) F = B x E (d)	[G] Estimated Total Water Use for HWUPs (AFY) G = D × 5.4 (e)	[H] Estimated Total Water Use for LWUPs (AFY) H = F × 1.88 (f)	[I] Estimated Total Outdoor Water Use (ETWU) (AFY) I = G + H (g)	[J] Maximum Applied Water Allowance (MAWA) (AFY) (h)
Area 1										
Village Center Retail										
51% Grocery	1.8	0.36	25%	0.09	75%	0.27	0.5	0.5	1.0	1.8
21% Drug store	0.7	0.15	25%	0.04	75%	0.11	0.2	0.2	0.4	0.8
14% Miscellaneous	0.5	0.10	25%	0.02	75%	0.07	0.1	0.1	0.3	0.5
7% Restaurant	0.2	0.05	25%	0.01	75%	0.04	0.1	0.1	0.1	0.3
7% Bank	0.2	0.05	25%	0.01	75%	0.04	0.1	0.1	0.1	0.3
Village Center Office	2.8	0.56	25%	0.14	75%	0.42	0.8	0.8	1.5	2.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D										
50% High Tech / Bio Tech	15	3.06	25%	0.77	75%	2.30	4.1	4.3	8.4	15.4
50% Other Office	15	3.06	25%	0.77	75%	2.30	4.1	4.3	8.4	15.4
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**20**	
Area 2										
Village Center Retail										
51% Grocery	9.8	1.96	25%	0.49	75%	1.47	2.7	2.8	5.4	9.9
21% Drug store	4.0	0.81	25%	0.20	75%	0.61	1.1	1.1	2.2	4.1
14% Miscellaneous	2.7	0.54	25%	0.13	75%	0.40	0.7	0.8	1.5	2.7
7% Restaurant	1.3	0.27	25%	0.07	75%	0.20	0.4	0.4	0.7	1.4
7% Bank	1.3	0.27	25%	0.07	75%	0.20	0.4	0.4	0.7	1.4
Village Center Office	15	3.04	25%	0.76	75%	2.28	4.1	4.3	8.4	15.3
Regional / Freeway-Oriented Comm.										
78.5% Miscellaneous Retail	21	4.20	25%	1.05	75%	3.15	5.7	5.9	11.6	21.2
7.5% Restaurant	2.0	0.40	25%	0.10	75%	0.30	0.5	0.6	1.1	2.0
7.5% Gas Station	2.0	0.40	25%	0.10	75%	0.30	0.5	0.6	1.1	2.0
6.5% Hotel	1.7	0.35	25%	0.09	75%	0.26	0.5	0.5	1.0	1.8
Office / R&D										
62% High Tech / Bio Tech	37	7.35	25%	1.84	75%	5.51	9.9	10.3	20.3	37.0
38% Medical Center	23	4.59	25%	1.15	75%	3.44	6.2	6.5	12.7	23.1
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	50%	5.00	50%	5.00	27.0	9.4	36.4	44.6
1 High School	55	27.50	50%	13.75	50%	13.75	74.3	25.8	100.1	122.5
Subtotal									**203**	

Table 7
Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses
Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] Area of Land Use (acre) (a)	[B] Area of Landscaping (acre) (b)	[C] Percentage of Landscaping Covered in HWUPs (c)	[D] Area of HWUPs (acre) D = B x C (c)	[E] Percentage of Landscaping Covered in LWUPs (d)	[F] Area of LWUPs (acre) F = B x E (d)	[G] Estimated Total Water Use for HWUPs (AFY) G = D × 5.4 (e)	[H] Estimated Total Water Use for LWUPs (AFY) H = F × 1.88 (f)	[I] Estimated Total Outdoor Water Use (ETWU) (AFY) I = G + H (g)	[J] Maximum Applied Water Allowance (MAWA) (AFY) (h)
Area 3										
Village Center Retail										
51% Grocery	6.2	1.24	25%	0.31	75%	0.93	1.7	1.7	3.4	6.2
21% Drug store	2.5	0.51	25%	0.13	75%	0.38	0.7	0.7	1.4	2.6
14% Miscellaneous	1.7	0.34	25%	0.08	75%	0.25	0.5	0.5	0.9	1.7
7% Restaurant	0.8	0.17	25%	0.04	75%	0.13	0.2	0.2	0.5	0.9
7% Bank	0.8	0.17	25%	0.04	75%	0.13	0.2	0.2	0.5	0.9
Village Center Office	10	1.91	25%	0.48	75%	1.43	2.6	2.7	5.3	9.6
Regional / Freeway-Oriented Comm.										
78.5% Miscellaneous Retail	54	10.81	25%	2.70	75%	8.11	14.6	15.2	29.8	54.5
7.5% Restaurant	5.2	1.03	25%	0.26	75%	0.77	1.4	1.5	2.8	5.2
7.5% Gas Station	5.2	1.03	25%	0.26	75%	0.77	1.4	1.5	2.8	5.2
6.5% Hotel	4.5	0.90	25%	0.22	75%	0.67	1.2	1.3	2.5	4.5
Office / R&D										
50% High Tech / Bio Tech	25	4.97	25%	1.24	75%	3.73	6.7	7.0	13.7	25.1
50% Other Office	25	4.97	25%	1.24	75%	3.73	6.7	7.0	13.7	25.1
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	50%	5.00	50%	5.00	27.0	9.4	36.4	44.6
Subtotal									**114**	
Area 4										
Village Center Retail										
51% Grocery	4.4	0.87	25%	0.22	75%	0.65	1.2	1.2	2.4	4.4
21% Drug store	1.8	0.36	25%	0.09	75%	0.27	0.5	0.5	1.0	1.8
14% Miscellaneous	1.2	0.24	25%	0.06	75%	0.18	0.3	0.3	0.7	1.2
7% Restaurant	0.6	0.12	25%	0.03	75%	0.09	0.2	0.2	0.3	0.6
7% Bank	0.6	0.12	25%	0.03	75%	0.09	0.2	0.2	0.3	0.6
Village Center Office	6.8	1.35	25%	0.34	75%	1.01	1.8	1.9	3.7	6.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	40	20.00	50%	10.00	50%	10.00	54.0	18.8	72.8	89.1
Subtotal									**81**	

Table 7
Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses
Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] Area of Land Use (acre) (a)	[B] Area of Landscaping (acre) (b)	[C] Percentage of Landscaping Covered in HWUPs (c)	[D] Area of HWUPs (acre) D = B x C (c)	[E] Percentage of Landscaping Covered in LWUPs (d)	[F] Area of LWUPs (acre) F = B x E (d)	[G] Estimated Total Water Use for HWUPs (AFY) G = D × 5.4 (e)	[H] Estimated Total Water Use for LWUPs (AFY) H = F × 1.88 (f)	[I] Estimated Total Outdoor Water Use (ETWU) (AFY) I = G + H (g)	[J] Maximum Applied Water Allowance (MAWA) (AFY) (h)
Area 5a										
Village Center Retail										
51% Grocery	1.4	0.29	25%	0.07	75%	0.21	0.4	0.4	0.8	1.4
21% Drug store	0.6	0.12	25%	0.03	75%	0.09	0.2	0.2	0.3	0.6
14% Miscellaneous	0.4	0.08	25%	0.02	75%	0.06	0.1	0.1	0.2	0.4
7% Restaurant	0.2	0.04	25%	0.01	75%	0.03	0.1	0.1	0.1	0.2
7% Bank	0.2	0.04	25%	0.01	75%	0.03	0.1	0.1	0.1	0.2
Village Center Office	2.3	0.46	25%	0.11	75%	0.34	0.6	0.6	1.3	2.3
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	50%	5.00	50%	5.00	27.0	9.4	36.4	44.6
Subtotal									**39**	
Area 5b										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0**	
Area 6a										
Village Center Retail										
51% Grocery	5.5	1.09	25%	0.27	75%	0.82	1.5	1.5	3.0	5.5
21% Drug store	2.2	0.45	25%	0.11	75%	0.34	0.6	0.6	1.2	2.3
14% Miscellaneous	1.5	0.30	25%	0.07	75%	0.22	0.4	0.4	0.8	1.5
7% Restaurant	0.7	0.15	25%	0.04	75%	0.11	0.2	0.2	0.4	0.8
7% Bank	0.7	0.15	25%	0.04	75%	0.11	0.2	0.2	0.4	0.8
Village Center Office	8	1.68	25%	0.42	75%	1.26	2.3	2.4	4.6	8.5
Regional / Freeway-Oriented Comm.	--		--	--	--	--	--	--	--	--
Office / R&D										
50% High Tech / Bio Tech	10	2.07	25%	0.52	75%	1.55	2.8	2.9	5.7	10.4
50% Other Office	10	2.07	25%	0.52	75%	1.55	2.8	2.9	5.7	10.4
Light Industrial / Warehouse										
75% Light Industrial / Warehouse	80	16.07	25%	4.02	75%	12.05	21.7	22.6	44.3	81.0
25% Community College	28	5.54	25%	1.39	75%	4.16	7.5	7.8	15.3	27.9
Schools										
1 K-8	20	10.00	50%	5.00	50%	5.00	27.0	9.4	36.4	44.6
Subtotal									**118**	

Table 7
Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses
Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] Area of Land Use (acre) (a)	[B] Area of Landscaping (acre) (b)	[C] Percentage of Landscaping Covered in HWUPs (c)	[D] Area of HWUPs (acre) D = B x C (c)	[E] Percentage of Landscaping Covered in LWUPs (d)	[F] Area of LWUPs (acre) F = B x E (d)	[G] Estimated Total Water Use for HWUPs (AFY) G = D × 5.4 (e)	[H] Estimated Total Water Use for LWUPs (AFY) H = F × 1.88 (f)	[I] Estimated Total Outdoor Water Use (ETWU) (AFY) I = G + H (g)	[J] Maximum Applied Water Allowance (MAWA) (AFY) (h)
Area 6b										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial										
Light Industrial / Warehouse	23	4.59	25%	1.15	75%	3.44	6.2	6.5	12.7	23.1
Solar Farm (h)	266	--	--	--	--	--	--	--	1.2	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**13.8**	
Area 6c										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	190	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Area 6d										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	173	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Area 6e										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	171	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Total School Outdoor Water Use									318	
Total Commercial, Institutional, and Industrial Outdoor Water Use (i)									**592**	

Table 7
Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses
Grapevine Project, Kern County, California

Abbreviations:

"ac" = acre
"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial
"HWUP" = high water use plants
"K-8" = kindergarten through eighth grade
"LWUP" = low water use plants
"MAWA" = maximum applied water allowance
"R&D" = Research and development

Notes:

(a) See Table 4 for area of land use calculation.
(b) Area of landscaping is the area of land use multiplied by the percentage of landscaping. Landscaped percentage is 50% for schools and 20% for non-school CII land uses.
(c) High water use plantings include turf grasses. Percentage of lot covered in high water use plantings is the area of high water use plantings divided by the area of land use (without streets).
(d) Low water use plantings include shrubs and native vegetation. Percentage of lot covered in low water use plantings is the area of low water use plantings divided by the area of land use (without streets).
(e) The estimated total water use for high water use plantings is the area of high water use plantings multiplied by the annual evapotranspiration rate for high water use plantings (5.4 AFY/ac) provided in Table 5.
(f) The estimated total water use for low water use plantings is the area of low water use plantings multiplied by the annual evapotranspiration rate for low water use plantings (1.88 AFY/ac) provided in Table 5.
(g) The ETWU is the sum of the estimated total water use for high water use plantings and estimated total water use for low water use plantings. The estimated total water outdoor water use must not be greater than the MAWA (see note h). The ETWU was calculated assuming all regular landscaped area, which accounts for plant type and irrigation efficiency, to estimate water demands. If special landscaped area was accounted for in the estimated total water use calculations according to Reference 1, the estimated total outdoor water use for non-school CII uses would equal the MAWA regardless of the planting types.
(h) The Maximum Applied Water Allowance (MAWA) calculations are described in Reference 1. For the non-school CII land uses, the MAWA was calculated assuming 100% special landscaped area and an evaporation adjustment factor of 0.45. The MAWA calculations for schools assumes 33% regular landscaped area, 67% special landscaped area (assumed recreational areas), and an evaporation adjustment factor of 0.65 based on amendments to CALGreen Code approved by the Building Standards Commission on July 21, 2015.
(h) Water use for the solar farms are based on the values for photovoltaic solar plants from Reference 2.
(i) Kern County Code of Ordinances, Title 19, Chapter 19.86, sections 19.86.050 and 19.86.060, states that for CII land uses a "*minimum of five percent (5%) of the total developed lot area shall be landscaped.*" Approximately 20% of the total developed land area for CII is assumed to be irrigated landscape, which complies with the minimum Kern County standard.
(k) Totals may not add exactly due to rounding.

Reference:

1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance* , July 9, 2015 Draft.
2 Bureau of Land Management, 2012. *Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* , Appendix M, July 2012.

Table 8

Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations

Grapevine, Kern County, California

		High Water Use Plantings				Low Water Use Plantings				Tree and Groundcover Plantings				Buffer Zone Plantings					
Landscaping Land Use (a)	[A] Total Acres (ac) (a)	[B] Percentage of Land as HWUP (%) (b)	[C] Total Area of HWUP (ac) C = A × B (c)	[D] Annual Evapo-transpiration Rate for HWUP (AFY/ac) (d)	[E] Estimated Total Water Use for HWUP (AFY) E = C × D (e)	[F] Percentage of Land as LWUP (%) (f)	[G] Total Area of LWUP (ac) G = A × F (c)	[H] Annual Evapo-transpiration Rate for LWUP (AFY/ac) (d)	[I] Estimated Total Water Use for LWUP (AFY) I = G × H (e)	[J] Percentage of Land as TGP (%) (g)	[K] Total Area of TGP (ac) K = A × J (c)	[L] Annual Evapo-transpiration Rate for TGP (AFY/ac) (d)	[M] Estimated Total Water Use for TGP (AFY) M = K × L (e)	[O] Percentage of Land as BZP (%) (h)	[P] Total Area of BZP (ac) K = A × J (c)	[Q] Annual Evapo-transpiration Rate for BZP (AFY/ac) (d)	[R] Estimated Total Water Use for BZP (AFY) M = K × L (e)	[S] Estimated Total Outdoor Water Use (ETWU) (AFY) J = E + I + M + R (i)	[T] Maximum Applied Water Allowance (MAWA) (AFY) (j)
Area 1																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping	26	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	26	4.4	113	--		--	--	113	130
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	22	25%	5.6	5.4	30	0%	0.0	1.9	0	50%	11	4.4	49	--		--	--	80	85
Landscaped I-5 Buffer Zones	16	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	16	2.5	40	40	81
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	237	
Area 2																			
Parks	42	45%	19	5.4	102	45%	18.9	1.9	35	0%	0	4.4	0	--		--	--	138	190
Road Landscaping	42	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	42	4.4	184	--		--	--	184	212
1 Roundabout	1	0%	0.0	5.4	0.0	100%	1.0	1.9	2	0%	0	4.4	0	--		--	--	2	5
Windrow	3	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	3	4.4	13	--		--	--	13	15
Irrigated Residential Common Area (k)	32	25%	8.0	5.4	43	0%	0.0	1.9	0	50%	16	4.4	70	--		--	--	113	120
Landscaped I-5 Buffer Zones	31	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	31	2.5	78	78	158
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	528	
Area 3																			
Parks	4	45%	1.8	5.4	10	45%	1.8	1.9	3	0%	0	4.4	0	--		--	--	13	18
Road Landscaping	32	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	32	4.4	139	--		--	--	139	160
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	8	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	8	4.4	34	--		--	--	34	39
Irrigated Residential Common Area (k)	21	25%	5.3	5.4	29	0%	0.0	1.9	0	50%	11	4.4	46	--		--	--	75	80
Landscaped I-5 Buffer Zones	48	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	48	2.5	119	119	239
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	384	
Area 4																			
Parks	42	45%	19	5.4	102	45%	19	1.9	35	0%	0	4.4	0	--		--	--	138	190
Golf Course (l)	90	40%	36	5.4	194	30%	27	1.9	51	0%	0	4.4	0	30%	27	2.5	68	313	453
Road Landscaping	37	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	37	4.4	160	--		--	--	160	184
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	9	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	9	4.4	38	--		--	--	38	44
Irrigated Residential Common Area (k)	33	25%	8.3	5.4	45	0%	0.0	1.9	0	50%	17	4.4	72	--		--	--	117	125
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	769	
Area 5a																			
Parks	4	45%	1.8	5.4	10	45%	1.8	1.9	3	0%	0	4.4	0	--		--	--	13	18
Road Landscaping	33	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	33	4.4	144	--		--	--	144	166
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	2	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	2	4.4	9	--		--	--	9	11
Irrigated Residential Common Area (k)	31	25%	7.7	5.4	42	0%	0.0	1.9	0	50%	15	4.4	68	--		--	--	110	117
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	276	
Area 5b																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	
Road Landscaping	7	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	7	4.4	30	--		--	--	30	35
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	7	25%	1.6	5.4	8.8	0%	0.0	1.9	0	50%	3	4.4	14	--		--	--	23	25
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	53	

Table 8

Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations

Grapevine, Kern County, California

		High Water Use Plantings				Low Water Use Plantings				Tree and Groundcover Plantings				Buffer Zone Plantings					
Landscaping Land Use (a)	[A] **Total Acres** (ac) (a)	[B] **Percentage of Land as HWUP** (%) (b)	[C] **Total Area of HWUP** (ac) C = A × B (c)	[D] **Annual Evapo-transpiration Rate for HWUP** (AFY/ac) (d)	[E] **Estimated Total Water Use for HWUP** (AFY) E = C × D (e)	[F] **Percentage of Land as LWUP** (%) (f)	[G] **Total Area of LWUP** (ac) G = A × F (c)	[H] **Annual Evapo-transpiration Rate for LWUP** (AFY/ac) (d)	[I] **Estimated Total Water Use for LWUP** (AFY) I = G × H (e)	[J] **Percentage of Land as TGP** (%) (g)	[K] **Total Area of TGP** (ac) K = A × J (c)	[L] **Annual Evapo-transpiration Rate for TGP** (AFY/ac) (d)	[M] **Estimated Total Water Use for TGP** (AFY) M = K × L (e)	[O] **Percentage of Land as BZP** (%) (h)	[P] **Total Area of BZP** (ac) K = A × J (c)	[Q] **Annual Evapo-transpiration Rate for BZP** (AFY/ac) (d)	[R] **Estimated Total Water Use for BZP** (AFY) M = K × L (e)	[S] **Estimated Total Outdoor Water Use (ETWU)** (AFY) J = E + I + M + R (i)	[T] **Maximum Applied Water Allowance (MAWA)** (AFY) (j)
Area 6a																			
Parks	4	45%	1.8	5.4	10	45%	1.8	1.9	3	0%	0	4.4	0	--		--	--	13	18
Road Landscaping	21	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	21	4.4	93	--		--	--	93	107
1 Roundabout	1	0%	0.0	5.4	0.0	100%	1.0	1.9	2	0%	0	4.4	0	--		--	--	2	5
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	10	25%	2.6	5.4	14	0%	0.0	1.9	0	50%	5	4.4	23	--		--	--	37	39
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	145	
Area 6b																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping	5	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	5	4.4	23	--		--	--	23	26
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	
Area 6c																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Area 6d																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow																			--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Area 6e																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Estimated Total Outdoor Water Use for Parks																		*314*	
Estimated Total Outdoor Water Use for Irrigated Residential Common Area																		*554*	
Estimated Total Outdoor Water Use for Roadways and Other Non-Residential Landscaped Areas																		*1,547*	
Estimated Total Outdoor Water Use for Community Landscaping																		**2,415**	

Table 8

Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations

Grapevine, Kern County, California

Abbreviations:

"ac" = acre
"AFY" = acre-feet per year
"AFY/ac" = acre-feet per year per acre
"BZP" = buffer zone plantings
"HWUP" = high water use plantings
"LWUP" = low water use plantings
"MAWA" = Maximum Applied Water Allowance
"TGP" = combination tree and groundcover plantings

Notes:

(a) Landscaping land uses and acres are based on the 8 June 2015 Land Use Program Summary. Passive open space and unprogrammed land is not included as it will not be irrigated.
(b) High water use plantings include turf grasses.
(c) The area of plantings is the acreage multiplied by the percentage of the land that is covered by that kind of plantings.
(d) The total water application rates for all plantings are estimated in Table 5.
(e) The estimated total water use for each planting type is the area of that planting type multiplied by the annual evapotranspiration rate for that kind of planting.
(f) Low water use plantings include shrubs and native vegetation.
(g) Combination tree and groundcover plantings include trees with full canopy coverage and full coverage of shrubs or low water use groundcover.
(h) Buffer zone plantings include sparsely planted trees and shrubs.
(i) The estimated total outdoor water use is the sum of the estimated total water use for all areas and plantings. The estimated total water outdoor water use must not be greater than the MAWA (see note h). The estimated total water outdoor water use was calculated assuming all regular landscaped area, which accounts for plant type and irrigation efficiency, to estimate water demands. If special landscaped area was accounted for in the estimated total water use calculations according to Reference 1, the estimated total outdoor water use would equal the MAWA regardless of the planting types.
(j) The Maximum Applied Water Allowance ("MAWA") calculations are described in Reference 1. The MAWA was calculated assuming 100% special landscaped area based on use of recycled water in non-residential areas and based on note k for residential areas.
(k) The irrigated residential common area is assumed to be classified as a special landscape area based on use as a recreational area and meeting space per Reference 1.
(l) The golf course is assumed to be a desert style course, which utilizes native vegetation and minimizes the use of turf grass, per verbal communication with staff at Todd Eckenrode Origins Golf Design.
(m) There are no new roadways planned in Areas 6c, 6d, and 6e.

Reference:

1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance* , July 9, 2015 Draft.

Table 9

Summary of Water Treatment and Distribution System Losses

Grapevine Project, Kern County, California

Development Category	**Estimated Water Loss** (AFY)
Losses at potable water treatment facility (a)	268
Losses at wastewater treatment facility (b)	--
Distribution system losses (associated with indoor water uses) (c)	125
Distribution system losses (associated with outdoor water uses) (d)	236
Total water losses (e)(f)	**629**

Abbreviations:

"AFY" = acre-feet per year

Notes:

(a) Losses at the potable water treatment facility are estimated to be approximately 5% of the indoor and outdoor residential, indoor commercial, indoor institutional, indoor industrial, outdoor school, and outdoor irrigated residential common area uses, plus distribution system losses (see Tables 1, 4, 7 and 8)

(b) Losses at the wastewater treatment facility are accounted for in the estimates of recycled water production (see Table 11).

(c) Potable water system distribution system losses are estimated to be 5% of the total potable indoor demand.

(d) Outdoor water system distribution system losses are estimated to be 5% of the sum of the total recycled and non-potable water demand and the potable water demand for outdoor uses (i.e., for residential irrigation).The portion of outdoor water system distribution losses associated with potable water uses is 129 AFY, and the portion associated with non-potable uses is 107 AFY.

(e) Water losses were conservatively estimated for water demand calculations only and should not be used for wastewater treatment design purposes.

(f) Values may not total exactly due to rounding.

Table 10

Estimated Grapevine Project Annual Water Demand by Planning Area

Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 1			
Residential (a)	468	237	231
Commercial, institutional and industrial (b)	70	50	20
Landscaping (c)	237	-	237
Treatment system losses (d)	31	-	-
Distribution system losses (d)	39	14	24
Area 1 Water Demand	***845***	***301***	***513***
Area 2			
Residential (a)	823	442	381
Commercial, institutional and industrial (b)	403	199	203
Landscaping (c)	528	-	528
Treatment system losses (d)	67	-	-
Distribution system losses (d)	88	32	56
Area 2 Water Demand	***1,908***	***673***	***1,168***
Area 3			
Residential (a)	565	306	259
Commercial, institutional and industrial (b)	343	230	114
Landscaping (c)	384	-	384
Treatment system losses (d)	48	-	-
Distribution system losses (d)	65	27	38
Area 3 Water Demand	***1,404***	***562***	***794***

Table 10
Estimated Grapevine Project Annual Water Demand by Planning Area
Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 4			
Residential (a)	747	387	360
Commercial, institutional and industrial (b)	100	19	81
Landscaping (c)	769	-	769
Treatment system losses (d)	50	-	-
Distribution system losses (d)	81	20	61
Area 4 Water Demand	***1,747***	***427***	***1,271***
Area 5a			
Residential (a)	650	330	321
Commercial, institutional and industrial (b)	47	7.9	39.2
Landscaping (c)	276	-	276
Treatment system losses (d)	42	-	-
Distribution system losses (d)	49	17	32
Area 5a Water Demand	***1,064***	***354***	***667***
Area 5b			
Residential (a)	12	5.6	6.0
Commercial, institutional and industrial (b)	0	0	0
Landscaping (c)	53	-	53
Treatment system losses (d)	1.8	-	-
Distribution system losses (d)	3.2	0.3	3.0
Area 5b Water Demand	***70***	***5.9***	***62***
Area 6a			
Residential (a)	373	214	159
Commercial, institutional and industrial (b)	199	81	118
Landscaping (c)	145	-	145
Treatment system losses (d)	28	-	-
Distribution system losses (d)	36	15	21
Area 6a Water Demand	***781***	***310***	***444***

Table 10
Estimated Grapevine Project Annual Water Demand by Planning Area
Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 6b			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	15	1	13.8
Landscaping (c)	23	-	23
Treatment system losses (d)	0.1	-	-
Distribution system losses (d)	1.9	0.1	1.8
Area 6b Water Demand	***40***	***1***	***38.6***
Area 6c			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.9	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6c Water Demand	***0.9***	***0.0***	***0.9***
Area 6d			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.8	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6d Water Demand	***0.8***	***0.0***	***0.8***

Table 10

Estimated Grapevine Project Annual Water Demand by Planning Area

Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 6e			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.8	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6e Water Demand	***0.8***	***0.0***	***0.8***
Project Annual Water Demand (e)(f)	***7,861***	***2,634***	***4,960***

Abbreviations:

"AFY" = acre-feet per year

Notes:

(a) See Table 3 for estimated residential water uses.
(b) See Tables 4 and 7 for estimated indoor and outdoor water use, respectively, for commercial, institutional, and industrial land uses.
(c) See Table 8 for estimated parks, roads and common area landscaping water use.
(d) See Table 9 for water losses associated with the project.
(e) The Project Annual Water Demand is the sum of the estimated water uses for the project, plus the assumed treatment and distribution system losses. The contingency is not included.
(f) Totals may not add exactly due to rounding.

Table 11

Recycled Water Production and Demand by Planning Area

Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 1			
Residential			
Indoor	201	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	43	0	
Outdoor	0	20	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	157	
Subtotal	244	178	66
Area 2			
Residential			
Indoor	375	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	169	0	
Outdoor	0	67	
School Landscaping	0	0	
Parks	0	138	
Road and Other Public Landscaping	0	278	
Subtotal	545	482	63
Area 3			
Residential			
Indoor	260	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	195	0	
Outdoor	0	77	
School Landscaping	0	0	
Parks	0	13	
Road and Other Public Landscaping	0	296	
Subtotal	455	386	69
Area 4			
Residential			
Indoor	329	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	16	0	
Outdoor	0	8	
School Landscaping	0	0	
Parks	0	138	
Road and Other Public Landscaping	0	514	
Subtotal	345	660	-315

Table 11

Recycled Water Production and Demand by Planning Area

Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 5a			
Residential			
Indoor	280	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	7	0	
Outdoor	0	3	
School Landscaping	0	0	
Parks	0	13	
Road and Other Public Landscaping	0	153	
Subtotal	287	169	118
Area 5b			
Residential			
Indoor	5	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	0	0	
Outdoor	0	0	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	30	
Subtotal	5	30	-25
Area 6a			
Residential			
Indoor	182	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	69	0	
Outdoor	0	82	
School Landscaping	0	0	
Parks	0	13	
Road and Other Public Landscaping	0	95	
Subtotal	251	190	61
Area 6b			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	1.0	0	
Outdoor	0	14	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	23	
Subtotal	1.0	37	-36

Table 11
Recycled Water Production and Demand by Planning Area
Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 6c			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.02	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.02	0.8	-0.8
Area 6d			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.01	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.01	0.8	-0.8
Area 6e			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.01	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.01	0.8	-0.7
Recycled Water Pond Net Evaporation and Rainfall (d)	*-149*	*0*	
Recycled Water Distribution System Loss (5%) (e)	*0*	*107*	
Recycled Water Produced, Used, and Surplus/Deficit (f)	1,983	2,241	-258
Total Supplemental Non-Potable Water Needed			**258**

Table 11
Recycled Water Production and Demand by Planning Area
Grapevine Project, Kern County, California

Abbreviations:

"AFY" = acre-feet per year

"CII" = Commercial, Institutional and Industrial

Notes:

(a) Production of recycled water is assumed to be 85% of total indoor water use. See Tables 3 and 4.

(b) Recycled water is assumed to be used for all CII, park and road landscape irrigation.

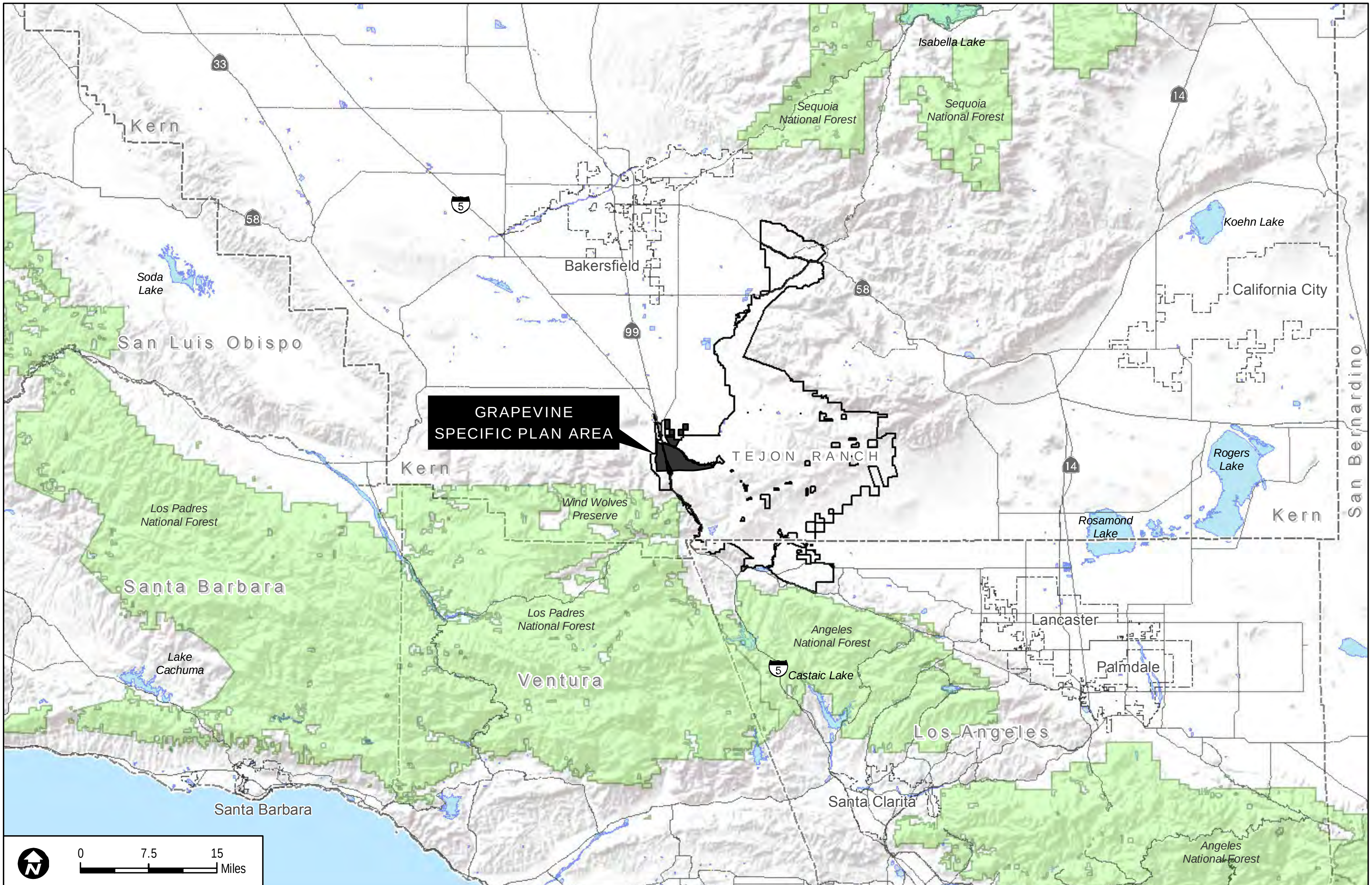
(c) A positive number indicates a surplus of recycled water, and a negative number indicates a deficit. Any deficit will be supplemented with filtered non-potable Nickel Water.

(d) Recycled water pond net evaporation and rainfall are calculated as shown in Table A-1.

(e) Recycled water distribution system loss is assumed to be 5% of the total recycled and non-potable water use in each area.

(f) Values may not total exactly due to rounding.

(g) The demands listed above do not include the contingency. See Table 1.

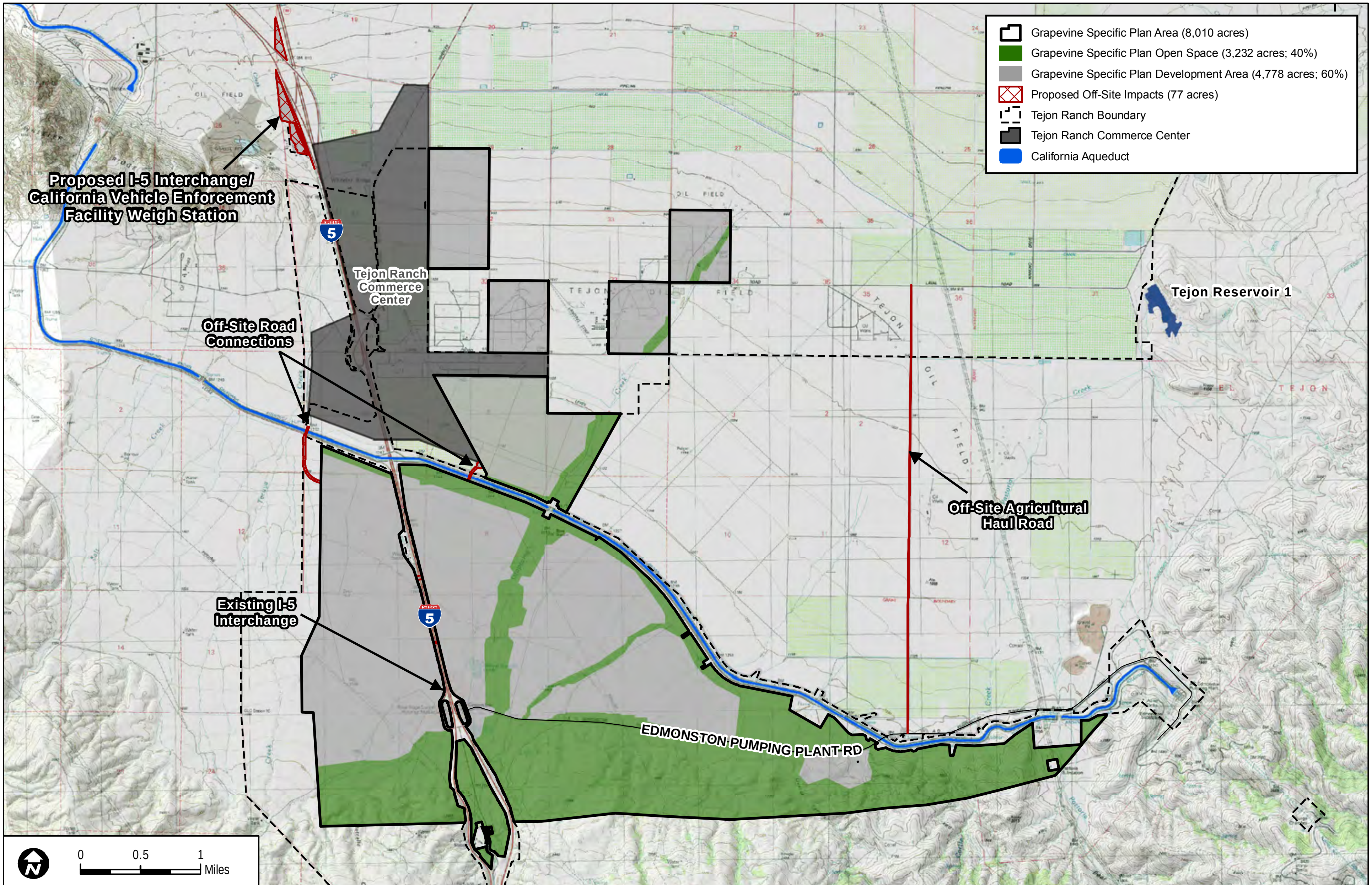


SOURCES: McIntosh & Associates 2013; TRC 2013a

FIGURE 1

Regional Location

GRAPEVINE PROJECT



SOURCES: McIntosh & Associates 2014; TRC 2013c

The California aqueduct (TRC 2013c) appears on subsequent figures; the source information will not be provided on subsequent figures.

FIGURE 2

Vicinity Map

GRAPEVINE PROJECT

ATTACHMENT A

Recycled Water Storage and Disposal Water Balance

Table A-1

Recycled Water Storage and Disposal Water Balance (Average-Year Rainfall)

Grapevine Project, Kern County, California

POND STORAGE NOVEMBER 1 (AF)	0	ASSUMED ACTIVE POND AREA (AC) (a)	36
POND PERCOLATION RATE (IN/DAY)	0	POND CATCHMENT AREA (AC)	36
		NON-POTABLE IRRIGATION AREA (AC) (b)	602
		CALC'D MAX STORAGE VOLUME (AF) (c)	445
		CALC'D MAX STORAGE DEPTH (FT) (d)	12.5
		CALC'D AVG STORAGE DEPTH (FT) (e)	5.7

PARAMETERS/DATA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
RECYCLED WATER FLOW (MGD) (f)	1.93	1.94	1.79	1.78	1.76	1.78	1.85	1.93	1.98	2.05	2.04	1.98	1.90
PRECIPITATION (IN) (g)	0.52	1.15	1.48	1.72	1.93	1.83	1.18	0.47	0.08	0.02	0.05	0.16	10.58
REFERENCE ETo (IN) (h)	4.06	2.01	1.41	1.45	2.22	4.03	5.49	7.63	8.63	9.14	8.55	6.18	60.78
IRRIGATION DEMAND FACTOR (IN) (i)	2.84	1.41	0.99	1.01	1.55	2.82	3.84	5.33	6.03	6.39	5.98	4.32	42.52
POND CALCULATIONS													
BEGINNING POND STORAGE (AF) (j)	0	24	126	244	361	430	445	400	281	120	0	0	--
RECYCLED WATER VOL (AF) (f)	184	179	171	170	152	169	170	183	183	195	195	182	2132
DIRECT PRECIPITATION VOL (AF) (k)	2	3	4	5	6	5	3	1	0	0	0	0	31
POND EVAPORATION VOL (AF) (l)	12	6	4	4	7	12	16	23	26	27	25	18	180
NON-POTABLE IRRIGATION DEMAND (AF) (m)	150	74	52	54	82	149	202	281	318	337	315	228	2241
STORAGE GAIN (AF) (n)	24	102	119	117	69	14	-45	-119	-161	-169	-146	-63	-258
FINAL POND STORAGE (AF) (o)	24	126	244	361	430	445	400	281	120	0	0	0	--
SUPPLEMENTAL IRRIGATION DEMAND (AF) (p)	0	0	0	0	0	0	0	0	0	49	146	63	258

Notes

(a) Assumed active pond area is estimated to maintain a calculated maximum storage depth of approximately 12.5 feet. This area consists of only a portion of the total pond area designed for the 100-year rainfall year (EKI, 2015). It is assumed that the excess pond acreage will only be used during above-average rainfall years.

(b) Non-potable irrigation area is the total landscaped area excluding residential areas and schools.

(c) Calculated maximum storage volume is the largest final pond storage volume from the pond calculations.

(d) Maximum storage depth is the calculated maximum storage volume divided by the active pond area. The calculated maximum storage depth does not include 2 feet for freeboard.

(e) Average storage depth is the average final pond storage volume from the pond calculations divided by the active pond area.

(f) Recycled water flow rate is the average indoor potable water demand less collection system and wastewater treatment losses of 15%. Note that collection system and wastewater treatment losses were not accounted for in the 100-year rainfall water balance in the *Wastewater Facilities Engineering Report* (EKI, 2015) to conservatively size the required total recycled water storage volume.

(g) Average monthly precipitation data were collected from the Western Regional Climate Center (WRCC) for the Bakersfield Airport in Bakersfield, California (1937-2012) and Tejon Rancho, California (1895-1914) and from the CIMIS Station 125 located in Arvin, CA. Precipitation data listed is the inverse-distance weighted monthly averages of the monthly averages for each station based on the distance of each station to the center of the Grapevine Project.

(h) Reference ETo data were obtained from the California Irrigation Management Information Services (CIMIS) station 125 located in Arvin, CA that measured evaporation from pans. Monthly averages were calculated using all available data from this CIMIS station, which has been in operation since 1995.

(i) The irrigation demand factor is the area weighted average irrigation demand factor for each planting type (high water use plantings, low water use plantings, combination trees and ground cover plantings, and buffer zone plantings) for the areas irrigated by non-potable water (all landscaped area except residential areas, parks, and schools). Refer to Table 5.

(j) Beginning pond storage is the final storage from the previous month.

(k) Direct precipitation is the active pond area multiplied by the precipitation.

(l) Pond evaporation is active pond area multiplied by the reference ETo, which is assumed to equal to the pond evaporation rate.

(m) Irrigation demand is the irrigation demand factor multiplied by the irrigation area.

(n) Storage gain is equal to the sum of the beginning pond storage, recycled water volume, and direct precipitation less the sum of the pond evaporation and irrigation demand. A negative storage gain represents a storage loss. The storage gain conservatively accounts for losses due to direct net evaporation when the ponds are empty. Total annual storage loss is approximately 50 AF less if it assumed that there is no net evaporation when the ponds are empty.

(o) Final pond storage is the beginning pond storage plus the storage gain. Final storage is zero when the storage loss is greater than the beginning pond storage.

(p) Irrigation demand includes 5% for distribution system losses. Supplemental irrigation demand is equal to the beginning pond storage less the storage loss (negative storage gain). If the storage loss is less than the beginning pond storage, the supplemental irrigation demand equals zero. It is assumed that the supplemental irrigation demand will be supplied with untreated California Aqueduct water.

Abbreviations

"AC" = acres
"AF" = acre-feet
"ETo" = reference evapotranspiration
"FT" = feet
"IN" = inches
"MGD" = Million Gallons per Day

References

(EKI, 2015) *Wastewater Facilities Engineering Report, Grapevine Project*, Erler & Kalinowski, Inc., October 2015.

Table A-2
Estimated Total Construction Water Use
Grapevine Project, Kern County, California

[A] Grapevine Project Total Grading Area (ac) (a)	[B] ETo Rate (in/yr) See Table 5	[C] Bare Soil "Crop" Factor (b)	[D] Bare Soil Evaporation Rate (in/yr) D = B × C (c)	[E] Duration of Dust Control on Each Acre Graded (months/ac) (d)	[F] Total Dust Control Water Demand (AF) G = A × D/12 × E/12 (e)	[G] Additional Construction Water Uses (AF) G = F × 0.25 (f)	[H] Total Construction Water Use (AF) H = F + G (g)
5,173	60.8	0.5	30.4	6	6,600	1,650	**8,250**

Abbreviations:
- "ac" = acre
- "AF" = acre-feet
- "in/yr" = inches per year
- "ETo" = reference evapotranspiration

Notes:
(a) The total Grapevine Project grading area is based on information provided by Dudek in an email dated 9 November 2015.
(b) Bare soil "crop" factor derived from Reference 1, based on the ETo and assuming a 7-day frequency between significant wetting (greater than 3 x ETo) and a soil hydraulic factor of 2.6.
(c) Bare soil evaporation rate calculated by multiplying the ETo rate by the bare soil "crop" factor. Water use for dust control is assumed to be applied at the same rate as soil evaporation.
(d) Six months of dust control was assumed to be required for each acre graded.
(e) Calculated by multiplying the total grading area by the bare soil evaporation rate and the length of dust control activities, rounded to the nearest hundred AF.
(f) Additional construction water uses were assumed to be 25% of the water used for dust control during grading activities.
(g) Calculated by summing the total dust control water use and additional construction water uses. This total construction water use will be used over a 19+ year period during buildout and supplied with Nickel Water from the California Aqueduct.

Reference:

1. Snyder, et al. 2007. *Crop Coefficients.* UC Davis Biometeorology Program. Updated March 2007. http://biomet.ucdavis.edu/Evapotranspiration/CropCoef/Kc.pdf.

ATTACHMENT B

Estimated Water Demands for 14,000 Residential Units Alternative Scenario

Table B-1
Comparison of Project Development Scenarios and Annual Water Demands
Grapevine Project, Kern County, California

Water Source	Water Supply Category	Estimated Total Water Demand (AFY)	
		Grapevine Plan *12,000 Residential Unit Base Scenario*	**Grapevine Plan** *14,000 Residential Unit Alternative Scenario*
California Aqueduct (Nickel Water)	Potable Water	5,620	5,873
	Supplemental Non-Potable Water	258	58
	Contingency	400	350
	California Aqueduct (Nickel Water) Subtotal	*6,278*	*6,281*
Recycled Water	Recycled Non-Potable Water	1,983	2,188
Overall Project Water Demand		***8,261***	***8,469***
Development Land Use Summary			
Residential Number of Units	Standard Residential Units (a)	8,410	9,810
	Village Center Residential Units (a)	3,590	4,190
	Total	*12,000*	*14,000*
Commercial and Industrial Square Footage	Village Center Retail (a)	450,000	42,000
	Village Center Office	350,000	350,000
	Freeway-Oriented Commercial	750,000	750,000
	Office/R&D	2,100,000	2,100,000
	Light Industrial	1,450,000	1,450,000
	Total	*5,100,000*	*4,692,000*
Total School Acreage (b)		175	175
Landscaping and Solar Farm Acreage	Parks (b) (c)	96	112
	Road Landscaping	203	203
	Roundabouts	8	8
	Windrow	22	22
	Irrigated Residential Common Area (b)	156	156
	Landscaped I-5 Buffer Zones	95	95
	Golf Course	90	90
	Solar Farms	800	800
	Total	*1,470*	*1,486*

Abbreviations:
"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial
"SRUs" = Standard Residential Units
"VCRUs" = Village Center Residential Units

Notes:
(a) To accommodate the additional 2,000 dwelling units in the 14,000 Residential Unit Alternative Scenario, village center retail square footage was reduced based on the vehicle trip equivalency ratios of 225 square feet per single-family dwelling unit and 155 square feet per multi-family dwelling unit. Alternatively, other commercial and industrial land areas could be reduced at their respective vehicle trip equivalency ratios.
(b) In 14,000 Residential Unit Alternative Scenario, landscaped water efficiency was increased for noted land uses. Refer to Table B-6

Table B-2
Estimated Annual Water Demand
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Development Category	**Estimated Total Water Use** (AFY)	**Estimated Indoor Water Use** (AFY)	**Estimated Outdoor Water Use** (AFY)
Residential (a)	4,243	2,240	2,003
Commercial, Institutional and Industrial (b)	1,011	556	455
Community Landscaping (c)	2,212	-	2,212
Treatment system losses (d)	280	-	-
Distribution system losses (d)	373	140	234
Subtotal Average Annual Water Demand (e)	8,119	2,935	4,904
Contingency (f)	350	-	-
Project Average Annual Water Demand	***8,469***	-	-

Abbreviations:
"AFY" = acre-feet per year

Notes:
(a) See Table B-3 for estimated residential water uses.
(b) See Tables B-4 and B-6 for estimated indoor and outdoor water use, respectively, for commercial, institutional, and industrial land uses. Includes 210 AFY of outdoor school water demand.
(c) See Table B-7 for estimated parks, roads and common area landscaping water use. Includes 318 AFY of residential common area demand.
(d) See Table B-8 for water losses associated with the project treatment and distribution systems. System losses associated with all potable outdoor uses are estimated to be 127 AFY, assumed to be 5% of the total of residential outdoor, outdoor school, and residential common area water demands.
(e) The Project Annual Water Demand is the sum of the estimated water uses for the project, plus the assumed treatment and distribution system losses.
(f) The contingency was reduced from 400 AFY to 350 AFY under this scenario to accommodate 2,000 additional homes. The contingency is inclusive of all losses associated with its treatment and distribution.
(g) Totals may not add exactly due to rounding.

Table B-3
Estimated Residential Water Use
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Project Development Phase and Housing Product Types	Number of Dwelling Units (a)	Median Density (a) (du/ac)	Household Size (c) (people/du)	Water Use Factor (b) Indoor (c) (AFY/du)	Water Use Factor (b) Outdoor (d) (AFY/du)	Water Use Factor (b) Total (AFY/du)	Subtotal Water Use (e) Indoor (AFY)	Subtotal Water Use (e) Outdoor (AFY)	Subtotal Water Use (e) Total (AFY)
Area 1									
Standard Residential Units	1,458	7.2	3.20	0.16	0.17	0.33	233	248	481
Village Center Residential Units	269	15.5	3.20	0.16	0.08	0.24	43	22	65
Subtotal	**1,727**	-	-	-	-	-	**276**	**269**	**546**
Area 2									
Standard Residential Units	2,076	7.2	3.20	0.16	0.17	0.33	332	353	685
Village Center Residential Units	1,144	15.5	3.20	0.16	0.08	0.24	183	92	275
Subtotal	**3,220**	-	-	-	-	-	**515**	**444**	**960**
Area 3									
Standard Residential Units	1,377	7.2	3.20	0.16	0.17	0.33	220	234	454
Village Center Residential Units	852	15.5	3.20	0.16	0.08	0.24	136	68	204
Subtotal	**2,229**	-	-	-	-	-	**357**	**302**	**659**
Area 4									
Standard Residential Units	2,158	7.2	3.20	0.16	0.17	0.33	345	367	712
Village Center Residential Units	665	15.5	3.20	0.16	0.08	0.24	106	53	160
Subtotal	**2,823**	-	-	-	-	-	**452**	**420**	**872**
Area 5a									
Standard Residential Units	2,018	7.2	3.20	0.16	0.17	0.33	323	343	666
Village Center Residential Units	385	15.5	3.20	0.16	0.08	0.24	62	31	92
Subtotal	**2,403**	-	-	-	-	-	**384**	**374**	**758**
Area 5b									
Standard Residential Units	41	7.2	3.20	0.16	0.17	0.33	7	7	14
Village Center Residential Units	0	15.5	3.20	0.16	0.09	0.25	0	0	0
Subtotal	**41**	-	-	-	-	-	**7**	**7**	**14**
Area 6a									
Standard Residential Units	682	7.2	3.20	0.16	0.17	0.33	109	116	225
Village Center Residential Units	875	15.5	3.20	0.16	0.08	0.24	140	70	210
Subtotal	**1,557**	-	-	-	-	-	**249**	**186**	**435**

Table B-3
Estimated Residential Water Use
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Project Development Phase and Housing Product Types	Number of Dwelling Units (a)	Median Density (a) (du/ac)	Household Size (c) (people/du)	Water Use Factor (b)			Subtotal Water Use (e)		
				Indoor (c) (AFY/du)	Outdoor (d) (AFY/du)	Total (AFY/du)	Indoor (AFY)	Outdoor (AFY)	Total (AFY)
Area 6b									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6c									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6d									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6e									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
TOTAL	**14,000**	-	-	-	-	-	**2,240**	**2,003**	**4,243**

Abbreviations:
"AFY" = acre-feet per year
"AFY/du" = acre-feet per year per dwelling unit
"du" = dwelling units
"du/ac" = dwelling units per acre

Table B-3

Estimated Residential Water Use

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Notes:

(a) The residential unit types, median residential densities for each product type, and numbers of residential units are based on the 8 June 2015 Project Land Use Program Summary.

(b) Water use factors, expressed as the annual volume of water consumed for each dwelling unit, have been estimated using models of residential indoor and outdoor water uses as discussed in Notes (c) and (d).

(c) Residential indoor water use factors were estimated using a model of total indoor water use developed in *Analysis of Water Use in* New Single-Family Homes dated 20 July 2011, William DeOreo, P.E., M.S. submitted to Salt lake City Corporation and the United States Environmental Protection Agency. The statistical model is based on single family homes that meet the standards for the Federal Energy Policy Act of 1992. The following assumptions were used for estimating water uses for each housing product type:

1. The average household size (i.e., number of residents per home) for each product type is assumed as 3.2 persons/dwelling unit, according to data for Kern County from: *State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties and the State — January 1, 2011- 2013* . Sacramento, California, May 2013.
2. Home water softening systems (e.g., regenerating ion exchange units or reverse osmosis units) are prohibited.
3. High-efficiency clothes washers that use less than 30 gallons of water per load are installed in 75% of residential homes.
4. Significant leaks (i.e., leaks greater than 50 gallons per day) occur at approximately 9% of homes for each housing product type.

(d) Residential outdoor water use factors were estimated in Table B-5.

(e) The subtotal water use for a residential unit type is the number of dwelling units multiplied by the corresponding water use factors.

Table B-4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 1											
Village Center Retail	0										
51% Grocery	0	0.18	0.0	0.0	1.1	0	122	0	0.0	0.00	0.0
21% Drug store	0	0.18	0.00	0.0	0.8	0	69	0	0.0	0.00	0.0
14% Miscellaneous	0	0.18	0.00	0.0	0.8	0	69	0	0.0	0.00	0.0
7% Restaurant	0	0.18	0.00	0.0	2	0	179	0	0.0	0.00	0.0
7% Bank	0	0.18	0.00	0.0	0.8	0	63	0	0.0	0.00	0.0
Village Center Office	22	0.18	0.5	2.8	2.3	51	53	2,669	1.8	1.5	3.4
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	400										
50% High Tech / Bio Tech	200	0.30	4.6	15	2.3	460	92	42,267	29.2	8.4	37.6
50% Other Office	200	0.30	4.6	15	2.3	460	53	24,268	16.8	8.4	25.2
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**48**	**18**	**66**
Area 2											
Village Center Retail	0										
51% Grocery	0	0.18	0.0	0.0	1.1	0	122	0	0.0	0.0	0.0
21% Drug store	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
14% Miscellaneous	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
7% Restaurant	0	0.18	0.0	0.0	2	0	179	0	0.0	0.0	0.0
7% Bank	0	0.18	0.0	0.0	0.8	0	63	0	0.0	0.0	0.0
Village Center Office	119	0.18	2.7	15	2.3	274	53	14,439	10.0	8.4	18.3
Regional / Freeway-Oriented Comm.	210										
78.5% Miscellaneous Retail	165	0.18	3.8	21	0.8	132	320	42,256	29.2	11.6	40.8
7.5% Restaurant	16	0.18	0.4	2.0	2	32	847	26,679	18.4	1.1	19.5
7.5% Gas Station	16	0.18	0.4	2.0	0.9	14	320	4,542	3.1	1.1	4.2
6.5% Hotel	14	0.18	0.3	1.7	0.48	7	506	3,315	2.3	1.0	3.2
Office / R&D	780										
62% High Tech / Bio Tech	480	0.30	11.0	37	2.3	1104	92	101,440	70.0	20.3	90.3
38% Medical Center	300	0.30	7	23	2.3	690	80	55,155	38.1	12.7	50.7
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	335										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	24.0	28.7
1 High School	240	0.10	5.5	55	1.3	302	55	16,661	11.5	66.1	77.6
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**187**	**146**	**333**

Table B-4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 3											
Village Center Retail	0										
51% Grocery	0	0.18	0.0	0.0	1.1	0	122	0	0.0	0.0	0.0
21% Drug store	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
14% Miscellaneous	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
7% Restaurant	0	0.18	0.0	0.0	2	0	179	0	0.0	0.0	0.0
7% Bank	0	0.18	0.0	0.0	0.8	0	63	0	0.0	0.0	0.0
Village Center Office	75	0.18	1.7	10	2.3	173	53	9,100	6.3	5.3	11.6
Regional / Freeway-Oriented Comm.	540										
78.5% Miscellaneous Retail	424	0.18	10	54	0.8	339	320	108,659	75.0	29.8	104.9
7.5% Restaurant	41	0.18	0.9	5.2	2	81	847	68,602	47.4	2.8	50.2
7.5% Gas Station	41	0.18	0.9	5.2	0.9	36	320	11,679	8.1	2.8	10.9
6.5% Hotel	35	0.18	0.8	4.5	0.48	17	506	8,524	5.9	2.5	8.4
Office / R&D	650										
50% High Tech / Bio Tech	325	0.30	7.5	25	2.3	748	92	68,683	47.4	13.7	61.1
50% Other Office	325	0.30	7.5	25	2.3	748	53	39,435	27.2	13.7	40.9
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	96										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	24.0	28.7
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**222**	**95**	**317**
Area 4											
Village Center Retail	0										
51% Grocery	0	0.18	0.0	0.0	1.1	0	122	0	0.0	0.0	0.0
21% Drug store	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
14% Miscellaneous	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
7% Restaurant	0	0.18	0.00	0.0	2	0	179	0	0.0	0.0	0.0
7% Bank	0	0.18	0.00	0.0	0.8	0	63	0	0.0	0.0	0.0
Village Center Office	53	0.18	1.2	6.8	2.3	122	53	6,431	4.4	3.7	8.2
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	192										
2 K-8	192	0.11	4.4	40	1.3	241	55	13,329	9.2	48.1	57.3
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**14**	**52**	**65**

Table B-4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 5a											
Village Center Retail	0										
51% Grocery	0	0.18	0.0	0.0	1.1	0	122	0	0.0	0.0	0.0
21% Drug store	0	0.18	0.00	0.0	0.8	0	69	0	0.0	0.0	0.0
14% Miscellaneous	0	0.18	0.00	0.0	0.8	0	69	0	0.0	0.0	0.0
7% Restaurant	0	0.18	0.00	0.0	2	0	179	0	0.0	0.0	0.0
7% Bank	0	0.18	0.00	0.0	0.8	0	63	0	0.0	0.0	0.0
Village Center Office	18	0.18	0.4	2.3	2.3	41	53	2,184	1.5	1.3	2.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	96									0	
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	24.0	28.7
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**6**	**25**	**31**
Area 5b											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0**	**0**
Area 6a											
Village Center Retail	42										
51% Grocery	21	0.18	0.5	2.7	1.1	24	122	2,875	2.0	1.5	3.5
21% Drug store	9	0.18	0.2	1.1	0.8	7	69	485	0.3	0.6	1.0
14% Miscellaneous	6	0.18	0.1	0.7	0.8	5	69	324	0.2	0.4	0.6
7% Restaurant	3	0.18	0.1	0.4	2	6	179	1,055	0.7	0.2	0.9
7% Bank	3	0.18	0.1	0.4	0.8	2	63	149	0.1	0.2	0.3
Village Center Office	66	0.18	1.5	8	2.3	152	53	8,008	5.5	4.6	10.2
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	270										
50% High Tech / Bio Tech	135	0.30	3.1	10	2.3	311	92	28,530	19.7	5.7	25.4
50% Other Office	135	0.30	3.1	10	2.3	311	53	16,381	11.3	5.7	17.0
Light Industrial / Warehouse	1,400										
75% Light Industrial / Warehouse	1,050	0.30	24	80	0.43	452	77	34,576	23.9	44.3	68.2
25% Community College	350	0.29	8	28	1.3	441	31	13,607	9.4	15.3	24.7
Schools (i)	96										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	24.0	28.7
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**78**	**103**	**180**

Table B-4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 6b											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	50										
Light Industrial / Warehouse	50	0.05	1	23	0.4	22	77	1,646	1.1	12.7	10.4
Solar Farm (j)	--	--	--	266	--	--	--	--	0.03	1.2	1.2
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**13.8**	**11.6**
Area 6c											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	190	--	--	--	--	0.02	0.8	0.9
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.9**
Area 6d											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	173	--	--	--	--	0.02	0.8	0.8
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.8**
Area 6e											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	171	--	--	--	--	0.02	0.8	0.8
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.8**
Total School Water Use (including state-of-the-art water conservation technologies and measures)									39	210	250
Total Commercial, Institutional, and Industrial Water Use (including state-of-the-art water conservation technologies and measures) (k)									**556**	**455**	**1,008**

Table B-4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Abbreviations:

"1,000 sf" = 1,000 square feet
"ac" = acre
"ac/ac" = acre per developed acre
"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial
"emp" = employees
"emp/1,000 sf" = employees per 1,000 square feet
"gpd" = gallons per day
"gpd/emp" = gallons per day per employee
"K-8" = kindergarten through eighth grade
"R&D" = research and development
"sf" = square feet
"TRCC" = Tejon Regional Commerce Center

Notes:

(a) The CII land uses and areas are based on the 8 June 2015 project Land Use Program Summary.
(b) The floor area ratio is the ratio between floor area to gross land area. The floor area ratios for the different land use categories are based on the 8 June 2015 project Land Use Program Summary.
(c) The floor area expressed in acres is calculated by dividing the floor area expressed in 1,000 square feet by 43.56. Note that 1 acre is equal to 43,560 square feet.
(d) The area of land use is calculated by dividing the floor area expressed in acres, by the floor area ratio.
(e) The employees per 1,000 square feet were based on the data in Reference 2. The number of employees was estimated by multiplying the floor area, expressed in 1,000 square feet, by the employees per 1,000 square feet.
(f) The employee indoor water use factors, derived from Reference 1, relate the indoor water use for a specific CII land use to the number of employees based on a 225-day work year and a conservation potential, which accounts for current water efficiency standards. The conservation potential is the "best potential" estimate of conservation savings based on the use of water efficient fixtures and efficient water management techniques for each industry. Conservation potential for the Regional/Freeway-Oriented Commercial land uses were assumed to be 0%, due to the high traffic volumes that these businesses are likely to receive (similar to high traffic volumes at the TRCC). Additionally, the employee indoor water use factors for the Regional/Freeway-Oriented Commercial land uses are multiplied by an escalation factor of 3.4 which is the average difference between the project indoor water use factors and actual indoor water use at the TRCC in fiscal year 2012 - 2013, weighted by land use category.
(g) The total average daily water use for each land use is estimated by multiplying the number of employees by the CII-specific indoor employee water use factor.
(h) Average Annual Water Use is calculated by multiplying the Average Daily Water Use, from Column H by the 225-day work year cited in Footnote (f) for the employee indoor water use factors, then dividing by 326,000 gallons per acre-foot.
(i) The floor area for schools is based on 11% of the total acreage for kindergarten through eighth grade and 10% of the total acreage for high schools.
(j) Water use for the solar farms are based on the values for photovoltaic solar plants from Reference 3.
(k) Totals may not add exactly due to rounding.

Reference:

1. Pacific Institute, 2003. *Waste Not, Want Not: The Potential for Urban Water Conservation in California,* November 2003.
2 Energy Information Administration, 2006. *2003 Commercial Buildings Energy Consumption Survey: Building Characteristics Tables* , Revised June 2006.
3 Bureau of Land Management, 2012. *Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* , Appendix M, July 2012.

Table B-5
Estimated Residential Outdoor Water Use Factors
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Housing Category / Unit Type (a)	[A] Median Density (du/ac)	[B] Median Size of Lot (without streets) (sq ft/du)	[C] Area of Landscaping Per Lot (sq ft/du)	[D] Percentage of Landscaping Covered in HWUPs	[E] Area of HWUPs (sq ft/du)	[F] Percentage of Landscaping Covered in LWUPs	[G] Area of LWUPs (sq ft/du)	[H] Estimated Total Water Use for HWUPs (AFY/du)	[I] Estimated Total Water Use for LWUPs (AFY/du)	[J] Estimated Total Water Use (ETWU) for Landscaping (AFY/du)	[K] Maximum Applied Water Allowance (MAWA) (AFY/du)	[L] Additional Outdoor Water Uses (AFY/du)	[M] Total Outdoor Water Use Factor (AFY/du)
	(a)	B = 43560 / A (b)	C = B x 40%	(c)	E = C x D (c)	(d)	G = C × F (d)	H = E × 5.4 /43560 (e)	I = G × 1.88 / 43560 (f)	J = H + I (g)	(h)	L = 0.1 × J (i)	M = J + L (j)
Area 1													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 2													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 3													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 4													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 5a													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 5b													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Area 6a													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6b													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6c													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6d													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6e													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08

Abbreviations:
"AFY" = Acre feet per year
"AFY/ac" = Acre feet per year per acre
"du/ac" = dwelling units per acre
"ETWU" = estimated total water use
"HWUPs" = high water use plantings
"LWUPs" = low water use plantings
"MAWA" = maximum allowable water allowance
"sq ft" = square feet

Notes:
(a) Residential unit types and median residential density are based on the 8 June 2015 Project Land Use Program Summary.
(b) The size of residential lots, including the area of associated surrounding streets, is calculated by dividing the residential density into 43,560 square feet per acre.
(c) High water use plantings include turf grasses. Percentage of lot covered in high water use plantings is the area of high water use plantings divided by the lot size (without streets).
(d) Low water use plantings include shrubs and native vegetation. Percentage of lot covered in low water use plantings is the area of low water use plantings divided by the lot size (without streets).
(e) The estimated total water use for high water use plantings is the area of high water use plantings, converted to acres (by dividing by 43,560), multiplied by the annual evapotranspiration rate for high water use plantings (5.4 AFY/ac) provided in Table 5.
(f) The estimated total water use for low water use plantings is the area of low water use plantings, converted to acres (by dividing by 43,560), multiplied by the annual evapotranspiration rate for low water use plantings (1.88 AFY/ac) provided in Table 5.
(g) For residential unit landscaping, the Estimated Total Water Use (ETWU) calculation described in Reference 1 is based on 100% regular landscape area, which equals the sum of the estimated total water use for high water use planting and the estimated total water use for low water use planting. This value must be less than or equal to the Maximum Applied Water Allowance (see note h).
(h) The Maximum Applied Water Allowance (MAWA) calculations are described in Reference 1. The MAWA was calculated assuming 100% regular landscaped area and an evaporation adjustment factor of 0.55 for residential areas.
(i) Additional outdoor water uses include miscellaneous outdoor water uses (e.g. car washing, outdoor cleaning, etc.), which are assumed at 10% of the applied irrigation of high and low water use plantings.
(j) The total annual outdoor water use is the sum of the ETWU for landscaping and additional outdoor water uses.

References:
1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance* , July 9, 2015 Draft.

Table B-6

Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] Area of Land Use (acre) (a)	[B] Area of Landscaping (acre) (b)	[C] Percentage of Landscaping Covered in HWUPs (c)	[D] Area of HWUPs (acre) D = B x C (c)	[E] Percentage of Landscaping Covered in LWUPs (d)	[F] Area of LWUPs (acre) F = B x E (d)	[G] Estimated Total Water Use for HWUPs (AFY) G = D × 5.4 (e)	[H] Estimated Total Water Use for LWUPs (AFY) H = F × 1.88 (f)	[I] Estimated Total Outdoor Water Use (ETWU) (AFY) I = G + H (g)	[J] Maximum Applied Water Allowance (MAWA) (AFY) (h)
Area 1										
Village Center Retail										
51% Grocery	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
21% Drug store	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
14% Miscellaneous	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Restaurant	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Bank	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
Village Center Office	2.8	0.56	25%	0.14	75%	0.42	0.8	0.8	1.5	2.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D										
50% High Tech / Bio Tech	15	3.06	25%	0.77	75%	2.30	4.1	4.3	8.4	15.4
50% Other Office	15	3.06	25%	0.77	75%	2.30	4.1	4.3	8.4	15.4
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**18**	
Area 2										
Village Center Retail										
51% Grocery	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
21% Drug store	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
14% Miscellaneous	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Restaurant	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Bank	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
Village Center Office	15	3.04	25%	0.76	75%	2.28	4.1	4.3	8.4	15.3
Regional / Freeway-Oriented Comm.										
78.5% Miscellaneous Retail	21	4.20	25%	1.05	75%	3.15	5.7	5.9	11.6	21.2
7.5% Restaurant	2.0	0.40	25%	0.10	75%	0.30	0.5	0.6	1.1	2.0
7.5% Gas Station	2.0	0.40	25%	0.10	75%	0.30	0.5	0.6	1.1	2.0
6.5% Hotel	1.7	0.35	25%	0.09	75%	0.26	0.5	0.5	1.0	1.8
Office / R&D										
62% High Tech / Bio Tech	37	7.35	25%	1.84	75%	5.51	9.9	10.3	20.3	37.0
38% Medical Center	23	4.59	25%	1.15	75%	3.44	6.2	6.5	12.7	23.1
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	15%	1.50	85%	8.50	8.1	15.9	24.0	44.6
1 High School	55	27.50	15%	4.13	85%	23.38	22.3	43.8	66.1	122.5
Subtotal									**146**	

Table B-6

Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] Area of Land Use (acre) (a)	[B] Area of Landscaping (acre) (b)	[C] Percentage of Landscaping Covered in HWUPs (c)	[D] Area of HWUPs (acre) D = B x C (c)	[E] Percentage of Landscaping Covered in LWUPs (d)	[F] Area of LWUPs (acre) F = B x E (d)	[G] Estimated Total Water Use for HWUPs (AFY) G = D × 5.4 (e)	[H] Estimated Total Water Use for LWUPs (AFY) H = F × 1.88 (f)	[I] Estimated Total Outdoor Water Use (ETWU) (AFY) I = G + H (g)	[J] Maximum Applied Water Allowance (MAWA) (AFY) (h)
Area 3										
Village Center Retail										
51% Grocery	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
21% Drug store	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
14% Miscellaneous	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Restaurant	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Bank	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
Village Center Office	10	1.91	25%	0.48	75%	1.43	2.6	2.7	5.3	9.6
Regional / Freeway-Oriented Comm.										
78.5% Miscellaneous Retail	54	10.81	25%	2.70	75%	8.11	14.6	15.2	29.8	54.5
7.5% Restaurant	5.2	1.03	25%	0.26	75%	0.77	1.4	1.5	2.8	5.2
7.5% Gas Station	5.2	1.03	25%	0.26	75%	0.77	1.4	1.5	2.8	5.2
6.5% Hotel	4.5	0.90	25%	0.22	75%	0.67	1.2	1.3	2.5	4.5
Office / R&D										
50% High Tech / Bio Tech	25	4.97	25%	1.24	75%	3.73	6.7	7.0	13.7	25.1
50% Other Office	25	4.97	25%	1.24	75%	3.73	6.7	7.0	13.7	25.1
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	15%	1.50	85%	8.50	8.1	15.9	24.0	44.6
Subtotal									**95**	
Area 4										
Village Center Retail										
51% Grocery	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
21% Drug store	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
14% Miscellaneous	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Restaurant	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Bank	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
Village Center Office	6.8	1.35	25%	0.34	75%	1.01	1.8	1.9	3.7	6.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	40	20.00	15%	3.00	85%	17.00	16.2	31.9	48.1	89.1
Subtotal									**52**	

Table B-6

Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] **Area of Land Use** (acre) (a)	[B] **Area of Landscaping** (acre) (b)	[C] **Percentage of Landscaping Covered in HWUPs** (c)	[D] **Area of HWUPs** (acre) D = B x C (c)	[E] **Percentage of Landscaping Covered in LWUPs** (d)	[F] **Area of LWUPs** (acre) F = B x E (d)	[G] **Estimated Total Water Use for HWUPs** (AFY) G = D × 5.4 (e)	[H] **Estimated Total Water Use for LWUPs** (AFY) H = F × 1.88 (f)	[I] **Estimated Total Outdoor Water Use (ETWU)** (AFY) I = G + H (g)	[J] **Maximum Applied Water Allowance (MAWA)** (AFY) (h)
Area 5a										
Village Center Retail										
51% Grocery	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
21% Drug store	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
14% Miscellaneous	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Restaurant	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Bank	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
Village Center Office	2.3	0.46	25%	0.11	75%	0.34	0.6	0.6	1.3	2.3
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	15%	1.50	85%	8.50	8.1	15.9	24.0	44.6
Subtotal									**25**	
Area 5b										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0**	
Area 6a										
Village Center Retail										
51% Grocery	2.7	0.55	25%	0.14	75%	0.41	0.7	0.8	1.5	2.8
21% Drug store	1.1	0.22	25%	0.06	75%	0.17	0.3	0.3	0.6	1.1
14% Miscellaneous	0.7	0.15	25%	0.04	75%	0.11	0.2	0.2	0.4	0.8
7% Restaurant	0.4	0.07	25%	0.02	75%	0.06	0.1	0.1	0.2	0.4
7% Bank	0.4	0.07	25%	0.02	75%	0.06	0.1	0.1	0.2	0.4
Village Center Office	8	1.68	25%	0.42	75%	1.26	2.3	2.4	4.6	8.5
Regional / Freeway-Oriented Comm.	--		--	--	--	--	--	--	--	--
Office / R&D										
50% High Tech / Bio Tech	10	2.07	25%	0.52	75%	1.55	2.8	2.9	5.7	10.4
50% Other Office	10	2.07	25%	0.52	75%	1.55	2.8	2.9	5.7	10.4
Light Industrial / Warehouse										
75% Light Industrial / Warehouse	80	16.07	25%	4.02	75%	12.05	21.7	22.6	44.3	81.0
25% Community College	28	5.54	25%	1.39	75%	4.16	7.5	7.8	15.3	27.9
Schools										
1 K-8	20	10.00	15%	1.50	85%	8.50	8.1	15.9	24.0	44.6
Subtotal									**103**	

Table B-6

Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] Area of Land Use (acre) (a)	[B] Area of Landscaping (acre) (b)	[C] Percentage of Landscaping Covered in HWUPs (c)	[D] Area of HWUPs (acre) D = B x C (c)	[E] Percentage of Landscaping Covered in LWUPs (d)	[F] Area of LWUPs (acre) F = B x E (d)	[G] Estimated Total Water Use for HWUPs (AFY) G = D × 5.4 (e)	[H] Estimated Total Water Use for LWUPs (AFY) H = F × 1.88 (f)	[I] Estimated Total Outdoor Water Use (ETWU) (AFY) I = G + H (g)	[J] Maximum Applied Water Allowance (MAWA) (AFY) (h)
Area 6b										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial										
Light Industrial / Warehouse	23	4.59	25%	1.15	75%	3.44	6.2	6.5	12.7	23.1
Solar Farm (h)	266	--	--	--	--	--	--	--	1.2	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**13.8**	
Area 6c										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	190	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Area 6d										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	173	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Area 6e										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	171	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Total School Outdoor Water Use									210	
Total Commercial, Institutional, and Industrial Outdoor Water Use (i)									**455**	

Table B-6

Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Abbreviations:

"ac" = acre
"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial
"HWUP" = high water use plants
"K-8" = kindergarten through eighth grade
"LWUP" = low water use plants
"MAWA" = maximum applied water allowance
"R&D" = Research and development

Notes:

(a) See Table B-4 for area of land use calculation.
(b) Area of landscaping is the area of land use multiplied by the percentage of landscaping. Landscaped percentage is 50% for schools and 20% for non-school CII land uses.
(c) High water use plantings include turf grasses. Percentage of lot covered in high water use plantings is the area of high water use plantings divided by the area of land use (without streets).
(d) Low water use plantings include shrubs and native vegetation. Percentage of lot covered in low water use plantings is the area of low water use plantings divided by the area of land use (without streets).
(e) The estimated total water use for high water use plantings is the area of high water use plantings multiplied by the annual evapotranspiration rate for high water use plantings (5.4 AFY/ac) provided in Table 5.
(f) The estimated total water use for low water use plantings is the area of low water use plantings multiplied by the annual evapotranspiration rate for low water use plantings (1.88 AFY/ac) provided in Table 5.
(g) The ETWU is the sum of the estimated total water use for high water use plantings and estimated total water use for low water use plantings. The estimated total water outdoor water use must not be greater than the MAWA (see note h). The ETWU was calculated assuming all regular landscaped area, which accounts for plant type and irrigation efficiency, to estimate water demands. If special landscaped area was accounted for in the estimated total water use calculations according to Reference 1, the estimated total outdoor water use for non-school CII uses would equal the MAWA regardless of the planting types.
(h) The Maximum Applied Water Allowance (MAWA) calculations are described in Reference 1. For the non-school CII land uses, the MAWA was calculated assuming 100% special landscaped area and an evaporation adjustment factor of 0.45. The MAWA calculations for schools assumes 33% regular landscaped area, 67% special landscaped area (assumed recreational areas), and an evaporation adjustment factor of 0.65 based on amendments to CALGreen Code approved by the Building Standards Commission on July 21, 2015.
(h) Water use for the solar farms are based on the values for photovoltaic solar plants from Reference 2.
(i) Kern County Code of Ordinances, Title 19, Chapter 19.86, sections 19.86.050 and 19.86.060, states that for CII land uses a "*minimum of five percent (5%) of the total developed lot area shall be landscaped.*" Approximately 20% of the total developed land area for CII is assumed to be irrigated landscape, which complies with the minimum Kern County standard.
(k) Totals may not add exactly due to rounding.

Reference:

1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance*, July 9, 2015 Draft.
2 Bureau of Land Management, 2012. *Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States*, Appendix M, July 2012.

Table B-7

Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations

14,000 Residential Unit Alternative Scenario

Grapevine, Kern County, California

		High Water Use Plantings				Low Water Use Plantings				Tree and Groundcover Plantings				Buffer Zone Plantings					
Landscaping Land Use (a)	[A] **Total Acres** (ac) (a)	[B] **Percentage of Land as HWUP** (%) (b)	[C] **Total Area of HWUP** (ac) C = A × B (c)	[D] **Annual Evapo-transpiration Rate for HWUP** (AFY/ac) (d)	[E] **Estimated Total Water Use for HWUP** (AFY) E = C × D (e)	[F] **Percentage of Land as LWUP** (%) (f)	[G] **Total Area of LWUP** (ac) G = A × F (c)	[H] **Annual Evapo-transpiration Rate for LWUP** (AFY/ac) (d)	[I] **Estimated Total Water Use for LWUP** (AFY) I = G × H (e)	[J] **Percentage of Land as TGP** (%) (g)	[K] **Total Area of TGP** (ac) K = A × J (c)	[L] **Annual Evapo-transpiration Rate for TGP** (AFY/ac) (d)	[M] **Estimated Total Water Use for TGP** (AFY) M = K × L (e)	[O] **Percentage of Land as BZP** (%) (h)	[P] **Total Area of BZP** (ac) K = A × J (c)	[Q] **Annual Evapo-transpiration Rate for BZP** (AFY/ac) (d)	[R] **Estimated Total Water Use for BZP** (AFY) M = K × L (e)	[S] **Estimated Total Outdoor Water Use (ETWU)** (AFY) J = E + I + M + R (i)	[T] **Maximum Applied Water Allowance (MAWA)** (AFY) (j)
Area 1																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping	26	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	26	4.4	113	--		--	--	113	130
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	22	0%	0.0	5.4	0	50%	11.2	1.9	21	25%	6	4.4	25	--		--	--	46	85
Landscaped I-5 Buffer Zones	16	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	16	2.5	40	40	81
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	203	
Area 2																			
Parks	49	40%	20	5.4	106	50%	24.5	1.9	46	0%	0	4.4	0	--		--	--	152	222
Road Landscaping	42	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	42	4.4	184	--		--	--	184	212
1 Roundabout	1	0%	0.0	5.4	0.0	100%	1.0	1.9	2	0%	0	4.4	0	--		--	--	2	5
Windrow	3	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	3	4.4	13	--		--	--	13	15
Irrigated Residential Common Area (k)	32	0%	0.0	5.4	0	50%	15.9	1.9	30	25%	8	4.4	35	--		--	--	65	120
Landscaped I-5 Buffer Zones	31	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	31	2.5	78	78	158
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	495	
Area 3																			
Parks	5	40%	2.0	5.4	11	50%	2.5	1.9	5	0%	0	4.4	0	--		--	--	15	23
Road Landscaping	32	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	32	4.4	139	--		--	--	139	160
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	8	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	8	4.4	34	--		--	--	34	39
Irrigated Residential Common Area (k)	21	0%	0.0	5.4	0	50%	10.6	1.9	20	25%	5	4.4	23	--		--	--	43	80
Landscaped I-5 Buffer Zones	48	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	48	2.5	119	119	239
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	354	
Area 4																			
Parks	49	40%	20	5.4	106	50%	25	1.9	46	0%	0	4.4	0	--		--	--	152	222
Golf Course (l)	90	40%	36	5.4	194	30%	27	1.9	51	0%	0	4.4	0	30%	27	2.5	68	313	453
Road Landscaping	37	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	37	4.4	160	--		--	--	160	184
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	9	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	9	4.4	38	--		--	--	38	44
Irrigated Residential Common Area (k)	33	0%	0.0	5.4	0	50%	16.6	1.9	31	25%	8	4.4	36	--		--	--	67	125
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	733	
Area 5a																			
Parks	5	40%	2.0	5.4	11	50%	2.5	1.9	5	0%	0	4.4	0	--		--	--	15	23
Road Landscaping	33	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	33	4.4	144	--		--	--	144	166
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	2	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	2	4.4	9	--		--	--	9	11
Irrigated Residential Common Area (k)	31	0%	0.0	5.4	0	50%	15.5	1.9	29	25%	8	4.4	34	--		--	--	63	117
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	232	
Area 5b																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	
Road Landscaping	7	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	7	4.4	30	--		--	--	30	35
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	7	0%	0.0	5.4	0.0	50%	3.3	1.9	6	25%	2	4.4	7	--		--	--	13	25
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	43	

Table B-7
Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations
14,000 Residential Unit Alternative Scenario
Grapevine, Kern County, California

		High Water Use Plantings				Low Water Use Plantings				Tree and Groundcover Plantings				Buffer Zone Plantings					
Landscaping Land Use (a)	[A] Total Acres (ac) (a)	[B] Percentage of Land as HWUP (%) (b)	[C] Total Area of HWUP (ac) C = A × B (c)	[D] Annual Evapo-transpiration Rate for HWUP (AFY/ac) (d)	[E] Estimated Total Water Use for HWUP (AFY) E = C × D (e)	[F] Percentage of Land as LWUP (%) (f)	[G] Total Area of LWUP (ac) G = A × F (c)	[H] Annual Evapo-transpiration Rate for LWUP (AFY/ac) (d)	[I] Estimated Total Water Use for LWUP (AFY) I = G × H (e)	[J] Percentage of Land as TGP (%) (g)	[K] Total Area of TGP (ac) K = A × J (c)	[L] Annual Evapo-transpiration Rate for TGP (AFY/ac) (d)	[M] Estimated Total Water Use for TGP (AFY) M = K × L (e)	[O] Percentage of Land as BZP (%) (h)	[P] Total Area of BZP (ac) K = A × J (c)	[Q] Annual Evapo-transpiration Rate for BZP (AFY/ac) (d)	[R] Estimated Total Water Use for BZP (AFY) M = K × L (e)	[S] Estimated Total Outdoor Water Use (ETWU) (AFY) J = E + I + M + R (i)	[T] Maximum Applied Water Allowance (MAWA) (AFY) (j)
Area 6a																			
Parks	4	40%	1.6	5.4	9	50%	2.0	1.9	4	0%	0	4.4	0	--		--	--	12	18
Road Landscaping	21	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	21	4.4	93	--		--	--	93	107
1 Roundabout	1	0%	0.0	5.4	0.0	100%	1.0	1.9	2	0%	0	4.4	0	--		--	--	2	5
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	10	0%	0.0	5.4	0	50%	5.2	1.9	10	25%	3	4.4	11	--		--	--	21	39
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	129	
Area 6b																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping	5	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	5	4.4	23	--		--	--	23	26
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	
Area 6c																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Area 6d																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow																			--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Area 6e																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Estimated Total Outdoor Water Use for Parks																		*347*	
Estimated Total Outdoor Water Use for Irrigated Residential Common Area																		*318*	
Estimated Total Outdoor Water Use for Roadways and Other Non-Residential Landscaped Areas																		*1,547*	
Estimated Total Outdoor Water Use for Community Landscaping																		**2,212**	

Table B-7
Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations
14,000 Residential Unit Alternative Scenario
Grapevine, Kern County, California

Abbreviations:
- "ac" = acre
- "AFY" = acre-feet per year
- "AFY/ac" = acre-feet per year per acre
- "BZP" = buffer zone plantings
- "HWUP" = high water use plantings
- "LWUP" = low water use plantings
- "MAWA" = Maximum Applied Water Allowance
- "TGP" = combination tree and groundcover plantings

Notes:

(a) Landscaping land uses and acres are based on the 8 June 2015 project Land Use Program Summary and modified to add 2,000 additional residential units. Passive open space and unprogrammed land is not included as it will not be irrigated.
(b) High water use plantings include turf grasses.
(c) The area of plantings is the acreage multiplied by the percentage of the land that is covered by that kind of plantings.
(d) The total water application rates for all plantings are estimated in Table 5.
(e) The estimated total water use for each planting type is the area of that planting type multiplied by the annual evapotranspiration rate for that kind of planting.
(f) Low water use plantings include shrubs and native vegetation.
(g) Combination tree and groundcover plantings include trees with full canopy coverage and full coverage of shrubs or low water use groundcover.
(h) Buffer zone plantings include sparsely planted trees and shrubs.
(i) The estimated total outdoor water use is the sum of the estimated total water use for all areas and plantings. The estimated total water outdoor water use must not be greater than the MAWA (see note h). The estimated total water outdoor water use was calculated assuming all regular landscaped area, which accounts for plant type and irrigation efficiency, to estimate water demands. If special landscaped area was accounted for in the estimated total water use calculations according to Reference 1, the estimated total outdoor water use would equal the MAWA regardless of the planting types.
(j) The Maximum Applied Water Allowance ("MAWA") calculations are described in Reference 1. The MAWA was calculated assuming 100% special landscaped area based on use of recycled water in non-residential areas and based on note k for residential areas.
(k) The irrigated residential common area is assumed to be classified as a special landscape area based on use as a recreational area and meeting space per Reference 1.
(l) The golf course is assumed to be a desert style course, which utilizes native vegetation and minimizes the use of turf grass, per verbal communication with staff at Todd Eckenrode Origins Golf Design.
(m) Assumes that there are no roadways in Areas 6c, 6d, and 6e.

Reference:

1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance* , July 9, 2015 Draft.

Table B-8

Summary of Water Treatment and Distribution System Losses
14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Category	Estimated Water Loss (AFY)
Losses at potable water treatment facility (a)	280
Losses at wastewater treatment facility (b)	--
Distribution system losses (associated with indoor water uses) (c)	140
Distribution system losses (associated with outdoor water uses) (d)	234
Total water losses (e)(f)	**653**

Abbreviations:

"AFY" = acre-feet per year

Notes:

(a) Losses at the potable water treatment facility are estimated to be approximately 5% of the indoor and outdoor residential, indoor commercial, indoor institutional, indoor industrial, outdoor school, and outdoor irrigated residential common area uses, plus distribution system losses (see Tables B-1, B-4, B-6, and B-7)

(b) Losses at the wastewater treatment facility are accounted for in the estimates of recycled water production (see Table B-10).

(c) Potable water system distribution system losses are estimated to be 5% of the total potable indoor demand.

(d) Outdoor water system distribution system losses are estimated to be 5% of the sum of the total recycled and non-potable water demand and the potable water demand for outdoor uses (i.e., for residential irrigation).The portion of outdoor water system distribution losses associated with potable water uses is 127 AFY, and the portion associated with non-potable uses is 107 AFY.

(e) Water losses were conservatively estimated for water demand calculations only and should not be used for wastewater treatment design purposes.

(f) Values may not total exactly due to rounding.

Table B-9

Estimated Grapevine Project Annual Water Demand by Planning Area
14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Phase	**Estimated Total Water Demand** (AFY)	**Estimated Indoor Water Use** (AFY)	**Estimated Outdoor Water Use** (AFY)
Area 1			
Residential (a)	546	276	269
Commercial, institutional and industrial (b)	66	48	18
Landscaping (c)	203	-	203
Treatment system losses (d)	34	-	-
Distribution system losses (d)	41	16	25
Area 1 Water Demand	***889***	***340***	***515***
Area 2			
Residential (a)	960	515	444
Commercial, institutional and industrial (b)	333	187	146
Landscaping (c)	495	-	495
Treatment system losses (d)	68	-	-
Distribution system losses (d)	89	35	54
Area 2 Water Demand	***1,945***	***738***	***1,139***
Area 3			
Residential (a)	659	357	302
Commercial, institutional and industrial (b)	317	222	95
Landscaping (c)	354	-	354
Treatment system losses (d)	50	-	-
Distribution system losses (d)	66	29	38
Area 3 Water Demand	***1,446***	***607***	***789***

Table B-9
Estimated Grapevine Project Annual Water Demand by Planning Area
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Development Phase	**Estimated Total Water Demand** (AFY)	**Estimated Indoor Water Use** (AFY)	**Estimated Outdoor Water Use** (AFY)
Area 4			
Residential (a)	872	452	420
Commercial, institutional and industrial (b)	65	14	52
Landscaping (c)	733	-	733
Treatment system losses (d)	53	-	-
Distribution system losses (d)	84	23	60
Area 4 Water Demand	***1,807***	***489***	***1,265***
Area 5a			
Residential (a)	758	384	374
Commercial, institutional and industrial (b)	31	6.1	25.3
Landscaping (c)	232	-	232
Treatment system losses (d)	45	-	-
Distribution system losses (d)	51	20	32
Area 5a Water Demand	***1,117***	***410***	***662***
Area 5b			
Residential (a)	14	6.6	7.0
Commercial, institutional and industrial (b)	0	0	0
Landscaping (c)	43	-	43
Treatment system losses (d)	1.4	-	-
Distribution system losses (d)	2.8	0.3	2.5
Area 5b Water Demand	***61***	***6.9***	***53***
Area 6a			
Residential (a)	435	249	186
Commercial, institutional and industrial (b)	180	78	103
Landscaping (c)	129	-	129
Treatment system losses (d)	29	-	-
Distribution system losses (d)	37	16	21
Area 6a Water Demand	***811***	***343***	***438***

Table B-9
Estimated Grapevine Project Annual Water Demand by Planning Area
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Development Phase	**Estimated Total Water Demand** (AFY)	**Estimated Indoor Water Use** (AFY)	**Estimated Outdoor Water Use** (AFY)
Area 6b			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	15	1	13.8
Landscaping (c)	23	-	23
Treatment system losses (d)	0.1	-	-
Distribution system losses (d)	1.9	0.1	1.8
Area 6b Water Demand	***40***	***1***	***38.6***
Area 6c			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.9	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6c Water Demand	***0.9***	***0.0***	***0.9***
Area 6d			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.8	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6d Water Demand	***0.8***	***0.0***	***0.8***

Table B-9

Estimated Grapevine Project Annual Water Demand by Planning Area
14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Phase	Estimated **Total Water Demand** (AFY)	Estimated **Indoor Water Use** (AFY)	Estimated **Outdoor Water Use** (AFY)
Area 6e			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.8	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6e Water Demand	***0.8***	***0.0***	***0.8***
Project Annual Water Demand (e)(f)	***8,119***	***2,935***	***4,904***

Abbreviations:

"AFY" = acre-feet per year

Notes:

(a) See Table B-3 for estimated residential water uses.
(b) See Tables B-4 and B-6 for estimated indoor and outdoor water use, respectively, for commercial, institutional, and industrial land uses.
(c) See Table B-7 for estimated parks, roads and common area landscaping water use.
(d) See Table B-8 for water losses associated with the project.
(e) The Project Annual Water Demand is the sum of the estimated water uses for the project, plus the assumed treatment and distribution system losses. The contingency is not included.
(f) Totals may not add exactly due to rounding.

Table B-10

Recycled Water Production and Demand by Planning Area

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 1			
Residential			
Indoor	235	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	41	0	
Outdoor	0	18	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	157	
Subtotal	275	176	100
Area 2			
Residential			
Indoor	438	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	159	0	
Outdoor	0	56	
School Landscaping	0	0	
Parks	0	152	
Road and Other Public Landscaping	0	278	
Subtotal	597	486	111
Area 3			
Residential			
Indoor	303	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	189	0	
Outdoor	0	71	
School Landscaping	0	0	
Parks	0	15	
Road and Other Public Landscaping	0	296	
Subtotal	492	382	110
Area 4			
Residential			
Indoor	384	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	12	0	
Outdoor	0	4	
School Landscaping	0	0	
Parks	0	152	
Road and Other Public Landscaping	0	514	
Subtotal	396	670	-274

Table B-10
Recycled Water Production and Demand by Planning Area
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 5a			
Residential			
Indoor	327	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	5	0	
Outdoor	0	1	
School Landscaping	0	0	
Parks	0	15	
Road and Other Public Landscaping	0	153	
Subtotal	332	170	162
Area 5b			
Residential			
Indoor	6	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	0	0	
Outdoor	0	0	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	30	
Subtotal	6	30	-24
Area 6a			
Residential			
Indoor	212	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	66	0	
Outdoor	0	79	
School Landscaping	0	0	
Parks	0	12	
Road and Other Public Landscaping	0	95	
Subtotal	278	186	92
Area 6b			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	1.0	0	
Outdoor	0	14	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	23	
Subtotal	1.0	37	-36

Table B-10
Recycled Water Production and Demand by Planning Area
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 6c			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.02	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.02	0.8	-0.8
Area 6d			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.01	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.01	0.8	-0.8
Area 6e			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.01	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.01	0.8	-0.7
Recycled Water Pond Net Evaporation and Rainfall (d)	*-188*	*0*	
Recycled Water Distribution System Loss (5%) (e)	*0*	*107*	
Recycled Water Produced, Used, and Surplus/Deficit (f)	2,188	2,246	-58
Total Supplemental Non-Potable Water Needed			**58**

Table B-10

Recycled Water Production and Demand by Planning Area

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Abbreviations:

"AFY" = acre-feet per year

"CII" = Commercial, Institutional and Industrial

Notes:

(a) Production of recycled water is assumed to be 85% of total indoor water use. See Tables B-3 and B-4.

(b) Recycled water is assumed to be used for all CII, park and road landscape irrigation.

(c) A positive number indicates a surplus of recycled water, and a negative number indicates a deficit. Any deficit will be supplemented with filtered non-potable Nickel Water.

(d) Recycled water pond net evaporation and rainfall are calculated as shown in Table B-11.

(e) Recycled water distribution system loss is assumed to be 5% of the total recycled and non-potable water use in each area.

(f) Values may not total exactly due to rounding.

(g) The demands listed above do not include the contingency. See Table B-2.

Table B-11

Recycled Water Storage and Disposal Water Balance (Average-Year Rainfall)

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

POND STORAGE NOVEMBER 1 (AF)	0	ASSUMED ACTIVE POND AREA (AC) (a)	45
POND PERCOLATION RATE (IN/DAY)	0	POND CATCHMENT AREA (AC)	45
		NON-POTABLE IRRIGATION AREA (AC) (b)	606
		CALC'D MAX STORAGE VOLUME (AF) (c)	562
		CALC'D MAX STORAGE DEPTH (FT) (d)	12.5
		CALC'D AVG STORAGE DEPTH (FT) (e)	6.3

PARAMETERS/DATA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
RECYCLED WATER FLOW (MGD) (f)	2.15	2.16	2.02	2.01	1.99	2.00	2.07	2.14	2.20	2.26	2.25	2.19	2.12
PRECIPITATION (IN) (g)	0.52	1.15	1.48	1.72	1.93	1.83	1.18	0.47	0.08	0.02	0.05	0.16	10.58
REFERENCE ETo (IN) (h)	4.06	2.01	1.41	1.45	2.22	4.03	5.49	7.63	8.63	9.14	8.55	6.18	60.78
IRRIGATION DEMAND FACTOR (IN) (i)	2.82	1.40	0.98	1.01	1.54	2.81	3.82	5.31	6.00	6.36	5.95	4.30	42.31
POND CALCULATIONS													
BEGINNING POND STORAGE (AF) (j)	0	41	162	302	441	529	562	534	429	281	124	0	--
RECYCLED WATER VOL (AF) (f)	204	199	192	191	171	191	191	204	202	215	215	202	2376
DIRECT PRECIPITATION VOL (AF) (k)	2	4	6	6	7	7	4	2	0	0	0	1	40
POND EVAPORATION VOL (AF) (l)	15	8	5	5	8	15	21	29	32	34	32	23	228
NON-POTABLE IRRIGATION DEMAND (AF) (m)	150	74	52	54	82	149	203	282	318	337	316	228	2246
STORAGE GAIN (AF) (n)	41	121	140	139	88	34	-28	-104	-148	-157	-133	-49	-57
FINAL POND STORAGE (AF) (o)	41	162	302	441	529	562	534	429	281	124	0	0	--
SUPPLEMENTAL IRRIGATION DEMAND (AF) (p)	0	0	0	0	0	0	0	0	0	0	9	49	57

Notes

(a) Assumed active pond area is estimated to maintain a calculated maximum storage depth of approximately 12.5 feet. This area consists of only a portion of the total pond area designed for the 100-year rainfall year (EKI, 2015). It is assumed that the excess pond acreage will only be used during above-average rainfall years.
(b) Non-potable irrigation area is the total landscaped area excluding residential areas and schools.
(c) Calculated maximum storage volume is the largest final pond storage volume from the pond calculations.
(d) Maximum storage depth is the calculated maximum storage volume divided by the active pond area. The calculated maximum storage depth does not include 2 feet for freeboard.
(e) Average storage depth is the average final pond storage volume from the pond calculations divided by the active pond area.
(f) Recycled water flow rate is the average indoor potable water demand less collection system and wastewater treatment losses of 15%. Note that collection system and wastewater treatment losses were not accounted for in the 100-year rainfall water balance in the *Wastewater Facilities Engineering Report* (EKI, 2015) to conservatively size the required total recycled water storage volume.
(g) Average monthly precipitation data were collected from the Western Regional Climate Center (WRCC) for the Bakersfield Airport in Bakersfield, California (1937-2012) and Tejon Rancho, California (1895-1914) and from the CIMIS Station 125 located in Arvin, CA. Precipitation data listed is the inverse-distance weighted monthly averages of the monthly averages for each station based on the distance of each station to the center of the Grapevine Project.
(h) Reference ETo data were obtained from the California Irrigation Management Information Services (CIMIS) station 125 located in Arvin, CA that measured evaporation from pans. Monthly averages were calculated using all available data from this CIMIS station, which has been in operation since 1995.
(i) The irrigation demand factor is the area weighted average irrigation demand factor for each planting type (high water use plantings, low water use plantings, combination trees and ground cover plantings, and buffer zone plantings) for the areas irrigated by non-potable water (all landscaped area except residential areas, parks, and schools). Refer to Table 5.
(j) Beginning pond storage is the final storage from the previous month.
(k) Direct precipitation is the active pond area multiplied by the precipitation.
(l) Pond evaporation is active pond area multiplied by the reference ETo, which is assumed to equal to the pond evaporation rate.
(m) Irrigation demand is the irrigation demand factor multiplied by the irrigation area.
(n) Storage gain is equal to the sum of the beginning pond storage, recycled water volume, and direct precipitation less the sum of the pond evaporation and irrigation demand. A negative storage gain represents a storage loss. The storage gain conservatively accounts for losses due to direct net evaporation when the ponds are empty. Total annual storage loss is approximately 50 AF less if it assumed that there is no net evaporation when the ponds are empty.
(o) Final pond storage is the beginning pond storage plus the storage gain. Final storage is zero when the storage loss is greater than the beginning pond storage.
(p) Irrigation demand includes 5% for distribution system losses. Supplemental irrigation demand is equal to the beginning pond storage less the storage loss (negative storage gain). If the storage loss is less than the beginning pond storage, the supplemental irrigation demand equals zero. It is assumed that the supplemental irrigation demand will be supplied with untreated California Aqueduct water.

Abbreviations

"AC" = acres
"AF" = acre-feet
"ETo" = reference evapotranspiration
"FT" = feet
"IN" = inches
"MGD" = Million Gallons per Day

References

(EKI, 2015) *Wastewater Facilities Engineering Report, Grapevine Project* , Erler & Kalinowski, Inc., October 2015.

ATTACHMENT C

Memorandum: Water and Wastewater Infrastructure for the New Weigh Station

25 November 2014

MEMORANDUM

To: Diana Hurlbert, Tejon Ranch

From: Erler & Kalinowski, Inc. ("EKI")

Subject: Water and Wastewater Infrustructure for the New Weigh Station (EKI B30043.00)

A California Highway Patrol weigh station ("weigh station") is currently located south of the California Aqueduct, as shown on Figure 1. A new interchange servicing the Grapevine Project development is planned for the location of the current weigh station. To accommodate the new interchange, a new weigh station will be constructed north of the Tejon Regional Commerce Center ("TRCC"), at the intersection of Interstate 5 and State Route 99 (see Figure 1).

Water use at the weigh station is minimal and primarily associated with lavatory use. Potable water for the weigh station is supplied by Tejon-Castac Water District ("TCWD") free of charge. Wastewater is conveyed to a septic system and treated onsite. TCWD plans to continue to supply potable water to the new weigh station and wastewater will be treated onsite using a new septic system.

A potable water distribution pipeline, owned and operated by TCWD, currently serves the Tejon Industrial Complex West Wastewater Treatment Facility and Kern County fire station ("fire station"), which are located at the northern portion of the currently developed TRCC area (see Figure 1). This water pipeline is the closest existing potable water supply to the proposed weigh station location, which is located approximately 1.25 miles to the north-northwest. The new weigh station could be served by either a new potable water pipeline extending from the fire station, or by a new groundwater well constructed at the weigh station site.

SOURCES: MCINTOSH 2013; TRC 2013; Public Land Survey

FIGURE 1

Existing and Proposed Weigh Station Locations

GRAPEVINE PROJECT

Appendix O

Water Treatment Facility Engineering Report

WATER TREATMENT FACILITY ENGINEERING REPORT

Grapevine Project

Prepared for:

Tejon Ranchcorp
4436 Lebec Road
Tejon Ranch, California 93243

Prepared by:

Erler & Kalinowski, Inc.

1870 Ogden Drive
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NOVEMBER 2015

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ABBREVIATIONS

AFY	Acre-Feet per year
Btu/hr	British thermal units per hour
CCR	California Code of Regulations
DDW	State Water Resources Control Board Division of Drinking Water
DU	Dwelling Units
DWR	Department of Water Resources
Ft or ft	Feet
gpd	Gallons per day
HDPE	High-density polyethylene
I-5	Interstate 5
KCWA	Kern County Water Agency
Mcf	Thousand cubic feet
MCL	Maximum Contaminant Levels
mgd	Million gallons per day
mg/L	milligrams per liter
MRDL	Maximum Residual Disinfectant Levels
NTU	Nephelometric turbidity units
PVC	Polyvinyl chloride
SR-58	State Route 58
SR-99	State Route 99
TRC	Tejon Ranchcorp
TRCC	Tejon Ranch Commerce Center
TTAL	Treatment Technique Action Levels
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

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1.0 SUMMARY OF PROJECT WATER TREATMENT

This Water Treatment Facility Engineering Report describes the source water quality, the potable water treatment process, the conceptual layout for the on-site potable water treatment plant, and the preliminary storage and distribution facilities for the Grapevine Project.

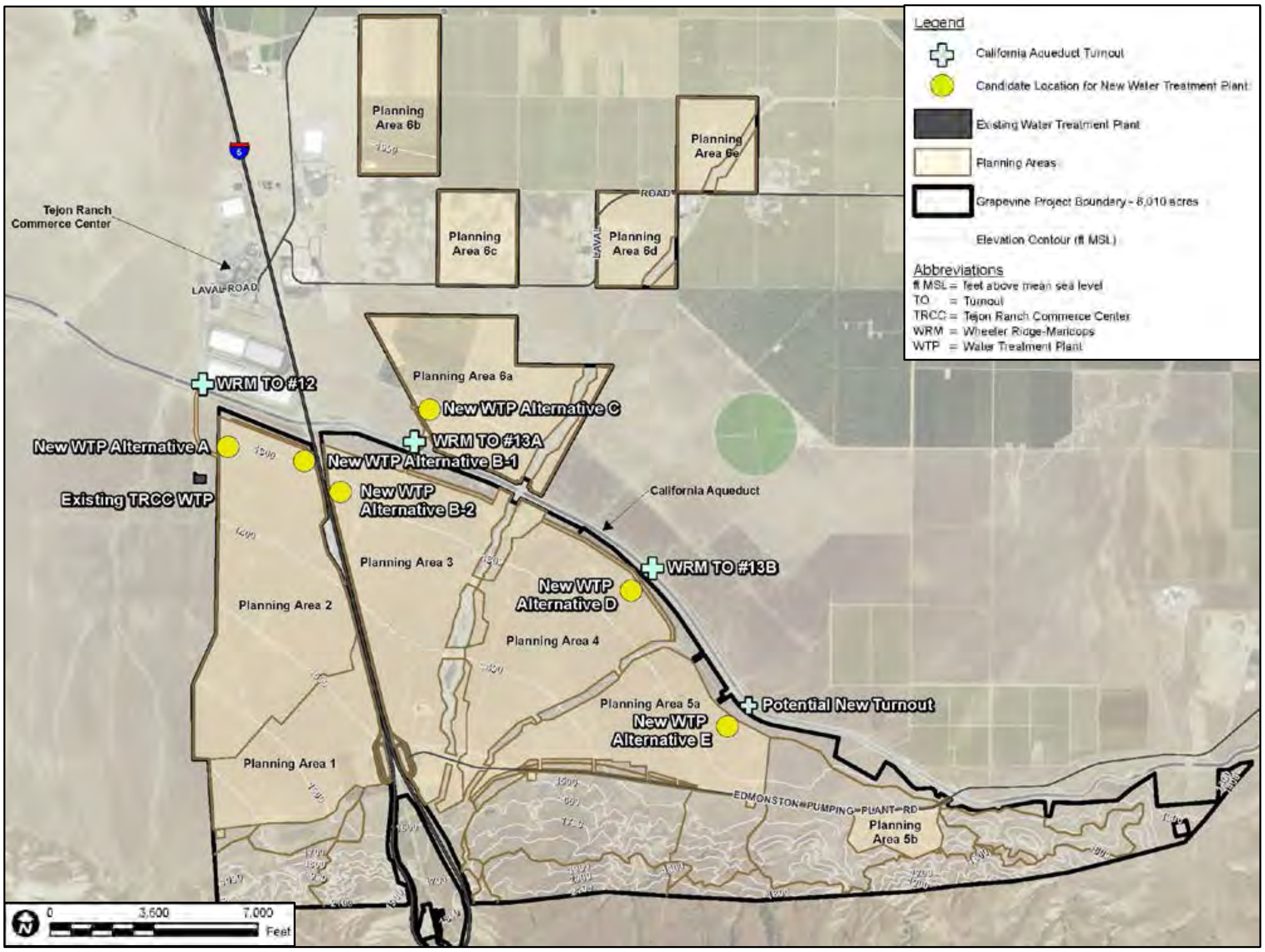
1.1. Grapevine Project Description

The 8,010-acre project site is located entirely within unincorporated Kern County, just south of the junction of highways Interstate 5 and State Route 99. The majority of the project is on the east side of I-5, with a smaller portion situated on the west side of I-5. The project site is bisected by the California Aqueduct. The project site is situated within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement that will permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as Interstate 5.

The Grapevine Project, which would include up to 12,000 residential units and 5.1 million square feet of commercial land uses, is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside these village cores, the project incorporates a mix of residential uses, office, research and development, regional commercial, and light industrial/warehouse uses. The project site is divided into a number of planning areas, with development phased over a period of 19+ years beginning in 2016.

1.2. Facility Location Alternatives

Five (5) potential locations were identified for the water treatment facility, and shown in the figure below. Final site selection would be based on factors including surrounding land uses, proximity to existing or new California Aqueduct turnouts, and the locations and timing of anticipated water demands based on final project phasing. Up to two (2) separate potable water treatment facilities may be constructed if found to be cost-effective or desirable to serve the successive development phases. The optimal number of potable water treatment plants and their locations will be evaluated during tentative tract design.



Source: Figure 3

1.3. Conceptual Design Basis for Water Treatment Facilities

Water and sewer service at the project would be provided by the Tejon–Castac Water District (TCWD). The project would be supplied with surface water under a transfer agreement between the Kern County Water Agency and the Nickel Family LLC, known as "Nickel Water." This water would be delivered through the California Aqueduct and extracted by the project at a turnout along the California Aqueduct. The delivery of Nickel Water is considered to be 100 percent reliable on a year-to-year basis and is not considered subject to hydrological variability, regulatory requirements, or supply constraints.

The project would construct a new potable water treatment plant[1] and associated storage and distribution facilities to meet the potable water demand of the project. The water treatment plant would utilize enhanced coagulation and membrane filtration, or equivalent technology. In the early stages of project construction, it may be practicable to phase construction of the new water treatment plant and/or to use available excess capacity, either temporarily or permanently, at the existing TCWD potable water treatment facility that supplies the nearby Tejon Ranch Commerce Center (TRCC).

1.3.1 Water Treatment Facility Flowrates

Up to 6,020 acre-feet per year (AFY) of treated potable water would be needed to meet the project's total potable water demand at full buildout, which includes a contingency (EKI, 2015a). An annual demand of 6,020 AFY is equivalent to an average daily potable water use of about 5.4 million gallons per day (mgd). For the purposes of this evaluation, it is conservatively assumed that the capacity of the water treatment plant, expressed as the average daily potable water usage, would be 6.0 mgd at project buildout, as shown below.

Water Demand Category	Water Demand (AFY)	Water Demand (MGD)
Potable Water Demand	5,620	5.0
Contingency	400	0.4
Total	*6,020*	*5.4*
	Assumed Water Treatment Plant Capacity	*6.0*

1.3.2 Peaking Factors

The California Waterworks Standards typically require that the following peaking factors be taken into account when designing new water supply systems:

- Ratio of maximum day demand to average daily usage: 2.25
- Ratio of peak hour demand to maximum day demand: 1.5

If these factors were applied without adjustment for project-specific conditions (e.g., the planned extensive use of recycled water to meet irrigation demands which would reduce peaking), the project’s maximum daily demand would be approximately 13.5 mgd (6.0 mgd average daily demand multiplied by 2.25) and the peak hourly demand would be about 20.3 mgd (13.5 mgd maximum daily demand multiplied by 1.5). Project-specific values for these peaking factors, and the consequential raw water and treated water storage volumes and equipment sizing, would be addressed with regulators prior to detailed design. However, for planning purposes, the potable

[1] Up to two separate potable water treatment plants may be constructed within the project if this approach would result in net cost savings.

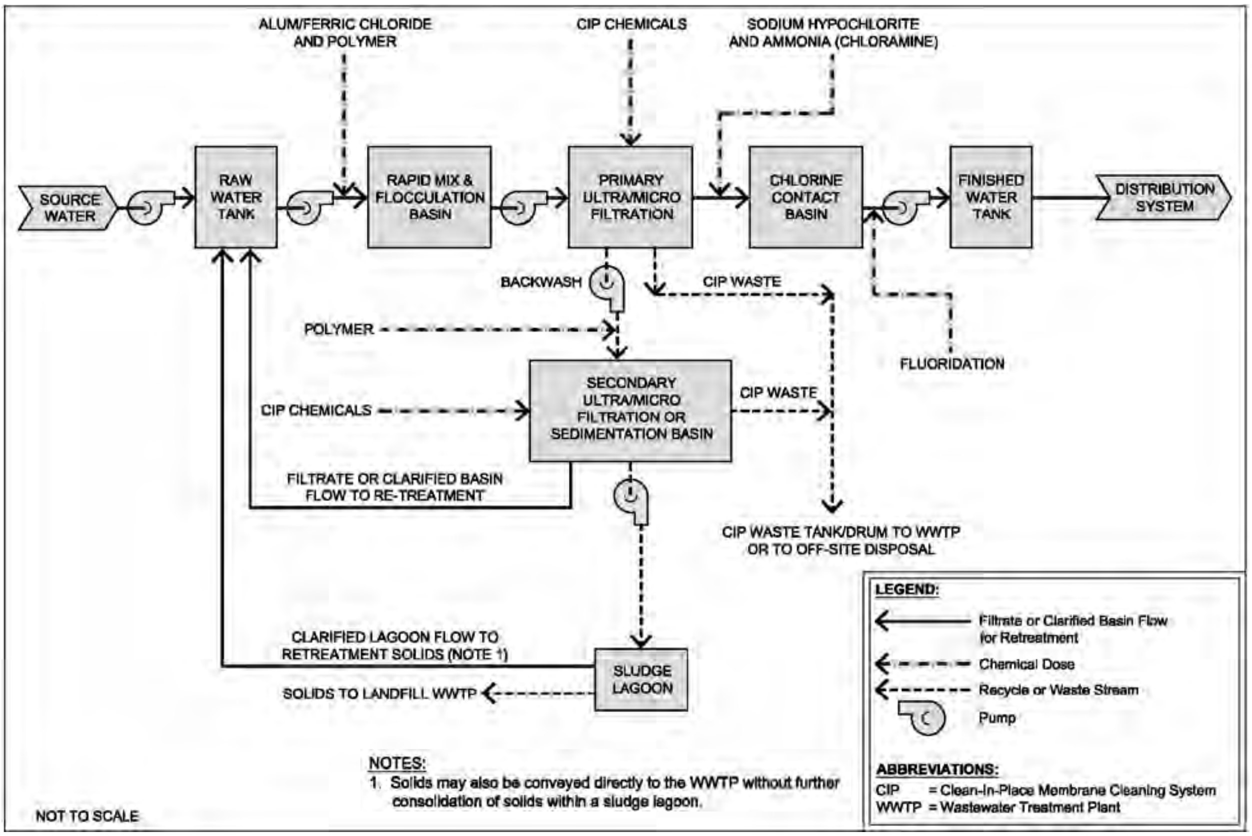
water facilities have been conservatively sized to accommodate the treatment and storage of anticipated maximum daily demand flows at project buildout (13.5 mgd). If determined to be cost-effective, or otherwise desirable, facility components would be designed and constructed in a modular fashion on an as-needed basis through project buildout.

1.3.3 Storage Volumes

At project buildout, the preliminary water treatment plant design incorporates approximately 7.1 million gallons of raw water storage to increase potable supply reliability. This volume of emergency storage is equivalent to three days of the projected indoor potable water demand of 2,634 AFY (EKI, 2015a). A smaller raw water storage volume would be appropriate during the earlier stages of project phasing prior to full buildout. Additional treated water storage of up to approximately 9.4 million gallons would be distributed at various optimized locations throughout the development. If lower peaking factors are established for the project, treated water storage volumes would commensurately decrease.

1.4. Preliminary Water Treatment Process and Water Treatment Facility Components

As shown below, the facility's water treatment process includes a raw water intake tank; a rapid mixing and flocculation chamber; an ultrafiltration or microfiltration unit; primary disinfection within a chlorine contact tank; final (secondary) disinfection with chloramines using in-line injection of ammonia; and fluoridation. Backwash from the micro or ultra filtration system would be treated using a secondary microfiltration or ultrafiltration system or sedimentation basin to further concentrate solids in the backwash water.



Source: Figure 5

The potable water treatment process is preliminarily assumed to include the following major components, sized to treat a flowrate of 13.5 mgd:

Potable Water Treatment Facility Components	Component Size	Unit
Treatment Train		
• New or modified raw water intake structure at a turnout along the California Aqueduct	1	acre
• Rapid mixing and flocculation chamber	2,500	square feet
• Primary ultrafiltration or microfiltration units	5,500	square feet
• Backwash water recovery system		
o Option 1: Secondary filtration system	500	square feet
o Option 2: Sedimentation basin	1,500	square feet
o Lagoons for further concentration of backwash (if not sent to wastewater treatment facility)	63,000	square feet
• Primary disinfection within a chlorine contact tank or buried piping	3,800	square feet
Raw and Treated Water Storage		
• Emergency raw water storage	7.1	million gallons
• Raw water intake tank	1	million gallons
• Clearwell/Treated water storage tanks	9.4	million gallons
Treated Water Distribution		
• Secondary disinfection via creation of chloramines	See Table 3	
• Fluoridation equipment	See Table 4	
• Treated water distribution pumps	Included in total	
Total Land Area	*6 acres*	

Based on the above assumptions, the total electrical energy consumption is estimated to be 11 to 14 million kilowatt-hours per year and the total natural gas consumption is estimated to be 140 thousand cubic feet per year. Each treated water storage tank located outside the treatment facility within the distribution system would occupy an additional area of about one to two acres.

2.0 INTRODUCTION

2.1. Purpose and Scope

This Water Treatment Facility Engineering Report describes the source water quality, the potable water treatment process, the conceptual layout for the on-site potable water treatment plant, and the preliminary storage and distribution facilities for the Grapevine Project.

2.2. Grapevine Project Description

2.2.1 Project Location

The Grapevine Project is located in the west-central portion of Tejon Ranch (the Ranch). The approximately 270,000-acre Ranch is currently held in private ownership by Tejon Ranchcorp (TRC). The Ranch includes a large portion of the Tehachapi Mountains as well as smaller portions of the San Joaquin and Antelope Valleys. Generally, the Ranch extends from Interstate 5 (I-5) on the western side to State Route 58 (SR-58) on the northern side and SR 138 on the southern side (Figure 1).

The 8,010-acre Grapevine Project site is entirely within unincorporated Kern County, just south of the junction of I-5 and SR-99. Downtown Bakersfield is approximately 25 miles north of the project. The majority of the project is on the east side of I-5, with a smaller portion situated on the west side of I-5. The project site is bisected by the California Aqueduct (Figure 1 and Figure 2).

The Grapevine Project site lies mainly in the Grapevine and Pastoria Creek U.S. Geological Survey (USGS) 7.5-minute quadrangles. There is one parcel and a portion of two other parcels in the project site that lie entirely within the Mettler USGS 7.5-minute quadrangle. The latitude and longitude of the approximate center of the site is 34°57′9″ N and 118°55′39″ W. The Universal Transverse Mercator (UTM) coordinates for the approximate center are UTM Easting (meters) 323999 and UTM Northing (meters) 3869472 in Zone 11.

2.2.2 Project Overview

The 8,010-acre project site is within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement, a landmark agreement reached in 2008 with leading environmental organizations (including the Sierra Club, Natural Resources Defense Council, California Audubon Society, Endangered Habitats League, and Planning and Conservation League) to permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as I-5.

The Grapevine Project site includes approximately 8,010 acres, of which approximately 3,232 acres (or about 40%) would be designated for agriculture (with grazing and open space as the predominant land uses) and approximately 4,778 acres (about 60%) would be developed as a new residential community and employment center. The community would leverage and build upon the economic expansion and job growth that has occurred at Tejon Ranch Commerce Center (Figure 2), located immediately north of the project on I-5. The Grapevine Project would feature a series of compact neighborhoods linked by bicycle and pedestrian trails that provide convenient access to grocery and drugstores, professional services, schools, and parks. The project site is located along I-5, at the gateway to the Central Valley, and is immediately adjacent to the extensive open space that was conserved in the Tejon Ranch Land Use and Conservation Agreement.

The project, which would include 12,000 residential units and 5.1 million square feet of commercial and light industrial land uses[2], is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside the village cores, the Grapevine Project includes a mix of residential uses, office, research and development, regional commercial, freeway-oriented commercial, and light industrial/warehouse uses. Other potential public facilities, including fire stations, a sheriff substation, transit facilities/park-and-rides, and water and wastewater treatment facilities, are proposed throughout the community.

Access to the first phases of the Grapevine community will be from Interstate 5 at the existing Grapevine Road and Laval Road interchanges. During later phases of development, the existing Grapevine Road/ Interstate 5 interchange may be expanded and relocated to the north. To allow for the relocation and replacement of the interchange, an existing Vehicle Enforcement Facility may be relocated to a TRC-owned parcel on the west side of the junction of I-5 and CA-99. The project would also improve an existing TRC agricultural road east of the project area to provide access for truck traffic currently using Edmonston Pumping Plant Road to travel to properties east of the project. The circulation network within the project is composed primarily of two- and four-lane arterials, collector streets, and local streets organized in a grid pattern. All roads within the project site will be public. Multipurpose trails are proposed along Grapevine Creek, Cattle Creek, the southern foothills, and the open space adjacent to the California Aqueduct and at other locations throughout the project site. Some of these trails would connect to on-street, Class 2 bike lanes. Water and sewer service will be provided by the Tejon–Castac Water District.

[2] The project could include up to 2,000 additional residential units, for a maximum total of 14,000 units, through a reduction of commercial/industrial square footage based on vehicle trip equivalency ratios.

2.2.3 Project Construction Scenario

The project site is divided into six planning areas ranging in size from approximately 450 to 1,400 acres. Development would be phased over a period of 19+ years, starting with the development of Planning Area 6a and/or 3 and continuing with the balance of the planning areas nearest to the initial phase. Buildout of each phase is projected to take approximately 2 to 4 years (Phase 1: 2 years; Phase 2: 4 years; Phase 3: 3 years; Phase 4: 4 years; Phase 5: 4 years; Phase 6: 2 years), with the first phase commencing in 2016. The portions of the site that are proposed to remain in exclusive agriculture/open space are primarily located along the southern edge of the California Aqueduct, along the southern portion of the project site at the foothills of the Tehachapi Mountains, and along Grapevine and Cattle Creeks.

The potable water treatment plant would also be constructed in phases to meet the potable water demand of each planning area. The plant would be designed to benefit from modular construction. Up to two separate water treatment plants may be constructed if this approach would result in net cost savings. It may also be practicable, either temporarily or permanently, to use available excess capacity at the existing water treatment facility that supplies the Tejon Ranch Commerce Center (TRCC).

2.2.4 Project Operation Scenario

The project operations are described in the Grapevine Specific and Special Plan, and land uses associated with operations are described in the Grapevine Special Planning District Plan.

2.3. Project Water Treatment Facility Overview

Water and sewer service at the project would be provided by TCWD. The project would be supplied with surface water under a transfer agreement between the Kern County Water Agency and the Nickel Family LLC, known as "Nickel Water." This water would be delivered through the California Aqueduct and extracted by the project at a turnout along the California Aqueduct. The delivery of Nickel Water is considered to be 100 percent reliable on a year-to-year basis and is not considered subject to hydrological variability, regulatory requirements, or supply constraints.

The project would construct a new potable water treatment plant[3] and associated storage and distribution facilities to meet the potable water demand of the project. The water treatment plant would utilize enhanced coagulation and membrane filtration, or equivalent technology. In the early stages of project construction, it may be practicable to phase construction of the new water

[3] Up to two separate potable water treatment plants may be constructed within the project if this approach would result in net cost savings.

treatment plant and/or to use available excess capacity, either temporarily or permanently, at the existing TCWD potable water treatment facility that supplies the nearby TRCC.

The following sections describe the basis for and elements of the project's potable water treatment facility design:

- Section 3.0 - Regulatory Setting
- Section 4.0 - Facility Location Alternatives and Phasing
- Section 5.0 - Basis for Water Treatment Facility Conceptual Design
- Section 6.0 - Preliminary Evaluation of Water Treatment Processes

The following sections then present how impacts from the water treatment process and facility will be managed and/or mitigated in the future:

- Section 7.0 - Offsite and Cumulative Impacts
- Section 8.0 - Mitigation Measures

3.0 REGULATORY SETTING

The design, construction, and operation of water treatment and distribution facilities are governed by federal, state, and local laws and regulations. Table 1 lists the statutes and regulations that affect the design and operation of the water treatment facility and distribution system.

At the federal level, the United States Environmental Protection Agency (U.S. EPA) promulgates regulations under the authority of the Safe Drinking Water Act and its amendments. These regulations, published in the Federal Register and codified in Code of Federal Regulations Title 40, establish policies, numerical levels, and goals for allowable concentrations of water constituents. Regulations also set forth operational requirements for water treatment facilities and distribution systems once constructed. Within the State of California, these federal regulations are implemented by the State Water Resources Control Board Division of Drinking Water (DDW).

The DDW also promulgates and enforces state regulations for potable water treatment facilities and distribution systems. These state regulations are codified in California Code of Regulations (CCR) Title 22.

The federal and state drinking water requirements establish maximum contaminant levels (MCLs), maximum residual disinfectant levels (MRDLs), and treatment technique action levels (TTALs). Concentrations of drinking water constituents must not exceed their respective MCLs. Similarly, concentrations of disinfectants must not exceed MRDLs. Water quality parameters detected in the source water above regulatory TTALs initiate specified treatment techniques. Drinking water regulations also include requirements for construction, operation, monitoring, and reporting.

Local regulations for potable water treatment facilities and distribution systems include Kern County Code of Regulations Title 14, Chapter 14.08 – 14.10, as well as the Kern County Development Standards, Division 2. These regulations are promulgated and enforced by Kern County and the Kern County Water Agency.

Local regulations for air emissions are promulgated and enforced by the San Joaquin Valley Air Pollution Control District (District). Analysis of emissions related to the project's potable water treatment facilities and the approach to compliance with District regulations are discussed in a separate report.

4.0 FACILITY LOCATION ALTERNATIVES AND PHASING

Several potential locations for the water treatment facility have been identified at this preliminary stage of the project. Site selection would be based on factors including surrounding land uses, proximity to existing or new California Aqueduct turnouts, and the locations and timing of anticipated water demands. Up to two (2) separate potable water treatment facilities may be constructed if found cost-effective to serve the successive development phases. The number of water treatment plants and their locations will be evaluated during tentative tract design.

4.1. Location Alternatives

Figure 3 shows the identified alternative locations for water treatment facilities. These alternatives are assumed to be located near the Aqueduct, within the project development area. Locating the water treatment plant near the Aqueduct would allow the treated water to be pressurized appropriately for distribution to each of the development's pressure zones, as opposed to pumping all of the raw water for treatment at high elevation and then distributing the treated water to lower zones via pressure-reducing valves.

As shown on Figure 3 and Figure 4, the existing TRCC development has an existing potable water treatment facility located west of I-5 and south of the Aqueduct. We understand that the TRCC complex, recently expanded to include an outlet mall, will be further expanded in the future. Based on information available at this preliminary engineering phase, the existing TRCC water treatment plant cannot be expanded to accommodate the project. However, it may be desirable to construct the new project water treatment plant near this existing TRCC water treatment facility and existing turnout WRM TO #12 to take advantage of existing infrastructure and operational resources (see Alternatives A, B-1, and B-2 on Figure 3 and Figure 4**)**.

If excess treatment capacity is available at the existing TRCC Water Treatment Plant, shown on Figure 4, temporary or permanent use of such excess capacity may be considered as part of the project under certain, specific conditions (e.g., if the project were to use any existing capacity at the TRCC water treatment facility during the early stages of development, the project would pursue construction of its new water treatment facility once 75% of the capacity of the TRCC water treatment facility had been utilized).

4.2. Preliminary Layout and Land Area Requirements

Figure 5 presents the preliminary layout of the project water treatment facility which is expected to include a raw water intake tank; a rapid mixing and flocculation chamber; an ultrafiltration or microfiltration unit; primary disinfection within a chlorine contact tank or buried piping; final (secondary) disinfection with chloramines using in-line injection of ammonia; and fluoridation. Backwash from the micro- or ultra-filtration system would be treated using a secondary microfiltration or ultrafiltration system or sedimentation basin to further concentrate solids in the backwash water. In addition, the water treatment facility would require support buildings to house the staff, laboratory, maintenance areas, and process and ancillary equipment. It is anticipated that one building would house administrative functions, including the control room, locker rooms, offices, and a break room/conference room, as well as a laboratory for routine water analyses. See Section 6.0 for detailed descriptions and sizes of each water treatment facility component.

Based on the above conceptualization of the water treatment facility, a new potable water treatment facility is estimated to occupy about six (6) acres, as shown on Figure 6. Additionally, each treated water storage tank that is constructed throughout the potable water distribution system, shown on Figure 4, would occupy an additional area of about one to two acres.

4.3. Project Phasing

As described in Section 2.2.3, the project is anticipated to be constructed in six phases over a number of years. The water treatment, storage, and distribution facilities could correspondingly be constructed in several phases, or at more than one location, to meet potable demands over time. Water treatment process units would be implemented using equipment modules facilitating phased facility construction, if determined to be desirable.

5.0 BASIS FOR WATER TREATMENT FACILITY CONCEPTUAL DESIGN

5.1. Background

The project has developed a conceptual water treatment facility design based on similar projects and current regulatory requirements. This conceptual design addresses source water quality and drinking water treatment standards, while meeting projected water demands. For planning purposes, the facilities have been assumed to be based on membrane filter technology (or equivalent) and conservatively sized to accommodate treatment and storage of all anticipated flows at project buildout. Facility components would likely be designed and constructed in a modular fashion on an optimized, as-needed basis. In the detailed design stage, sizing will be refined according to the most current flow projections and maximum demand peaking factors, with the final facilities potentially smaller than estimated herein.

5.2. Source Water Quality and Drinking Water Quality Goals

The project would be supplied with Nickel Water that would be delivered through the California Aqueduct[4]. The quality of the project's raw source water would be determined by water quality in the California Aqueduct at the point of delivery. Aqueduct water quality is monitored at (1) Check Station 29 (KA024454), which is located 40 miles upstream from the project near Highway 119; (2) Check Station 41 (KA030341), located 15 miles downstream near the community of Gorman; and (3) the existing TRCC water treatment plant, located adjacent to the project site.

Table 2 compiles water quality data for raw Aqueduct water at Check Stations 29 and 41, between January 2010 and October 2013[5], and at the TRCC water treatment plant, between January 2012 and October 2013. To explore typical parameter values while considering the potential range in quality, this source water quality is presented both as the average (arithmetic mean) of the data set and as the recorded maximum value for each of these two Check Stations.

[4] Tejon Ranchcorp, an affiliate of the Grapevine Project applicant, has the right to receive 6,693 AFY of water from the Kern County Water Agency (KCWA) through at least 2079 as the assignee of a Kern River water transfer agreement between KCWA and the Nickel Family LLC (the "Nickel Water"). The delivery of Nickel Water is 100 percent reliable on a year-to-year basis and is not subject to hydrological variability, regulatory requirements, or supply constraints that may affect other water sources.

[5] Water quality data collected between October 2013 and October 2015 (the date of this report) at Check Stations 29 and 41 were not substantially different than data collected between January 2010 and October 2013. California Aqueduct water quality data will be reviewed and confirmed prior to detailed design of the water treatment plant.

Assumed project drinking water quality goals are summarized in Table 2 based on Federal and State MCLs, MRDLs, and TTALs; other regulatory requirements; and common water treatment practices.

As shown in Table 2, project source water would occasionally exceed primary MCLs for fecal and total coliform bacteria; secondary, esthetic-based MCLs for color, turbidity, aluminum, iron, manganese; and common treatment hardness objectives. All of these constituents would be fully addressed as part of the planned treatment process.

5.3. Water Treatment Facility Engineering Design Criteria

This section summarizes the conceptual facility design process, flowrates, water storage volumes, treatment chemical requirements, and electrical power consumption.

5.3.1 Engineering Design Guidelines

The conceptual treatment facility design has these objectives:

- Achievement of water quality treatment standards;
- Safe use and storage of treatment chemicals;
- Efficient use of energy;
- Control of water losses at the treatment facility; and
- Sufficient reserve capacity and equipment redundancy to mitigate treatment disruptions and meet peak flow demands.

5.3.2 Process Flowrates and Storage Volumes

5.3.2.1 *Project Average Annual Drinking Water Use*

A maximum of approximately 6,435 AFY of treated potable water would be needed to meet the project's total potable water demand at full buildout (EKI 2015a)[6]. An annual demand of 6,435 AFY is equivalent to an average daily potable water use of about 5.74 mgd. For evaluation purposes, we have conservatively assumed that the total capacity of the water treatment plant(s), expressed as the average daily potable water demand, would be 6.0 mgd at project buildout, as shown below.

[6] This total projected potable water demand includes the potable water demand (5,620 AFY) and the water demand contingency (400 AFY) described in Table 2 of EKI 2015a.

Water Demand Category	Water Demand (AFY)	Water Demand (MGD)
Potable Water Demand	5,620	5.0
Contingency	400	0.4
Total	*6,435*	*5.4*
	Assumed Water Treatment Plant Capacity	*6.0*

5.3.2.2 *Peaking Factors*

The California Waterworks Standards[7] typically require that the following peaking factors be taken into account when designing new water supply systems:

- Ratio of maximum day demand to average daily usage: 2.25; and
- Ratio of peak hour demand to maximum day demand: 1.5.

If these factors were applied without adjustment for project-specific conditions, the project's maximum daily demand would be approximately 13.5 mgd (6.0 mgd average daily demand multiplied by 2.25) and the peak hourly demand would be about 20.3 mgd (13.5 mgd maximum daily demand multiplied by 1.5).

As discussed in the Grapevine Project's water demand and wastewater treatment facility engineering reports (EKI 2015a; 2015b), the project's non-residential irrigation demand will be largely met with tertiary-treated recycled water. The regulatory water treatment peaking factors cited above assume a high summer-period irrigation demand. For the project, most of these peak-summer irrigation demands would actually be met with recycled water supplemented by other non-potable sources, thus reducing the potable water peaking factors.

To be conservative, the daily and hourly peak flow estimates included in the current conceptual design are based on application of the standard water treatment peaking factors. However, it is anticipated that more appropriate project-specific values for these peaking factors, and the consequential raw water and treated water storage volumes and equipment sizing, would be addressed with regulators prior to detailed design.

5.3.2.3 *Process Flowrates and Storage Volumes*

The California Waterworks Standards require that a water treatment facility have the ability to meet maximum day demand at all times, including during equipment failures or maintenance (Californian Waterworks Standards, 22 CCR 64557 – 64604). The conceptual facility design presented in this report includes sufficient treatment capacity, water storage volume, and

[7] 22 CCR, Section 64554.

equipment redundancy to meet the maximum day demand of 13.5 mgd that has been assumed for evaluation purposes. The design at full project buildout also incorporates approximately 7.1 million gallons of raw water storage that would be located at the potable water treatment facility for use in case of an emergency, such as loss of source water (see Figure 6). This volume of emergency storage is equivalent to three days of the projected indoor potable water demand of 2,634 AFY (EKI 2015a). A smaller raw water storage volume would be appropriate during the stages of project phasing prior to full buildout.

Additional treated water storage would be provided by tanks located at the water treatment facility and at suitable locations within the potable water distribution system (see Figure 4). As called for by Division 2 of the Kern County Development Standards, the treated water storage volume at full project buildout would be the sum of (1) one day of indoor maximum day demand (5.3 mgd)[8], or 5.3 million gallons; (2) four hours of the hypothetical peak hour demand of 20.3 mgd, equivalent to 3.4 million gallons; and (3) four hours of fire flow for industrial buildings at 1,500 gallons per minute in each of two assumed pressure zones, equal to a fire flow volume of 0.7 million gallons. The sum of the above volumes yields a hypothetical needed treated water storage volume of 9.4 million gallons at project buildout. A smaller treated water storage volume would be appropriate during the stages of project phasing prior to full buildout.

As noted above in Section 4.3.2.2, lower peaking factors would be appropriate for the Grapevine Project due to the extensive application of recycled water to meet the bulk of summer peak, non-residential irrigation demands. A maximum day indoor demand of 5.3 mgd was used in this analysis to evaluate potential storage needs for treated water. However, if lower peaking factors are established for the Grapevine Project, treated water storage volumes would commensurately decrease.

Prior to approval of each tentative tract map or development of any commercial site, the project planners would verify that sufficient raw water and treated water storage capacity exists or would be constructed to meet requirements set forth in Division 2 of the Kern County Development Standards.

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[8] Average day indoor water use is estimated to be 2,634 AFY, equivalent to an average daily flow of 2.35 mgd. (EKI, 2015a). Multiplying this average demand by the regulatory maximum day peaking factor of 2.25 yields a hypothetical maximum day indoor demand of approximately 5.3 mgd. As noted in Section 4.3.2.2, a lower peaking factor is likely appropriate for the Grapevine Project because most of the summer-peak non-residential irrigation demands will be met by recycled water.

6.0 PRELIMINARY EVALUATION OF WATER TREATMENT PROCESSES

This section summarizes a preliminary evaluation of the potable water treatment process, based on assumed application of membrane filter technology. Facility land requirements and energy consumption are also projected. To the extent that different and better technologies are available at the time of project construction, those options will be evaluated as part of detailed design.

6.1. Water Treatment Process and Water Treatment Facility Components

The preliminary treatment process design is shown on Figure 5. The conceptual layout of the water treatment facility is shown on Figure 6. The facility's water treatment process is expected to include a raw water intake tank; a rapid mixing and flocculation chamber; an ultrafiltration or microfiltration unit; primary disinfection within a chlorine contact tank or buried piping; final (secondary) disinfection with chloramines using in-line injection of ammonia; and fluoridation. Backwash from the microfiltration or ultrafiltration system would be treated using a secondary microfiltration or ultrafiltration system or sedimentation basin to further concentrate solids in the backwash water. The concentrated backwash would be managed as described in Section 6.1.3.2. Redundant systems would be included in the final design to enable the maximum daily treated water demand to be met at all times. These redundant systems are included in the conceptual-level treatment facility layout shown on Figure 6.

6.1.1 Water Intake Structure

Water for the existing TRCC Water Treatment Plant is currently supplied from California Aqueduct turnout WRM TO #12 (see Figure 3). The TCWD operates one of the two raw water pumps located at this turnout; the other is operated by the Wheeler Ridge-Maricopa Water Storage District (Wheeler Ridge). According to TCWD, there are currently two open pump bays available, and it is our understanding that TCWD would contract or make arrangements with Wheeler Ridge for project use of the existing turnout and available pump bays, or expansion of the turnout, as needed.

Up to eight (8) raw water intake pumps would be needed to furnish the maximum day treated water demand at project buildout. This number of pumps would allow for phased expansion of the water treatment plant's raw water supply, as well as provide redundant and standby pumping capacity. As an example, if turnout WRM TO #12 were designated as the point of raw water supply, the turnout would be expanded by constructing additional bays to accommodate this number of pumps. Such an expansion beyond the two available open pump bays would likely be feasible within the current turnout property area, subject to all appropriate permits and agreements.

An alternative to expanding existing turnout WRM TO #12 is to construct a new Aqueduct turnout or modify an existing one. Several agricultural turnouts exist near the project site that could be potentially expanded or replaced to accommodate the development; however, these agricultural turnouts, shown on Figure 3, are typically not constructed with pump bays and would need extensive modification to accommodate the raw water pumps for the project.

From a technical perspective, construction of a new or improved turnout on the Aqueduct would require implementing a temporary cofferdam at the Aqueduct to allow construction under dry conditions, while maintaining full water flow in the Aqueduct. It is expected that the design of a new turnout would be similar to existing WRM TO #12, with an intake structure, wetwell, and pump bays designed hydraulically to accommodate the needed number of raw water pumps; above-grade pump motors and associated piping, valves, instrumentation, and controls; a hydropneumatic or hydraulic surge control tank; and a building to house equipment and controls. The turnout sites would be fenced and paved for security and for maintenance access, with a paved access road. In total, construction of a new turnout would disturb approximately 1 acre of land.

From a permitting perspective, modification of existing turnouts and construction of new turnouts are overseen by the Department of Water Resources (DWR) State Water Project Analysis Office. According to a conversation with Lincoln King, Chief of the Turnouts and Special Projects Section of DWR, the following steps are to be followed to obtain approval for such modifications or new construction at turnouts (DWR 2014):

- Submittal of a written request by the local State Water Project Contractor, in this case the Kern County Water Agency, to DWR presenting the conceptual turnout design;
- Review of the conceptual design by DWR;
- Submittal of final plans and specifications, including environmental documentation, permits, and proposed State Water Project outage schedule;
- Approval of these final plans and specifications by DWR; and
- Execution of an agreement between DWR and the construction contractor.

DWR would also inspect the constructed turnout before the as-built drawings are completed. The project (via TCWD) would be required to compensate DWR for these reviews.

6.1.2 Raw Water Intake Tank

Raw water for the project would be delivered by TCWD under contract with the Kern County Water Agency. As shown on Figure 6, the preliminary facility design includes an intake tank that is approximately 25 feet high and 90 feet in diameter and that is capable of storing approximately one (1) million gallons of raw water. As described above in Section 5.3.2.3, the preliminary design at project buildout also incorporates approximately 7.1 million gallons of raw water storage that would be located at the potable water treatment facility for use in case of an emergency, such as loss of source water. This emergency raw water storage is assumed to consist of three, 2.4 million gallon tanks, each approximately 30 feet high and 120 feet in diameter. These emergency raw water storage tanks would be configured such that raw water flows through the tanks prior to the treatment plant intake to help keep the stored water fresh.

6.1.3 Enhanced Coagulation and Membrane Filtration System for Water Treatment

The preliminary potable water treatment process, shown on Figure 5, features enhanced coagulation followed by an ultrafiltration or microfiltration unit. Enhanced coagulation promotes the formation of settleable "floc" particles, with adsorption of organic matter and certain dissolved solids onto the particles. A coagulant, typically alum or ferric chloride, and a flocculant, often a polymer, are added to the water and rapidly mixed. The water then flows through a flocculation chamber where particulate, colloidal, and certain dissolved matter form floc particles.

Organic matter is typically in colloidal or dissolved form and thus is difficult to remove using conventional treatment processes such as settling flocculated water in a clarifier tank. During disinfection, residual organic matter can form undesirable disinfection byproducts such as trihalomethanes and haloacetic acids, which are regulated drinking water analytes. Enhanced coagulation promotes the removal of organic matter and thus tends to reduce the formation of disinfection byproducts.

Floc particles formed during the enhanced coagulation step would be removed by microfiltration or ultrafiltration using membranes with small pores, between about 0.01 to 10 micrometers, to separate the floc particles from the water. Unlike conventional settling within a clarifier, such membranes can remove even non-settling particles.

Microfiltration and ultrafiltration membranes require periodic backwashing to prevent particle buildup on the membrane surface. Backwashing occurs every few minutes or hours, depending on the particle loading. The preliminary facility design assumes that water recovery for the coagulated water stream would be about 95%.[9] The other 5% of the influent water would be used for membrane backwashing. Spent backwash would be piped to a second microfiltration or ultrafiltration system or to a sedimentation basin to further concentrate the backwashed solids, with the clarified water from this secondary filtration or sedimentation basin routed to the head of the plant for retreatment. Solids would be managed as discussed in Section 6.1.3.2.

[9] According to Pall, a treatment equipment manufacturer, based on experience with microfiltration membranes at other facilities a water recovery of about 97% is typically practicable for coagulation of raw water having <50 nephelometric turbidity units (NTU) of turbidity and <5 milligrams per liter (mg/L) of Total Organic Carbon (Pall 2013).

A sedimentation basin, if implemented to concentrate the backwash solids, would require a hydraulic retention time of approximately four (4) hours (MWH 2005). Assuming a spent backwash flowrate of up to 675,000 gallons per day (gpd), equivalent to 5% of the hypothetical max day demand influent flowrate of 13.5 mgd, and an active water depth of 10 feet, the sedimentation basin would require an area of about 1,500 square feet.

In addition to backwashing, the membranes would need chemical cleaning with a caustic solution several times annually using the equipment's "clean-in-place" system. The spent "clean-in-place" wastewater would be collected in a tank or drum and either disposed off-site at an appropriately licensed facility or conveyed to the project’s wastewater treatment facility.

6.1.3.1 Chemical Use

Enhanced coagulation relies on addition of a coagulant, typically alum or ferric chloride, plus a flocculent, often a polymer. Both treatment agents would be added to the feed water to promote floc particle formation and removal (Figure 5).

For conventional coagulation, the dose of coagulant is about equivalent to the raw water suspended solids concentration (Frenkel 1998). From Table 2, the maximum recorded total suspended solids concentration in the raw Aqueduct water was 46 milligrams per liter (mg/L). Assuming this dosage of coagulant, about 380 pounds of coagulant would be needed for every million gallons of water produced, or about 420 tons annually at the design average flowrate of 6.0 mgd. The dose of the polymer flocculent can be estimated at about 20% of the coagulant dose, equivalent to about 76 pounds per million gallons or about 83 tons of flocculent per year. Additional flocculent would be applied as needed to promote solids separation in the spent backwash.

As described above, microfiltration or ultrafiltration membranes require periodic "cleaning-in-place" with a solution typically combining biocides, enzymes, surfactants, and chelating agents, plus acids or caustics. The cleaning frequency depends on the rate of biological fouling or chemical scaling. Typically, the volume of cleaning solution is not large; therefore, the conceptual design assumes spent cleaning materials would be managed in drums or small tanks for disposal offsite at an appropriately licensed facility or can be directed to the project wastewater treatment facilities.

6.1.3.2 Management of Spent Backwash

As described above in Section 6.1.3, net water recovery from the primary microfiltration or ultrafiltration system is assumed to be 95% of the influent flow, with the remaining 5% used for backwashing and producing a spent backwash flow. As shown on Figure 5, the preliminary water treatment design assumes that a secondary filtration system or sedimentation basin would be implemented to further concentrate the spent backwash solids by an additional 95%. With this approach, the net backwash water volume generated each year would be about 5.5 million gallons assuming an average treatment plant flowrate of 6.0 mgd. The filtrate would be directed back to the plant intake for retreatment. The secondary filtration equipment would be housed at the water treatment facility. Alternately, a sedimentation basin, if used, would be located within the water treatment plant as shown conceptually on Figure 6.

Solids within the concentrated backwash are assumed to be further managed, although it may be practicable to convey the concentrated spent backwash directly to the project wastewater treatment facility. The preliminary design shown schematically on Figure 5 assumes that the concentrated spent backwash would be sent to sludge lagoons at the water treatment plant. The lagoons would constitute separate cells to facilitate solids concentration and removal. From these lagoon cells, concentrated or dried solids would be conveyed to an appropriately-permitted landfill or to the project wastewater treatment plant. The clarified supernatant would be directed to the plant raw water intake for retreatment.

The feed rate to the sludge lagoon cells would equal the net concentrated spent backwash flow, preliminarily estimated at 5.5 million gallons per year. Based on this flow, an assumed hydraulic retention time of 90 days, and a lagoon water depth of 4 feet, the lagoon would cover about 63,000 square feet, including a 40% allowance for sloped berms and access roads.

6.1.3.3 Conceptual Facility Sizing

As noted above in Section 5.3.2.2, lower potable water summertime peak flow factors would be appropriate for the project due to the extensive application of recycled water to meet most non-residential irrigation demands. If lower peaking factors are established, thereby reducing the hypothetical peak treatment flowrates, the facility sizing and raw and treated water storage volumes would commensurately decrease from those described herein.

The rapid mixing and flocculation basin would require approximately 2,500 square feet of basin area, based on the hypothetical maximum day influent flow rate of 13.5 mgd, a contact time of 20 minutes, and a basin depth of 10 feet.

The primary and secondary microfiltration or ultrafiltration systems would occupy about 5,000 to 6,000 square feet of building space based on the size of five 3.25 mgd GE Z-Box ultrafiltration packaged plants and one 1.73 mgd GE Z-Box ultrafiltration packaged plant (General Electric 2013). Additional indoor space would be needed for standby equipment and auxiliary systems such as chemical feed and storage, electrical, controls, and work rooms.

6.1.4 Disinfection and Associated Equipment

Disinfection would be accomplished in two steps, primary disinfection and secondary disinfection. Primary disinfection provides the desired reduction in microorganisms, while secondary disinfection helps prevent rebound in microorganism levels.

6.1.4.1 Primary Disinfection

To provide primary disinfection, sodium hypochlorite would be added at the inlet of a contact tank or buried pipeline (Figure 5). The hypochlorite dose would depend on the initial chlorine demand, the desired concentration of chlorine during primary disinfection, initial bacterial levels, and the targeted residual disinfectant concentration in the distributed water. The assumed sodium hypochlorite dose and usage and the conceptual design of the contact chamber are described in Table 3.

6.1.4.2 Secondary Disinfection

Chloramination may be used to provide a residual (secondary) level of disinfectant within the water distribution system. Ammonia would be added following the chlorine contact tank to form monochloramine, which can provide longer-lasting secondary disinfection (Figure 5). Monochloramine can also reduce levels of undesirable disinfection byproducts such as trihalomethanes and haloacetic acids compared with use of sodium hypochlorite or free chlorine without ammonia. Table 3 estimates ammonia dosage and use. Booster stations and tank mixers may also be co-located with the treated water tanks within the distribution system to help maintain chloramine levels.

6.1.5 Fluoridation Equipment

The finished water would be fluoridated in compliance with applicable regulations (Table 1 and Figure 5). Fluoridation would utilize sodium fluoride or sodium silicofluoride, with dosage and consumption rates shown in Table 4.

6.1.6 Distribution System

The project's potable water distribution system would be designed in accordance with applicable rules and regulations for potable water, including those described in Section 3.0 and listed in Table 1. The conceptual-level distribution system is shown on Figure 4.

Treated water would be pumped from a clearwell at the water treatment facility into the distribution system. The conceptual distribution system design assumes the establishment of two pressure zones, with one or two storage tanks per zone to furnish the total treated water storage volume described in Section 5.3.2.3. Booster pump stations would be built at those tanks not located at high elevation. Each tank and booster station would require approximately one to two acres.

Potable water distribution pipelines would be polyvinyl chloride (PVC), high-density polyethylene (HDPE), or other material allowed by regulation.

6.1.7 Other Major Facility Components

The water treatment facility would require support buildings to house the staff, laboratory, maintenance areas, and process and ancillary equipment. It is anticipated that one building would house administrative functions, including the control room, locker rooms, offices, and a break room/conference room, as well as a laboratory for routine water analyses. All of these facilities are included in the planned water treatment facility footprint (see Figure 6).

6.2. Other Planning Information

6.2.1 Treatment Chemicals

Treatment agents and other chemicals would be delivered to and stored at the water treatment facility. Chemicals would include coagulants, flocculants, acids, caustics, disinfectants, detergents, and fuels, with a more complete listing provided in Table 5. Storage would comply with applicable environmental health and safety regulations.

6.2.2 Facility Visual, Noise, and Odor Impacts

Aboveground structures would be visually compatible with nearby structures. Outdoor lighting would be shielded to mitigate glare. Noise-producing equipment would be housed in structures with acoustical dampening where necessary.

Based on other water treatment facilities using similar technology and source water, impacts from nuisance odors are not anticipated.

6.2.3 Electrical Energy Consumption

Table 6 estimates electrical energy consumption for raw water management and treatment and for treated water distribution. Energy consumption is estimated to be about 11 to 14 million kilowatt-hours per year.

6.2.4 Natural Gas Consumption

Natural gas would provide hot water and space heating. An average heating demand of roughly 6,000 British thermal units per hour (Btu/hr) is estimated for water heating[10], plus 30,000 Btu/hr for space heating for four winter months. On this basis, the facility's natural gas consumption would be approximately 140 thousand cubic feet (Mcf) per year assuming 1,000 Mcf per million Btu and an annual heating requirement of 140 million Btu.

[10] Assume 150 gallons per day is heated by 70 degrees Fahrenheit at 75% heating efficiency, plus 25% additional allowance to maintain water heater storage tank temperature.

7.0 OFFSITE AND CUMULATIVE IMPACTS

This section describes the offsite and cumulative impacts of the project as they relate to water treatment and storage facilities.

7.1. Offsite Impacts

Offsite land uses identified for this project include:

- Connector and Haul Roads
- California Highway Patrol Weigh Station
- California Aqueduct Turnouts
- Expansion of the TRCC East or West Wastewater Treatment Plants
- Interchange (over I-5)

The only offsite land use related to water treatment is the construction or modification of turnouts on the California Aqueduct. Potential impacts of the turnouts are discussed in Section 6.1.1. Treated water storage tanks are assumed to be constructed within the project site, either at the potable water treatment facility or within the water distribution system.

7.2. Cumulative Impacts

The project would be supplied by Nickel Water, which would be conveyed to the project through the California Aqueduct and treated on-site at the project's water treatment plant or plants. Because the project's potable water needs would be met by a source that is not shared with any other entity, there are no cumulative impacts associated with the project water treatment facilities.

8.0 MITIGATION MEASURES

Mitigation measures are steps taken to reduce an identified environmental impact caused by the project. Impacts due to land use and facility emissions of greenhouse gas and other air pollutants are being mitigated on a project-wide basis and are not addressed in this report. Facility operations, including plant maintenance and chemical handling, will be performed in general accordance with applicable laws and regulations, and therefore do not require mitigation. The following mitigation measures ensure that there would be sufficient water treatment capacity to meet the demand of specific development phases proposed within the overall project.

- **Mitigation Measure #1: Water Service Agreement**. Prior to approval of each tentative tract map or development of any commercial site, the project will obtain a will-serve letter for water service from TCWD.

- **Mitigation Measure #2**: **Use of Tertiary-treated Recycled Water to Meet Most Non-residential Irrigation Demands.** Most summertime non-residential irrigation demands (i.e., peak demands) will be met with recycled water rather than with potable water. The wide-spread use of recycled water will reduce the potable water treatment plant peaking factors, as compared to the standard regulatory peaking factors conservatively assumed in this report. Smaller peaking factors will correspond to reduced storage volumes for raw water and treated potable water, and will result in smaller footprints for the potable water treatment plant and water storage tanks.

- **Mitigation Measure #3**: **Concentration of Spent Backwash Flows.** The solids in the spent screening backwash water will be further concentrated by means of a secondary filtration system or sedimentation basin. In this way, the volume of solids requiring further management and disposal will be reduced, with most of the clarified spent backwash flow returned to the water treatment plant intake for retreatment.

9.0 REFERENCES

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Table 1
Statutes and Regulations Potentially Applicable to Water Treatment and Distribution
Grapevine Project, Kern County, California

Statute or Regulation	Citation	Description	Implementing Agency	Applicability to Project
Federal Regulations				
Safe Drinking Water Act, as Amended				
National Interim Primary Drinking Water Regulations; Arsenic Rule; Fluoride Rule; Lead and Copper Rule; Phase I, II, and V Standards; Radionuclides Rule; Total Coliform Rule	40 FR 59566, 66 FR 6975, 51 FR 11396, 56 FR 26460, 52 FR 23690, 56 FR 3526, 56 FR 30266, 57 FR 31776, 65 FR 76707, 54 FR 27544	• Set forth federal MCLs for inorganic, organic, radionuclide, and microbial analytes and total coliforms in drinking water • Establish monitoring and general requirements for these analytes • Set treatment techniques with action levels for lead and copper	DDW	• MCLs and action levels applicable to Grapevine Project drinking water quality • California has adopted regulations at least as strict as these regulations
Filter Backwash Recycling Rule; Surface Water Treatment Rule; Interim, Long Term 1, and Long Term 2 Enhanced Surface Water Treatment Rules	66 FR 31085, 54 FR 27486, 63 FR 69477, 67 FR 1811, 71 FR 653	• Set forth surface water treatment requirements for microbial removal or inactivation based on source water turbidity • Establish monitoring of surface water source quality	DDW	• California has adopted regulations at least as strict as the Filter Backwash Recycling Rule and Surface Water Treatment Rule • California has proposed to adopt regulations at least as strict as the Interim Enhanced Surface Water Treatment Rule
Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rule	63 FR 69389, 71 FR 387	• Set forth MCLs for disinfection byproducts in water • Require evaluation of water system to identify treatment process corrections • Establish monitoring of distribution system	DDW	• MCLs applicable to Grapevine Project drinking water quality • California has adopted regulations at least as strict as the Stage 1 Disinfectants and Disinfection Byproducts Rule
Unregulated Contaminants Monitoring 2	72 FR 367	• Identified potential contaminants for monitoring in 2008 through 2010 to evaluate potential future regulation	DDW	• Applicable to drinking water quality or water treatment if regulations are promulgated
Proposed Radon Rule	64 FR 59246	• Intends to establish an MCL, or an alternative MCL with a multimedia mitigation program, for radon in drinking water	-	• MCL or alternative MCL applicable to Grapevine Project drinking water quality once promulgated
Proposed Revisions to Lead and Copper Rule	71 FR 40828	• Intends to clarify language and revise current lead and copper rule to improve notification to the primary agency and the public	-	• Action levels applicable to Grapevine drinking water quality once promulgated
California Regulations				
Regulations Promulgated Under the California Safe Drinking Water Act				
Water Treatment Devices	22 CCR 60400 - 60475	• Requires approved methodology for testing and certification of water treatment devices	DDW	• Applicable to water treatment devices used at the Grapevine Project water treatment facility
Water System Permits	22 CCR 64001 - 64260	• Requires permitting for proposed water system	DDW	• Applicable to permitting of Grapevine Project water treatment facility and distribution system
General Requirements	22 CCR 64412 - 64416	• Sets forth general requirements for water systems	DDW	• Applicable to Grapevine Project water treatment facility in regard to siting requirements
Primary Standards - Bacteriological Quality	22 CCR 64421 - 64427	• Sets forth MCL for total coliforms • Establishes monitoring requirements	DDW	• MCL applicable to Grapevine Project drinking water quality
Primary Standards - Inorganic Chemicals	22 CCR 64431 - 64432.8	• Sets forth MCLs for 19 inorganic analytes • Establishes monitoring requirements	DDW	• MCLs applicable to Grapevine Project drinking water quality
Fluoridation	22 CCR 64433 - 64434	• Requires fluoridation for certain water systems	DDW	• Fluoridation is mandatory because Grapevine Project will have more than 10,000 service connections

Table 1

Statutes and Regulations Potentially Applicable to Water Treatment and Distribution

Grapevine Project, Kern County, California

Statute or Regulation	Citation	Description	Implementing Agency	Applicability to Project
California Regulations (continued)				
Regulations Promulgated Under the California Safe Drinking Water Act (continued)				
Radioactivity	22 CCR 64442 - 64443	• Sets forth MCLs and monitoring requirements for five radionuclides and gross alpha and gross beta particle activities	DDW	• MCLs applicable to Grapevine Project drinking water quality
Primary Standards - Organic Chemicals	22 CCR 64444 - 64445.2	• Sets forth MCLs and monitoring requirements for 27 volatile organic compounds and 33 semi-volatile organic compounds	DDW	• MCLs applicable to Grapevine Project drinking water quality
Secondary Drinking Water Standards	22 CCR 64449 - 64449.5	• Sets forth secondary MCLs and monitoring requirements for additional analytes and water quality parameters	DDW	• Secondary MCLs applicable to Grapevine Project drinking water quality
Disinfectant Residuals, Disinfection Byproducts, and Disinfection Byproduct Precursors	22 CCR 64530 - 64537.6	• Sets forth MCLs for disinfection byproducts and MRDLs for disinfectants • Establishes monitoring requirements, corrective treatment techniques, and other requirements	DDW	• MCLs and MRDLs applicable to Grapevine Project drinking water quality
California Waterworks Standards	22 CCR 64551 - 64604	• Sets forth requirements for distribution systems, including specifications for design, construction, and operation of equipment, piping, and chemical addition facilities	DDW	• Design, construction, and operation requirements applicable to Grapevine Project water treatment facility and potable water distribution system
Surface Water Treatment	22 CCR 64650 - 64666	• Set treatment requirements for microbial removal or inactivation and monitoring of surface water source quality	DDW	• Applicable to Grapevine Project water treatment facility
Lead and Copper	22 CCR 64670 - 64690.80	• Sets forth lead and copper treatment techniques, distribution system requirements, and public education programs	DDW	• Action levels applicable to Grapevine Project drinking water quality
Regulations Promulgated Under the Global Warming Solutions Act				
Greenhouse Gas Emissions Regulations	Assembly Bill 32	• Intends to set forth regulatory requirements for greenhouse gas emissions	SJVAPCD	• Regulations to be evaluated if promulgated

Table 1

Statutes and Regulations Potentially Applicable to Water Treatment and Distribution

Grapevine Project, Kern County, California

Statute or Regulation	Citation	Description	Implementing Agency	Applicability to Project
California Regulations (continued)				
California Clean Air Act, as amended				
Emissions Permitting Regulations	SJVAPCD Regulations	• Sets forth regulatory requirements for standby generators and boilers	SJVAPCD	• Regulations will be applicable for pertinent equipment
Local Ordinances Regulations				
Kern County				
Water Design Standards	Code Title 14 Chapter 14.08 - 14.10	• Establishes water supply system design standards for water systems in Kern County	Kern County	• Applicable to Grapevine Project water distribution facilities
	Kern County Development Standards - Division Two	• Establishes water supply system design standards for water systems in Kern County		
Kern County Water Agency				
Water District Ordinances	Various	• Ordinances and regulations to be compiled and evaluated by communication with Kern County Water Agency during design of water treatment facility	Kern County Water Agency	• Identified ordinances and regulations to be evaluated

Abbreviations:
"AMCL" = Alternative Maximum Contaminant Level
"CCR" = California Code of Regulations
"DDW" = State Water Resources Control Board Division of Drinking Water
"FR" = Federal Register
"SJVAPCD" = San Joaquin Valley Air Pollution Control District
"MCL" = Maximum Contaminant Level
"MRDL" = Maximum Residual Disinfectant Level

Table 2

Summary of Analytical Results for Selected California Aqueduct Samples and Assumed Drinking Water Quality Goals

Grapevine Project, Kern County, California

Water Quality Parameter		TRCC Treatment Plant Raw Water (a)		Check Station 29 (b)		Check Station 41 (b)		Average (c)	Maximum (c)	Assumed Drinking Water Quality Goal (e)	
		Average	Maximum	Average	Maximum	Average	Maximum			Upper Limit (f)	Rationale (g)
Biological (MPN/100 ml)	Coliform, Fecal	18.5	50	-	-	-	-	**18.5**	**50**	0	MCL
	Coliform, Total	42.3	51	-	-	-	-	**42.3**	**51**	See Note (h)	MCL
Physical	pH, laboratory (pH units)	7.8	8.7	8.0	8.4	8.1	8.6	8.0	8.7	See Note (i)	See Note (i)
	Color (Color Units)	22.5	25	-	-	-	-	**22.5**	**25**	15	SMCL
	Turbidity (NTU)	3.1	4.9	6	28	4	14	4.4	**28**	5	SMCL
	Dissolved Organic Carbon (mg/L)	-	-	3.1	5.4	3.1	4.6	3.1	5.4	--	--
	Total Organic Carbon (mg/L)	2.9	4.8	3.2	8.2	3.2	4.4	3.1	8.2	--	--
General Water Quality	Alkalinity (as Calcium Carbonate) (mg/L)	92	92	65	89	71	91	76	92	--	--
	Specific Conductance (µS/cm) (n)	-	-	422	632	496	619	459	632	See Note (k)	SMCL
	Hardness (as Calcium Carbonate) (mg/L)	120	130	90	135	102	123	104	**135**	120 to 150	See Note (j)
	Total Dissolved Solids (mg/L)	-	-	241	352	280	347	261	352	See Note (k)	SMCL
	Total Suspended Solids (mg/L)	-	-	8	46	6	27	7	46	--	--
Inorganic Constituents (mg/L)	Ammonia (as Nitrogen)	-	-	0.02	0.06	0.02	0.03	0.02	0.06	--	--
	Calcium	28	30	19	33	21	30	23	33	--	--
	Chloride	67	76	64	117	78	122	70	122	250	SMCL (See Note (l))
	Cyanide, Total	ND	ND	-	-	-	-	ND	ND	0.15	MCL
	Fluoride	0.125	0.15	-	-	-	-	0.125	0.15	2	MCL
	Magnesium	12.5	13	11	15	12	16	12	16	--	--
	Nitrate (as Nitrate)	4.6	5.3	2.7	7.5	2.7	6.4	3.3	7.5	45	MCL
	Nitrite (as Nitrogen)	ND	ND	-	-	-	-	ND	ND	1	MCL
	Nitrate and Nitrite (as Nitrogen)	1.04	1.2	0.5	1.5	0.53	1.4	0.7	1.5	10	MCL
	Total Kjeldahl Nitrogen	-	-	0.4	0.8	0.5	1.8	0.5	1.8	--	--
	Potassium	2.6	2.8	-	-	-	-	2.6	2.8	--	--
	Sodium	57	65	46	77	56	76	53	77	--	--
	Sulfate	60.5	67	36	67	38	58	45	67	250	SMCL (See Note (l))
Other Analytes (µg/L)	VOCs	ND	ND	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	See Note (m)	MCLs
	Pesticides (only detected are shown)										
	Dacthal (DCPA)	-	-	<0.5	0.04	<0.01	0.02	<0.5	0.04	--	--
	Diuron	-	-	<0.25	1.7	<0.25	1.2	<0.25	1.7	--	--
	Metolachlor	-	-	<0.05	0.1	<0.05	<0.05	<0.05	0.1	--	--
	Simazine	-	-	<0.02	0.06	0.02	0.06	0.02	0.06	4	MCL
Emergent Chemicals	Perchlorate (µg/L)	ND	ND	-	-	-	-	ND	ND	6	MCL

Table 2

Summary of Analytical Results for Selected California Aqueduct Samples and Assumed Drinking Water Quality Goals

Grapevine Project, Kern County, California

Water Quality Parameter		TRCC Treatment Plant Raw Water (a)		Check Station 29 (b)		Check Station 41 (b)		Average (c)	Maximum (c)	Assumed Drinking Water Quality Goal (e)	
		Average	Maximum	Average	Maximum	Average	Maximum			Upper Limit (f)	Rationale (g)
	Aluminum, Dissolved	-	-	<10	<10	<10	23	<10	23	--	--
Metals	Aluminum, Total	125	140	105	429	95	400	108	**429**	200	SMCL
(µg/L)	Antimony, Total	ND	ND	<1	<1	<1	<1	<1	<1	6	MCL
	Arsenic, Dissolved	-	-	<1	<1	2	3	2	3	--	--
	Arsenic, Total	ND	ND	2	4	3	3	3	4	10	MCL
	Barium, Dissolved	-	-	31	40	30	42	31	42	--	--
	Barium, Total	ND	ND	34	43	34	43	34	43	1,000	MCL
	Beryllium, Dissolved	-	-	<1	<1	<1	<1	<1	<1	--	--
	Beryllium, Total	ND	ND	<1	<1	<1	<1	<1	<1	4	MCL
	Boron, Dissolved	-	-	158	300	157	300	158	300	1,000	TT AL
	Bromide, Dissolved	-	-	198	430	249	410	224	430	--	--
	Cadmium, Dissolved	-	-	<1	<1	<1	<1	<1	<1	--	--
	Cadmium, Total	-	-	<1	<1	<1	<1	<1	<1	5	MCL
	Chromium, Dissolved	ND	ND	<1	1	<1	2	<1	2	--	--
	Chromium, Total	-	-	1	2	1	2	1	2	50	MCL
	Copper, Dissolved	-	-	1	2	1	3	1	3	--	--
	Copper, Total	ND	ND	3	20	2	4	3	20	1,000	SMCL
	Hexavalent Chromium	-	-	-	-	-	-	-	-	10	MCL
	Iron, Dissolved	-	-	8	28	6	27	7	28	--	--
	Iron, Total	201	390	157	607	130	356	163	**607**	300	SMCL
	Lead, Dissolved	-	-	<1	<1	<1	<1	<1	<1	--	--
	Lead, Total	ND	ND	<1	5	<1	<1	<1	5	15	TT AL
	Manganese, Dissolved	-	-	<1	7	<1	<1	<1	7	--	--
	Manganese, Total	9.4	32	19	78	18	67	15	**78**	50	SMCL
	Mercury, Dissolved	-	-	<1	<1	<0.2	1	<0.2	1	2	MCL
	Nickel, Dissolved	-	-	1	2	1	1	1	2	--	--
	Nickel, Total	ND	ND	2	3	2	2	2	3	100	MCL
	Selenium, Dissolved	-	-	1	1	1	1	1	1	--	--
	Selenium, Total	ND	ND	1	2	1	2	1	2	50	MCL
	Silver, Dissolved	-	-	<1	<1	<1	<1	<1	<1	--	--
	Silver, Total	ND	ND	<1	<1	<1	<1	<1	<1	100	SMCL
	Thallium	ND	ND	-	-	<1	<1	<1	<1	2	MCL
	Zinc, Dissolved	-	-	6	21	<5	5	3	21	--	--
	Zinc, Total	ND	ND	15	57	<5	13	8	57	5,000	SMCL

Table 2

Summary of Analytical Results for Selected California Aqueduct Samples and Assumed Drinking Water Quality Goals

Grapevine Project, Kern County, California

Abbreviations:

"CCR" = California Code of Regulations
"MCL" = Maximum Contaminant Level
"mg/L" = milligrams per liter
"µg/L" = micrograms per liter
"MPN/100 ml" = Most Probable Number per 100 milliliters
"ND" = Not detected
"NTU" = Nephelometric turbidity units
"SMCL" = Secondary Maximum Contaminant Level
"µS/cm" = microSiemens per centimeter
"TRCC" = Tejon Ranch Commerce Center
"TT AL" = Action level requiring a specified treatment technique
"VOC" = Volatile Organic Compounds

Notes:

(a) Values for the TRCC Water Treatment Plant Raw Water were provided by the California Water Company. Data from January 2012 through October 2013 were used to calculate average values.
(b) Values for Check Stations 29 and 41 were taken from the Department of Water Resources, Water Data Library: http://www.water.ca.gov/waterdatalibrary. Data from January 2010 through October 2013 were used to calculate average values.
(c) "Average" values in this column represent the arithmetic average of the average parameter values reported for the TRCC Treatment Plant Raw Water and for Check Station 41. The "maximum" values are the maximum for each parameter reported for these two sampling locations. Values shown in **bold typeface** exceed the respective assumed Drinking Water Quality Goal.
(d) Source water concentrations should be reevaluated during design of the water treatment facility.
(e) Drinking water quality goals are based on preliminary assessments of federal and state drinking water regulations (see Table 1) and typical water treatment practices. These goals and should be reevaluated during design of the water treatment facility and distribution system.
(f) These are maximum values assumed for this preliminary engineering analysis.
(g) The rationales for the drinking water quality goals include federal and state drinking water regulations.
(h) The upper limit for total coliforms is that less than five percent of samples have detected levels of total coliforms.
(i) Although pH levels are not regulated, typical water treatment practice is that pH is be kept between about 7 to 9.
(j) Typical water treatment experience is that water with hardness above 120 to 150 mg/L as calcium carbonate is undesirable to consumers.
(k) From Table 64449-B found in 22 CCR, Division 4, Chapter 15, Section 64449, the maximum contaminant level range for Specific Conductance is 900 µS/cm "recommended", 1,600 "upper", and 2,200 "short term". The respective levels for Total Dissolved Solids are 500, 1,000, and 1,500 mg/L.
(l) As shown in the table referenced in Note (k),the "recommended" maximum contaminant level range is 250 mg/L, with an "upper" level of 500 and a "short term" level of 600.
(m) MCLs for VOCs vary from 0.5 µg/L to 1,750 µg/L depending on the VOC analyte.
(n) Specific Conductance is also referred to as "Electrical Conductivity."

Table 3
Preliminary Disinfection Requirements for the Water Treatment Facility
Grapevine Project, Kern County, California

Item	Unit	Estimated Value	Comments
Primary Disinfection (Sodium hypochlorite)			
Immediate chlorine demand	mg/L Cl	2.0	Assumed chlorine demand. Chlorine demand should be reevaluated during design of the water treatment facility.
Residual chlorine concentration in contact tank	mg/L Cl	2.0	
Sodium hypochlorite dose rate (as chlorine)	mg/L Cl	4.0	Sum of immediate chlorine demand and residual chlorine concentration in contact tank
Sodium hypochlorite dose rate (as NaOCl)	mg/L NaOCl	4.2	Dose rate (as chlorine) multiplied by ratio of NaOCl molecular weight to Cl_2 molecular weight (1.05)
Design chlorine CT parameter	mg-min/L	20	Preliminary assumed value for 4-log inactivation of viruses (a)
Minimum contact time	min	10	Assumed chlorine CT divided by the chlorine dose rate
Design contact time	min	15	Minimum contact time increased by safety factor of 1.5
Minimum contact tank volume based on maximum day flow	gal	141,000	Maximum throughput flow of 13.5 Mgd multiplied by the design contact time
Area required for contact tank, assuming a water depth of 5 feet	ft^2	3,800	Minimum Contact tank volume divided by the assumed water depth
Secondary Disinfection (Chloramination)			
Chlorine to ammonia mass ratio		3.5	To create monochloramine
Ammonia dose rate	mg/L	0.6	Residual chlorine concentration in contact tank (2 mg/L) divided by chlorine to ammonia mass ratio

Abbreviations:
"CT" = Concentration × Time
"Cl" = Chlorine
"ft^2" = square feet
"gal" = gallons
"Mgd" = million gallons per day
"mg/L" = milligrams per liter
"mg-min/L" = milligrams-minutes per liter
"min" = minutes
"NaOCl" = Sodium hypochlorite

Notes:
(a) Value for 4-log inactivation of viruses with free chlorine was obtained from Viessman, W. and Hammer, M.J., *Water Supply and Pollution Control*, 6th Ed., Addison-Wesley, Menlo Park, CA, 1998.

Table 4

Preliminary Fluoridation Requirements for the Water Treatment Facility

Grapevine Project, Kern County, California

Item	Unit	Value	Comments
Fluoridation with sodium fluoride			
Assumed fluoride dose (as fluoride)	mg/L	1	
Fluoride to sodium fluoride mass ratio		0.45	Ratio of fluoride atomic weight to sodium fluoride molecular weight
Sodium fluoride dose	mg/L	2.2	Assumed fluoride dose divided by above mass ratio
Fluoridation with sodium silicofluoride			
Assumed fluoride dose (as fluoride)	mg/L	1	
Fluoride to sodium silicofluoride mass ratio		0.61	Ratio of fluoride atomic weight to sodium silicofluoride molecular weight
Sodium silicofluoride dose	mg/L	1.6	Assumed fluoride dose divided by above mass ratio

Abbreviations:
"mg/L" = milligrams per liter

Table 5

Preliminary Summary of Potential Chemical Usage for the Water Treatment Facility

Grapevine Project, Kern County, California

Purpose (a)	Product (b)	Physical Form	Incompatible Products at Water Treatment Facility	Environmental Health and Safety Concerns	Mitigation Measures	Anticipated Storage Requirements (c)	Comments
Coagulation and Flocculation	Aluminum Sulfate	Liquid or solid	Ammonia Caustic Diesel Fuel Mineral Acid Sodium Hypochlorite	Corrosive; Health hazard in concentrated form; Vapors from concentrated solutions	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	Approximately 22,000 pounds or 5,500 gallons	Would not be used if ferric chloride is used
	Ferric Chloride	Liquid or solid	Ammonia Caustic Diesel Fuel Mineral Acid Sodium Hypochlorite	Corrosive; Health hazard in concentrated form; Vapors from concentrated solutions	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	Approximately 24,000 pounds or 6,500 gallons	Would not be used if alum is used
	Polymer	Aqueous solution	Ammonia Caustic Diesel Fuel Mineral Acid Sodium Hypochlorite	Slipping hazards in concentrated form	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	Approximately 550 gallons	Could be used to supplement alum or ferric chloride addition
Clean-in-place Chemicals for Micro/Ultra Filtration	Mineral acid Caustic Chelating agents Detergents Enzymes Disinfectants	Aqueous solutions	To be determined during detailed design	Potential fumes; Potential health hazards in concentrated forms; Potential corrosive compounds; Potential oxidizer hazards	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate with potential exhaust neutralization system	To be determined during detailed design	Would be stored as part of the clean-in-place system. Chemicals will be selected during detailed design

Table 5

Preliminary Summary of Potential Chemical Usage for the Water Treatment Facility

Grapevine Project, Kern County, California

Purpose (a)	Product (b)	Physical Form	Incompatible Products at Water Treatment Facility	Environmental Health and Safety Concerns	Mitigation Measures	Anticipated Storage Requirements (c)	Comments
Disinfection	Sodium hypochlorite	Aqueous solution	Ammonia Aluminum Sulfate Caustic Cationic Polymer Diesel Fuel Ferric Chloride Mineral Acid Sodium Fluoride Sodium Silicofluoride	Decays over time; Emits chlorine gas; Corrosive; Health hazard in concentrated form	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate with potential exhaust neutralization system	Approximately 4,000 gallons	
	Ammonia	Liquefied gas or aqueous ammonium hydroxide	Aluminum Sulfate Caustic Cationic Polymer Diesel Fuel Ferric Chloride Mineral Acid Sodium Hypochlorite Sodium Fluoride Sodium Silicofluoride	Health hazard in concentrated form; Anhydrous ammonia may be fire or explosion hazard; Potential vapors	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate with potential exhaust neutralization system	Approximately 3,000 gallons	Would be used to mitigate levels of disinfection byproducts and to form monochloramine as secondary disinfectant
Fluoridation	Sodium fluoride	Granular solid	Ammonia Caustic Diesel Fuel Mineral Acid Sodium Hypochlorite	Health hazard in concentrated form; Hygroscopic	Store in container with appropriate materials; Provide double-containment in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	Approximately 16,000 pounds	Would not be used if sodium silicofluoride is used
	Sodium silicofluoride	Granular solid	Ammonia Caustic Diesel Fuel Mineral Acid Sodium Hypochlorite	Health hazard in concentrated form; Hygroscopic	Store in container with appropriate materials; Provide double-containment in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	Approximately 16,000 pounds	Would not be used if sodium fluoride is used

Table 5

Preliminary Summary of Potential Chemical Usage for the Water Treatment Facility

Grapevine Project, Kern County, California

Purpose (a)	Product (b)	Physical Form	Incompatible Products at Water Treatment Facility	Environmental Health and Safety Concerns	Mitigation Measures	Anticipated Storage Requirements (c)	Comments
Emergency Standby Electrical Generation	Diesel fuel	Liquid	Ammonia Aluminum Sulfate Caustic Cationic Polymer Diesel Fuel Ferric Chloride Mineral Acid Sodium Hypochlorite Sodium Fluoride Sodium Silicofluoride	Liquid and vapors are health hazards; Fire and potential explosion hazard	Store in container with appropriate materials; Provide double-containment in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	To be determined during detailed design	
Laboratory chemicals and general cleaning supplies	To be determined during detailed design	Small containers of solids, liquids, and compressed gases	To be determined during detailed design	Potential fumes; Potential health hazards; Potential corrosive compounds; Potential fire and oxidizer hazards	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	To be determined during detailed design	Would be stored and used in a laboratory room or storage closet

Notes:

(a) Other substances may be used such as natural gas, liquid petroleum gas, fuels, oils, lubricants, hydraulic fluids, refrigerants, paints, protective coatings, solvents, deicers, pesticides, herbicides, and fire extinguishers.

(b) All chemicals added to potable water would be approved as appropriate by NSF or other organization.

(c) Chemical delivery would occur about once every two weeks.

Table 6

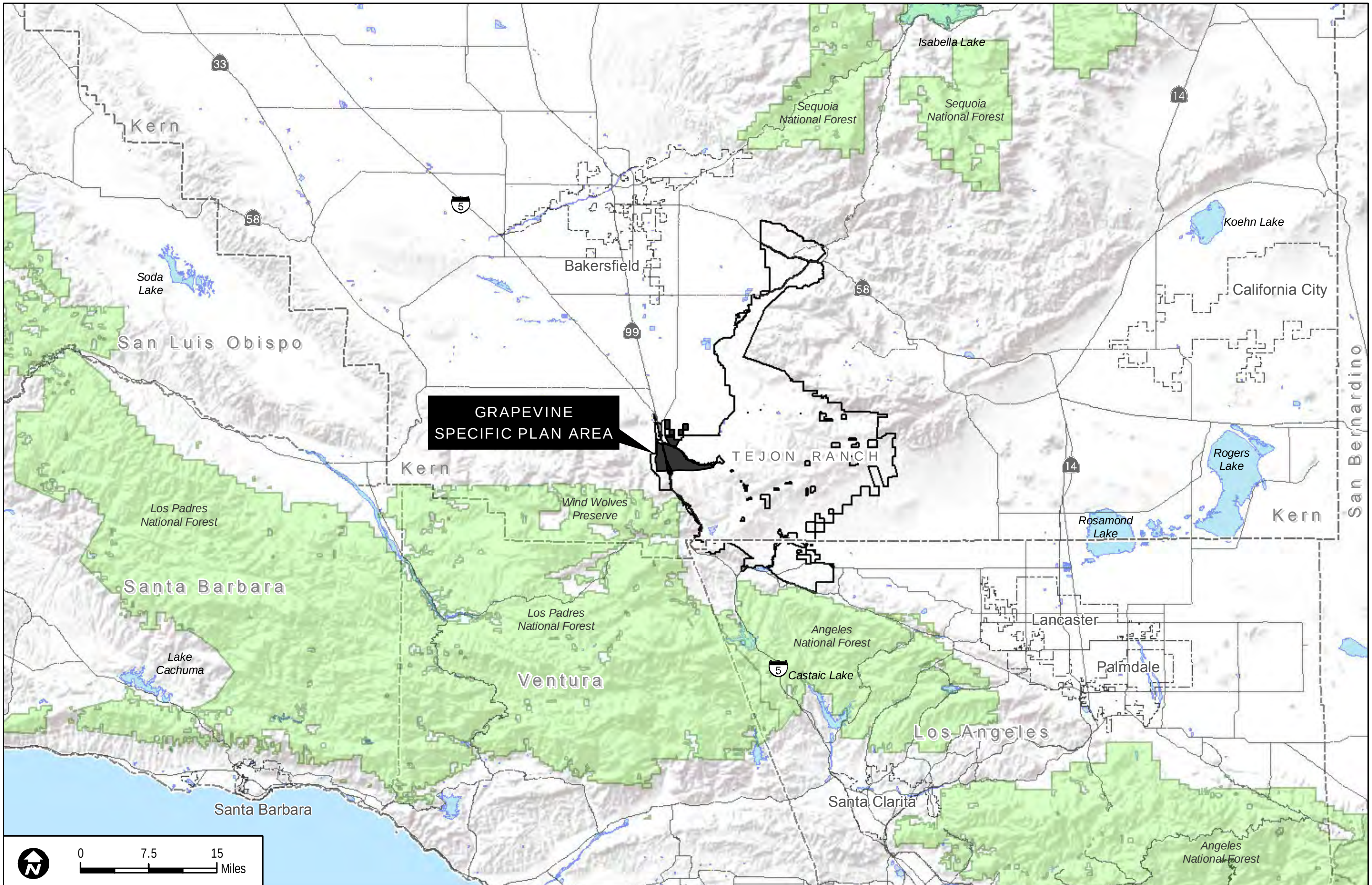
Preliminary Summary of Estimated Electrical Consumption for the Water Treatment Facility and Distribution System

Grapevine Project, Kern County, California

Treatment Facility Component	Estimated Annual Electrical Consumption (kW-hr/year) (a)
Raw Water Intake	2,914,000
Rapid Mix and Flocculation	660,000
Primary UF/MF	1,378,000
Secondary UF/MF	72,000
Transfer to Clearwell	589,000
Distribution	4,659,000
Chemical Injection	86,000
Sludge Handling	22,000
Other (b)	519,000
Subtotal	**10,900,000**
30% Contingency/Allowance for Peak Flows	**3,270,000**
Estimated Total Electrical Consumption (c)	**14,170,000**

Abbreviations:
"kW-hr/year" = kilowatt-hours per year
"MF" = microfiltration
"Mgd" = Million gallons per day
"UF" = ultrafiltration

Notes:
(a) Electrical consumption assumes an average treated water demand of 6.0 Mgd. See Figure 5 for schematic diagram for the preliminary treatment train.
(b) Other electrical consumption at the water treatment facility, including air conditioning, general electrical use for buildings, control system equipment, and other miscellaneous electrical uses, is assumed to be 5% of the total power consumption.

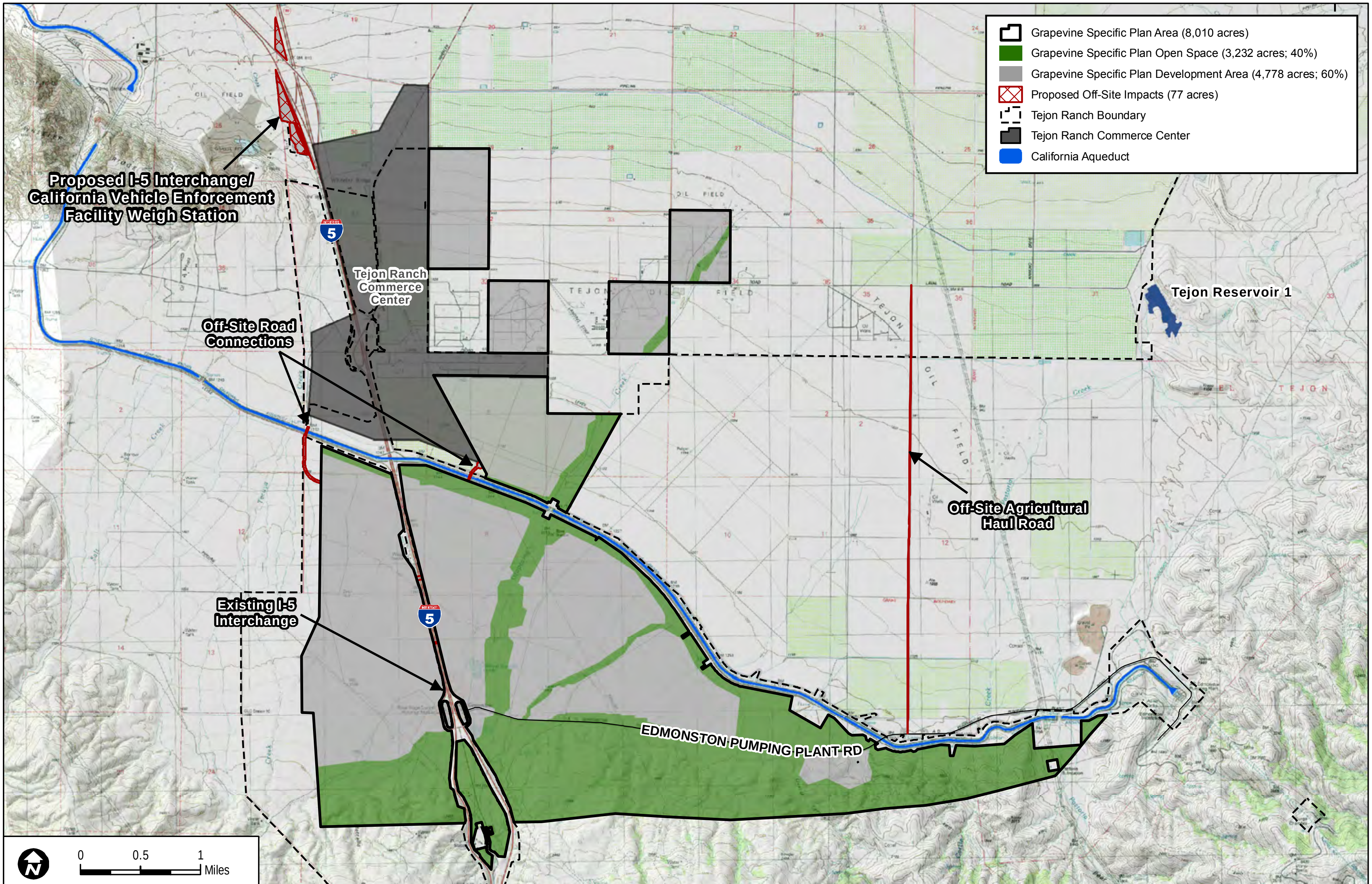


SOURCES: McIntosh & Associates 2013; TRC 2013a

FIGURE 1

Regional Location

GRAPEVINE PROJECT



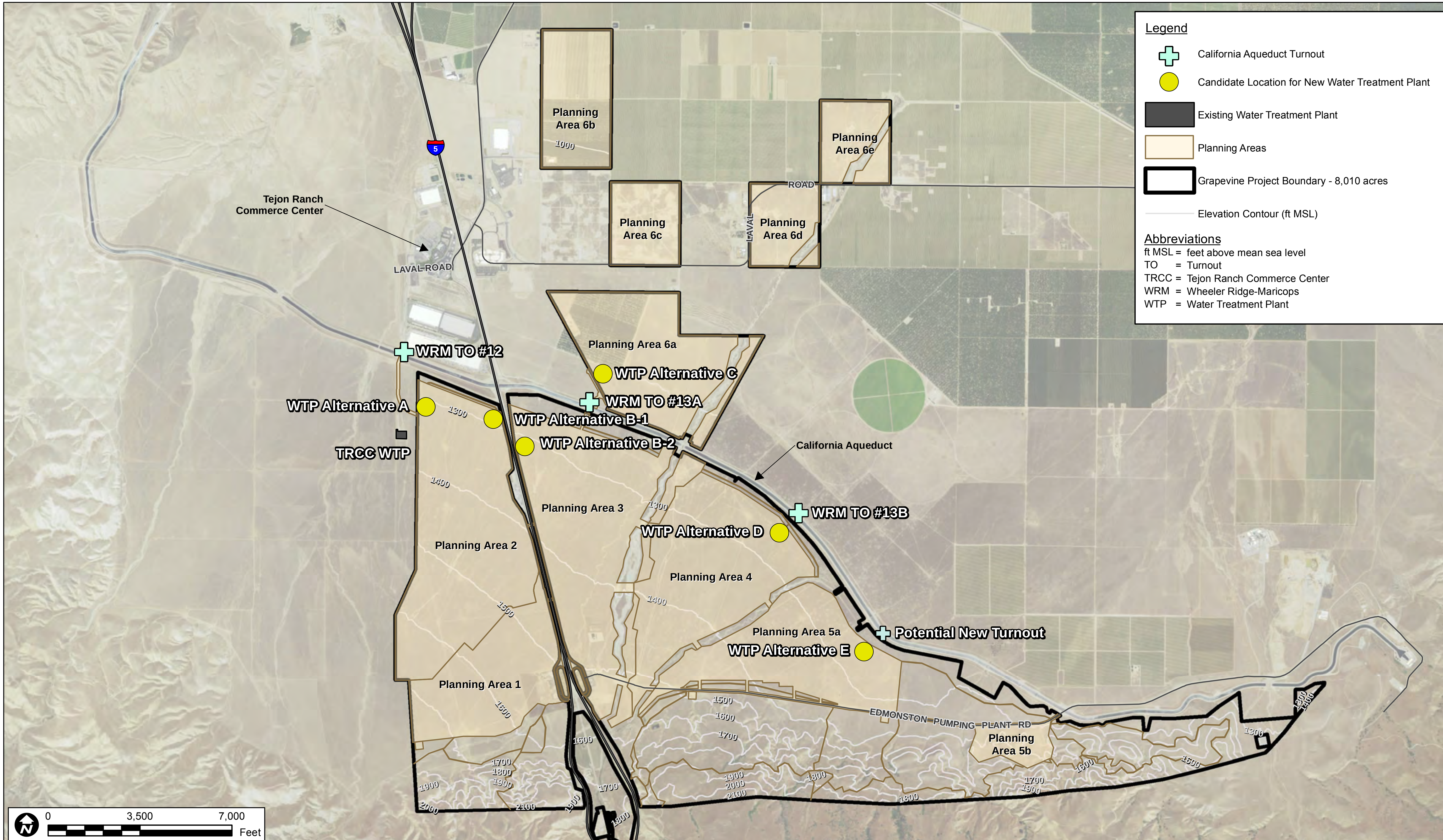
SOURCES: McIntosh & Associates 2014; TRC 2013c

The California aqueduct (TRC 2013c) appears on subsequent figures; the source information will not be provided on subsequent figures.

FIGURE 2

Vicinity Map

GRAPEVINE PROJECT

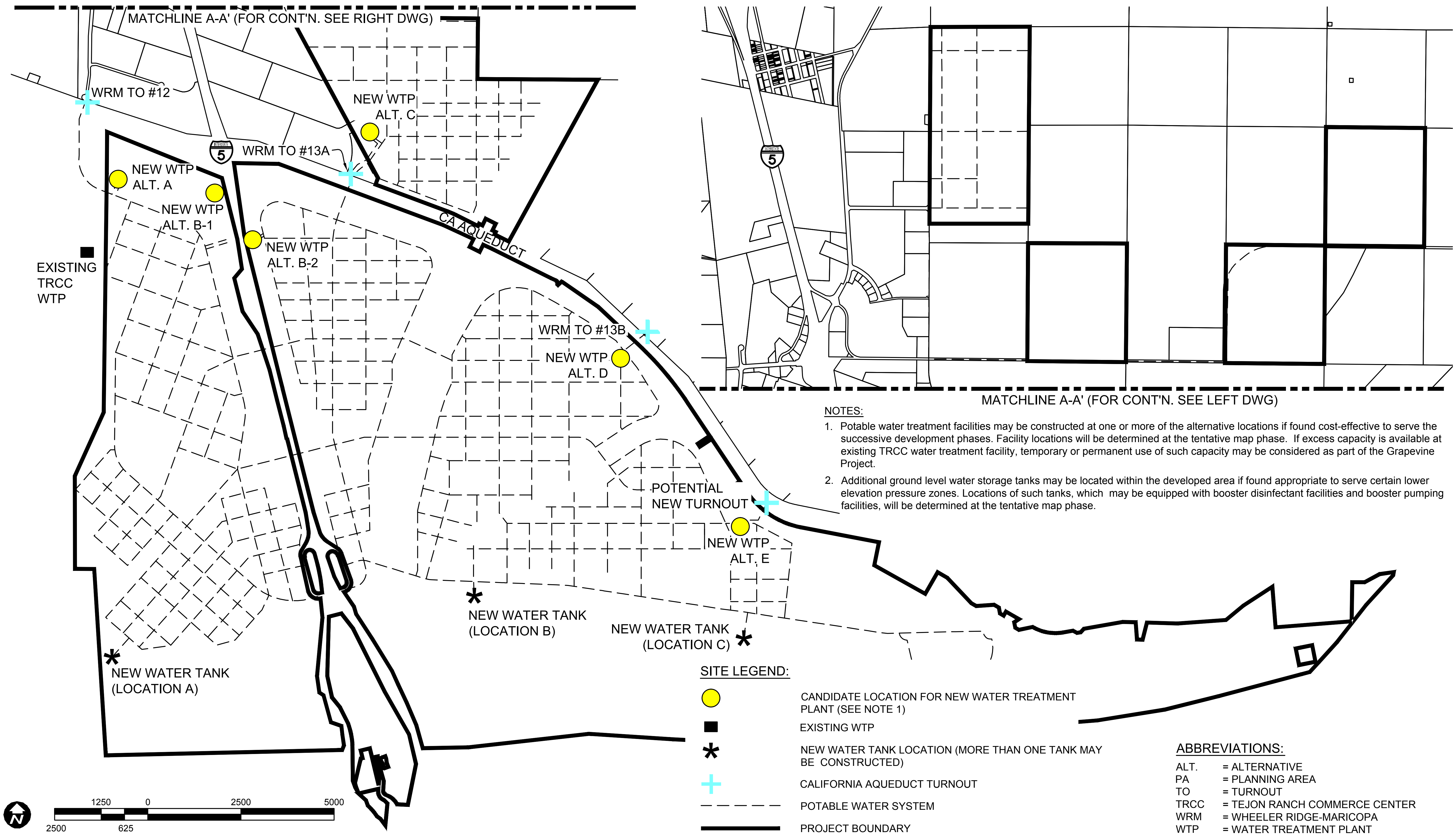


SOURCES: MCINTOSH 2013; TRC 2013; Public Land Survey

FIGURE 3

Water Treatment Plant Location Alternatives

GRAPEVINE PROJECT



NOTES:

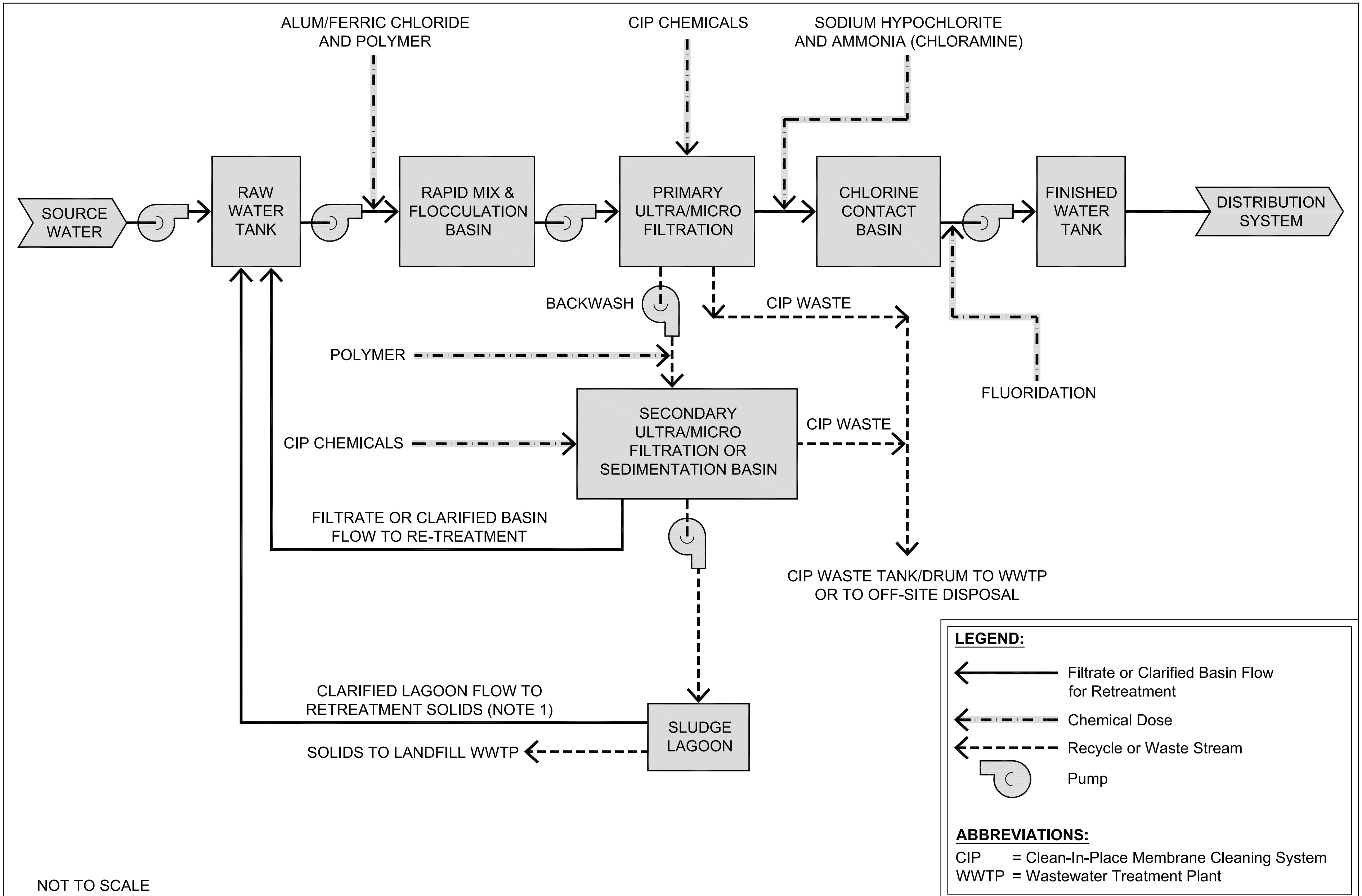
1. Potable water treatment facilities may be constructed at one or more of the alternative locations if found cost-effective to serve the successive development phases. Facility locations will be determined at the tentative map phase. If excess capacity is available at existing TRCC water treatment facility, temporary or permanent use of such capacity may be considered as part of the Grapevine Project.
2. Additional ground level water storage tanks may be located within the developed area if found appropriate to serve certain lower elevation pressure zones. Locations of such tanks, which may be equipped with booster disinfectant facilities and booster pumping facilities, will be determined at the tentative map phase.

ABBREVIATIONS:

ALT.	= ALTERNATIVE
PA	= PLANNING AREA
TO	= TURNOUT
TRCC	= TEJON RANCH COMMERCE CENTER
WRM	= WHEELER RIDGE-MARICOPA
WTP	= WATER TREATMENT PLANT

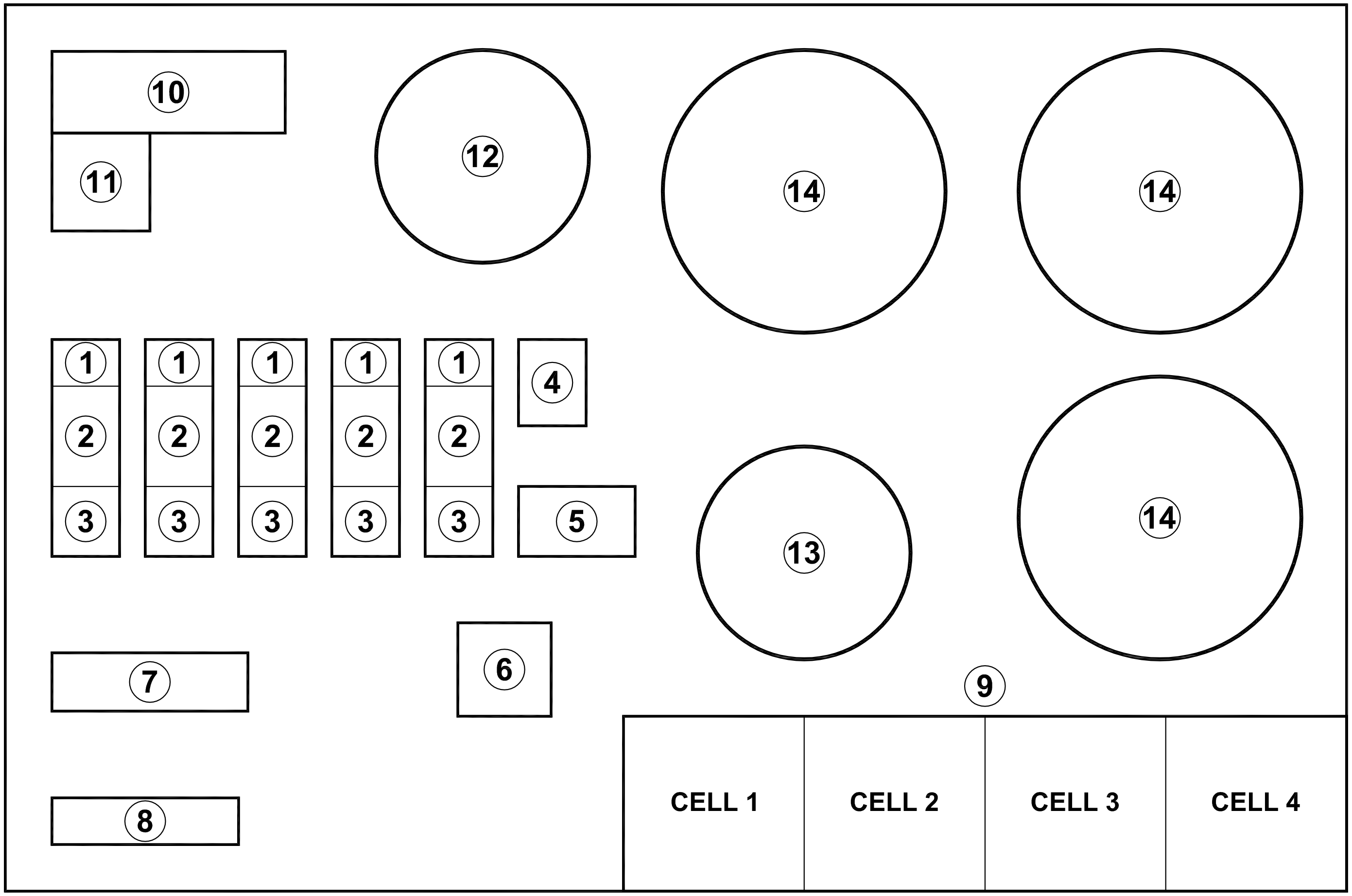
FIGURE 4

FRAMEWORK: WATER SYSTEM PLAN



NOTES:
1. Solids may also be conveyed directly to the WWTP without further consolidation of solids within a sludge lagoon.

FIGURE 5
Preliminary Treatment Train



TOTAL AREA PER FACILITY: APPROXIMATELY 6 ACRES

LEGEND:

1. RAPID MIX AND FLOCCULATION CHAMBER
2. PRIMARY UF/MF
3. CHLORINE CONTACT BASIN
4. SECONDARY UF/MF
5. CIP SKID
6. DISTRIBUTION PUMPS
7. CHEMICAL STORAGE
8. SEDIMENTATION BASIN
9. SLUDGE LAGOONS
10. ADMINISTRATIVE/LAB BUILDING
11. MAINTENANCE BUILDING
12. 1.0 MG RAW WATER INTAKE TANK
13. 1.0 MG TREATED WATER CLEAR WELL TANK
14. 2.4 MG RAW WATER EMERGENCY STORAGE TANK

ABBREVIATIONS:

CIP = CLEAN IN PLACE
MG = MILLION GALLONS
MF = MICROFILTRATION
UF = ULTRAFILTRATION

NOTES:

1. Either secondary UF/MF or a sedimentation basin may be used to further concentrate solids from the primary UF/MF unit process. See Figure 5.

NOT TO SCALE

FIGURE 6

Conceptual Layout of Water Treatment Facility

GRAPEVINE PROJECT

Appendix P

Wastewater Treatment Facilities Engineering Report

WASTEWATER TREATMENT FACILITIES ENGINEERING REPORT

GRAPEVINE PROJECT

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ABBREVIATIONS

ADWF	average dry weather flow
AFY	acre-feet per year
BMP	Best Management Practice
BOD	5-day biochemical oxygen demand
BPTC	Best Practicable Treatment or Control
Btu	British thermal unit
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CIMIS	California Irrigation Management Information System
DAU	Detailed Analysis Unit
DU	dwelling units
EC	electrical conductivity, also called "specific conductance"
Eto	Evapotranspiration
ft	feet
gal	gallon
gpd	gallons per day
HDPE	high density polyethylene
HSC	California Health and Safety Code
hp	horsepower
I-5	Interstate 5
KCEHSD	Kern County Environmental Health Services Department
kW	kilowatt
kW-hr	kilowatt-hours
lb	pounds
m	meter
MBR	membrane bioreactor
Mcf	thousand cubic feet
MCL	Maximum Contaminant Level
MG	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
mm	millimeters
MPN/100 ml	Most Probable Number per 100 milliliters
NA	not applicable
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric turbidity units
in	inches

PVC	polyvinyl chloride
RWQCB	Central Valley Regional Water Quality Control Board
SJVAPCD	San Joaquin Valley Air Pollution Control District
SR 58	State Route 58
SR 99	State Route 99
SR 138	State Route 138
TBD	to be determined
TCWD	Tejon-Castac Water District
TDS	total dissolved solids
TKN	Total Kjeldahl Nitrogen
TRC	Tejon Ranchcorp
TRCC	Tejon Ranch Commerce Center
TSS	Total Suspended Solids
μmhos/cm	micromhos per centimeter
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
UV	ultraviolet
VOC	volatile organic compounds
WAS	waste activated sludge
WDR	Waste Discharge Requirements
WTP	water treatment plant
WWTF	wastewater treatment facility
yr	year

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1.0 SUMMARY OF PROJECT WASTEWATER AND RECYCLED WATER FACILITIES

This Wastewater Treatment Facilities Engineering Report describes the proposed wastewater treatment and recycled water systems for the Grapevine Project (the project), includes a description of the project's anticipated wastewater flows and effluent requirements, and identifies design parameters and facility sizing, layouts and land use.

1.1 Grapevine Project Description

The 8,010-acre project site is located entirely within unincorporated Kern County, just south of the junction of highways Interstate 5 and State Route 99. The majority of the project is on the east side of I-5, with a smaller portion situated on the west side of I-5. The project site is bisected by the California Aqueduct. The project site is situated within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement that will permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as Interstate 5.

The project, which would include 12,000 residential units and 5.1 million square feet of commercial and light industrial land uses[1], is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside these village cores, the project incorporates a mix of residential uses, office, research and development, regional commercial, and light industrial/warehouse uses. The project is divided into a number of planning areas planned to be phased over a period of 19+ years beginning in 2016. Water and sewer service would be provided by the Tejon–Castac Water District (TCWD).

1.2 Project Wastewater and Recycled Water Systems Overview

The project would generate wastewater from residential, commercial, and industrial indoor water uses that would be conveyed by the wastewater collection system to the project’s wastewater treatment facilities (WWTFs). The project's WWTFs would produce disinfected recycled water suitable for unrestricted reuse. At project buildout, all recycled water would be used onsite in compliance with the project Waste Discharge Requirements (WDRs). Wastewater treatment facilities would likely be designed and constructed in a modular fashion on an as-needed basis to meet wastewater flow demands.

[1] The project could include up to 2,000 additional residential units, for a maximum of 14,000 units, through a reduction the commercial and light industrial land uses based on vehicle trip equivalency ratios.

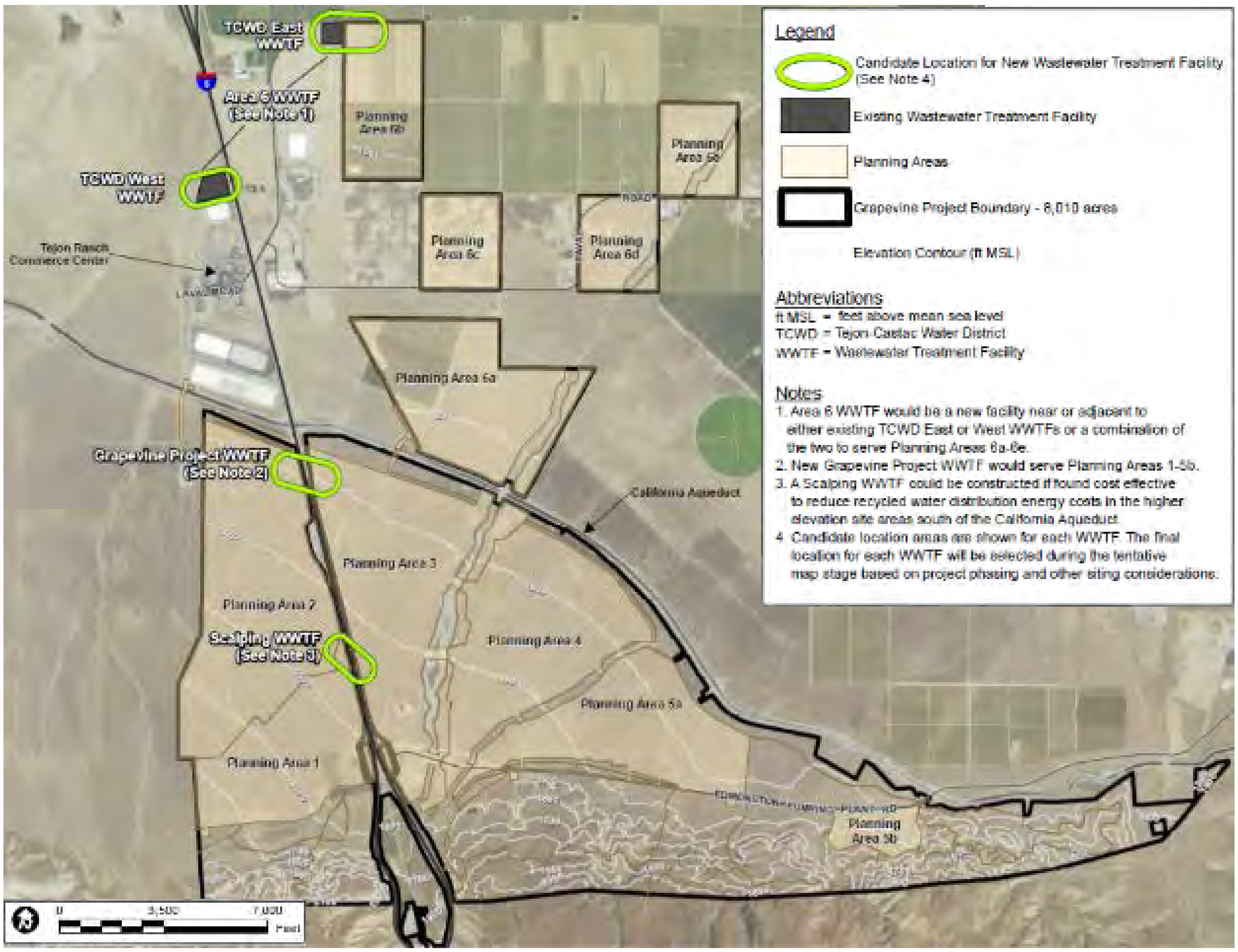
This report assumes that separate wastewater collection and treatment systems would serve the project areas located north and south of the California Aqueduct. Alternatively, a single wastewater collection and treatment system could serve both areas, with a sewer constructed over or under the California Aqueduct to connect the two areas. This potential alternative is discussed below in Section 1.4

North of the Aqueduct, it may be practicable for the project to either temporarily or permanently use available excess capacity at the existing TCWD wastewater treatment facilities that serve the Tejon Ranch Commerce Center (TRCC). South of the Aqueduct, a new primary WWTF and, potentially, a scalping plant would be constructed.

The project’s WWTFs will generate dried biosolids, which are assumed to meet Class B biosolids standards for use as soil amendment. Consistent with applicable regulations, dried biosolids would be applied at agronomical rates to land within the project area and/or transported to a licensed solid waste facility for disposal.

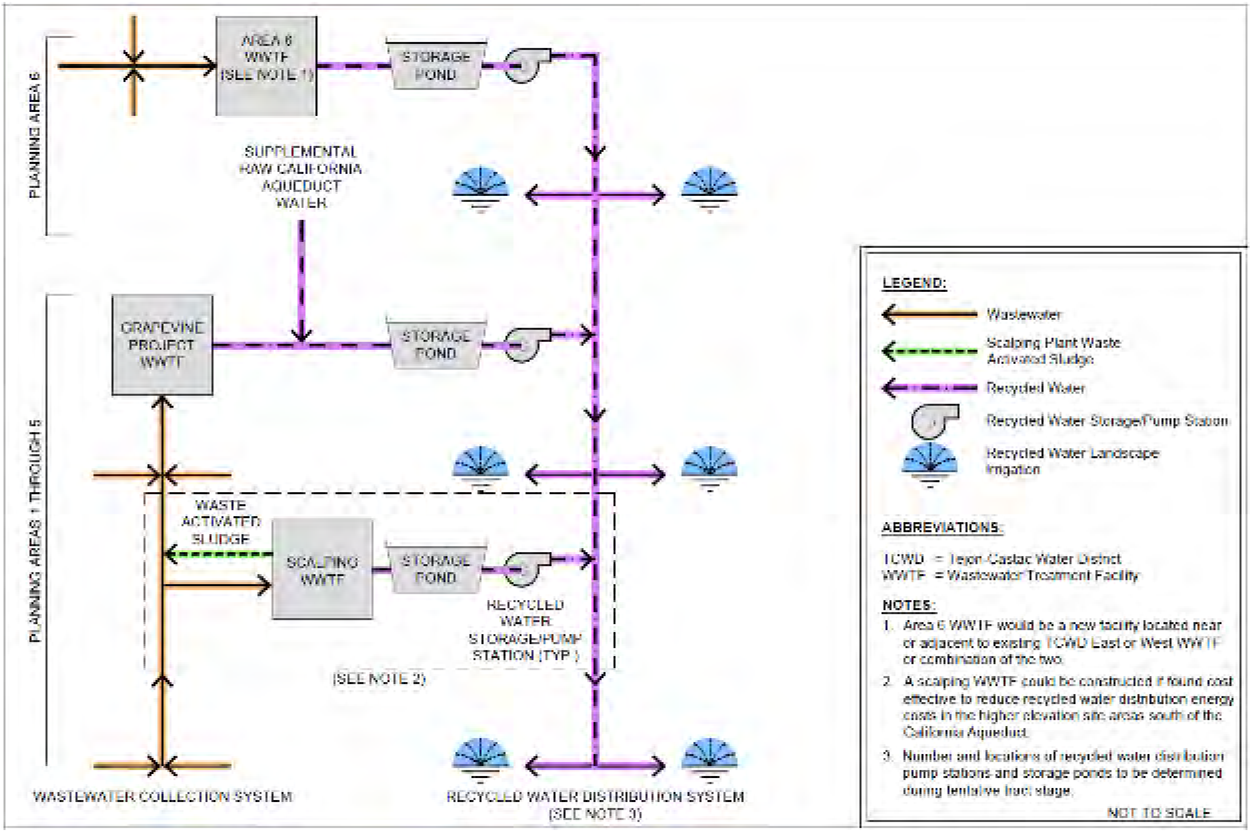
1.3 Wastewater Facility Locations

The figure below shows the planned locations of wastewater treatment facilities that could serve Planning Areas 1 though 5b, located south of the California Aqueduct, and Planning Areas 6a through 6e, located north of the California Aqueduct.



Source: Figure 4

The figure below schematically depicts the planned wastewater collection and recycled water distribution systems at project buildout with separate systems serving the areas north and south of the California Aqueduct.



Source: Figure 5

1.3.1 North of the Aqueduct Wastewater Treatment Facilities – "Area 6 WWTF"

Wastewater generated in project areas 6a through 6e would be conveyed to a new or expanded wastewater treatment facility (i.e., the "Area 6 WWTF") located near or adjacent to either: (1) the TCWD East WWTF, (2) the TCWD West WWTF, or (3) a combination of these two existing facilities that currently serve the TRCC. At build out, the total land area occupied by the Area 6 WWTF would be approximately eight (8) acres.

1.3.2 South of the Aqueduct Wastewater Treatment Facilities – "Grapevine Project WWTF" and "Scalping WWTF"

Up to two (2) new wastewater facilities would be constructed to treat wastewater flows from Planning Areas 1 through 5b. The new "Grapevine Project WWTF" would be the primary wastewater treatment facility serving the south-of-Aqueduct area. A "Scalping WWTF" may also be constructed if such a facility is determined to offer energy cost savings or other benefits related to collecting, treating and distributing recycled water; this evaluation would be conducted during the tentative tract stage. At build out, the land area occupied by these WWTFs would be approximately 20 acres for the Grapevine Project WWTF and two (2) acres for the Scalping WWTF.

1.4 Alternative Wastewater Facility Locations for a Consolidated Wastewater System

As discussed above in Section 1.2, a single, consolidated wastewater collection and treatment system could serve all project areas in lieu of the two separate systems described above. This alternative would involve constructing a sewer over or under the California Aqueduct to connect the planning areas North and South of the Aqueduct. Under this scenario, all the project's wastewater flow would likely be conveyed to the location of the Area 6 WWTF, described in Section 1.3.1. The Area 6 WWTF would be sized to treat all the project wastewater flow. A scalping facility could also be constructed at one of the locations identified south of the California Aqueduct if such a facility is determined to offer energy cost savings or other benefits related to collecting, treating and distributing recycled water. A decision about whether to construct two separate or one consolidated wastewater system would be made during the tentative tract stage.

1.5 Wastewater Treatment Facility Phasing and Interim Facilities

Based on preliminary discussions with TCWD, the project may be able to use all or a portion of the planned and permitted capacity of the TCWD East WWTF on an interim basis during the early development of the project area north of the Aqueduct. Once capacity within the TCWD East WWTF location reaches 75%, the project could construct the Area 6 WWTF adjacent to or near the existing TCWD East or West WWTF footprints.

During the early development of the project area south of the Aqueduct, wastewater flows would be smaller than those required to support the biological processes of a full-scale mechanical facility. Therefore, a potential approach for early-development stages would be to construct an interim, smaller-scale facility that employs conventional pond treatment technologies at the Grapevine Project WWTF location. These lined ponds would be mechanically aerated or would act as facultative treatment ponds. The pond outflow would be filtered, denitrified, and disinfected to meet Title 22 recycled water requirements. When capacity of the interim system reaches 50%, permitting and design would begin for the Grapevine Project WWTF and the lined ponds would be converted to emergency raw wastewater storage.

1.6 Design Basis for Wastewater Treatment Facilities

1.6.1 Facility Flowrates

To preliminarily size the project WWTFs, it was conservatively assumed that all of the project's indoor water use would be collected as wastewater. The project's indoor water use, not including potable water distribution losses, is estimated to be approximately 2,508 acre-feet per year (AFY) at full buildout (EKI, 2015a). The project's water demand estimates also include a contingency (EKI, 2015a). This analysis conservatively assumes that 100% of the contingency would be used to meet additional indoor water demands within the project and contribute to wastewater flows. Therefore, the total annual average wastewater flowrate would be approximately 2,908 AFY or 2.6 million gallons per day (mgd). Approximately 0.5 mgd average dry-weather flow (ADWF) would be treated at the Area 6 WWTF and 2.2 mgd ADWF would be treated at the Grapevine Project and Scalping WWTFs.[2] All project WWTFs would be designed to accommodate peak wastewater flowrates, except for the potential Scalping WWTF, which would only treat the wastewater sidestream needed to meet local recycled water demands.

1.6.2 Wastewater Characteristics and Effluent Quality Goals

All wastewater flows would be subject to tertiary treatment and disinfection suitable for unrestricted reuse as defined in Section 60301.230 of CCR Title 22. All tertiary-treated recycled water would be used in compliance with the project's WDRs that would be issued by the Central Valley Regional Water Quality Control Board (RWQCB) pursuant to the California Water Code (CWC) and consistent with water quality objectives and specific discharge limits established in the Basin Plan (RWQCB 2004) for the White Wolf Subarea of the Tulare Lake Basin, where the project is located.

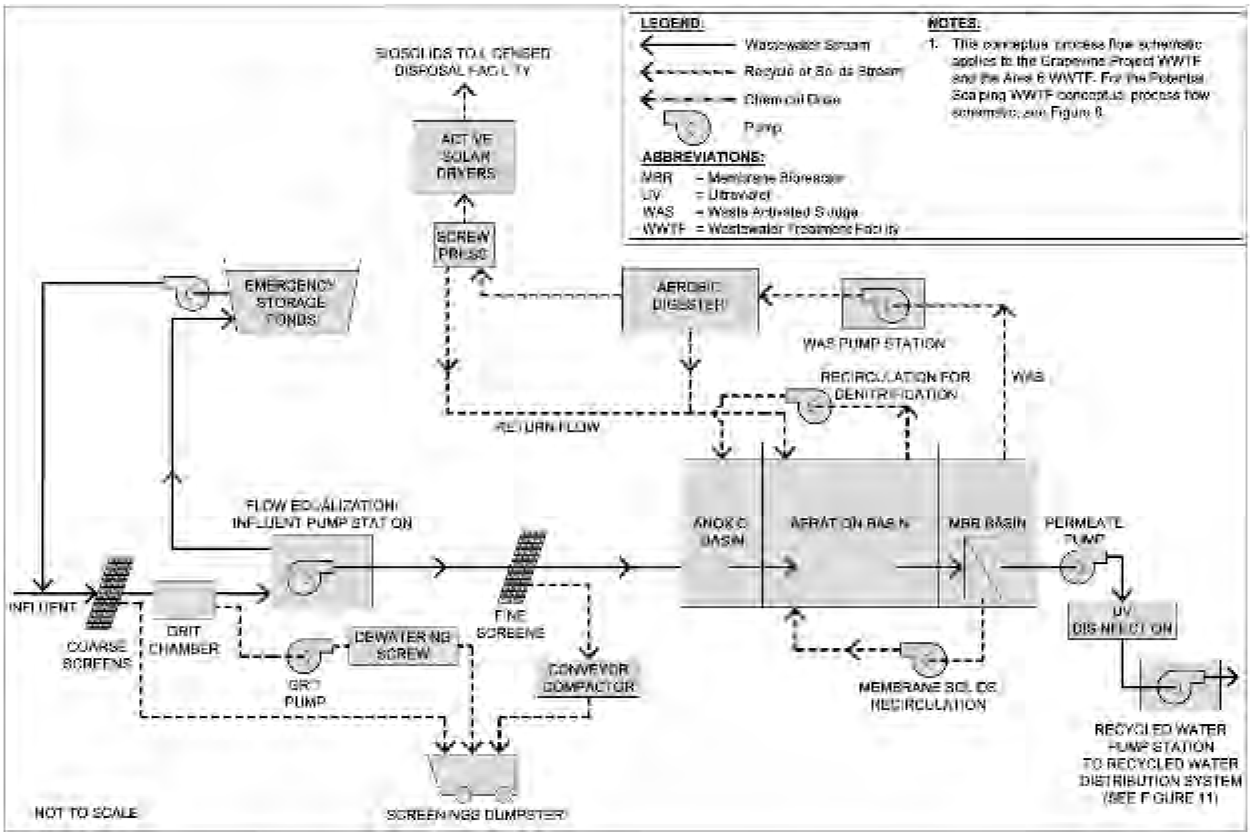
1.7 Treatment Technology

Several wastewater treatment technologies can meet applicable water quality standards for unrestricted recycled water use. The WWTFs could use conventional wastewater treatment, membrane bioreactor (MBR) technology, or an equivalent system. The conceptual wastewater treatment system design assumes that MBR technology would be implemented to treat project raw wastewater. The MBR technology allows wastewater treatment within a compact footprint and simplifies solids management.

The Scalping WWTF, if constructed, would also be an MBR plant or equivalent, but would not include biosolids handling facilities or emergency raw wastewater storage. Biosolids generated at the Scalping WWTF would be pumped into the wastewater collection system for treatment at the new Grapevine Project WWTF and sufficient emergency raw wastewater storage would be located at the Grapevine Project WWTF to meet project needs.

[2] Total ADWF for each WWTF is rounded up to the nearest 0.1 mgd.

The main facility components for the WWTFs using MBR treatment technology are shown in the following conceptual-level process flow schematic.



Source: Figure 7

1.8 Wastewater Collection System

The wastewater collection system, which would generally be constructed within road rights-of-way, would convey wastewater to the WWTFs by gravity sewer or by force main. Raw wastewater pump stations would be constructed when the fall in elevation is insufficient to enable gravity flow or where gravity mains would need to be constructed at impracticably great depths.

To estimate power consumption for wastewater collection, we conservatively assumed that approximately 50% of the total project wastewater ADWF of 2.7 MGD would be pumped at an average total dynamic head of 200 feet of water. Based on the above assumptions, the wastewater collection system's total electrical energy consumption is estimated to be 1.44 million kilowatt-hours per year.

1.9 Recycled Water Storage and Conveyance Facilities

Tertiary treated recycled water generated by the projects WWTFs would supply the project's non-potable water demands in compliance with the WDRs. The supply of recycled water would be supplemented, as needed, with filtered, non-potable Nickel Water from the Aqueduct.

Recycled water storage ponds would be located at several locations on the project site. Total estimated recycled water storage volume, sized to store recycled water generated during the 100-year rainfall year, would be about 950 acre-feet. This volume would require ponds that would be approximately 12.5 feet deep, with a total surface area of approximately 76 acres. A total land area of approximately twice the pond surface area, or about 160 acres, would be needed to accommodate the ponds, berms, access roads, and associated pumping and infrastructure. The ponds would be located throughout the project site at optimized locations considering recycled water storage needs, demand centers, and potential aesthetic benefits.

Pump stations at each of the storage ponds would deliver recycled water and boost system pressure for distribution to higher elevations and for sprinkling. Disinfection booster stations and irrigation disc filters would also be provided at each of the storage ponds.

As with the wastewater collection system, the recycled water distribution system conveyance pipes would typically be constructed within road rights-of-way.

To estimate power consumption for recycled water pumping, we conservatively assumed that the total recycled water volume would equal the total project wastewater ADWF of 2.7 MGD and would be pressurized to an average total dynamic head of 275 feet. Based on the above assumptions, the recycled water distribution system's total electrical energy consumption is estimated to be 3.3 million kilowatt-hours per year.

2.0 INTRODUCTION

2.1 Purpose and Scope

This Wastewater Treatment Facilities Engineering Report describes the proposed wastewater treatment and recycled water reuse systems for the Grapevine Project (the project). This report describes the project's anticipated wastewater flows and effluent requirements, and identifies design parameters, facility sizing, chemical use, electrical use, and facility layouts and land use.

2.2 Grapevine Project Description

2.2.1 Project Location

The Grapevine Project is located in the west-central portion of Tejon Ranch (the Ranch). The approximately 270,000-acre Ranch is currently held in private ownership by Tejon Ranchcorp (TRC). The Ranch includes a large portion of the Tehachapi Mountains as well as smaller portions of the San Joaquin and Antelope Valleys. Generally, the Ranch extends from Interstate 5 (I-5) on the western side to State Route 58 (SR 58) on the northern side and SR 138 on the southern side (Figure 1).

The 8,010-acre Grapevine Project site is entirely within unincorporated Kern County, just south of the junction of I-5 and SR 99. Downtown Bakersfield is approximately 25 miles north of the project. The majority of the project is on the east side of I-5, with a smaller portion situated on the west side of I-5. The project site is bisected by the California Aqueduct (Figure 1 and Figure 2).

The Grapevine Project site lies mainly in the Grapevine and Pastoria Creek U.S. Geological Survey (USGS) 7.5-minute quadrangles. There is one parcel and a portion of two other parcels in the project site that lie entirely within the Mettler USGS 7.5-minute quadrangle. The latitude and longitude of the approximate center of the site is 34°57′9″ N and 118°55′39″ W. The Universal Transverse Mercator (UTM) coordinates for the approximate center are UTM Easting (meters) 323999 and UTM Northing (meters) 3869472 in Zone 11.

2.2.2 Project Overview

The 8,010-acre project site is within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement, a landmark agreement reached in 2008 with leading environmental organizations (including the Sierra Club, Natural Resources Defense Council, California Audubon Society, Endangered Habitats League, and Planning and Conservation League) to permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as I-5.

The Grapevine Project site includes approximately 8,010 acres, of which approximately 3,232 acres (or about 40%) would be designated for agriculture (with grazing and open space as the predominant land uses) and approximately 4,778 acres (about 60%) would be developed as a new residential community and employment center. The community would leverage and build upon the economic expansion and job growth that has occurred at Tejon Ranch Commerce Center (TRCC; Figure 2), located immediately north of the project on I-5. The Grapevine Project would feature a series of compact neighborhoods linked by bicycle and pedestrian trails that provide convenient access to grocery and drugstores, professional services, schools, and parks. The project site is located along I-5, at the gateway to the Central Valley, adjacent to the extensive open space that was conserved in the Tejon Ranch Land Use and Conservation Agreement.

The project, which would include 12,000 residential units and 5.1 million square feet of commercial and light industrial land uses[3], is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside the village cores, the Grapevine Project includes a mix of residential uses, office, research and development, regional commercial, freeway-oriented commercial, and light industrial/warehouse uses. Other potential public facilities, including fire stations, a sheriff substation, transit facilities/park-and-rides, and water and wastewater treatment facilities, are proposed throughout the community.

Access to the first phases of the Grapevine community would be from Interstate 5 at the existing Grapevine Road and Laval Road interchanges. During later phases of development, the existing Grapevine Road/ Interstate 5 interchange may be expanded and relocated to the north. To allow for the relocation and replacement of the interchange, an existing Vehicle Enforcement Facility may be relocated to a TRC-owned parcel on the west side of the junction of I-5 and CA-99. The project would also improve an existing TRC agricultural road east of the project area to provide access for truck traffic currently using Edmonston Pumping Plant Road to travel to properties east of the project. The circulation network within the project is composed primarily of two- and four-lane arterials, collector streets, and local streets organized in a grid pattern. All roads within the project site would be public. Multipurpose trails are proposed along Grapevine Creek, Cattle Creek, the southern foothills, and the open space adjacent to the California Aqueduct and at other locations throughout the project site. Some of these trails would connect to on-street, Class 2 bike lanes. Water and sewer service would be provided by the TCWD.

[3] The project could include up to 2,000 additional residential units, for a maximum total of 14,000 units, through a reduction of commercial/industrial square footage based on vehicle trip equivalency ratios.

2.2.3 Project Construction Scenario

As shown on Figure 2, the project site is divided into six planning areas ranging in size from approximately 450 to 1,400 acres. Development would be phased over a period of 19+ years, starting with the development of Planning Area 6a and/or 3and continuing with the balance of the planning areas nearest to the initial phase. Buildout of each phase is projected to take approximately 2 to 4 years (Phase 1: 2 years; Phase 2: 4 years; Phase 3: 3 years; Phase 4: 4 years; Phase 5: 4 years; Phase 6: 2 years), with the first phase commencing in 2016. The portions of the site that are proposed to remain in exclusive agriculture/open space are primarily located along the southern edge of the California Aqueduct, along the southern portion of the project site at the foothills of the Tehachapi Mountains, and along Grapevine and Cattle Creeks.

2.2.4 Project Operation Scenario

The project operations are described in the Grapevine Specific and Special Plan. Land uses associated with operations are described in the Grapevine Special Planning District Plan.

2.3 Project Wastewater and Recycled Water Facilities Overview

The project would generate wastewater from residential, commercial, and industrial indoor water uses. Wastewater would be conveyed by the wastewater collection system to the project's WWTFs. The WWTFs would produce disinfected recycled water such that the effluent would be suitable for unrestricted reuse. Recycled water would be used to meet selected, non-potable water needs throughout the project. The WWTFs would also generate dried biosolids, which are assumed to meet Class B biosolids standards for use as a soil amendment. Consistent with applicable regulations, dried biosolids may be applied at agronomical rates to land within the project area and/or transported to a licensed solid waste facility for disposal.

The wastewater collection system, treatment facilities, and associated recycled water storage and distribution facilities would likely be implemented in phases to meet the wastewater treatment needs of each successive planning area. Separate wastewater treatment collection and treatment systems could serve the areas north and south of the California Aqueduct. Alternatively, a single collection and treatment system could serve both sides. The conceptual wastewater facilities design described herein conservatively assumes that separate systems will serve each side of the California Aqueduct.

It may be practicable north of the Aqueduct to either temporarily or permanently use available excess capacity at the existing TCWD East WWTF. Once capacity within that facility reaches 75%, the project would construct the Area 6 WWTF adjacent to or near the existing facility footprint.

A new Grapevine Project WWTF would be constructed south of the Aqueduct. There is also a possibility of locating a scalping wastewater treatment facility (Scalping WWTF) south of the Aqueduct, if it could offer energy cost savings or other benefits associated with the collection, treatment and distribution of recycled water.

The recycled water systems from each project WWTF would be interconnected to facilitate the distribution of recycled water throughout the project area; therefore, recycled water pipelines would cross over or under the Aqueduct. Recycled water storage ponds and distribution pump stations would be located at several locations on the project site.

The following sections describe the basis for, and elements of, the project's wastewater and recycled water facility design:

- Section 3.0 – Regulatory Setting
- Section 4.0 – Wastewater Treatment Facility Locations and Phasing
- Section 4.0 – Design Basis for Wastewater Treatment Facilities
- Section 6.0 – Description of Wastewater Treatment Facilities
- Section 7.0 – Description of Wastewater Collection System
- Section 8.0 – Description of Recycled Water Use and Facilities

The following sections then present how impacts from the water treatment process and facility would be managed and/or mitigated in the future:

- Section 9.0 – Antidegradation Analysis
- Section 10.0 – Offsite and Cumulative Impacts
- Section 11.0 – Mitigation Measures

3.0 REGULATORY SETTING

Standards for wastewater treatment and recycled water use are based on federal, state, and local statutes, ordinances, and regulations. Table 1 summarizes identified statutes and regulations related to wastewater effluent quality, solids handling, and recycled water use.

3.1 Federal Regulations

3.1.1 Clean Water Act

At the federal level, the United States Environmental Protection Agency (U.S. EPA) promulgates regulations that protect surface waters under the Water Pollution Control Act Amendments of 1972, commonly referred to as the Clean Water Act. These federal regulations, published in the Federal Register and codified in Code of Federal Regulations Title 40, establish wastewater treatment policies, effluent requirements for surface water disposal, and requirements for biosolids management and disposal. Regulations also set forth pretreatment requirements for preventing pollutants from entering publicly owned treatment works at levels that could interfere with treatment operation or solids management.

3.2 State Regulations

3.2.1 Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Control Act (California Water Code Section 13000 et seq.) gives the State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCBs) responsibility for protecting beneficial uses of California's surface water and groundwater. Beneficial uses include domestic, agricultural, recreational, and environmental. Each RWQCB establishes the beneficial uses and water quality objectives and regulates discharges within its jurisdiction. Under the Porter-Cologne Act, parties proposing to discharge wastewaters that could affect waters of the state must file a Report of Waste Discharge with the appropriate regional board. If the proposal is found satisfactory, the RWQCB issues WDRs.

The project is within the Tulare Lake hydrologic region that falls under the jurisdiction of the Central Valley RWQCB. The RWQCB has established qualitative and quantitative standards regarding allowable levels of various constituents, including salts and nutrients, in surface water and groundwater to protect designated beneficial uses within the Tulare Lake basin. These standards are set forth in the “Water Quality Control Plan for the Tulare Lake Basin,” also called the "Basin Plan" (RWQCB 2004). The Basin Plan specifies that wastewater dischargers are to reclaim and reuse wastewater when feasible.

Under the Porter-Cologne Act, the RWQCB issues site-specific WDRs for wastewater treatment facilities to regulate treatment plant operations and treated effluent management. These WDRs describe acceptable effluent quality and quantity, regulate facility operation and future modifications, and establish monitoring and reporting programs. As discussed in Section 3.2.3 below, when administering a recycled water program a wastewater treatment facility may also be eligible to obtain coverage under the SWRCB's General WDRs for Recycled Water Use.

3.2.2 Antidegradation Policy

The SWRCB Resolution No. 68-16, titled "Statement of Policy with Respect to Maintaining High Quality Water of the State" and known as the "Antidegradation Policy," requires that the State's high quality waters be maintained consistent with their beneficial uses and water quality objectives as defined in the Basin Plan. Resolution No. 68-16 prohibits degradation of groundwater by waste discharges unless dischargers meet several conditions. An antidegradation analysis for the proposed Grapevine Project wastewater discharges, required under the Antidegradation Policy, is provided in Section 9.0 below.

3.2.3 Recycled Water Regulations

Chapter 7 of the California Water Code (Section 13500 et seq.), also known as the Water Recycling Law, establishes a statewide goal to encourage wastewater reuse. Such reuse, also called "water recycling," helps to meet the state's water needs. This statute directs the SWRCB, which has primary statewide responsibility for protecting public health, to create water-recycling criteria and to develop reporting and permitting requirements for implementation by the SWRCB and regional boards.

The SWRCB establishes statewide criteria for the production, distribution, and use of recycled water in Title 22 of the California Code of Regulations (CCR), Section 60301 et seq. Title 22 establishes minimum water quality criteria for specific use categories, and sets minimum separation distances between domestic water supply wells and areas irrigated with recycled water. Title 22, Section 60323, requires wastewater recyclers to submit an engineering report to SWRCB detailing the proposed use of recycled water, contingency plans, and safeguards. The SWRCB must approve the Title 22 report before dischargers implement WDRs for recycled water.

In February 2009, the SWRCB adopted its Recycled Water Policy, promulgated by SWRCB Resolution No. 2009-0011. This policy, amended in January 2013 by SWRCB Resolution No. 2013-0003, promotes the use of recycled water and streamlines the regional board permitting process.

In April 2009, the RWQCB adopted Resolution No. R5-2009-0028, titled "In support of Regionalization, Reclamation, Recycling and Conservation for Wastewater Treatment Plants," also known as the "Regionalization Resolution." The Regionalization Resolution encourages water recycling, water conservation, and regionalization of wastewater treatment facilities. It requires dischargers to document efforts to promote wastewater recycling, water conservation, and regional wastewater management.

In June 2014, the SWRCB adopted Water Quality Order 2014-0090, the "General WDRs for Recycled Water Use," also called the "General WDRs." The General WDRs are potentially applicable to the Grapevine Project pending confirmation from the RWQCB, which has discretion over enrolling dischargers under the General WDRs. The General WDRs are intended to streamline the permitting process for recycled water programs compared with a site-specific WDR process. Under the General WDRs, the applicant submits a Notice of Intent with supporting information at least 90 days prior to the project start. The applicant also prepares a Title 22 Engineering Report for the Production, Distribution, and Use of Recycled Water, as is also required for site-specific WDRs.

The General WDRs cover direct beneficial uses of recycled water permitted under Title 22, including landscape irrigation, agricultural irrigation, and certain industrial processes, subject to the listed monitoring requirements. The General WDRs do not cover using recycled water for groundwater recharge or wastewater disposal via injection or percolation; neither recharge, injection, nor percolation are proposed as part of the project.

3.2.4 Biosolids Regulations

Biosolids generated during wastewater treatment are regulated by the state under SWRCB Water Quality Order No. 2004-0012-DWQ, titled the "Final General Waste Discharge Requirements for Land Application of Biosolids for Use as a Soil Amendment in Agricultural, Silvicultural, Horticultural, and Land Reclamation Activities." This order, implemented under the federal biosolids rules set forth in 40 CFR Part 503, applies to all land application of Class A and Class B biosolids as well as “exceptional quality” biosolids-derived mixtures consisting of 50% or more biosolids. The order establishes permitting, monitoring, and reporting requirements. Local ordinances, described below, would also regulate the disposal of biosolids in Kern County.

3.2.5 Emissions Regulations

The San Joaquin Valley Air Pollution Control District (SJVAPCD) would regulate emissions to the atmosphere from the project’s wastewater treatment facilities. Analysis of emissions related to the project’s WWTFs and compliance with SJVAPCD regulations is provided under a separate report.

3.3 Local Regulations

Kern County has issued several local policies and ordinances applicable or potentially applicable to the project’s wastewater and water recycling facilities. The Kern County General Plan includes policies related to sewers, wastewater treatment facilities, and recycled water distribution. These polices are set forth in Chapter 1 of the General Plan, titled “Land Use, Open Space, and Conservation Element.”

The Kern County Environmental Health Services Department (KCEHSD) promulgates and enforces the "Standards and Rules and Regulations for Land Development—Sewage Disposal, Water Supply, and Preservation of Environmental Health." Under its Land Development program, KCEHSD reviews new and tentative land uses to evaluate the proposed water supply, sewage disposal methods, and environmental mitigation measures.

The Kern County Ordinance Code includes ordinances pertinent to wastewater collection and treatment. Title 14, Utilities, includes codes related to the design, construction, and regulation of sewer systems.

4.0 WASTEWATER TREATMENT FACILITY LOCATIONS AND PHASING

4.1 Existing Wastewater and Recycled Water Infrastructure

Three (3) wastewater facilities are currently in operation within or near the project boundaries. Where practicable, the project would endeavor to use available capacity at existing wastewater treatment facilities, either permanently or temporarily.

The TCWD currently owns and operates the TCWD East WWTF and the TCWD West WWTF. These existing facilities, which serve the TRCC, are located northwest of the project site as shown on Figure 3.

The TCWD East WWTF, located east of I-5, is a MBR treatment plant with a design capacity of 0.1 mgd. The TCWD East WWTF was designed and permitted such that the capacity could be expanded incrementally up to 0.8 mgd. Recycled water produced by the TCWD East WWTF, which meets Title 22 requirements for unrestricted reuse, is supplied to the TRCC for non-potable uses (RWQCB 2011; Black & Veatch 2013).

The TCWD West WWTF, located west of I-5, is permitted for a treatment capacity of 0.1 mgd. Currently, the TCWD West WWTF processes approximately 0.03 MGD of wastewater with a packaged conventional activated sludge treatment system (Black and Veatch 2013). TCWD reportedly intends to replace the TWCD West WWTF with an MBR system to produce recycled water meeting Title 22 effluent requirements for unrestricted reuse (RWQCB 2008; Black and Veatch 2013). The new plant would be located within the existing facility footprint.

A third existing WWTF, the Grapevine WWTF (see Figure 3), is owned and operated by Tejon Ranchcorp to serve the Grapevine commercial area south of the Aqueduct. The existing Grapevine WWTF consists of unlined percolation/evaporation ponds with a total water surface area of up to 6.62 acres. This WWTF, with a permitted treatment capacity of 0.235 mgd, is located within Planning Area 3. As a beneficial project impact, this existing facility and its unlined wastewater ponds would be decommissioned during development. After decommissioning, flows previously conveyed to the existing Grapevine WWTF would be directed to the new Grapevine Project WWTF.

4.2 Planned Grapevine Project Wastewater Treatment Facility Locations

This report assumes that Planning Areas 1 though 5b, located south of the Aqueduct, and Planning Areas 6a through 6e, located north of the Aqueduct, would be served by separate wastewater collection and treatment facilities. However, the project could alternatively construct a single, consolidated wastewater system. This alternative is discussed in Section 4.2.3.

The WWTFs proposed for each project area are described below, with facility locations shown on Figure 4. Figure 5 schematically depicts the project's planned wastewater collection and recycled water distribution systems at buildout. In all cases, treated effluent from the project WWTFs would supply recycled water for use in compliance with the project WDRs, potentially both north and south of the Aqueduct. Pending discussions with the RWQCB, either new WDRs would be obtained, or existing WDRs would be revised to reflect the new project wastewater demands. Alternatively, subject to RWQCB discretion, the project WWTFs could be enrolled under the SWRCB General WDRs.

4.2.1 Wastewater Treatment Facility North of the California Aqueduct (Planning Areas 6a though 6e)

Wastewater generated in Planning Areas 6a through 6e would be conveyed to a new or expanded wastewater treatment facility (i.e., the "Area 6 WWTF") located near or adjacent to either: (1) the existing TCWD East WWTF, (2) the TCWD West WWTF, or (3) a combination of these two WWTFs. Figure 4 shows the location of the existing and planned existing facilities and the Area 6 WWTF is shown schematically on Figure 5. The final Area 6 WWTF location would be determined during the tentative tract stage based on project phasing and other considerations.

4.2.2 Wastewater Treatment Facilities South of the California Aqueduct (Planning Areas 1 through 5b)

As shown on Figure 4 and Figure 5, up to two (2) new wastewater facilities would be constructed to treat wastewater flows from Planning Areas 1 through 5b, located south of the California Aqueduct. These facilities consist of the new "Grapevine Project WWTF", which would be the primary WWTF for the project area south of the Aqueduct, and potentially a smaller facility called the "Scalping WWTF".

As shown on Figure 4, the new Grapevine Project WWTF would be constructed near the northern, lower elevation end of the project area south of the Aqueduct. Because there is an approximately 500-foot elevation difference between the Grapevine Project WWTF and the project's far southern boundary, the Scalping WWTF, if built, would be located at the approximate mid-point of these high and low elevations. The intended function of the Scalping WWTF would be to more energy-efficiently receive and treat the wastewater flows from, and distribute recycled water to, the southern, higher elevation portions of the project.

The final project WWTF locations, and the decision whether or not to incorporate a scalping plant would be determined during the tentative tract stage based on project phasing and other considerations.

4.3 Alternative Wastewater Facility Locations for a Consolidated Wastewater System

As discussed above in Section 4.2, a single, consolidated wastewater collection and treatment system could serve all project areas in lieu of the two separate systems described above. This alternative would involve constructing a sewer over or under the California Aqueduct to connect the planning areas North and South of the California Aqueduct. Under this scenario, all the project's wastewater flow would likely be conveyed to the location of the Area 6 WWTF, described in Section 4.2.1. The Area 6 WWTF would be sized to treat all the project wastewater flow. A scalping facility could also be constructed at one of the locations identified south of the California Aqueduct if such a facility is determined to offer energy cost savings or other benefits related to collecting, treating and distributing recycled water. A decision about whether to construct two separate or one consolidated wastewater system would be made during the tentative tract stage.

4.4 Wastewater Treatment Facility Phasing and Interim Facilities

The proposed approach to WWTF phasing is shown as a flowchart on Figure 6. Based on preliminary discussions with TCWD, the project may be able to use all or a portion of the planned and permitted expanded capacity of the TCWD East WWTF on an interim basis during early phases of development. When about 75% of this available capacity is utilized, permitting and design would begin for constructing the permanent Area 6 WWTF. This new Area 6 WWTF would come online as the existing capacity is utilized by the TRCC. The Area 6 WWTF would then be progressively expanded as needed to meet wastewater treatment needs north of the Aqueduct.

Figure 6 also includes a flowchart depicting a potential approach to phasing wastewater treatment for the project areas located south of the California Aqueduct. During the early development of the area south of the Aqueduct, wastewater flows would be low. A minimum flow is required to support the biological processes of a full-scale mechanical treatment facility (e.g., such as the planned MBR facility). Therefore, a potential approach for early-development stages, prior to construction of the permanent Grapevine Project WWTF, would be to construct an interim, smaller-scale facility employing conventional pond treatment technologies. Under this approach, mechanically-aerated or facultative ponds would be constructed at the future Grapevine Project WWTF location, with a suitable setback from the Aqueduct. These lined ponds would be mechanically aerated or would act as facultative treatment ponds. The pond outflow would be filtered, denitrified if necessary, and disinfected to meet Title 22 recycled water requirements.

The capacity of the interim system would be approximately 200,000 gallons per day. When about 50% of the pond treatment capacity is utilized, as development proceeds in the southern project area, permitting and design would begin for constructing the permanent Grapevine Project WWTF. The lined ponds would be converted to emergency raw wastewater storage. The Grapevine Project WWTF and the emergency raw wastewater storage would be progressively expanded as needed to meet wastewater treatment needs for the project's southern project area. The potential Scalping WWTF could be constructed, if found cost-effective to reduce recycled water distribution energy costs, after the initial phase of the Grapevine Project WWTF is constructed and as development progresses in the higher-elevation site areas south of the Aqueduct.

5.0 DESIGN BASIS FOR WASTEWATER TREATMENT FACILITIES

5.1 Background

The project would generate wastewater from residential, commercial, and industrial indoor water uses. Wastewater would be conveyed by the wastewater collection system to the project's WWTFs. The WWTFs would produce disinfected recycled water as defined in Section 60301.230 of CCR Title 22 such that the effluent would be suitable for unrestricted reuse. At project buildout, all recycled water produced by the WWTFs would be used in compliance with the project's WDRs. Recycled water use criteria are described in the Grapevine Specific and Special Plan.

Wastewater treatment facilities would likely be designed and constructed in a modular fashion on an as-needed basis. During the detailed design stage, sizing would be refined to reflect current demands and flow projections.

5.2 Wastewater Flowrates

To preliminarily size the project wastewater facilities, this analysis assumes that all of the project's indoor water use would be collected as wastewater and flow to the project WWTFs. The project's estimated indoor water use, not including potable water distribution losses, is estimated to be approximately 2,508 AFY at full buildout (EKI 2015a). The project's water demand estimates also include a contingency (EKI 2015a). This analysis conservatively assumes that 100% of the contingency would be indoor water demands and be collected as wastewater flows.[4] The total annual average wastewater flowrate used for facility sizing purposes is approximately 2,908 AFY or 2.6 mgd.

The ADWF of raw wastewater to each project WWTF at buildout, assuming separate north and south collection systems, is preliminarily estimated in the table below.

[4] Future environmental impact review and analysis would be conducted if the uses associated with the contingency generate more wastewater than assumed, requiring material expansion of the project WWTFs, or if significant additional land or more intensive irrigation is needed to dispose of the resulting additional recycled water.

Preliminary Wastewater ADWFs for Project WWTFs

WWTF	Service Area	ADWF (a) (mgd)		
		Planned Indoor Demands	*Assumed Indoor Portion of Contingency*	*Total*
Area 6 WWTF	Planning Areas 6a through 6e (North of the California Aqueduct)	0.3	0.2	0.5
Grapevine Project WWTF	Planning Areas 1 through 5b (South of the California Aqueduct)	2.0	0.2	2.2

Notes:
(a) The total ADWF to each WWTF is rounded up to the nearest 0.1.

The Scalping WWTF, if constructed, is preliminarily designed to treat a wastewater flow of 0.5 mgd based on the projected average annual recycled water demand for the Scalping WWTF's service area (EKI 2015a).[5] Raw wastewater flows exceeding recycled water needs within this service area would bypass the Scalping WWTF and flow directly to the new Grapevine Project WWTF.

All project WWTFs would be designed to accommodate peak wastewater flowrates, except for the potential Scalping WWTF, which would only treat the wastewater sidestream needed to meet local recycled water demands. The designs would also reflect that residential water use is higher during the morning and evening hours, commercial and industrial building water use is typically higher during the day, and indoor water uses are generally higher during the summer.

Table 2 lists the assumed influent wastewater "peaking factors" relative to ADWF based on data from similar communities. On this basis, the capacities of the WWTFs have been preliminarily sized to accommodate a peak month flowrate of 1.3 times ADWF, a peak day flowrate of 1.5 times

[5] In comparison to the potential Scalping WWTF's treatment capacity of 0.5 mgd, the average annual raw wastewater flow estimated to be generated from the Scalping WWTF's upstream collection system area is approximately 0.65 mgd at full project buildout.

ADWF, and a peak hour flowrate of 2.5 times ADWF.[6] Groundwater infiltration and stormwater infiltration/inflow into the wastewater collection system are expected to be negligible given that the collection system will be new and groundwater depths range between 500 and 900 feet below ground surface (RWQCB 2011).

Project buildout would occur over several years, such that construction of each WWTF and related infrastructure would likely be phased to accommodate increases in wastewater flows over time.

5.3 Wastewater Characteristics

Project wastewater flows would be generated by indoor residential, commercial, light industrial, and institutional water use. Table 3 compiles estimated wastewater flows, quality, and mass loadings based on data from similar projects (Eco:LOGIC 2006) and published guidelines (Metcalf & Eddy 2003).

The project's potable water needs would be met by Nickel Water delivered via the California Aqueduct and treated for potable use.[7] The highest reported total dissolved solids (TDS) concentration in Aqueduct water near the project site between January 2010 and October 2013 was 352 milligrams per liter (mg/L) (EKI 2015b). TDS concentrations added by domestic water use have been measured between 150 to 380 mg/L above the source water TDS levels (Metcalf & Eddy 2003). The conceptual WWTF system design for the Grapevine Project assumes that project indoor use could increase TDS to a level as much as 275 mg/L above the source water concentration.[8] This degree of TDS increase to reflects the planned high level of water conservation within the project development, which would increase salt concentrations in the resulting low volume of wastewater. Under these assumptions, the TDS concentration in project wastewater could be as high as 627 mg/L.

[6] The Scalping WWTF, if constructed, would not be designed to capture and treat peak wastewater flows or to provide flow equalization. For this report, the new Grapevine Project WWTF is assumed to be sized large enough to accommodate the entire peak wastewater flowrate generated in the project areas located south of the California Aqueduct—that is, Planning Areas 1 through 5b.

[7] Tejon Ranchcorp, an affiliate of the Grapevine Project applicant, has the right to receive 6,693 AFY of water from the Kern County Water Agency (KCWA) through at least 2079 as the assignee of a Kern River water transfer agreement between KCWA and the Nickel Family LLC (the "Nickel Water"). The delivery of Nickel Water is 100 percent reliable on a year-to-year basis and is not subject to hydrological variability, regulatory requirements, or supply constraints that may affect other water sources.

[8] A salinity source study for a development built in Lathrop, California, a San Joaquin Valley city, estimated that residential indoor use added approximately 200 mg/L of TDS (EKI 2007).

5.4 Basis for Assumed Effluent Quality Goals

5.4.1 General Effluent Quality Goals

All wastewater flows would be subject to tertiary treatment and disinfection suitable for unrestricted reuse as defined in Section 60301.230 of CCR Title 22. All tertiary-treated recycled water would be used for onsite uses in compliance with recycled water quality standards and monitoring requirements be defined in the project’s WDRs. The effluent standards set in the WDRs would be consistent with water quality objectives and specific discharge limits established in the Basin Plan (RWQCB 2004) for the White Wolf Subarea of the Tulare Lake Basin, where the project is located.

Table 4 summarizes the treated effluent water quality goals assumed to be met at each project WWTF based on applicable regulations and on permits for comparable facilities.

5.4.2 Salt Management Requirements

The Basin Plan establishes several salt management requirements, described in terms of electrical conductivity (EC), a surrogate for salinity, and other parameters.[9] The Basin Plan's salinity requirements include the following:

- The incremental increase in salts from use and treatment must be controlled to the extent possible. The maximum EC of the effluent discharged to land is not to exceed the EC of the source water plus 500 micromhos per centimeter (μmhos/cm).
- In the White Wolf Subarea, discharges to Class I irrigation water[10] are s not to exceed an EC of 1,000 μmhos/cm, a chloride content of 175 mg/L, or a boron content of 1.0 mg/L.
- Discharges to Class II irrigation water are not to exceed an EC of 2,000 μmhos/cm, a chloride content of 350 mg/L, or a boron content of 2.0 mg/L. The Basin Plan specifies that Class II irrigation water have an EC between 1,000 and 3,000 μmhos/cm, chlorides between 175 and 350 mg/L, sodium between 60 and 75 (percent base constituents), and boron between 0.5 and 2.0 mg/L.

Based on available water quality data, underlying groundwater at the project site is considered Class II for EC (RWQCB 2011). The Basin Plan requires that discharges to land in areas overlying Class II or poorer groundwater shall not exceed an EC of 2,000 μmhos/cm.

[9] One mg/L of TDS is approximately equivalent to 1.4 to 1.8 micromhos per centimeter (μmhos/cm) of EC.

[10] For the project case, "irrigation water" pertains to underlying groundwater.

As discussed above in Section 5.3, the salinity concentration added by project domestic use is preliminarily projected to be at or below 275 mg/L TDS, equivalent to about 500 μmhos/cm EC, which would be in general compliance with the Basin Plan objectives. As described in Section 10.0, to limit the salinity addition by indoor uses, the project would implement a pretreatment program for commercial and industrial properties and a salinity education and reduction program for residents. Salt-regenerating water softeners would also be prohibited.

6.0 DESCRIPTION OF THE WASTEWATER TREATMENT FACILITIES

This section provides a conceptual-level description of the major components of the project's planned wastewater treatment facilities, the layout and sizing of the plant areas, projected chemical and electricity uses, and biosolids generation. Section 7.0 describes the wastewater collection system. Section 8.0 describes the recycled water distribution system and storage ponds.

6.1 Wastewater Treatment Technologies

Several existing wastewater treatment technologies can meet applicable water quality standards for unrestricted recycled water use. One option is to implement conventional treatment steps to produce recycled water; this optional approach is discussed below in Section 6.2.10.[11] The conceptual wastewater treatment system design described below assumes that MBR technology (or equivalent) would be implemented to treat project raw wastewater. MBR technology has the following advantages:

- The MBR process allows secondary treatment, secondary sedimentation, and tertiary filtration process to occur simultaneously in the same modular treatment structure and within a smaller footprint.
- While influent screening and grit removal are necessary for both MBR and conventional treatment, primary sedimentation and primary sludge management are typically not required in an MBR facility. Waste activated sludge can typically be managed without a thickening step, requiring only digestion, dewatering, drying, and disposal.
- MBR treatment is typically furnished in modules, such that modules can conveniently be added when wastewater flows increase as the development proceeds.

6.2 Wastewater Treatment Facilities Components and Processes

This section describes the major components and unit processes for the WWTFs using MBR technology. Conceptual-level process flow schematics are shown on Figure 7 for the new Grapevine Project and Area 6 WWTFs and on Figure 8 for the potential Scalping WWTF. The Scalping WWTF would not include solids handling facilities, flow equalization, or emergency raw wastewater storage, as these functions would be handled by the new Grapevine Project WWTF. Preliminary design criteria for each WWTF's main process units are shown in Table 5 with

[11] For wastewater treatment during the earlier development phases south of the California Aqueduct, it may be feasible to implement mechanically-aerated or facultative lined ponds at the new Grapevine Project WWTF location shown on Figure 4. This interim pond treatment approach is described above in Section 4.3 and shown on Figure 6.

redundancy in accordance with regulatory requirements. Peak flow factors appropriate for the project will be discussed with regulatory authorities as part of the detailed design effort.

6.2.1 Headworks

Raw wastewater would first be mechanically screened at the WWTF headworks. Coarse screens, such as a mechanical bar screen, would remove large solids, rags, and debris ahead of the influent pump station. Wastewater pumped from the influent pump station, described below, would pass through fine screens to remove smaller solids that could interfere with downstream MBR processes. Backup screens would be installed for redundancy at each WWTF, except at the Scalping WWTF. If the screens at the Scalping WWTF need servicing, the Scalping WWTF would be taken offline, and wastewater would bypass it and flow to the Grapevine Project WWTF.

The recovered screenings would be washed, compacted, and collected in a dumpster for disposal at a licensed solid waste disposal site. The compactor drainage would be sent back to the influent pump station.

Grit removal chambers may be appropriate downstream of the coarse screens prior to flow equalization and influent pumping to remove entrained sand that can damage pumps and membranes. Grit chambers may be horizontal flow, aerated, or vortex-type units. The grit would be dewatered and collected with the screenings.

Odor control may be implemented at the headworks. Headworks components can be covered so that odorous gases are contained under a negative pressure. If needed, collected odorous gases can be treated using activated carbon, biofilters, or a scrubber.

6.2.2 Influent Pump Stations

The coarse screened and degritted wastewater at each WWTF would be discharged from the influent pump station into the MBR system. The influent pumps would be designed for the peak-month average flowrates, with provision for standby units. The conceptual treatment system designs assume that the influent pump station structures would be below-grade concrete wet wells equipped with submersible sewage pumps. Flows in excess of the influent pump capacity at the Grapevine Project and Area 6 WWTFs would be diverted to the flow equalization basins and returned gradually to the wet well when flows subside. Flows in excess of the Scalping WWTF influent pump capacity would bypass the Scalping WWTF.

6.2.3 Flow Equalization

Flow equalization facilities at the Grapevine Project and Area 6 WWTFs would detain wastewater flows exceeding the design average peak month flowrates. The Scalping WWTF would not include flow equalization, as the Grapevine Project WWTF would manage flows bypassing the Scalping WWTF. Stored equalized wastewater would be discharged at a controlled rate back into the influent pump station when influent flows subside. Flow equalization would reduce variations in wastewater flowrates, benefiting performance and reducing the size of downstream treatment processes.

To preliminarily size flow equalization storage, the conceptual wastewater design assumes a required flow equalization volume of 20% of the peak day flow based on literature values and observation of facilities at similar communities (Veolia & Eco:LOGIC 2005). This equalization volume is equivalent to 300,000 gallons per 1.0 mgd ADWF.[12] Table 5 shows the total active storage required for each WWTF and Figure 9 shows the locations of flow equalization storage in the conceptual wastewater facilities layouts.

6.2.4 Membrane Bioreactor System

An MBR facility typically requires less area than does a conventional activated sludge WWTF and is expandable in modular increments. MBR facilities can typically produce recycled water that meets Title 22 standards for unrestricted use.

The conceptual MBR facility design assumes that ammonia-nitrogen would be removed through a nitrification/denitrification process. Nitrification biologically converts ammonia-nitrogen into nitrite and then nitrate within the MBR system's aerobic basins. Blowers aerate these basins, maintaining appropriate dissolved oxygen concentrations.

Denitrification converts nitrate to inert nitrogen gas in an anoxic (non-oxygenated) microbial process that requires a carbonaceous energy source. Denitrification would occur in the anoxic MBR system's anoxic basin by combining the recirculation from the MBR aerobic basins with the influent wastewater, which provides a carbonaceous energy source. A supplemental energy source, such as methanol, may also be added if needed.

Following nitrification/denitrification, the wastewater would be filtered through the MBR ultrafiltration membrane assemblies. The remaining biological solids would be separated by drawing the treated water through the ultrafiltration membranes by a mild vacuum induced by rotary-lobe blowers. Excess biological material suspended in liquid, called "waste activated sludge" or "WAS," would exit the MBR tank and be routed to the solids handling facilities.

At buildout, each WWTF would include an appropriate number of MBR modules to process peak month flowrates. The conceptual facility design assumes that the MBR modules would have

[12] For 1.0 mgd ADWF, the design peak day flow is 1.5 mgd based on the peaking factor listed in Table 5. Storage volume of 20% of the 1.5 mgd peak day flow is equivalent to 300,000 gallons.

capacities of 0.5 mgd at the new Grapevine Project WWTF and the Scalping WWTF and 0.22 at the Area 6 WWTF. For example, at full build-out the Grapevine Project WWTF would have a projected peak month flowrate of 2.9 MGD. As a result, the conceptual facility design assumes that the Grapevine Project WWTF includes six online 0.5 MGD MBR modules with a total capacity of 3.0 MGD.[13]

6.2.5 Disinfection

Wastewater disinfection is commonly achieved by chlorination or by UV light:

- Chlorination involves sending the MBR effluent through a chamber where chlorine is added at an appropriate concentration and remains in contact for a designated time. Chlorine is often added in the form of liquid sodium hypochlorite.

- The UV disinfection process uses UV light to inactivate microorganisms. Unlike chlorination, UV disinfection does not add any treatment agents or dissolved solids to the effluent and can be accomplished within a smaller physical volume, plus it does not produce undesirable disinfection byproducts. UV disinfection by itself does not provide residual disinfection within the recycled water distribution system, such that secondary disinfection would be needed. The electrical power required is greater for UV than for chlorine disinfection, as electricity powers the UV lamps.

Disinfection would be designed to meet CCR Title 22, Section 60301.230 requirements for recycled water suitable for unrestricted use. The conceptual project design assumes UV disinfection as the primary disinfection process.

Secondary disinfection via chlorination would also be implemented to provide a residual disinfectant level throughout the recycled water distribution to retard regrowth of microorganisms.

6.2.6 Recycled Water Pump Stations

Recycled water would be pumped from the WWTFs to storage facilities, discussed in Section 7.2, to meet project needs. Vertical turbine pumps with variable frequency drives would draw treated recycled water from below-grade concrete wet wells at the WWTFs to provide the pressurization needed for distribution and sprinkling.

[13] As described in Section 5.2, future environmental impact review and analysis would be conducted if the uses associated with the contingency generate more wastewater than assumed, requiring material expansion of the project WWTFs, or if significant additional land or more intensive irrigation is needed to dispose of the resulting additional recycled water.

6.2.7 Biosolids Handling and Disposal

The WAS (waste activated sludge) generated by a MBR process is typically digested, dewatered, and dried before disposal. The MBR process generally produces WAS at a flowrate of approximately 2% of the total influent flow, with a 1% solids concentration.

The WWTF solids handling facilities would stabilize, concentrate, and dry the WAS prior to disposal with the objective of meeting Class B biosolids agricultural soil amendment standards as defined in 40 CFR Parts 501 and 503. Production of Class A biosolids may also be an option, which would minimize the land application and disposal requirements compared to Class B biosolids. The conceptual facility design includes solids handling facilities at the Grapevine Project WWTF and the Area 6 WWTF. The WAS generated at the Scalping WWTF, if constructed, would be directed back to the raw wastewater collection system for treatment at the Grapevine Project WWTF. Biosolids disposal would comply with Kern County, state, and federal requirements.

As shown preliminarily on Figure 7, WAS biosolids would be managed in three steps:

- First, aerobic digesters would stabilize and thicken the WAS, oxidize organic matter, and reduce pathogens. Periodically, the biosolids would be allowed to settle, with the clarified supernatant decanted to increase the solids content in the digester. The supernatant would be returned to the MBR system aeration basin.

- Second, digested biosolids would be pumped to a screw press, chemically conditioned with a polymer, and fed through the press by a rotating screw. Water would drain through perforated screens surrounding the screw as sludge is conveyed through the press. The product from the screw press is a sludge cake that is typically 14% to 25% solids. The drained filtrate would be returned to the MBR system aeration basin.

- In the third step, the sludge cake would be dewatered further using sludge drying beds, heat drying, or active solar dryers. It is assumed that active solar dryers, which typically require less land area than sludge drying beds and lesser energy inputs, would be used for final drying of the biosolids.

Active solar dryers are steel structures with transparent polycarbonate cellular sheets for the walls. Acting similarly to a greenhouse, the active solar dryer maintains a warm environment to promote sludge digestion and drying. Solar dryers often use a mechanical rototill called a “mole” to turn over the sludge to facilitate drying. The active solar dryers are roofed to protect the sludge cake from rain.

Consistent with applicable federal, state, and local regulations discussed above in Section 3.0, biosolids may be applied at agronomical rates to land within the project area or transported for disposal to a licensed solid waste facility.

6.2.8 Emergency Storage Basins

Title 22 CCR, Section 60341 requires that wastewater facilities provide either (1) short-term emergency wastewater retention, under the assumption that all equipment can be replaced within 24 hours, or (2) long-term retention, for 20 days, to allow for extended treatment system outages. The short-term retention option, which requires that backup equipment be pre-located within or near the WWTF, is not commonly implemented except for small facilities.

The conceptual facility design assumes that long-term (20-day) raw wastewater retention would be put in place to meet emergency storage requirements. Emergency storage capacity would be located at the new Grapevine Project WWTF for planning areas south of the Aqueduct and at the Area 6 WWTF for the planning areas north of the Aqueduct. Figure 9 shows the locations of emergency storage ponds in the conceptual WWTF layouts.

Under applicable regulations, the 20-day emergency storage requirement applies to the treatment capacity of any discrete treatment modules or subunits in a WWTF. As shown in Table 5, the Grapevine Project WWTF would include multiple, independent 0.5 MGD treatment modules or trains. The emergency storage requirement would thus be the 0.5 mgd modular capacity multiplied by 20 days, equivalent to an emergency storage capacity of 10 million gallons. Emergency raw wastewater storage at the Grapevine Project WWTF would also serve the Scalping WWTF, which would have the same treatment module size of 0.5 mgd, if constructed.

The Area 6 WWTF would require 4.4 million gallons of emergency storage, calculated as 20 days storage at the 0.22 MGD per-module design flowrate. The conceptual design assumes lined basins would be built to meet these requirements.

6.2.9 Laboratory, Administration, and Maintenance Buildings

Each project WWTF would require support buildings to house the staff, laboratory, and maintenance facilities. One building can house administration functions, including the control room, locker rooms, offices, and a break room, as well as a laboratory to monitor WWTF operations. A maintenance building would store tools and equipment and have space for minor vehicle and equipment repairs. The conceptual design assumes that all administrative and maintenance functions for the project WWTFs would be located at the Grapevine Project WWTF, with smaller support buildings at the other WWTFs.

6.2.10 Potential Application of Conventional Wastewater Treatment Technology

Several existing "conventional" wastewater treatment technologies can also meet applicable water quality standards for unrestricted recycled water use. One option other than MBR technology is to implement conventional treatment steps to produce recycled water. Such a conventional treatment approach could be implemented in lieu of MBR at one or more of the new project WWTFs.

In a typical conventional treatment approach, the first step would be primary treatment to remove most of the suspended solids and a portion of the organic matter through screening or sedimentation. The second step, secondary treatment, reduces suspended solids and biodegradable organic concentrations through biological treatment by activated sludge or aerated biotowers, or through lagoon systems followed by sedimentation.

The final step, tertiary treatment, often includes filtration to remove suspended particulates followed by disinfection with either chlorine or ultraviolet (UV) light. Removal of nitrogen and phosphorous can also be accomplished if needed to meet discharge standards and limit biological regrowth within the recycled water distribution system.

Biosolids handling would include anaerobic or aerobic digestion, dewatering, drying, and disposal via transport to an appropriate landfill or application to land as a soil amendment.

Another potential application of conventional wastewater treatment technologies is as follows. As discussed above in Section 4.3, during the early development phases in the southern project area, wastewater flows would be small, suggesting that a smaller-scale facility employing conventional treatment technologies could provide adequate treatment for some time. Under the potential approach summarized on Figure 6, mechanically-aerated or facultative ponds would be constructed at the new Grapevine Project WWTF location. These lined ponds would be mechanically aerated or would act as facultative treatment ponds. The pond outflow would be filtered, denitrified if necessary, and disinfected to meet Title 22 recycled water requirements. As wastewater flows increase during project development, these ponds could be converted to emergency raw wastewater storage ponds, with wastewater treatment needs taken over by new MBR or conventional treatment equipment.

6.3 Site Work

Figure 9 illustrates conceptual layouts for the Grapevine Project, Scalping, and Area 6 WWTFs.

The new Grapevine Project WWTF would occupy approximately 20 acres, constructed where shown on Figure 4 to enable a buffer of approximately 600 feet between the WWTF and the California Aqueduct.

The conceptual layout of the Scalping WWTF, if built, would cover about 2 acres located where shown on Figure 4. The Area 6 WWTF[14], located either in the existing TCWD West WWTF footprint or adjacent to the existing TCWD East WWTF, would occupy approximately 8 acres.[15] Facilities would be visually compatible with nearby buildings.

Recycled water storage ponds and distribution pump stations, discussed in Section 8.0, would be distributed throughout the site and are not included in the conceptual WWTF layouts. The required recycled water storage volume and land requirements are discussed in Section 8.2.2.

6.4 Wastewater Facility Chemical and Energy Use and Biosolids Production

6.4.1 Chemical, Electrical, and Natural Gas Consumption

Chemicals anticipated for WWTF operations are compiled in Table 6. Chemicals would be delivered about every two weeks to two months.

Table 7 estimates electricity and natural gas use for each WWTF. Natural gas would be used for building hot water heating and space heating. Table 7 estimates energy consumption for the wastewater collection, treatment, and recycled water distribution systems.

6.4.2 Biosolids Production

This report assume that 2% of the influent flow would be generated from the MBR system as WAS, equivalent to 20,000 gallons per day (gpd) per 1.0 mgd of influent flow. Based on comparable projects, the conceptual facility design assumes a mixed liquor suspended solids concentration of 12,000 mg/L for the MBR aerobic basin's activated sludge and a 75% solids concentration in the dried biosolids produced by the active solar dryers. On this basis, approximately 1.3 tons of Class B biosolids would be produced daily per 1.0 mgd treated, or about 3.5 tons per day at full buildout.

[14] The acreage listed for the Area 6 WWTF represents the area required for treating Planning Areas 6a through 6e wastewater flows and does not include the acreage of existing TCWD facilities.

[15] Additional analysis would be conducted if significant expansion of the wastewater treatment facilities would be needed to treat the increased wastewater volume due to unanticipated uses of the contingency.

7.0 DESCRIPTION OF WASTEWATER COLLECTION SYSTEM

This section describes the project's wastewater collection system, shown schematically on Figure 5.

7.1 Collection System

The collection system would convey wastewater to the WWTFs mainly via gravity sewers designed for peak flows in accordance with the Kern County Development Standards and Ordinance Code. Sewers would be constructed within the project's streets with appropriate clearance from other utilities. Manholes would be placed at sewer main intersections and other appropriate locations as required by county standards. The conceptual-level collection system framework is shown on Figure 10.

7.2 Wastewater Pump Stations and Force Mains

Gravity sewers would be supplemented by wastewater pump stations and force mains. Wastewater pump stations could be appropriate where the fall in elevation is insufficient to allow gravity flow or where gravity mains would need to be constructed at impracticably great depths to maintain gravity flow. Pump stations would be designed for peak flow conditions, using submersible centrifugal sewage pumps installed within a wet well. The pumps would convey the wastewater in a pressurized force main to a downstream gravity sewer line or directly to the WWTF.

If the project constructs a single, consolidated wastewater collection system in lieu of separate north and south collection system, as discussed in Section 4.3, a force main would be constructed over or under the California Aqueduct to connect the service areas on either side of the Aqueduct.

7.3 Site Work

The wastewater collection system would largely be constructed within the project's streets as shown on Figure 10. Where crossings under I-5 or the California Aqueduct are needed, the sewer would be installed by trenchless construction methods and contained within a casing pipe in accordance with California Department of Transportation and California Department of Water Resources requirements, respectively.

7.4 Electrical Consumption

Table 7 estimates electricity use by the wastewater collection, treatment, and recycled water systems. To estimate power consumption for wastewater collection, we conservatively assumed that approximately 50% of the total project wastewater ADWF of 2.7 MGD would be pumped at an average total dynamic head of 200 feet of water.

8.0 DESCRIPTION OF RECYCLED WATER USE AND FACILITIES

This section describes the project's tertiary-treated recycled water distribution system and recycled water use. The recycled water distribution system is shown schematically on Figure 5 and Figure 11.

8.1 Recycled Water Use

Tertiary treated recycled water would furnish non-potable water needs in compliance with the project WDRs. Application of recycled water for irrigation purposes would not exceed reasonable agronomic demand. Recycled water would be supplemented as needed with filtered, non-potable Nickel Water to meet demands (EKI 2015a).

8.2 Recycled Water Facilities

8.2.1 Distribution System

Recycled water from the WWTFs would be distributed within a separate piping system for use throughout the site. Piping would be polyvinyl chloride (PVC) or high-density polyethylene (HDPE) or similar non-corroding material, colored purple to help prevent cross-connections. All pipelines would be installed with appropriate clearance from other utilities. The conceptual-level distribution system framework is shown on Figure 10.

8.2.2 Storage Ponds

Storage ponds for recycled water would be located at several project site locations. The storage ponds would be necessary in most years to store recycled water during the rainy season, when less recycled water would be needed.

Regulations require that storage ponds provide adequate storage capacity during a high-rainfall year with 100-year return frequency, plus two feet of freeboard. Table 8 presents a preliminary water balance developed to estimate the recycled water storage volume required during a 100-year rainfall year for managing the anticipated total recycled water flow at buildout. This balance further assumes no loss of recycled water during collection, treatment, and distribution in order to conservatively size the recycled water storage ponds. The conservative storage sizing approach of Table 8 is different from that used in the Grapevine Project water demand report (EKI 2015a), which incorporates losses and assumes an average year rainfall, and not a high-rainfall year, to conservatively estimate recycled water availability in average rainfall years.

As shown in Table 8, the total estimated recycled water storage volume is approximately 950 acre-feet, requiring approximately 76 acres of ponds at an assumed maximum water depth of 12.5 feet, not counting the two feet of freeboard. The total storage volume would likely be distributed in several ponds throughout the project site. As discussed below in Section 8.2.5, a total land area of approximately twice the pond surface area, or about 160 acres, would be required to accommodate the storage ponds, sloped berms, distribution pump stations, access roads, fencing, and related infrastructure.

Table 8 also demonstrates that during the 100-year rainfall-year a volume of recycled water remains in storage at the end of the year without additional demands for recycled water. During wet years excess recycled water would be used for crop irrigation or other non-potable uses, the location of which will be identified during the tentative map phase.

8.2.3 Distribution System Pump Stations

Pumping stations would deliver water from the storage ponds and boost system pressure for distribution to higher elevations. A typical recycled water distribution system is shown schematically on Figure 11.

8.2.4 Disinfection Booster Station and Disc Filters

Disinfection booster stations located at the storage ponds would maintain residual disinfectant concentrations to retard regrowth of microorganisms in the recycled water storage and distribution system. Disinfectant would be added as needed to recycled water as it is pumped into or out from each storage pond. It is assumed that sodium hypochlorite would be applied as the disinfectant to maintain a chlorine residual in the distribution system on the order of 1 to 3 mg/L[16], consistent with current guidance documents (WateReuse 2010).

Irrigation disc filters would also be included at the storage ponds to remove any sediment or debris from the recycled water before it reenters the distribution system.

8.2.5 Site Work

The recycled water distribution system conveyance pipes would typically be constructed within road rights-of-way as shown on Figure 10. Where recycled water pipeline crossings under I-5 are required, the pipe would be installed by trenchless construction methods in accordance with California Department of Transportation standards.

We assume that recycled water pipeline crossings over or under the California Aqueduct would be acceptable and suitable to obtain necessary permits and encroachments. Buried crossings would

[16] The sodium hypochlorite dose necessary to maintain this chlorine residual will increase TDS in the recycled water by approximately 1%, given that the recycled water has been denitrified and filtered.

be accomplished using horizontal directional drilling or other trenchless techniques. Such crossings could be needed to enable the recycled water supply to be balanced with project site demands, which in some cases could be situated on the opposite side of the Aqueduct.

8.2.6 Electrical Consumption

Table 7 estimates electricity use for the recycled water distribution system. To estimate power consumption for recycled water pumping, we conservatively assumed that the total recycled water volume would equal the total project wastewater ADWF of 2.7 MGD and would be pressurized to an average total dynamic head of 275 feet.

9.0 ANTIDEGRADATION ANALYSIS

As discussed in Section 3.2.2, the SWRCB Antidegradation Policy requires that high quality waters of the California be maintained “consistent with the maximum benefit to the people of the State.” Resolution No. 68-16 prohibits degradation of groundwater by waste discharges unless it has been shown that:

- The degradation does not result in water quality poorer than that prescribed in state and regional policies, including violation of one or more water quality objectives;
- The degradation will not unreasonably affect present and anticipated future beneficial uses;
- The discharger employs BPTC (Best Practicable Treatment or Control) to mitigate degradation; and
- The degradation is consistent with the maximum benefit to the people of California.

9.1 Basin Plan, Beneficial Uses, and Water Quality Objectives

The Basin Plan designates beneficial uses and establishes narrative and numerical water quality objectives for all waters of the Basin. The WWTFs and the recycled water use areas are in Detailed Analysis Units (DAUs) No. 258 and No. 261, within the Kern County Basin hydrologic unit. The Basin Plan identifies the beneficial uses of groundwater in both DAUs as municipal and domestic supply, agricultural supply, and industrial service supply. The Basin Plan also identifies DAU No. 258 as having industrial process supply beneficial uses.

The Basin Plan requires that analyte concentrations in waters designated as domestic or municipal supply comply with the maximum contaminant levels (MCLs) specified in CCR Title 22. The Basin Plan also establishes narrative water quality objectives for chemical constituents, taste and odors, and toxicity, and includes salt management requirements. Salt management requirements are described above in Section 5.4.2.

9.2 Antidegradation Analysis

Salts and nutrients are the constituents of concern in project WWTF effluent that have the potential to degrade groundwater quality. At the same time, application of the treated effluent generated at the Grapevine Project WWTFs for WDR-compliant uses such as non-residential irrigation would not unreasonably affect present and anticipated future beneficial uses of groundwater, for these reasons:

a. For salts, as described above in Section 5.4.2, the Basin Plan specifies that the incremental EC of a discharge cannot exceed the EC of the source water plus 500 μmhos/cm. The Basin Plan considers groundwater in the White Wolf Subarea of the Tulare Lake Basin to be Class II irrigation waters, and discharges to the White Wolf Subarea cannot exceed an EC limit of 2,000 μmhos/cm (see Section 5.4.2).

   The measured maximum EC of source water was 630 μmhos/cm between 2010 and 2013 (EKI 2015b). Based on the assumption that the EC addition from domestic use is 500 μmhos/cm or less (see Section 5.3), the EC in WWTF effluent would be no higher than 1,130 μmhos/cm, which meets both the Basin Plan limit for EC of source water plus 500 μmhos/cm and the Basin Plan discharge limit for EC of 2,000 μmhos/cm in the White Wolf Subarea. Underlying groundwater has an EC that ranges from 1,500 μmhos/cm to 2,300 μmhos/cm. Therefore, the EC of the WWTF effluent would meet the water quality objectives for the White Wolf Subarea and the EC of underlying groundwater.

b. Nitrogenous nutrients in water can be assessed as total nitrogen, which can be defined as the sum of nitrate, nitrite, organic nitrogen, and ammonium (all expressed as nitrogen). The project WWTFs would be designed to remove total nitrogen to an effluent limit of 10 mg/L or less. Irrigation with recycled water produced by the project WWTFs that applies residual total nitrogen at agronomic rates would reduce the likelihood of groundwater impacts by applied nitrogen.

c. Monitoring specified by WDRs would verify that recycled water use does not violate water quality objectives or impair beneficial uses.

As described above in Section 3.2.3, the SWRCB concludes in its General WDRs that recycled water used for irrigation and applied at agronomic rates complies with the Antidegradation Policy. The General WDRs find that use of recycled water in place of raw or potable water supplies for non-potable uses such as irrigation improves water supply availability and helps allocate higher quality water for human uses and for fish and wildlife. The SWRCB establishes that the limited degradation of groundwater that may occur due to recycling is in accord with the principle of providing maximum benefit to the people of California.

With respect to the Grapevine Project, it is anticipated that approximately 8,700 new jobs (Stanley R. Homan Assoc. 2015) and 12,000 new housing units would be created at full project buildout. The project would also support the local economy by purchasing construction materials from local merchants and by hiring local contractors. As such, the economic benefits associated with the development of the Grapevine Project, and the associated use of recycled water, is of maximum benefit to the people of California, provided water quality objectives are met and beneficial uses are preserved.

9.3 Treatment and Control Practices

The project WWTFs would provide treatment and control of the wastewater effluent discharge that features the following:

- Nitrate reduction to less than the MCL of 10 mg/L (as nitrogen);
- Total coliform treatment at most times to less than 2.2 most probable number per 100 mL;
- UV disinfection;
- Application of recycled water at rates that would not exceed agronomic demand in areas where recycled water would be used for irrigation;
- Sludge handling and hauling off-site or use as soil amendment onsite;
- Certified operators experienced with operation and maintenance;
- Source water and discharge monitoring; and
- Salinity control.

Employment of these measures represents Best Practicable Treatment or Control.

10.0 OFFSITE AND CUMULATIVE IMPACTS

This section describes the offsite and cumulative impacts of the project as they relate to wastewater treatment.

10.1 Offsite Impacts

The offsite land uses that have been identified for this project include:

- Connector and Haul Roads
- California Highway Patrol Weigh Station
- California Aqueduct Turnouts
- Expansion of the TRCC East or West Wastewater Treatment Plants
- Interchange (over I-5)

The only offsite land uses related to wastewater treatment are the interim use of TRCC East WWTF and the potential expansion of the TRCC East WWTF or replacement of the TRCC West WWTF to treat all project wastewater flows generated in Planning Areas 6a through 6e north of the California Aqueduct. Potential impacts from interim use and expansion or replacement of existing WWTFs are discussed in Section 4.3 and Section 6.2.

10.2 Cumulative Impacts

10.2.1 North of the California Aqueduct.

Wastewater generated in project areas 6a through 6e would be conveyed to a new or expanded wastewater treatment facility (i.e., the "Area 6 WWTF") located near or adjacent to either: (1) the TCWD East WWTF, (2) the TCWD West WWTF, or (3) a combination of these two existing facilities that currently serve the TRCC.

Based on preliminary discussions with TCWD, the project may be able to use all or a portion of the planned and permitted expanded capacity of the TCWD East WWTF on an interim basis during early phases of development. Once capacity within the TCWD East WWTF location reaches 75%, the project could construct the Area 6 WWTF adjacent to or near the existing TCWD East WWTF footprint or within or near the existing TCWD West WWTF footprint to serve Planning Areas 6a through 6e.

10.2.2 South of the California Aqueduct.

As a beneficial project impact, the existing Grapevine WWTF and its unlined wastewater ponds (discussed in Section 4.1) would be decommissioned during project development. The project would construct new facilities for collecting and treating all project wastewater generated south of the Aqueduct. Since new facilities would be constructed solely for use by the project, no other cumulative impacts related to wastewater treatment are noted in this report.

11.0 MITIGATION MEASURES

Mitigation measures are steps taken to reduce an environmental impact caused by the project. Impacts due to land use and facility emissions of greenhouse gas and other air pollutants are being mitigated on a project-wide basis and are not addressed in this report. Facility operations, including plant maintenance and chemical handling, would be performed in general accordance with applicable laws and regulations, and therefore do not require mitigation. Implementation of the following mitigation measures would promote wastewater treatment capacity sufficient to meet the wastewater production and recycled water demands of specific development projects proposed within the project, and promote facility management to reduce the environmental impact.

- **Mitigation Measure #1: Wastewater Service Agreement.** Prior to approval of each tentative tract map or development of any commercial or industrial site, the applicant will provide a will-serve letter for wastewater service from the TCWD, which will operate the project WWTFs.

- **Mitigation Measure #2**: **Treatment of Contingency.** An independent environmental impact review and analysis would be conducted if significant expansion of a project WWTF is needed to treat additional wastewater associated with greater use than assumed of the demand contingency.

- **Mitigation Measure #3: Biosolids Disposal and Handling**. Prior to issuance of building permits for the first residence or for commercial or industrial development, the applicant will provide written verification of an agreement with the TCWD for the method of managing and disposing of the project-generated biosolids.

- **Mitigation Measure #4: Wastewater Pretreatment Program.** Prior to issuance of building permits for commercial or industrial development, the applicant will provide written verification of an agreement with the TCWD for a pretreatment program that establishes wastewater pretreatment standards for commercial and industrial properties under Code of Federal Regulations Title 40, Part 403.

- **Mitigation Measure #5: Vector Control.** The wastewater treatment facility operator will implement appropriate Best Management Practices (BMPs) for control of vectors such as mosquitos, rodents, and flies at the WWTFs and recycled water storage ponds.

  The BMPs will include:
  - Elimination of stagnant water;
  - Removal of emergent vegetation from edges of recycled water ponds;
  - Promotion of circulation within all recycled water ponds; and
  - Adequate stabilization of biosolids.

- **Mitigation Measure #6: Best Practicable Treatment or Control (BPTC).** The wastewater treatment facility operator will ensure that the Grapevine Project wastewater treatment facilities employ BPTCs to control degradation of groundwater. BPTCs would include nitrate reduction, UV disinfection to Title 22 standards, application of recycled water at rates not in excess of reasonable agronomic demand in areas where the project uses recycled water for non-residential irrigation, sludge handing and hauling off-site, certified operators, source water and discharge monitoring, and salinity management.

- **Mitigation Measure #7: Salinity Education and Management Program.** Prior to issuance of building permits for the first residence or for commercial or industrial development, the applicant will provide written verification of an agreement with the TCWD to implement a salinity education and management program discouraging or prohibiting the use of products that may increase salinity in wastewater, such as self-regenerative water softeners and high-salts-containing cleaning products.

- **Mitigation Measure #8: Odor Control.** Prior to issuance of building permits for the first residence or for commercial or industrial development, the applicant will provide written verification of an agreement with the TCWD for the method of odor control at the wastewater treatment facilities.

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Table 1
Recycled Water and Wastewater Treatment Statutes and Regulations
Grapevine Project, Kern County, California

Regulation	Citation	Description	Implementing Agency	Applicability to Project
Federal Regulations				
Clean Water Act				
Regulations pertaining to the National Pollutant Discharge Elimination System	40 CFR Parts 122 - 125; 40 CFR Parts 129 - 136	• Defines regulations pertaining to the National Pollutant Discharge Elimination System ("NPDES") • Establishes effluent and water quality standards	SWRCB/ RWQCB	• Not applicable to discharge standards for the Grapevine Project wastewater treatment facility because only pertains to surface water discharges and not to discharge by land application.
General Provisions and General Pretreatment	40 CFR Parts 401 and 403	• Describe requirements for controlling pollutants entering publicly owned treatment works that could interfere with operation, treatment, or sludge disposal	SWRCB/ RWQCB	• Applicable to the Grapevine Project wastewater treatment facility operations • Requirements will be incorporated by reference into WDRs
Regulations pertaining to biosolids	40 CFR Parts 501 and 503	• Describes sludge management programs for states • Sets requirements for the disposal or use of biosolids	SWRCB/ RWQCB	• Applicable to disposal of biosolids from the Grapevine Project wastewater treatment facility • Requirements will be incorporated by reference into WDRs
California Statutes and Regulations				
Porter-Cologne Act				
Waste Discharge Requirements	California Water Code Section 13000 et seq.	• Regulates land disposal of treated effluent • Sets limits on effluent quality and quantity • Establishes monitoring and reporting program • Regulates operation and future modifications	RWQCB	• Applicable to Grapevine Project wastewater treatment facilities operation and discharge standards
Basin Plan	Water Quality Control Plan for the Tulare Lake Basin	• Establishes overall management guidelines for groundwater and surface water in the Tulare Lake Basin	RWQCB	• Applicable to the Grapevine Project wastewater treatment facility effluent quality for reuse as irrigation water • Requirements will be incorporated into WDRs
Antidegradation Policy				
Antidegradation Policy	SWRCB Resolution No. 68-16	• Protects water bodies where existing quality is higher than necessary for the protection of beneficial uses • Requires preparation of an antidegradation analysis for wastewater discharges	RWQCB	• Applicable to the permitting for the Grapevine Project wastewater treatment facilities
California Recycled Water-Related Statues, Regulations, Policies, and General Permit				
Water Recycling Law	California Water Code Section 13500 et seq.	• Establishes statewide goal to encourage use of recycled water • Directs SWRCB to develop water-recycling criteria	SWRCB/ RWQCB	• Applicable to recycled water use at the Grapevine Project
Environmental Health - Drinking Water	HSC 116551	• Mandates that recycled water cannot be used directly as a drinking water supply	SWRCB	• Applicable to recycled water use at the Grapevine Project
Environmental Health - Water Recycling Criteria	22 CCR § 60001 - 60357	• Regulations related to production and use of recycled water	SWRCB/ RWQCB	• Applicable to treatment standards for the Grapevine Project wastewater treatment facilities
Public Health, Sanitation - Drinking Water Supplies	17 CCR § 7583 - 7630	• Regulations pertaining to backflow prevention requirements for public water supplies	SWRCB/ RWQCB	• Applicable to backflow prevention for the potable water system • Requirements will be incorporated by reference into WDRs
In Support of Regionalization, Reclamation, Recycling and Conservation for Wastewater Treatment Plants	RWQCB Resolution No. R5-2009-0028	• Policies promoting water recycling, water conservation, and regionalization of wastewater treatment facilities • Requires dischargers to document efforts to expand water recycling, water conservation, and regional management.	RWQCB	• Applicable to the permitting for the Grapevine Project wastewater treatment facilities

Table 1
Recycled Water and Wastewater Treatment Statutes and Regulations
Grapevine Project, Kern County, California

Regulation	Citation	Description	Implementing Agency	Applicability to Project
California Statutes and Regulations (Continued)				
California Recycled Water-Related Statues, Regulations, Policies, and General Permit (Continued)				
Recycled Water Policy	SWRCB Resolutions and Nos. 2009-011 & 2013-003	• Policies promoting the increased use of recycled water from municipal wastewater sources • Provides permitting criteria intended to streamline recycled water project permitting process by RWQCB	SWRCB/ RWQCB	• Applicable to the permitting for the Grapevine Project wastewater treatment facilities
General WDRs for Recycled Water Use	SWRCB Water Quality Order 2014-0090	• General Permit for eligible wastewater treatment facilities that use recycled water in accordance with Title 22. • Issued by SWRCB to streamline recycled water permitting process	SWRCB	• Potentially applicable to the permitting for the Grapevine Project wastewater treatment facilities
Biosolids General Order				
Land Application of Biosolids	SWRCB Order No. 2004-10-DWQ	• General Order for land application of biosolids from Municipal Wastewater Treatment Plants, in compliance with 40 CFR Part 503.	RWQCB	• Applicable to criteria for the land application of biosolids • Requirements will be incorporated by reference into WDRs
California Clean Air Act, as amended				
Ambient Air Quality Requirements	SJVAPCD Regulations	• Requires permitting for wastewater treatment facilities, including analysis of air contaminant discharges	SJVAPCD	• Applicable to the Grapevine wastewater treatment facilities
Local Ordinances and Regulations				
Kern County General Plan				
Land use, Open Space, and Conservation Element	General Plan, Chapter 1	• Policies related to sewers, wastewater treatment facilities, and recycled water distribution	Kern County	• Applicable to the Grapevine Project's wastewater and recycled water facilities
Kern County Development Standards				
Standards and Rules and Regulations for Land Development	Standards and Rules and Regulations for Land Development – Sewage Disposal, Water Supply, and Preservation of Environmental Health	• Standards for sewage disposal for new development • Requires KCEHSD review of land uses for proposed sewage disposal systems	KCEHSD	• Applicable to the Grapevine Project's wastewater and recycled water facilities
Kern County Ordinance Code				
Biosolids Rule	Title 8.05	• Prohibits the application of biosolids in unincorporated areas within Kern County	Kern County	• Potentially applicable to the criteria for land application of biosolids
Utilities	Title 14	• Regulations related to wastewater collection systems	Kern County	• Applicable to the criteria for the wastewater collection system

Abbreviations:
CCR: California Code of Regulations
CFR: Code of Federal Regulations
DPH: California Department of Public Health
HSC: California Health and Safety Code
KCEHSD: Kern County Environmental Health Services Department
NPDES: National Pollutant Discharge Elimination System
RWQCB: Regional Water Quality Control Board, Central Valley Region
SJVAPCD: San Joaquin Valley Unified Air Pollution Control District
SWRCB: State Water Resources Control Board
WDR: Waste Discharge Requirements

Table 2
Wastewater Influent Flow Peaking Factors
Grapevine Project, Kern County, California

Flow Ratio	Assumed Peaking Factor
Peak Month/ADWF	1.3
Peak Day/ADWF	1.5
Peak Hour/ADWF	2.5

Abbreviations
ADWF: average dry weather flow

Table 3
Projected Wastewater Influent Flows and Loadings
Grapevine Project, Kern County, California

Parameter	Planning Areas 1-5b		Planning Areas 6a-6e
	Grapevine Project WWTF (a)	Scalping WWTF (a,b)	Area 6 WWTF (c)
Flows (MGD)			
ADWF (d)	2.20	0.50	0.50
Peak Month	2.90	0.50	0.65
Peak Day	3.30	0.50	0.75
Peak Hour	5.50	0.50	1.25
Average Constituent Influent Concentration (mg/L) (e)			
BOD	350	350	350
TSS	350	350	350
TKN	70	70	70
TDS	625	625	625
Average Constituent Load (lb/day) (f)			
BOD	6,400	1,500	1,500
TSS	6,400	1,500	1,500
TKN	1,300	300	300
TDS	11,500	2,600	2,600
Peak Month Constituent Load (lb/day) (f)			
BOD	8,500	1,500	1,900
TSS	8,500	1,500	1,900
TKN	1,700	300	400
TDS	15,100	2,600	3,400
Peak Day Constituent Load (lb/day) (f)			
BOD	9,600	1,500	2,200
TSS	9,600	1,500	2,200
TKN	1,900	300	400
TDS	17,200	2,600	3,900

Notes

(a) Flows and loads listed for the Grapevine Project WWTF are the total of those generated in Planning Areas 1-5b. Flows listed for the potential Scalping WWTF are based on the average annual recycled water demand for the Scalping WWTF service area. When the Scalping WWTF is operating, the flows and loads to the Grapevine Project WWTF would be reduced by those treated at the Scalping WWTF, and WAS generated at the Scalping WWTF (approximately 2% of the influent flow to the Scalping WWTF) would be conveyed to the Grapevine Project WWTF.

(b) The potential Scalping WWTF would not capture peak flowrates above ADWF. When operating, flows above the ADWF would bypass the Scalping WWTF and be conveyed to the Grapevine Project WWTF.

(c) Flows and loads listed for the Area 6 WWTF, located near or adjacent to the existing TCWD East WWTF or TCWD West WWTF, are limited to those generated in Planning Areas 6a-6e and do not include flows and loads from TRCC.

(d) Except the potential Scalping WWTF, ADWF is based on the estimated indoor potable water demand (MGD) in each WTTF's service area plus 100% of the water demand contingency, distributed evenly between service areas, rounded to the nearest tenth of an MGD (EKI 2015a). Flows for the potential Scalping WWTF are described in notes a and b.

(e) Average constituent concentration based on anticipated wastewater characteristics and constituent concentrations from similar communities.

(f) Mass loading (lb/day) = Flowrate (MGD) x Constituent concentration (mg/L) x (8.34 [lb/Mg]/[mg/L]) rounded to the nearest 100.

Abbreviations

ADWF: average dry weather flow
BOD: 5-day biochemical oxygen demand
lb/day: pounds per day
mg/L: milligrams per liter
MGD: million gallons per day
TCWD: Tejon-Castac Water District
TDS: Total Dissolved Solids
TKN: Total Kjeldahl Nitrogen
TRCC: Tejon Ranch Commerce Center
TSS: Total Suspended Solids
WTP: Water Treatment Plant
WWTF: wastewater treatment facility

Table 4
Assumed Effluent Water Quality Goals
Grapevine Project, Kern County, California

Constituent	Units	Average or Median	Maximum or Range
Turbidity (a)	NTU	NA	- < 0.2 NTU 95% of time in 24 hour period - Always < 0.5 NTU
Total Coliform Bacteria (a)	MPN/100 ml	Running 7-day median < 2.2 MPN/100 ml	- Only once every 30 days > 23 MPN/100 ml - At all times < 240 MPN/100 ml
BOD (b)	mg/L	< 10 monthly	<20 daily
TSS (b)	mg/L	< 10 monthly	<20 daily
TKN (b)	mg/L	< 10 monthly	NA
EC [TDS] (b,c)	as noted	- The running 12-month average effluent EC should be less than or equal to the sum of the running 12-month average in the raw source plus 500 µmhos/cm. Also see Note (d). - < 2,000 µmhos/cm EC monthly	NA
Chlorides (b)	mg/L	NA	350
Boron (b)	mg/L	NA	2.0
pH (b)	-	NA	6.5 - 8.5

Notes

(a) Minimum water quality requirements for Disinfected Tertiary Recycled Water for unrestricted use per California Code of Regulations Title 22.

(b) Effluent limitations are assumed for Disinfected Tertiary Recycled Water for unrestricted use based on the Basin Plan and existing Waste Discharge Requirements for similar communities with residential, commercial, and light industrial land uses. See Section 3.4 of the text.

(c) The Grapevine Project would receive Nickel Water from the California Aqueduct. Average EC and TDS concentration measured in this source water were 459 µmhos/cm and 261 mg/L, respectively. The maximum EC and TDS concentrations measured during the same period were 632 µmhos/cm and 352 mg/L, respectively (EKI 2015b).

(d) An incremental additional EC of 500 µmhos/cm is roughly equivalent to adding 275 mg/L of fixed TDS.

Abbreviations

BOD: 5-day biochemical oxygen demand
EC: Electrical Conductivity
mg/L: milligrams per liter
MPN/100 ml: Most Probable Number per 100 milliliters
NA: Not Applicable
NTU: Nephelometric turbidity units
TDS: Total Dissolved Solids
TKN: Total Kjeldahl Nitrogen
TSS: Total Suspended Solids
µmhos/cm: micromhos per centimeter

Table 5
Wastewater Treatment Plant Conceptual Design Criteria
Grapevine Project, Kern County, California

Parameter	Planning Areas 1 through 5b		Planning Areas 6a-6e
	Grapevine Project WWTF (a)	Scalping WWTF (a)(b)	Area 6 WWTF (c)
Flows and Loadings (d)			
Flows (MGD)			
ADWF	2.20	0.50	0.50
Peak Month	2.90	0.50	0.65
Peak Day	3.30	0.50	0.75
Peak Hour	5.50	0.50	1.25
BOD Loading (lb/day)			
Average Day	6,400	1,500	1,500
Peak Month	8,500	1,500	1,900
TSS Loading (lb/day)			
Average Day	6,400	1,500	1,500
Peak Month	8,500	1,500	1,900
TKN Loading (lb/day)			
Average Day	1,300	300	300
Peak Month	1,700	300	400
Fixed TDS Loading (lb/day)			
Average Day	11,500	2,600	2,600
Peak Month	15,100	2,600	3,400
WAS Production (e)			
WAS Production at ADWF (gpd)	44,000	10,000	10,000
WAS Production at Peak Month (gpd)	58,000	10,000	13,000
Assumed Effluent Water Quality Goals (f)			
Headworks			
Flow Measurement			
Type	Parshall Flume or Magnetic Flow Meter	Parshall Flume or Magnetic Flow Meter	Parshall Flume or Magnetic Flow Meter
Coarse Screen			
Number	6	1	2
Screening Opening Size (mm)	6	6	6
Capacity Each (MGD)	1.40	1.00	1.25
Grit Chamber			
Number	4	1	1
Capacity Each (MGD)	1.40	1.00	1.25
Fine Screen			
Number	6	1	2
Screening Opening Size (mm)	2.0	2.0	2.0
Capacity Each (MGD)	0.75	0.50	0.65
Flow Equalization			
Active Volume (gal) (g)	660,000	(h)	150,000
Influent Pumping			
Type	Submersible Variable Frequency Drive	Submersible Variable Frequency Drive	Submersible Variable Frequency Drive
Number	6	1	2
Capacity Each (MGD) (Peak)	0.75	0.50	0.65
Total Dynamic Head (ft)	TBD	TBD	TBD
Individual Power (hp)	TBD	TBD	TBD

Table 5
Wastewater Treatment Plant Conceptual Design Criteria
Grapevine Project, Kern County, California

Parameter	Planning Areas 1 through 5b		Planning Areas 6a-6e
	Grapevine Project WWTF (a)	Scalping WWTF (a)(b)	Area 6 WWTF (c)
Membrane Bioreactor			
MBR Module Size (MGD)	0.50	0.50	0.22
MBR Aeration Basin with Anoxic Zone			
Number	6	1	3
Capacity Each (MGD)	0.50	0.50	0.22
MBR Filtration Basins			
Number	6	1	3
Capacity Each (MGD)	0.50	0.50	0.22
Ultraviolet Disinfection			
Type	Inline UV disinfection	Inline UV disinfection	Inline UV disinfection
Number of Channels	6	1	2
Capacity Each (MGD)	0.75	0.50	0.65
Recycled Water Pumping			
Number	TBD	TBD	TBD
Individual Capacity (gpm)	TBD	TBD	TBD
Individual Power (hp)	TBD	TBD	TBD
Solids Storage and Dewatering			
Aerobic Digester			
Number of Units	2	(i)	2
Capacity Each (gpd)	30,000	(i)	6,500
Solids Dewatering			
Type	Screw Press	(i)	Screw press
Number of Units	2	(i)	2
Capacity Each (gpd)	9,000	(i)	1,950
Solids Conveyance			
Type	Screw Pump	(i)	Screw Pump
Active Solar Dryers			
Number	TBD	(i)	TBD
Diameter (ft)	TBD	(i)	TBD
Total Depth (ft)	TBD	(i)	TBD
Volume (gal)	TBD	(i)	TBD
Emergency Storage/Stormwater Detention			
Volume (MG) (j)(k)	10.0	(j)	4.4

Table 5
Wastewater Treatment Plant Conceptual Design Criteria
Grapevine Project, Kern County, California

Notes

(a) The Grapevine Project WWTF is designed to capture and treat the total flows and loads generated in Planning Areas 1-5b. The potential Scalping WWTF is designed to treat a flow equivalent to the average annual recycled water demand for the Scalping WWTF service area. When the Scalping WWTF is operating, the flows and loads to the Grapevine Project WWTF would be reduced by those treated at the Scalping WWTF, and WAS generated at the Scalping WWTF would be conveyed to the Grapevine Project WWTF.
(b) Sizes of each component at the potential Scalping WWTF are all less than those at the Grapevine WWTF. Therefore, design criteria listed for the Scalping WWTF do not include any redundancy. When the Scalping WWTF requires service, the Scalping WWTF would go offline and all flows will be bypassed to the Grapevine Project WWTF.
(c) Design criteria listed for the Area 6 WWTF, which would consist of a new facility adjacent to the existing TCWD East WWTF or replacement of the existing TCWD West WWTF, are only for the facilities required to treat wastewater generated in Planning Areas 6a-6 and do not cover existing facilities or future facilities planned for the Tejon Ranch Commerce Center.
(d) From Table 3-2.
(e) WAS production is assumed to be 2% of the influent flow.
(f) See Table 3-3 for assumed effluent water quality goals.
(g) Flow equalization volume is assumed equivalent to 20% of peak daily flowrate.
(h) The potential Scalping WWTF would not be designed to capture and treat peak flows and therefore is not anticipated to include flow equalization. When the Scalping WWTF is operating, flows above the ADWF would bypass the Scalping WWTF and be conveyed to the Grapevine Project WWTF.
(i) The potential Scalping WWTF is not anticipated to include solids handling processes. All WAS produced at the Scalping WWTF is assumed to be conveyed to the Grapevine Project WWTF.
(j) Emergency storage at the Grapevine Project WWTF would serve both the Grapevine Project and Scalping WWTFs.
(g) The total volume of emergency storage is assumed to be equivalent to 20 days of wastewater flow through the largest single treatment unit in the MBR process (0.50 MGD for the Grapevine Project WWTF and Scaling WWTF and 0.22 MGD for the Area 6 WWTF).

Abbreviations

ADWF: average dry weather flow
BOD: 5-day biochemical oxygen demand
ft: feet
gal: gallons
gpd: gallons per day
gpm: gallons per minute
hp: horsepower
lb/day: pounds per day
lb: pound
m: meter
MBR: membrane bioreactor
MG: million gallons
MGD: million gallons per day
mg/L: milligrams per liter
mm: millimeter
TCWD: Tejon-Castac Water District
TDS: Total Dissolved Solids
TKN: Total Kjeldahl Nitrogen
TSS: Total Suspended Solids
TBD: To Be Determined
WAS: waste activated sludge
WWTF: wastewater treatment facility

Table 6
Summary of Potential Chemical Usage for the Wastewater Treatment Facilities
Grapevine Project, Kern County, California

WWTF Process	Product	Physical Form	Incompatible Products at WWTF	Environmental Health and Safety Concerns	Mitigation Measures	Comments
Denitrification	Acetate or similar electron donor	Aqueous solution	Strong oxidants Strong caustics	Flammable; Eye and skin irritant Inhalation hazard	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used as a bacterial food source for the denitrification process.
MBR	Citric Acid	Aqueous solution	Caustics	Flammable (dust form); Eye irritant.	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used to clean MBR membranes.
	Sodium Hypochlorite	Aqueous solution	Polymeric scale inhibitor Ammonia	Corrosive; Eye and skin irritant; Inhalation hazard	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used to clean MBR membranes. May also be used for disinfection of for biological process control.
	Sodium Hydroxide	Aqueous solution	Acids	Eye and skin irritant; Health hazard in concentrated form; Fumes from concentrated solutions; Hygroscopic.	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used for pH control.

Table 6
Summary of Potential Chemical Usage for the Wastewater Treatment Facilities
Grapevine Project, Kern County, California

WWTF Process	Product	Physical Form	Incompatible Products at WWTF	Environmental Health and Safety Concerns	Mitigation Measures	Comments
MBR (Continued)	Hydrochloric Acid	Aqueous solution	Hydroxides Bases	Corrosive; Eye and skin irritant; Health hazard in concentrated form; Inhalation hazard	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used to clean MBR membranes.
Disinfection	Sodium Hypochlorite	Aqueous solution	Polymeric scale inhibitor Ammonia	Corrosive; Eye and skin irritant; Inhalation hazard	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used for disinfection or for biological process control.
Solids dewatering	Polymer	Powder or liquid.	None	Slipping hazard.	Store in container with appropriate materials; Isolate from incompatible products in covered room or storage building;	Used to promote drying of wet sludge as part of screw press process.

Notes:
(a) Other substances may be used such as natural gas, liquid petroleum gas, fuels, oils, lubricants, hydraulic fluids, refrigerants, paints, protective coatings, solvents, coolants, antifreezes, deicers, pesticides, herbicides, laboratory reagents, and fire extinguishers.

Abbreviations
MBR: membrane bioreactor

TABLE 7
Preliminary Estimated Energy Consumption for Conceptual Wastewater and Recycled Water Facilities
Grapevine Project, Kern County, California

	Grapevine Project WWTF (a)	Scalping WWTF	Area 6 WWTF (b)	Total	Notes
Wastewater Treatment Electrical Energy Consumption					
ADWF (MGD):	2.2	0.5	0.5	--	
Estimated Electrical Power Consumption/Volume Wastewater Treated (kW-hr/MG)	8,000	8,000	8,000	--	(c)
Estimated Annual Electrical Energy Consumption (kW-hr/yr)	**6,400,000**	**1,500,000**	**1,500,000**	**9,400,000**	
Wastewater Treatment Natural Gas Consumption					
Estimated Heating Requirements/ADWF (Btu/yr/MGD)	140,000,000	140,000,000	140,000,000	--	(d)
Estimated Heating Requirements (Btu/yr):	**308,000,000**	**70,000,000**	**70,000,000**	--	
Assumed Natural Gas Heat Content (Btu/Mcf)	1,000,000	1,000,000	1,000,000	--	
Estimated Natural Gas Consumption (Mcf/yr)	**308**	**70**	**70**	**448**	
Wastewater Collection System Electrical Energy Consumption					
Assumed Pumped ADWF (MGD):	--	--	--	1.35	(e)
Assumed Average RW Distribution Pressure (ft of water)	--	--	--	200	
Assumed Combined RW Pump and Motor Net Efficiency (%)	--	--	--	50%	
Estimated Average RW Pumping Power (kW):	--	--	--	164	
Estimated Annual Electrical Energy Consumption (KW-hr/yr):	--	--	--	**1,440,000**	
Recycled Water Distribution Electrical Energy Consumption					
Assumed Total Average Daily RW Pumped Flow (MGD):	--	--	--	2.7	(f)
Assumed Average RW Distribution Pressure (ft of water)	--	--	--	275	
Assumed Combined RW Pump and Motor Net Efficiency (%)	--	--	--	60%	
Estimated Average RW Pumping Power (kW):	--	--	--	375	
Estimated Annual Electrical Energy Consumption (KW-hr/yr):	--	--	--	**3,300,000**	

Notes:
(a) Energy consumption shown for the Grapevine Project WWTF assumes that the potential Scalping WWTF is not operating and Grapevine Project treats all wastewater generated in Planning Areas 1-5b.
(b) Energy consumption shown for the Area 6 WWTF is limited to consumption associated with treating wastewater generated in Planning Areas 6a-6e and does not include energy consumption for the existing WWTFs.
(c) Based on plant-wide electrical use reported at similarly sized WWTFs that use a similar MBR treatment process (Tetra Tech, 2013).
(d) WWTF heating requirements per 1.0 ADWF were assumed to be approximately 6,000 Btu/hr throughout the year for water heating, plus 30,000 Btu/hr for four months during the winter. This is equivalent to an annual average heating demand of 16,000 Btu/hr, or 140 million Btu/MGD/yr.
(e) The ADWF of pumped wastewater was assumed to be approximately 50% of the total ADWF.
(f) The ADWF of pumped recycled water was assumed to be approximately 100% of the total ADWF.

TABLE 7
Preliminary Estimated Energy Consumption for Conceptual Wastewater and Recycled Water Facilities
Grapevine Project, Kern County, California

Abbreviations:
ADWF: average dry weather flow
Btu: British thermal unit
ft: feet
kW: kilowatt
kW-hr: kilowatt-hours
hr: hours
Mcf: thousand cubic feet
MGD: million gallons per day
MG: million gallons
WWTF: wastewater treatment facility
yr: year

References:
Santroch, J. & Vargas R. (Tetra Tech). 2012. "Energy Use at MBRs and Jefferson County's Port Hadlock MBR Treatment Plant" [PowerPoint presentation]. Tetra Tech. Presented at the Pacific Northwest Clean Water Association 2012 Annual Conference, 21-24 October 2012.

Table 8
Recycled Water Storage and Disposal Water Balance (100-Year Rainfall)
Grapevine Project, Kern County, California

POND STORAGE OCTOBER 1 (AF)	0	ASSUMED ACTIVE POND AREA (AC) (a)	76
POND PERCOLATION RATE (IN/DAY)	0	POND CATCHMENT AREA (AC)	76
		NON-POTABLE IRRIGATION AREA (AC) (b)	602
		CALC'D MAX STORAGE VOLUME (AF) (c)	950
		CALC'D MAX STORAGE DEPTH (FT) (d)	12.5
		CALC'D AVG STORAGE DEPTH (FT) (e)	8.7

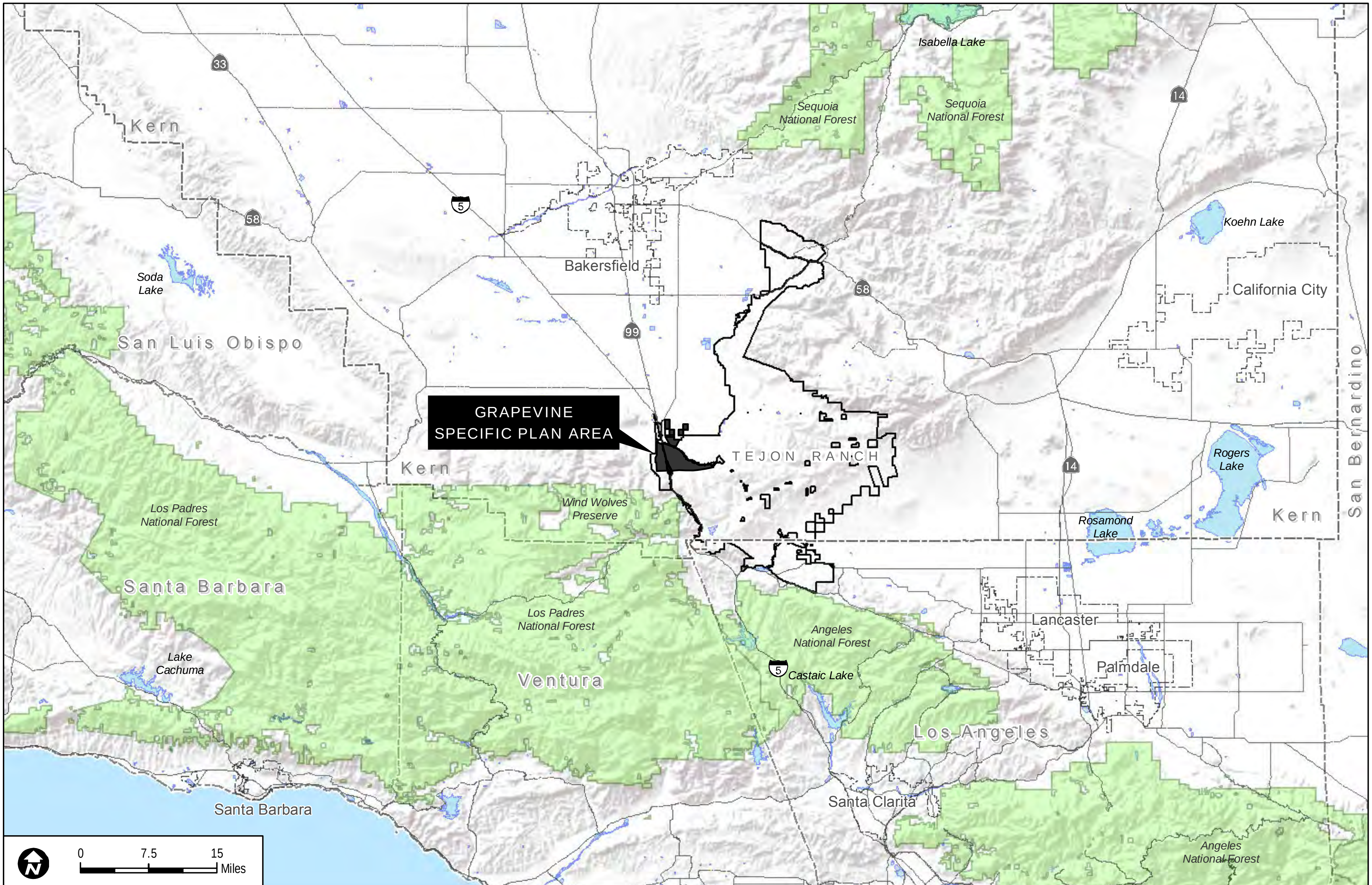
PARAMETERS/DATA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
RECYCLED WATER FLOW (MGD) (f)	2.63	2.65	2.45	2.43	2.40	2.43	2.52	2.63	2.70	2.79	2.79	2.70	2.59
PRECIPITATION (IN) (g)	0.45	1.55	1.98	1.76	6.43	3.30	2.46	1.69	0.36	0.01	0.00	0.76	20.74
REFERENCE ETo (IN) (h)	3.89	1.88	1.48	1.46	1.52	3.56	5.03	5.56	7.48	9.00	8.47	5.61	54.94
IRRIGATION DEMAND FACTOR (IN) (i)	2.72	1.32	1.04	1.02	1.06	2.49	3.52	3.89	5.23	6.30	5.92	3.92	38.43
POND CALCULATIONS													
BEGINNING POND STORAGE (AF) (j)	0	85	258	439	619	800	898	929	950	878	755	654	--
RECYCLED WATER VOL (AF) (f)	251	244	233	232	207	231	232	250	249	266	265	248	2908
DIRECT PRECIPITATION VOL (AF) (k)	3	10	13	11	41	21	16	11	2	0	0	5	131
POND EVAPORATION VOL (AF) (l)	25	12	9	9	10	23	32	35	47	57	54	36	348
NON-POTABLE IRRIGATION DEMAND (AF) (m)	144	70	55	54	56	131	185	205	276	332	312	207	2026
STORAGE GAIN (AF) (n)	85	172	181	180	182	98	30	21	-72	-123	-100	11	665
FINAL POND STORAGE (AF) (o)	85	258	439	619	800	898	929	950	878	755	654	665	--
SUPPLEMENTAL IRRIGATION DEMAND (AF) (p)	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes

(a) Assumed active pond area is estimated to maintain a calculated maximum storage depth of approximately 12.5 feet.
(b) Non-potable irrigation area is the total landscaped area excluding residential areas and schools. Refer to the *Evaluation of Potable, Non-Potable, and Recycled Water Demands* (EKI 2015a).
(c) Calculated maximum storage volume is the largest final pond storage volume from the pond calculations.
(d) Maximum storage depth is the calculated maximum storage volume divided by the active pond area. The calculated maximum storage depth does not include 2 feet for freeboard.
(e) Average storage depth is the average monthly final pond storage volume from the pond calculations divided by the active pond area.
(f) Recycled water flow rate is assumed equal to the sum of the average indoor potable water demand and 100% of the contingency. Note that collection system and wastewater treatment losses of 15% were accounted for in the average-year rainfall water balance in the *Evaluation of Potable, Non-Potable, and Recycled Water Demands* (EKI 2015a) to conservatively calculate the amount of supplemental California Aqueduct water needed for non-potable irrigation.
(g) Monthly average precipitation data were collected from the Western Regional Climate Center ("WRCC") for the Bakersfield Airport in Bakersfield, California (1937-2012) and Tejon Rancho, California (1895-1914) and from CIMIS Station 125 located in Arvin, California during 1998 (the wettest year on record for each station). Precipitation data listed is the inverse-distance weighted monthly averages of the monthly averages for each station based on the distance of each station to the center of the Grapevine Project.
(h) Reference ETo data were obtained from CIMIS Station 125 located in Arvin, CA that measured evaporation from pans. Reference ETo data listed are values from 1998 (wettest year on record).
(i) The irrigation demand factor is the area weighted average irrigation demand factor for each planting type (high water use plantings, low water use plantings, combination trees and ground cover plantings, and buffer zone plantings) in the 100-year rainfall-year for the areas irrigated by non-potable water (all landscaped area except residential areas, parks, and schools). Refer to EKI (2015a).
(j) Beginning pond storage is the final storage from the previous month.
(k) Direct precipitation is the active pond area multiplied by the precipitation.
(l) Pond evaporation is active pond area multiplied by the reference ETo, which is assumed to equal to the pond evaporation rate.
(m) Irrigation demand is the irrigation demand factor multiplied by the irrigation area. Irrigation demand includes 5% for distribution system losses.
(n) Storage gain is equal to the sum of the beginning pond storage, recycled water volume, and direct precipitation less the sum of the pond evaporation and irrigation demand. A negative storage gain represents a storage loss.
(o) Final pond storage is the beginning pond storage plus the storage gain. Final storage at the end of September during the 100-year rainfall-year (671 AF) would be used for crop irrigation or non-potable uses in commercial and industrial buildings.
(p) Supplemental irrigation demand is equal to the beginning pond storage less the storage loss (negative storage gain). Supplemental irrigation demand may be negligible during the 100-year rainfall-year. In lower rainfall years, supplemental irrigation water will be Nickel Water from the California Aqueduct.

Abbreviations

AC: acres
AF: acre-feet
CIMIS: California Irrigation Management Information System
ETo: evapotranspiration
FT: feet
IN: inches
MGD: million gallons per day

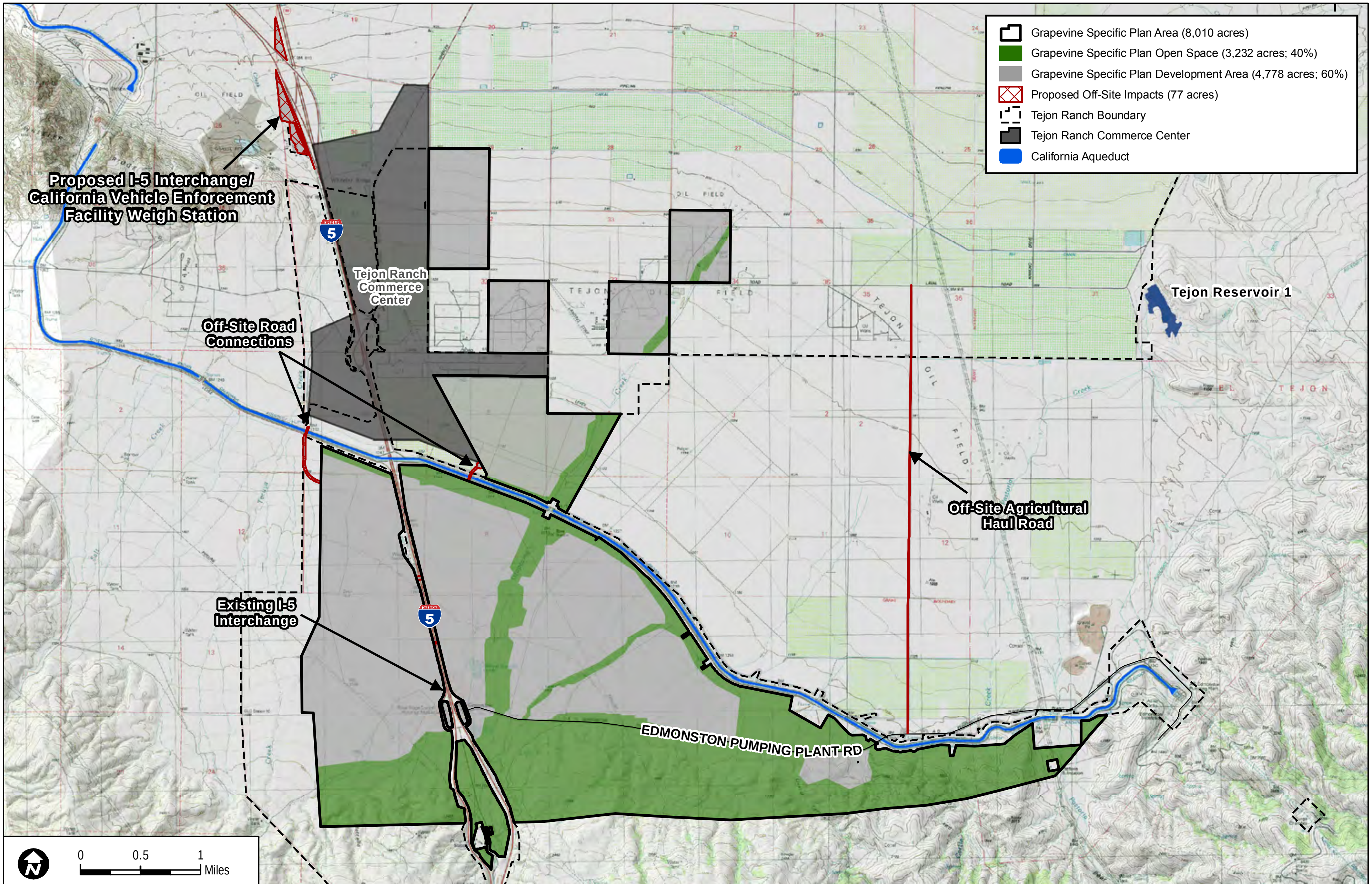


SOURCES: McIntosh & Associates 2013; TRC 2013a

FIGURE 1

Regional Location

GRAPEVINE PROJECT



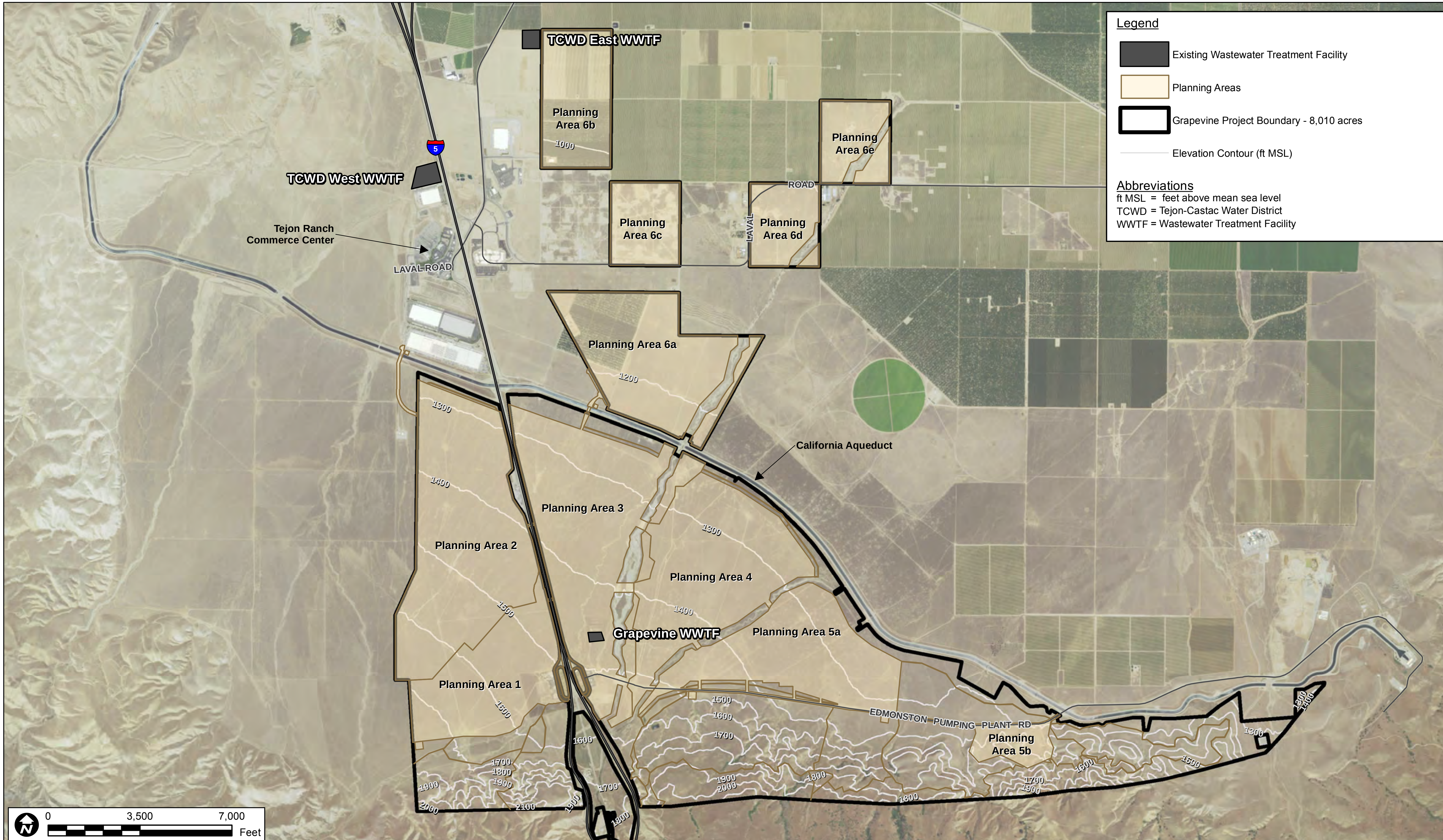
SOURCES: McIntosh & Associates 2014; TRC 2013c

The California aqueduct (TRC 2013c) appears on subsequent figures; the source information will not be provided on subsequent figures.

FIGURE 2

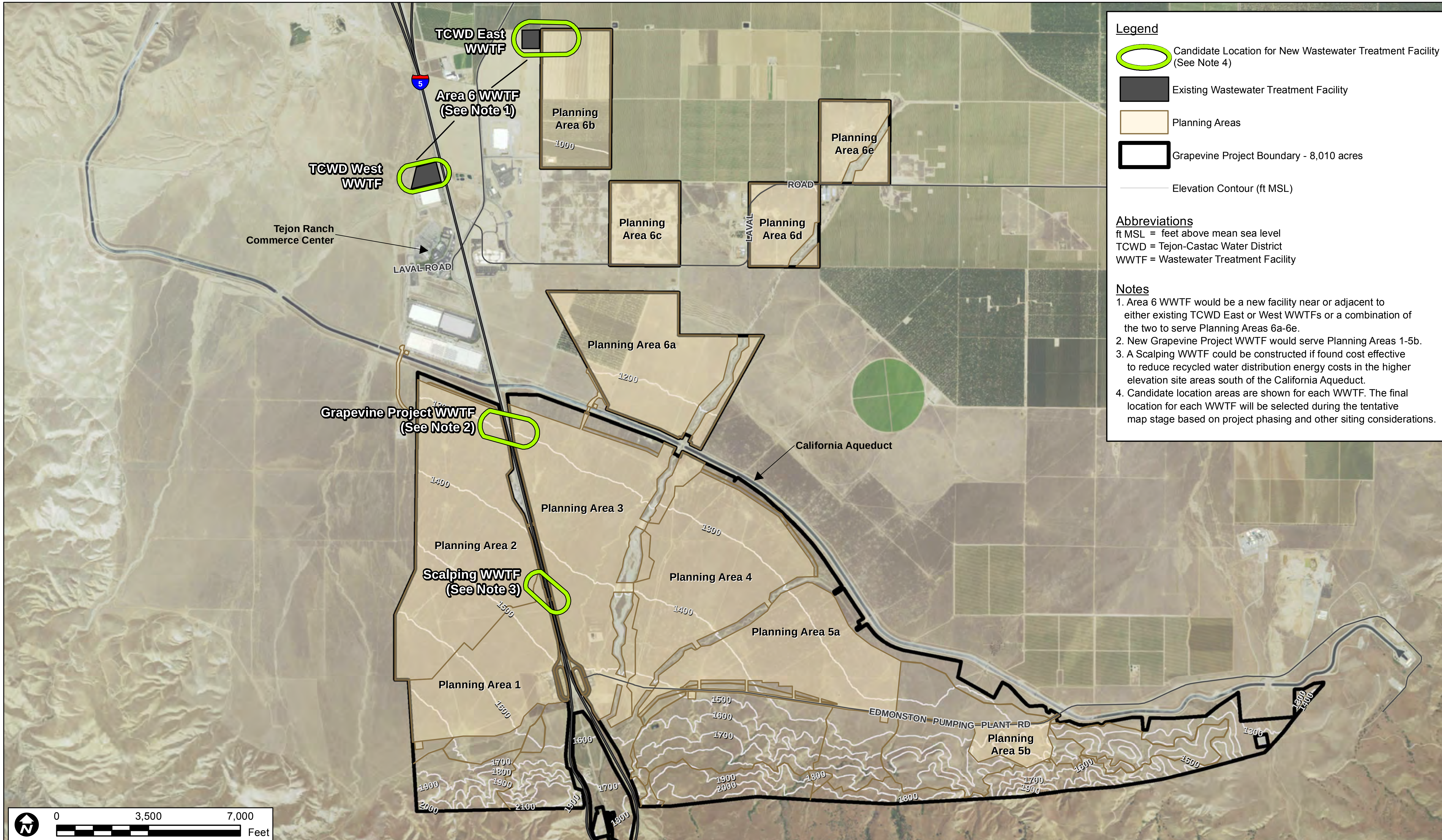
Vicinity Map

GRAPEVINE PROJECT



SOURCES: MCINTOSH 2013; TRC 2013; Public Land Survey

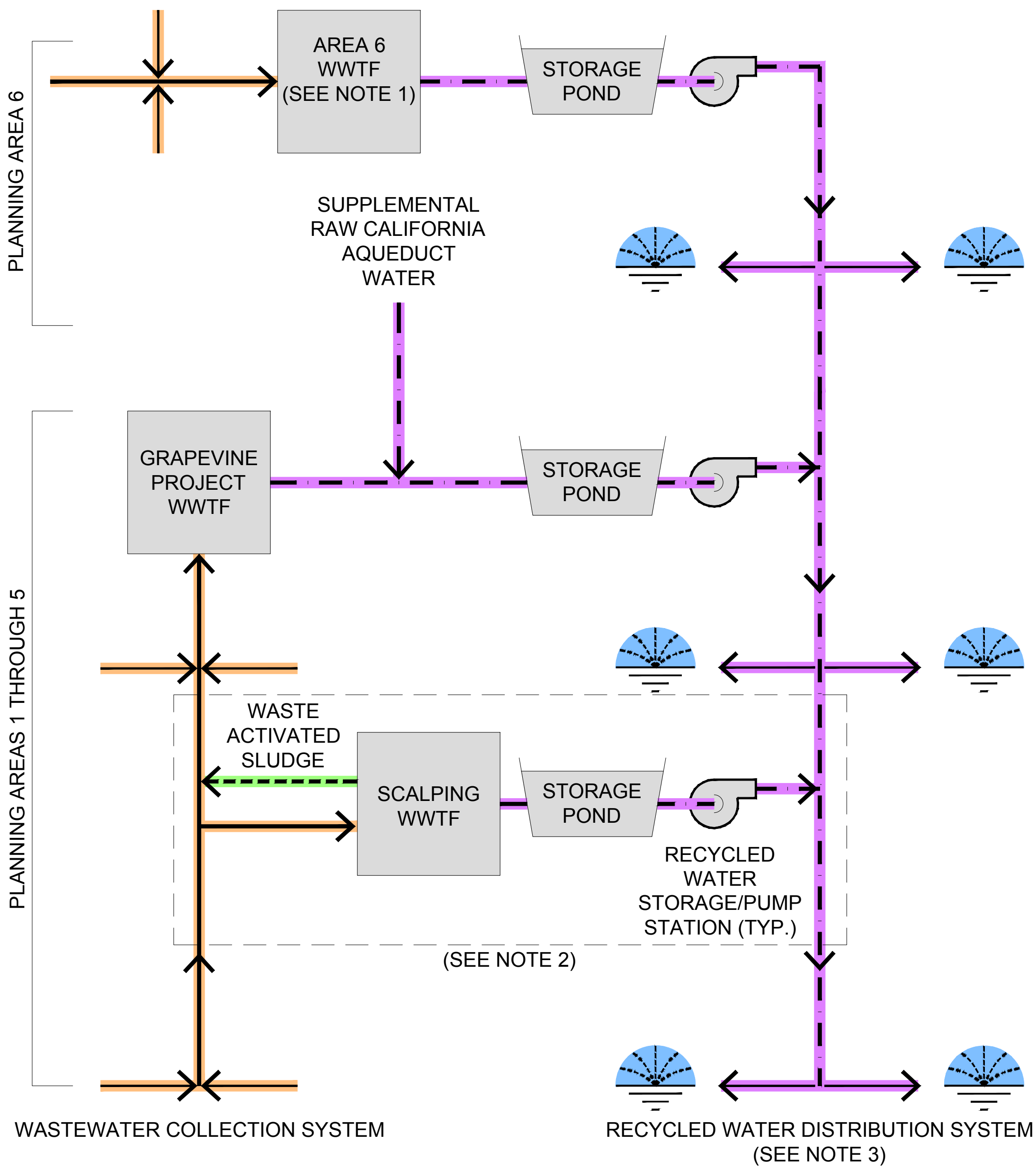
FIGURE 3
Existing Wastewater Treatment Facilities Location Map



SOURCES: MCINTOSH 2013; TRC 2013; Public Land Survey

FIGURE 4

Proposed Wastewater Treatment Facilities Location Map



LEGEND:

- Wastewater
- Scalping Plant Waste Activated Sludge
- Recycled Water
- Recycled Water Storage/Pump Station
- Recycled Water Landscape Irrigation

ABBREVIATIONS:

TCWD = Tejon-Castac Water District
WWTF = Wastewater Treatment Facility

NOTES:

1. Area 6 WWTF would be a new facility located near or adjacent to existing TCWD East or West WWTF or combination of the two.
2. A scalping WWTF could be constructed if found cost effective to reduce recycled water distribution energy costs in the higher elevation site areas south of the California Aqueduct.
3. Number and locations of recycled water distribution pump stations and storage ponds to be determined during tentative tract stage.

NOT TO SCALE

FIGURE 5

Conceptual Wastewater Collection System and Recycled Water Distribution System Schematic

GRAPEVINE PROJECT

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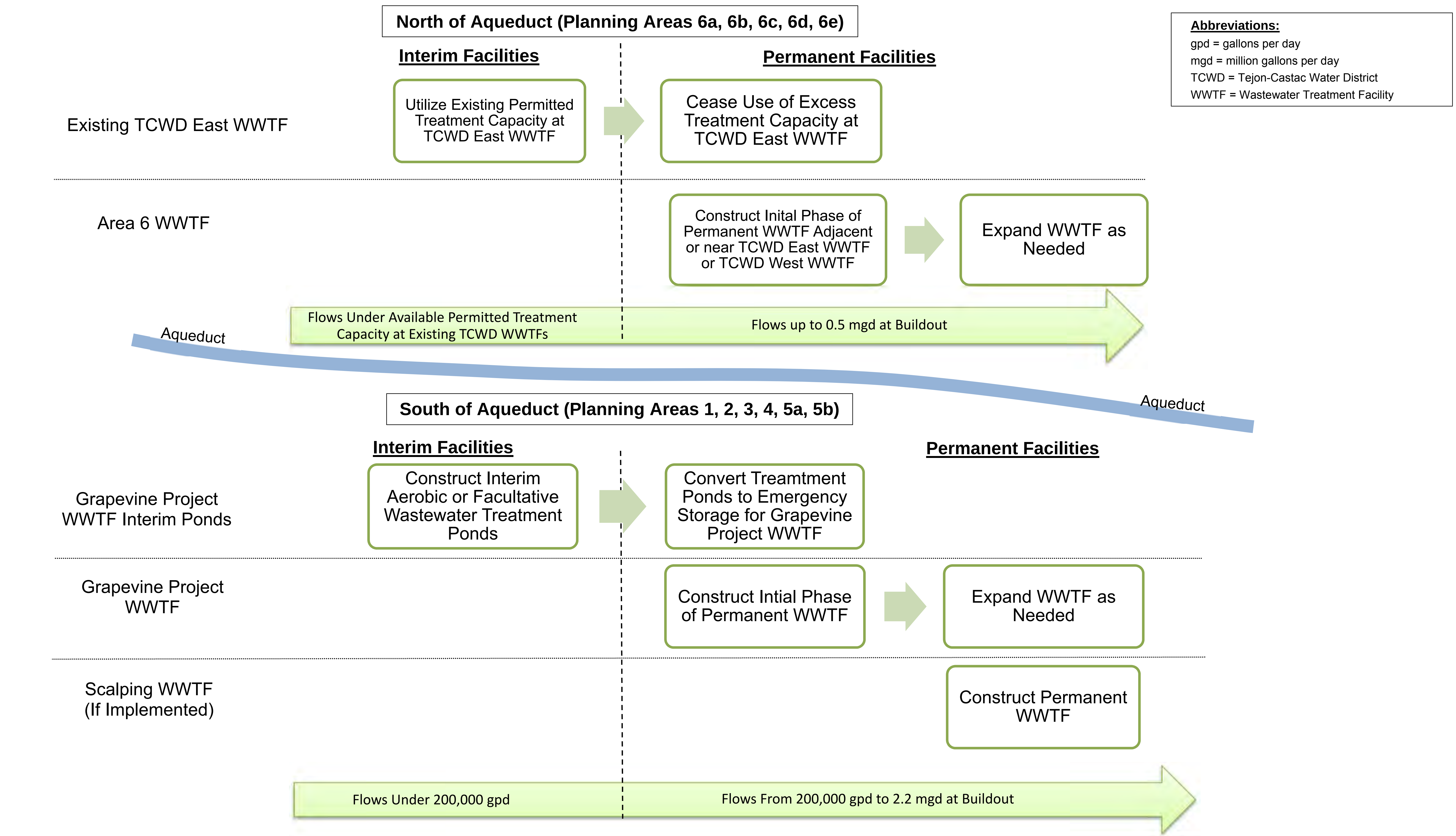

FIGURE 6
Approach to Wastewater Treatment Facility Phasing

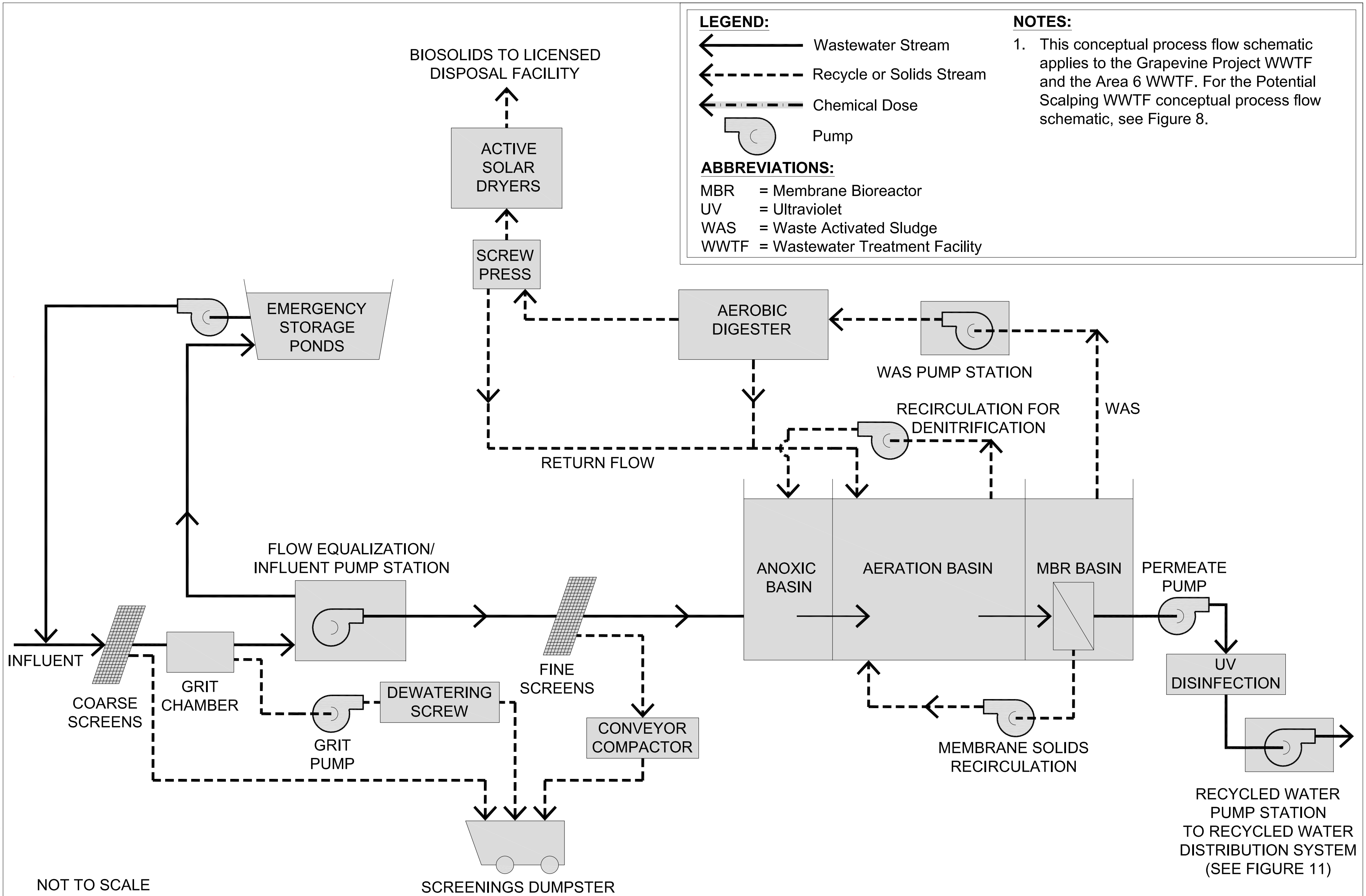

FIGURE 7

Conceptual Primary Wastewater Treatment Facility Process Flow Schematic

GRAPEVINE PROJECT

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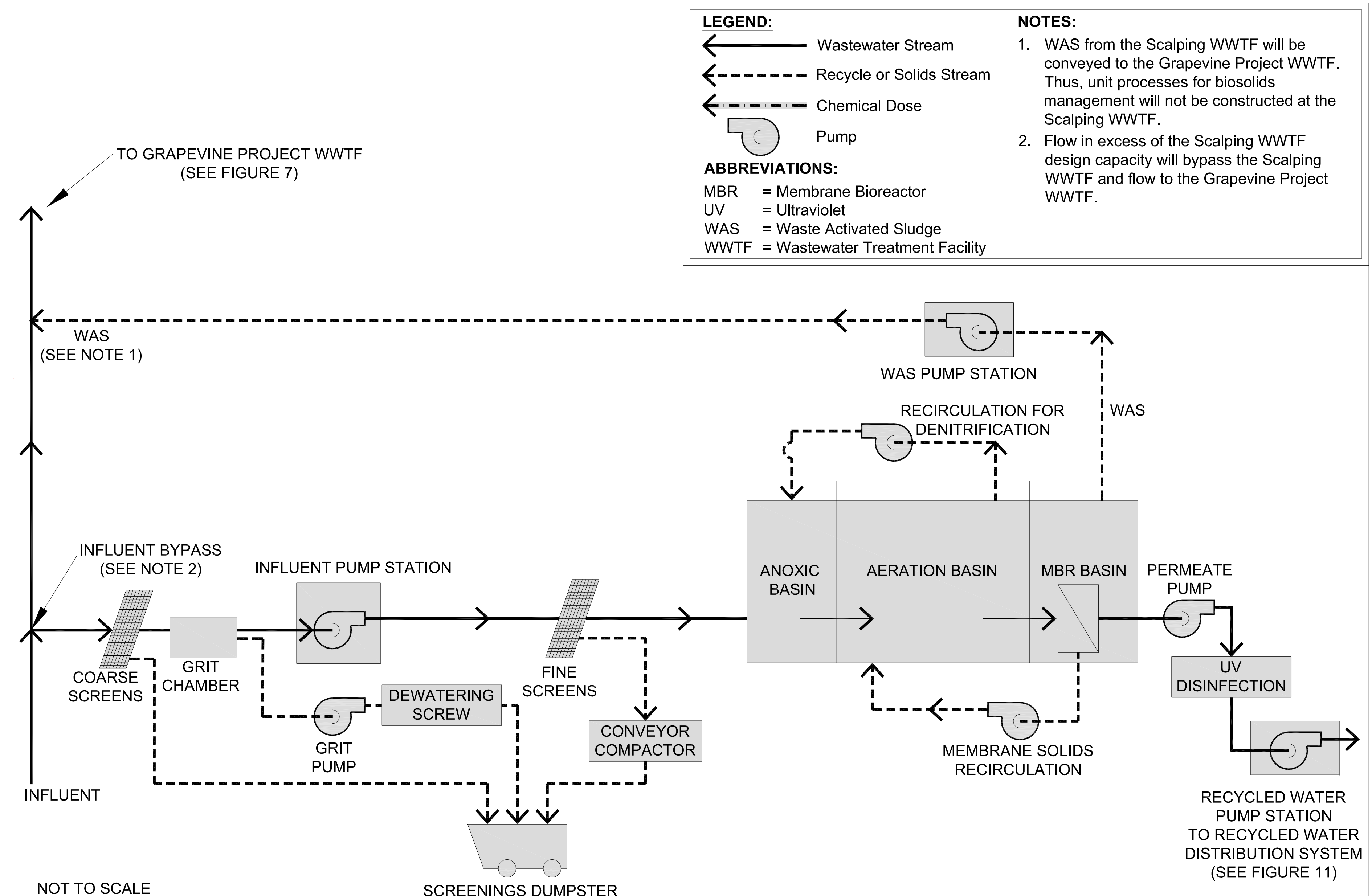
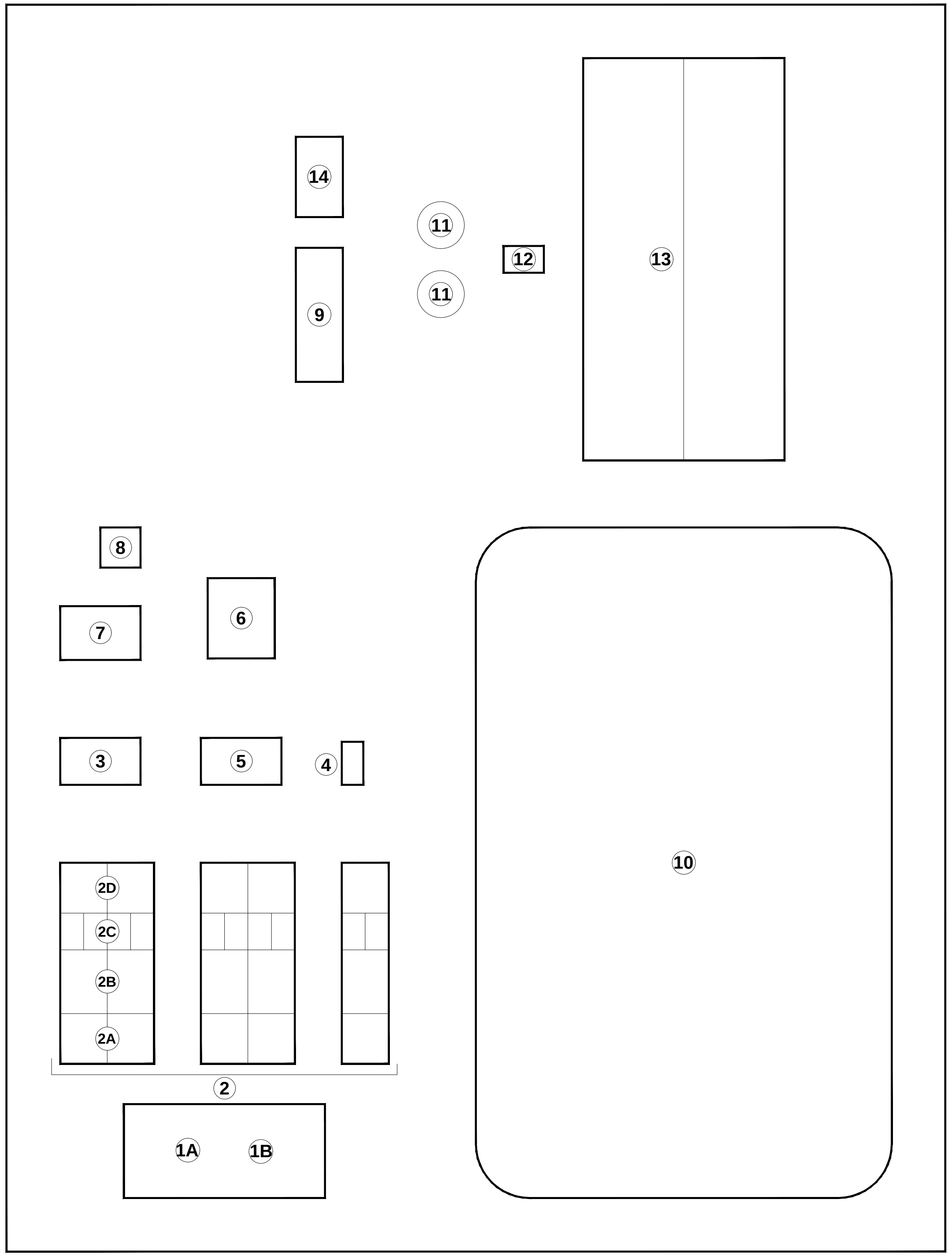


FIGURE 8

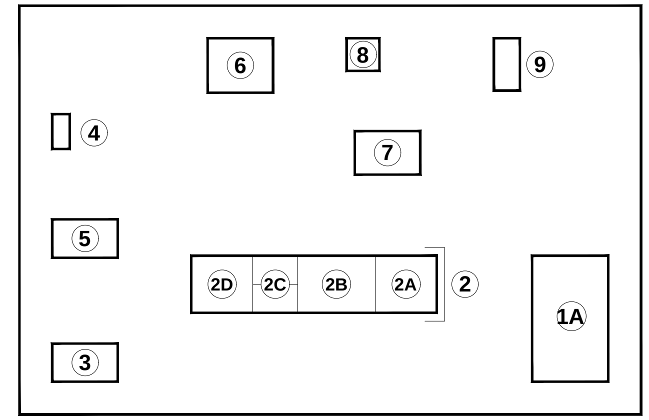
Conceptual Scalping Wastewater Treatment Facility Process Flow Schematic

GRAPEVINE PROJECT



GRAPEVINE PROJECT WWTF

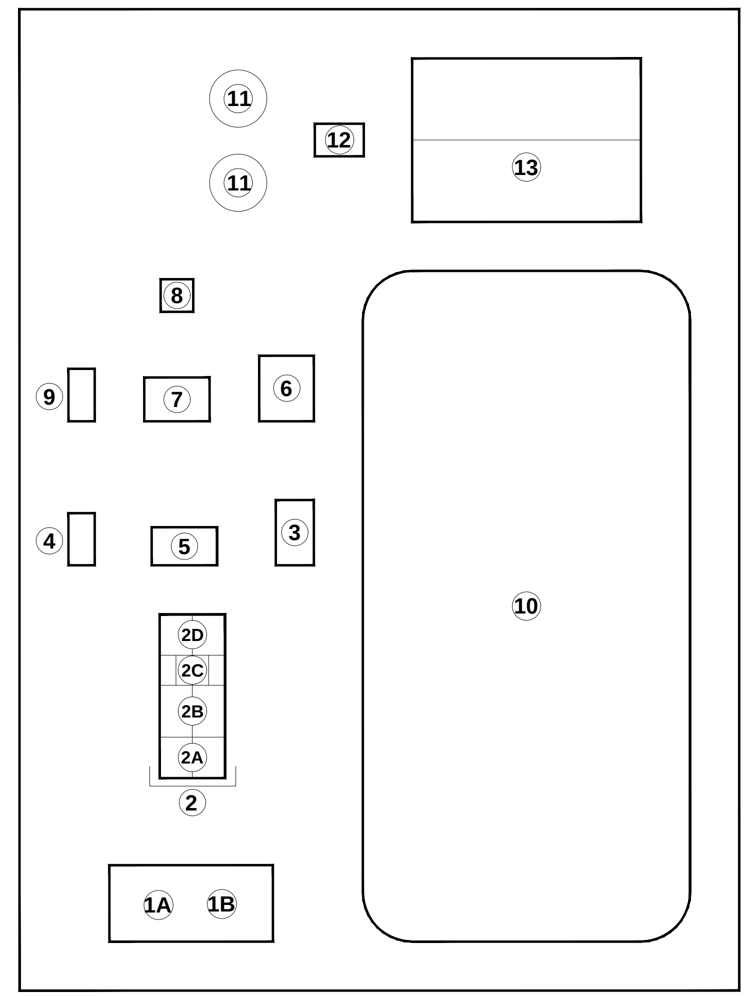
Total Area: Approximately 20 Acres



SCALPING WWTF

(SEE NOTE 2)

Total Area: Approximately 2 Acres



AREA 6 WWTF

(SEE NOTE 3)

Total Area: Approximately 8 Acres

LEGEND:

- 1A Headworks/Influent Pump Station
- 1B Flow Equaliztion
- 2 MBR Modules
- 2A Anoxic Basins
- 2B Aerobic Basins
- 2C Membrane Basins
- 2D Mechanical Equipment/Permeate Pumps/In-Line UV Disinfection
- 3 Recycled Water Pump Station
- 4 WAS Pump Station
- 5 Chemical Storage
- 6 Electrical Building
- 7 Transformer
- 8 Emergency Generator
- 9 Administrative Building/Laboratory
- 10 Emergency Storage Ponds
- 11 Aerobic Digester
- 12 Screw Press
- 13 Active Solar Dryers
- 14 Maintenance Building

ABBREVIATIONS:

MBR = Membrane Bioreactor
TCWD = Tejon-Castac Water District
UV = Ultraviolet
WAS = Waste Activated Sludge
WWTF = Wastewater Treatment Facility

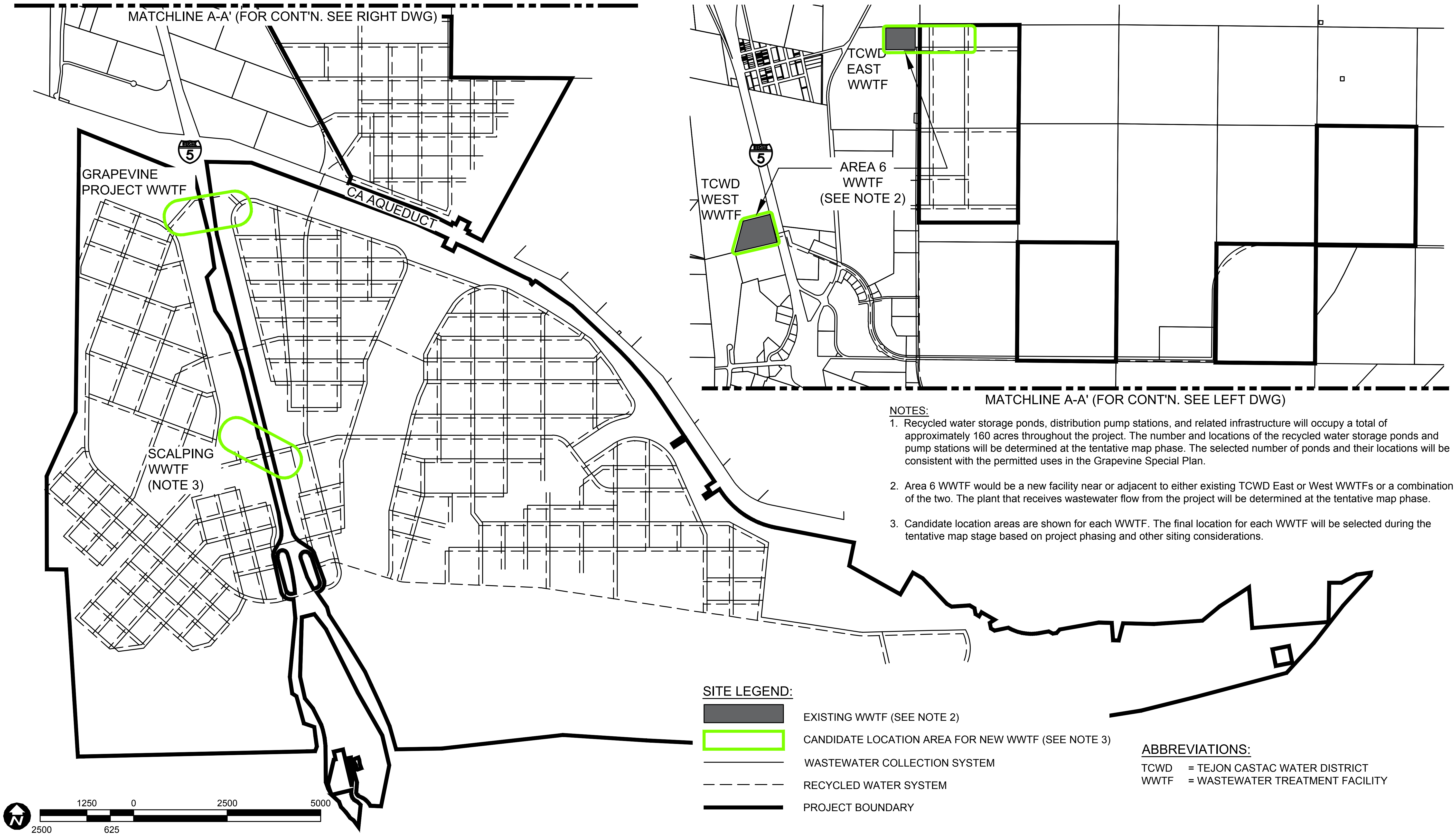
NOTES:

1. Recycled water storage ponds and distribution pump stations are not shown. Recycled water storage ponds, distribution pump stations, and related infrastructure will occupy approximately 170 acres distributed at various locations throughout the project.
2. A scalping WWTF could be constructed if found cost effective to reduce recycled water distribution energy costs in the higher elevation site areas south of the California Aqueduct.
3. Area 6 WWTF will be constructed either adjacent to the existing TCWD East WWTF footprint or within the existing TCWD West WWTF footprint. Existing facilities are not shown in the conceptual WWTF layout.

NOT TO SCALE

FIGURE 9

Conceptual Wastewater Treatment Facility Layouts



NOTES:

1. Recycled water storage ponds, distribution pump stations, and related infrastructure will occupy a total of approximately 160 acres throughout the project. The number and locations of the recycled water storage ponds and pump stations will be determined at the tentative map phase. The selected number of ponds and their locations will be consistent with the permitted uses in the Grapevine Special Plan.
2. Area 6 WWTF would be a new facility near or adjacent to either existing TCWD East or West WWTFs or a combination of the two. The plant that receives wastewater flow from the project will be determined at the tentative map phase.
3. Candidate location areas are shown for each WWTF. The final location for each WWTF will be selected during the tentative map stage based on project phasing and other siting considerations.

SITE LEGEND:

EXISTING WWTF (SEE NOTE 2)
CANDIDATE LOCATION AREA FOR NEW WWTF (SEE NOTE 3)
WASTEWATER COLLECTION SYSTEM
RECYCLED WATER SYSTEM
PROJECT BOUNDARY

ABBREVIATIONS:

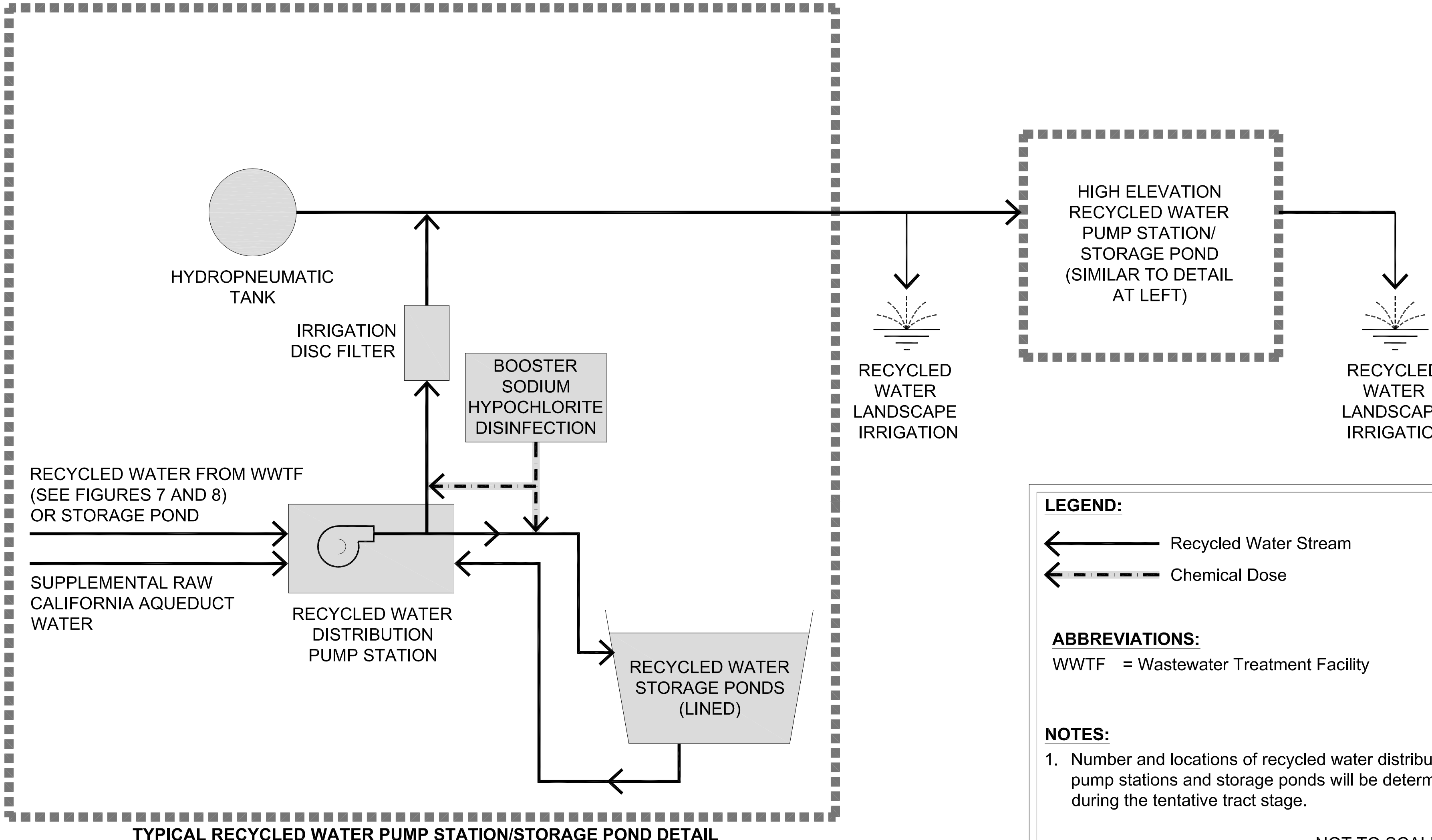
TCWD = TEJON CASTAC WATER DISTRICT
WWTF = WASTEWATER TREATMENT FACILITY

GRAPEVINE PROJECT

FIGURE 10

SOURCE: McINTOSH 2014

FRAMEWORK: WASTEWATER SYSTEM PLAN



LEGEND:

Recycled Water Stream

Chemical Dose

ABBREVIATIONS:

WWTF = Wastewater Treatment Facility

NOTES:

1. Number and locations of recycled water distribution pump stations and storage ponds will be determined during the tentative tract stage.

NOT TO SCALE

FIGURE 11

Conceptual Recycled Water Distribution System Process Flow Schematic

GRAPEVINE PROJECT

Appendix Q

Water Supply Assessment

RESOLUTION OF THE BOARD OF DIRECTORS OF THE TEJON-CASTAC WATER DISTRICT

RESOLUTION NO. 2016-1

IN THE MATTER OF:

APPROVING UPDATED AND AMENDED WATER SUPPLY ASSESSMENT FOR PROPOSED GRAPEVINE PROJECT

WHEREAS, Kern County is the California Environmental Quality Act (CEQA) lead agency for the proposed Grapevine Project (Project); and

WHEREAS, the Tejon-Castac Water District (TCWD) is the public water system that may supply water for Project as set forth in California Water Code (Water Code) Section 10910(b); and

WHEREAS, the Kern County Planning Department requested that TCWD prepare a Water Supply Assessment (WSA) for the Project in compliance with Water Code Sections 10910 *et seq.*; and

WHEREAS, TCWD prepared a WSA for the Project with the assistance of the Kern County Water Agency (KCWA) and this Board adopted and approved same on March 10, 2015, the WSA was subsequently updated and amended reflecting comments of the County of Kern and new information, and this Board has been provided a copy of and reviewed the updated and amended WSA; and

WHEREAS, Water Code Section 10910 (g)(1) requires that TCWD approve the Project WSA at a regular or special meeting prior to submitting the WSA to Kern County;

NOW, THEREFORE, BE IT RESOLVED, that the Tejon-Castac Water District hereby approves the updated and amended Water Supply Assessment for the Project now on file with the Secretary of the Board at the district's duly-noticed special meeting on January 12, 2016, and directs that the WSA and a certified copy of this resolution be transmitted to Kern County Planning Department in accordance with Water Code Sections 10910, *et seq.*

ALL THE FOREGOING, being on motion of Director Poire, seconded by Director Lyda, was authorized by the following vote, namely:

Directors

AYES: Mark Fanucchi, Allen Lyda, Patricia Poire.

NOES: None

ABSENT: None

ABSTAIN: Dennis Atkinson, Ryan Fachin.

I HEREBY CERTIFY that the foregoing is a full, true, and correct copy of a resolution adopted by the Board of Directors of the Tejon-Castac Water District at its special meeting on January 12, 2016.

Allen Lyda, Secretary
Tejon-Castac Water District

Grapevine Project

Water Supply Assessment

Date: January 2016

Prepared by:

Tejon-Castac Water District
P.O. Box 1000
Lebec, CA 93243

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APPENDICES

Appendix A *Water Treatment Facility Engineering Report* (EKI 2015a)

Appendix B *Water Supply Delivery Evaluation for the Grapevine Project* (GEI 2014)

Appendix C *Evaluation of Potable, Non-Potable and Recycled Water Demands* (EKI 2015b)

Appendix D *Wastewater Treatment Facilities Engineering Report* (EKI 2015c)

Appendix E1 TMV WSA prepared by TCWD and included in the TMV EIR.

Appendix E2 Tables A-C, pages 7-1429 to 7-1431 of the TMV FEIR.

Appendix F *Contract to Transfer the Kern River Lower River Water Rights* between the Nickel Family LLC, KCWA and the Olcese Water District (January 2001)

Appendix G *Option and Water Purchase Agreement* between DMB Communities II LLC and Nickel Family LLC (May 2007)

Appendix H *Purchase and Sale Agreement*, *First Amendment to the Purchase and Sale Agreement*, and *Second Amendment to Purchase and Sale Agreement and Partial Assignment Agreement* between Tejon Ranchcorp, Inc. and DMB Pacific LLC, and Nickel consent, (October-November 2013).

1.0 INTRODUCTION

1.1 Background and Purpose

This water supply assessment (WSA) has been prepared for Kern County (County) by the Tejon-Castac Water District (TCWD) in accordance with California Water Code Section 10910 *et seq*. The County is the California Environmental Quality Act (CEQA) lead agency for the proposed Grapevine project. TCWD is the applicable public water system as defined in the Water Code with respect to the Grapevine project, which would include up to 12,000 residential units and 5.1 million square feet of commercial land uses. The County requested that TCWD prepare this WSA as part of the CEQA review of the proposed Grapevine project.

A WSA provides the CEQA lead agency with an analysis of a project's water supply availability and reliability over a twenty-year planning period, including average rainfall and hydrologic years, a single dry year, and multiple dry years. The WSA is a technical, informational, advisory opinion prepared by the project's water provider for use by the CEQA lead agency. Under the Water Code, a WSA must be included in the environmental impact report (EIR) prepared by the CEQA lead agency.

As discussed more fully below, Tejon Ranchcorp, an affiliate of the Grapevine project applicant, has the right to receive 6,693 acre-feet per year (AFY) of water from the Kern County Water Agency (KCWA) through at least 2079 as the assignee of a Kern River water transfer agreement between KCWA and the Nickel Family LLC (the "Nickel Water"). The delivery of Nickel Water is 100 percent reliable on a year-to-year basis and is not subject to hydrological variability, regulatory requirements, or supply constraints that may affect other water sources. This WSA assumes that Tejon Ranchcorp will contract with TCWD to meet all of the Grapevine project's water demand by using Nickel Water supplies delivered via the State Water Project (SWP) aqueduct and recycled water produced by onsite wastewater treatment facilities and analyzes the availability and reliability of these supplies for the purpose of serving the proposed Grapevine project in accordance with the Water Code. The analysis is conservative. It assumes that: (a) full build-out demand will occur from the start of the analysis period although project construction will occur over several years; and (b) other water sources currently or potentially available to TCWD during the analysis period will not be used for project purposes. The WSA demonstrates that TCWD will be able to supply the Grapevine project with sufficient water supplies using Nickel Water and onsite recycled water throughout the analysis period.

Section 2 of this WSA provides a description of the proposed Grapevine project and the proposed land uses. Section 3 discusses the Grapevine project's water demand. Section 4 summarizes the water treatment and distribution systems that will supply water for the Grapevine project. Section 5 describes the water supplies that are available to TCWD to serve the proposed project and to meet the district's other water service obligations. Section 6 identifies TCWD's water service requirements over the WSA analysis period. Section 7 analyzes the district's ability to meet anticipated demands in accordance with the Water Code, including an analysis of normal or average year, single dry year and multiple dry year conditions. Section 7 also discusses other water supplies that may become available for project use during or after the analysis period and certain water supply issues that the County requested be analyzed in this WSA. Section 8 provides a summary of the WSA analysis results.

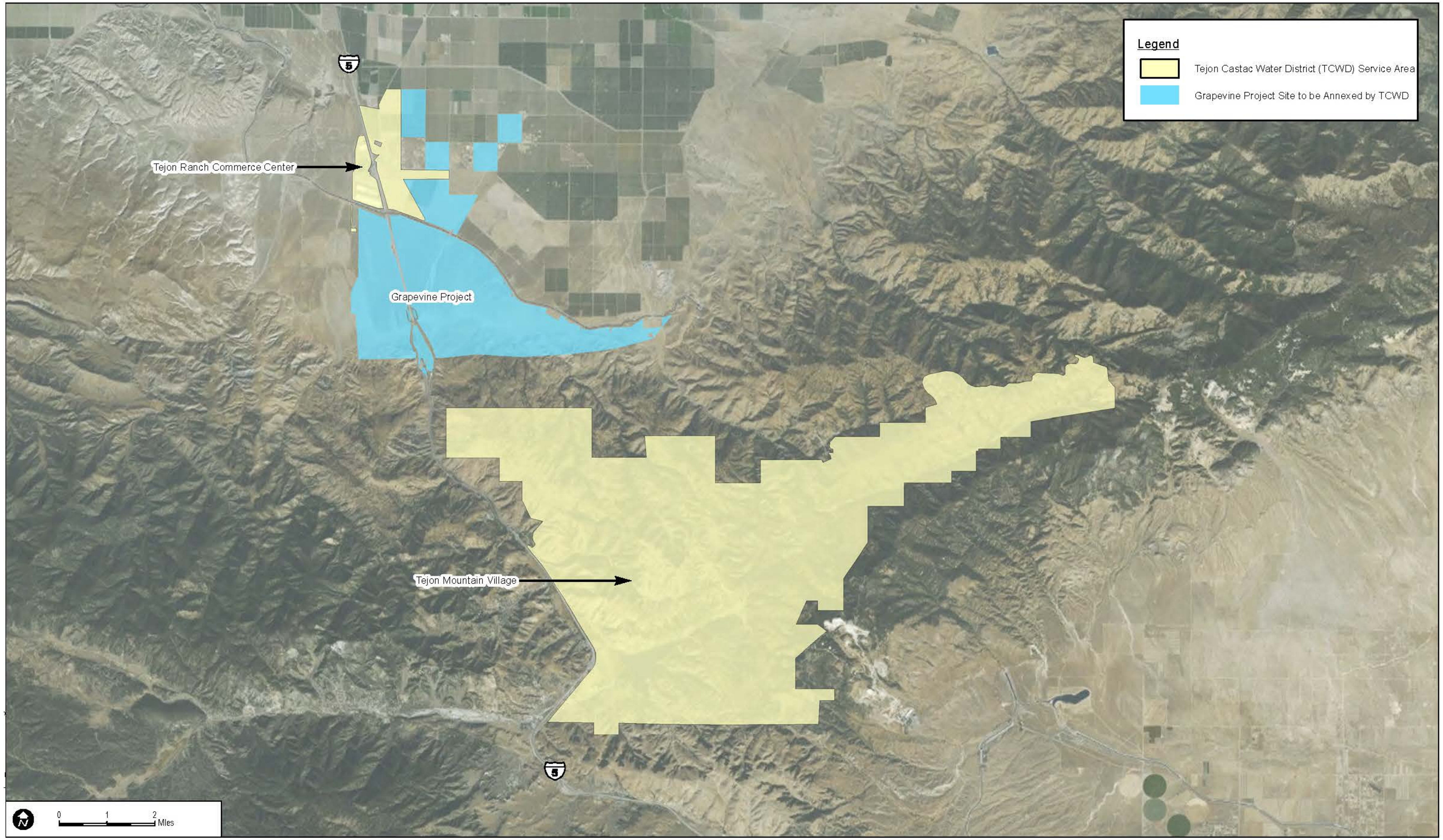
Under California Government Code Section 66473.7 *et seq.*, the County may be required to obtain water supply verifications from TCWD prior to approving certain tentative tract or other Grapevine project maps. TCWD will provide water supply verifications for the project based on this WSA and other district water supply and demand analyses upon request by the County. TCWD may identify water supplies other than Nickel Water with sufficient reliability and quality for project use during the water supply verification or other applicable project approval process.

1.2 District Overview

TCWD is a California water district formed and operated under the provisions of California Water Code Sections 34000, *et seq.* The district is a member unit of the KCWA and has rights to receive SWP supplies under contracts with KCWA. The district's current service area includes the Tejon Ranch Commerce Center (TRCC) site, and the Tejon Mountain Village (TMV) site. The TRCC service area is located along the I-5 corridor and adjacent to the north and west boundaries of the Grapevine project. TMV is located in the uplands to the south. TCWD will annex the Grapevine project site following the completion of the project's CEQA analysis and project approval by the County. The annexation is subject to approval by the Kern County Local Agency Formation Commission. TRCC, TMV and the Grapevine project would comprise the district's three water service areas after the Grapevine project annexation is completed (see Figure 1).

As discussed in the attached *Water Treatment Facility Engineering Report* (EKI 2015a; see Appendix A), and in the attached *Water Supply Delivery Evaluation for the Grapevine Project* (GEI 2014) (see Appendix B), TCWD will coordinate with KCWA to deliver Nickel Water for project use through one or more existing turnouts, or a potential new turnout, located along the SWP aqueduct adjacent to the project site. KCWA has sufficient aqueduct conveyance and capacity rights to deliver Nickel Water to any of the turnouts that would serve the project site. The Nickel Water will be conveyed to one or more onsite water treatment facilities to meet the project's potable water demand. TCWD will also operate dedicated wastewater treatment facilities for the Grapevine project and provide recycled water treated to the highest tertiary standard for non-potable uses including onsite outdoor irrigation. The services TCWD will provide to the Grapevine project include supplying, treating, and delivering potable and recycled water, and sewer collection and wastewater treatment.

Figure 1 - TCWD Existing and Proposed Grapevine Service Areas



2.0 GRAPEVINE PROJECT DESCRIPTION AND LAND USES

2.1 Project Description

The proposed Grapevine project is located in the west-central portion of the 270,000-acre Tejon Ranch which extends from Interstate 5 (I-5) on the western side to State Route (SR) 58 on the northern side and SR 138 on the southern side. The project site is entirely within unincorporated Kern County south of the junction of I-5 and SR 99. Downtown Bakersfield is approximately 25 miles north of the project. The majority of the project is on the east side of I-5. The SWP aqueduct traverses through the site from the northwest to the southeast.

The Grapevine project includes 8,010 acres within the 15,644 acre Grapevine Development Area identified in the Tejon Ranch Land Use and Conservation Agreement, a landmark agreement reached in 2008 with leading environmental organizations (including the Sierra Club, Natural Resources Defense Council, California Audubon Society, Endangered Habitats League, and Planning and Conservation League) to permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as I-5. Approximately 3,232 acres, or 40% of the 8,010 acre project area would be designated for agriculture, with grazing and open space as the predominant land uses. Approximately 4,778 acres, or 60% of the site would be developed as a new residential community and employment center.

2.2 Project Land Uses

The project site is divided into six planning areas ranging in size from approximately 450 to 1,400 acres. Development will be phased over a period of at least 19 years, starting with the development of Planning Area 6a and/or 3 and continuing with the balance of the planning areas nearest to the initial phase. The project would include 12,000 residential units and 5.1 million square feet of commercial and light industrial land uses in a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. The project could include up to 2,000 additional residential units, for a maximum of 14,000 units, through a reduction the commercial and light industrial land uses based on vehicle trip equivalency ratios. A fire station, sheriff sub-station (located within the project or at the adjacent TRCC), transit facility/park-and-ride, and water and wastewater treatment facilities, would also serve the community. A mix of residential uses, office, research and development, regional commercial, freeway-oriented commercial, and light industrial/warehouse uses would be built outside of the village core areas. Bicycle and pedestrian trails would provide convenient access to grocery and drugstores, professional services, schools, and parks. The Grapevine Specific Plan also allows for certain industrial uses, such as a tannery or food processing facilities related to local ranching and agricultural activity, and electrical power cogeneration. These potential industrial uses are included in the Specific Plan to allow for future flexibility in response to market conditions.

The attached *Evaluation of Potable, Non-Potable and Recycled Water Demands* (EKI 2015b) ("*Water Demand Report*" see Appendix C) analyzes the water demands associated with the project's proposed land uses. The project's proposed land uses are summarized in Table 1.

Table 1
Grapevine Project Land Use Summary

Land Use	Units
Residential	**Number of Units**
Standard Residential Units (7.2 units per acre)	8,410
Village Center Residential Units (15 units per acre)	3,590
Commercial, Industrial and Institutional	**Floor Area (Thousand Square Feet)**
Village Center Retail	**447**
Grocery	228
Drug store	94
Miscellaneous	63
Restaurant	31
Bank	31
Village Center Office	**353**
Regional / Freeway-Oriented Commercial	**750**
Miscellaneous Retail	589
Restaurant	56
Gas Station	56
Hotel	49
Office / R&D	**2,100**
High Tech / Bio Tech	1,140
Other Office	660
Medical Center	300
Industrial or Light Industrial / Warehouse	**1,450**
Light Industrial / Warehouse	1,100
Community College	350
Schools	**815**
K-8 (6)	575
High Schools (2)	240
Landscaping and Solar Farm	**Acres**
Parks	96
Roadways	203
Roundabouts	8
Windrow	22
Irrigated Residential Common Area	156
Landscaped I-5 Buffer Zones	95
Golf Course	90
Solar Farm	800

Source: *Water Demand Report*, Appendix C (all values subject to rounding)

3.0 GRAPEVINE PROJECT WATER DEMANDS

This section describes the proposed Grapevine project and the estimated water demands associated with each of the project's proposed land uses. Water demands are summarized in terms of "potable" and "non-potable" demands. Potable water demands include all treated indoor and outdoor water uses other than those that will be supplied with recycled water or filtered, untreated Nickel Water. Non-potable water demands include those uses that will primarily use recycled water supplies, supplemented during certain times of the year with filtered, untreated and non-potable Nickel Water. The project demand estimates conservatively include a 400 AFY contingency factor that could provide for possible future uses allowed under the proposed Grapevine Specific and Special Plans. At full build-out, the Grapevine project will require approximately 5,620 AFY of potable water and 2,241 AFY of non-potable water. Total project average annual water demand at full build-out, including the 400 AFY contingency, will be approximately 8,261 AFY (see Table 2).

Table 2
Grapevine Project Full Build-out Water Demand Summary

DEMAND CATEGORY	AVERAGE ANNUAL DEMAND (AFY)
TOTAL POTABLE WATER DEMAND	**5,620**
Residential	*3,637*
Commercial, Industrial and Institutional	*907*
Landscaping	*554*
System Losses	*522*
TOTAL NON-POTABLE WATER DEMAND	**2,241**
Commercial, Industrial and Institutional	*270*
Landscaping	*1,865*
System Losses	*107*
TOTAL CONTINGENCY	**400**
Water Demand Contingency	*400*
TOTAL WATER DEMAND	**8,261**

Source: *Water Demand Report*, Appendix C (all values subject to rounding)

3.1 Potable Water Demand

The *Water Demand Report* (EKI, 2015b; Appendix C) summarizes the Grapevine project's total indoor and outdoor potable water demand at full build-out. Indoor potable water demand includes all residential and commercial, industrial and institutional indoor water uses. Outdoor potable water demand is conservatively assumed to include all residential yard and garden uses, all residential common area landscaping and maintenance, and outdoor irrigation at the schools. TCWD could use disinfected tertiary-treated recycled supplies for some or all of these outdoor uses if available and consistent with applicable legal requirements. Full build-out potable water demands by land use category are summarized in Table 3. The following sections summarize the potable water demand estimated for residential and commercial, industrial and institutional uses, residential landscaping, and system losses.

Table 3
Grapevine Project Potable Water Demand Summary

LAND USE CATEGORY	INDOOR WATER USE UNIT	INDOOR WATER USE FACTOR	OUTDOOR WATER USE UNIT	OUTDOOR WATER USE FACTOR	WATER DEMAND
Residential	**Number of Units**	**AFY / Unit**	**Number of Units**	**AFY /Unit**	**AFY**
Standard Residential Units	8,410	0.16	8,410	0.17	2,775
Village Center Residential Units	3,590	0.16	3,590	0.08	862
Commercial, Industrial and Institutional	**Number of Employees**	**Gallons / day / Employee**	**Acres**	**AFY /acre**	**AFY**
Village Center Retail					
Grocery	251	122	-	-	21
Drug store	75	69	-	-	4
Miscellaneous	50	69	-	-	2.4
Restaurant	63	179	-	-	8
Bank	25	63	-	-	1.1
Village Center Office	812	53	-	-	30
Regional / Freeway-Oriented Commercial					
Miscellaneous Retail	471	320	-	-	104
Restaurant	113	847	-	-	66
Gas Station	51	320	-	-	11
Hotel	23	506	-	-	8
Office / R&D					
High Tech / Bio Tech	2,622	92	-	-	166
Other Office	1,518	53	-	-	55
Medical Center	690	80	-	-	38
Light Industrial / Warehouse					
Light Industrial / Warehouse	473	77	-	-	25
Community College	441	31	-	-	9
Schools					
K-8 (6)	724	55	60.0	3.64	246
High Schools (1)	302	55	27.5	3.64	112
Landscaping	**-**	**-**	**Acres**	**AFY / ac**	**AFY**
Residential Common Area	-	-	156	3.54	554
System Losses					
Potable Water Treatment Facility Losses					268
Potable Indoor Distribution System Losses					125
Potable Outdoor Distribution System Losses					129
TOTAL POTABLE WATER DEMAND					**5,620**
WATER DEMAND CONTINGENCY[1]					
Contingency					400
TOTAL CONTINGENCY					**400**

[1]Contingency is assumed to be met with potable Nickel Water and is inclusive of losses.
Source: *Water Demand Report*, EKI 2015b; Appendix C (all values subject to rounding)

3.1.1 Residential Potable Water Use

Potable water use was estimated separately for each of the two residential unit types included in the Grapevine project: (1) approximately 8,410 detached single-family “standard” residential units with an average density of 7.2 units per acre; and (2) approximately 3,590 “village center” residential units consisting of higher density or multi-family units with an average density of 15.5 units per acre.

Indoor water use factors were estimated by using a predictive model of residential water use developed for the United States Environmental Protection Agency and several large water utilities (DeOreo, 2011). Based on assumptions regarding fixture efficiency, household size, and other key factors, indoor water use factors were estimated for the different housing product types described in the Grapevine Specific and Special Plan.

The outdoor water use factors were estimated using the landscape irrigation demand model described in the recently-updated Model Water Efficient Landscape Ordinance (MWELO; DWR, 2015). Residential outdoor irrigation requirements were based on median lot sizes of 6,050 square feet for standard residential units and 2,810 square feet for village center residential units. The estimates assume that 40% of each lot would be planted with a mix of higher and lower water use vegetation, consistent with MWELO requirements (*Water Demand Report*, Appendix C).

As shown in Table 3, standard and village center residential unit indoor use will be approximately 0.16 AFY per unit. Standard residential unit outdoor water use will be approximately 0.17 AFY per unit. Outdoor water use for village center residential units, which will be constructed on smaller lots, will be approximately 0.08 AFY per unit. The level of estimated residential unit demand is comparable with the measured and documented water use for similar land uses in the same geographic area, including a study by the Vaughn Water Company of residential water use in the Rosedale area of Bakersfield (Vaughn Water Company 2009) and average residential potable water use in California as documented by the State Water Resources Control Board (SWRCB, 2015). At full build-out, total residential potable water use will be approximately 3,637 AFY, including 1,920 AFY for indoor uses and 1,717 AFY for outdoor uses (see Table 2).

3.1.2 Commercial, Industrial and Institutional Potable Water Use

Only indoor water for commercial, industrial and institutional land uses will be served with potable water; all outdoor uses (except for schools) will be served with non-potable water. Commercial, industrial and institutional indoor potable water use was estimated using the data and methodology included in the Pacific Institute’s *Waste Not, Want Not: The Potential for Urban Water Conservation in California* (2003), also called the “Pacific Institute study” for all land uses except indoor solar farm and outdoor school demand. The Pacific Institute study correlated water use with the number of employees associated with specific commercial, industrial and institutional land uses in California (Pacific Institute, 2003). Full build-out employment was estimated for each of the commercial, industrial and institutional land uses identified in Table 1, including retail, restaurants and regional and freeway service facilities, offices, high-tech flex buildings, warehouses, light industrial uses, and schools. Indoor daily water use per employee was estimated for each commercial, industrial and institutional land use based on per-employee water use factors presented in the Pacific Institute study. The daily employee water use factors developed in the Pacific Institute study are based on a normalized 225-day work year, and reflect projected water use efficiencies associated with the adoption of CalGreen building code standards, and other water-efficient design features that are included in the project. Annual indoor water demand was estimated by multiplying the daily indoor employee water use factors by the number of employees and by 225 workdays per year for each commercial, industrial and institutional land use.

Potable indoor water use for solar farms was derived from information developed by the Bureau of Land Management (2012). Potable outdoor water use for schools was estimated using the landscape irrigation demand model described in the recently-updated MWELO (EKI, 2015b; DWR, 2015).

As shown in Table 2, commercial, industrial and institutional indoor potable water use will be approximately 907 AFY at full build-out, including approximately 318 AFY of potable water used for limited outdoor irrigation in the six kindergarten through eighth grade schools and one high school included in the proposed project. The estimated water use is within the range of measured and documented commercial, industrial and institutional water use for comparable land uses at the adjacent TRCC (*Water Supply Report*, Appendix C).

3.1.3 Potable Landscaping Water Use in Residential Common Areas

This WSA conservatively assumes that potable water will be used to irrigate landscaped residential common areas. TCWD could provide disinfected, tertiary-treated recycled water for this use if available and consistent with applicable legal requirements. Landscaping irrigation demand was estimated using the landscape irrigation demand model described in the recently-updated MWELO (EKI, 2015b; DWR, 2015). A water use factor of 3.54 AFY per acre was developed for residential common areas, assuming that 25% of these areas will include higher water use plants, 50% will consist of combination plantings (trees and plants), and 25% will be hardscape that does not require irrigation. Based on application of these assumptions and methodology, approximately 554 AFY of potable water will be used to irrigate residential common area landscaping at full build-out (see Table 2).

3.1.4 Potable Water System Losses and Contingency

Potable water treatment and distribution system losses due to leakage, treatment processing and other factors are estimated to be approximately 522 AFY, including potable water treatment facility losses of 268 AFY, potable indoor distribution system losses of 125 AFY and potable outdoor distribution system losses of 129 AFY (see Table 3). These distribution and treatment losses are consistent with measured and documented operational results for typical new, well-designed and well-maintained water treatment and distribution systems (*Water Demand Report*, Appendix C).

The Grapevine Specific and Special Plans allow for certain other land uses, such as industrial uses, up to 2,000 additional residential units, and urban agriculture. These uses could be developed in response to future market conditions and through a reduction commercial and light industrial land uses based on vehicle trip equivalency ratios. To accommodate the possibility that these land uses might be developed in the future, a 400 AFY contingency has been included in the potable water use estimates for the project

(EKI, 2015b). The water treatment facilities described in the *Water Treatment Facility Engineering Report* (EKI, 2015a; Appendix A) are sized to accommodate treatment of an additional 400 AFY, if required for project purposes.

3.1.5 Full Build-out Potable Water Demand Summary

Table 3 summarizes the project's potable water demand by land use. At full build-out, the project's potable water system will supply approximately 2,508 AFY for indoor uses and approximately 2,589 AFY for outdoor uses. The project's full build-out potable water demand, including system and treatment losses, will be approximately 6,020 AFY, including 5,620 AFY for indoor and outdoor uses, and a 400 AFY contingency. These demands will be met by using Nickel Water treated onsite as necessary for potable use.

3.2 Non-Potable Water Demand

The *Water Demand Report* (EKI 2015b; Appendix C) summarizes the Grapevine project's total outdoor, non-potable water demand at full build-out. Outdoor, non-potable water demand includes all outdoor commercial, industrial and institutional outdoor irrigation except for schools, all community landscape irrigation except for residential common areas, and system losses. Recycled water will be used for all non-potable water uses up to the amount of the recycled water supply generated by the project's wastewater treatment plants. Filtered, untreated Nickel Water will be used to supplement recycled water supplies as required to meet non-potable water demand. Full build-out non-potable water demands by land use category are summarized in Table 4 below. The following sections discuss the non-potable water demand estimated for commercial, industrial and institutional uses, landscaping and system losses.

3.2.1 Commercial, Industrial and Institutional Non-potable Water Use

Commercial, industrial and institutional non-potable water use was primarily assumed to be associated with irrigation and was estimated using the landscape irrigation demand model described in the recently-updated MWELO (EKI, 2015b; DWR, 2015). Commercial, industrial and institutional outdoor irrigation requirements were based on the area of land use for each of the commercial, industrial and institutional land uses shown in Table 1 and the assumption that 20% of the land area will be planted with a mix of higher and lower water use vegetation (*Water Demand Report*, Appendix C). Outdoor non-potable water use for solar farms was derived from information developed by the Bureau of Land Management (2012). As shown in Table 2, commercial, industrial and institutional outdoor non-potable water use will be approximately 270 AFY at full build-out. These estimated water demands are within the range of measured and documented commercial, industrial and institutional water uses for similar land uses at the adjacent TRCC (*Water Demand Report*, Appendix C).

Table 4
Grapevine Project Non-Potable Water Demand Summary

LAND USE CATEGORY	WATER USE UNIT	OUTDOOR WATER USE FACTOR	WATER DEMAND
Commercial, Industrial and Institutional	**Acres**	**AFY per acre**	**AFY**
Village Center Retail			
Grocery	6	2.76	16
Drug store	2	2.76	7
Miscellaneous	2	2.76	4
Restaurant	1	2.76	2
Bank	1	2.76	2
Village Center Office	9	2.76	25
Regional / Freeway-Oriented Commercial			
Miscellaneous Retail	15	2.76	41
Restaurant	1	2.76	4
Gas Station	1	2.76	4
Hotel	1	2.76	3
Office / R&D			
High Tech / Bio Tech	17	2.76	48
Other Office	10	2.76	28
Medical Center	5	2.76	13
Light Industrial / Warehouse			
Light Industrial / Warehouse	21	2.76	57
Community College	6	2.76	15
Landscaping and Solar Farm	**Acres**	**AFY per acre**	**AFY**
Parks	96	3.28	314
Roadways	203	4.38	887
Roundabouts	8	1.88	15
Windrow	22	4.38	95
Landscaped I-5 Buffer Zones	95	2.50	238
Golf Course	90	3.47	313
Solar Farm	800	0.004	3.6
System Losses			
Non-potable Outdoor Distribution System Losses			107
TOTAL NON-POTABLE WATER DEMAND			**2,241**

Source: Water *Demand* Report, Appendix C (all values subject to rounding)

3.2.2 Community Landscaping Water Use

Non-potable water will be used to irrigate all community landscaped areas except residential common areas, including parks, roadways, roundabouts, windrows, landscaped Interstate-5 buffer zones, landscaped open space and a golf course. Community landscaping irrigation use was estimated using the landscape irrigation demand model described in the recently-updated MWELO (EKI, 2015b; DWR, 2015). Annual per acre irrigation requirements were estimated for high and low water use plantings, combination plantings (trees and plants), and buffer zone plantings. The area occupied by each type of planting for each landscaped land use was multiplied by the applicable irrigation requirements.

Parklands will consist of 45% high water use plants, 45% low water use plants and 10% impervious or other areas that will not be irrigated. Artificial turf may be used for play fields, which would reduce the parkland water demand below the levels assumed in this WSA. Approximately 630,000 linear feet along all new project roads in Planning Areas 1 through 6 will be bordered on each side with seven-foot-wide irrigated landscaping, instead of medians. Approximately 13,450 linear feet along the proposed central east-west roadway will be a windrow with 35 feet of irrigated landscaping on each side.

As shown in Table 4, landscaping water use factors will range from approximately 1.88 AFY/acre for roundabouts to 4.38 AFY/acre for windrows and roadway borders. Approximately 1,865 AFY of non-potable water would be used for community landscape irrigation at full build-out (Table 2).

3.2.3 Non-potable System Losses

Non-potable distribution system losses are estimated to be 107 AFY consistent with measured and documented operational results for typical new, well-designed and well-maintained water treatment and distribution systems (*Water Demand Report*, Appendix C). Recycled water treatment system losses are included in the recycled supply estimates (*Water Demand Report,* Appendix C).

3.2.4 Full Build-out Non-potable Water Demand Summary

Table 4 summarizes the project's non-potable water demand by land use. At full build out, the project will use approximately 2,241 AFY of non-potable water, including distribution system losses for outdoor irrigation. Approximately 1,983 AFY of the non-potable water demand will be met by using disinfected tertiary-treated recycled water. Non-potable water demand in excess of recycled supplies (258 AFY) would be met by using untreated, filtered Nickel Water.

3.3 Construction Water Supply

During project construction water demand for dust control, soil compaction and other construction-related purposes would be met using Nickel Water. The project would require approximately 8,250 AF, or an average of approximately 420 AFY of construction water over an approximately 19 year buildout period, (EKI, 2015b). Nickel water supplies will exceed residential and commercial and industrial demand throughout project construction and will be sufficient to meet the estimated construction water demands.

3.4 Total Grapevine Water Demand

At full build-out, the Grapevine project's total water demand is estimated be approximately 8,261 AFY, including 5,620 AFY of potable water, 2,241 AFY of non-potable water, and a 400 AFY contingency. Table 2 summarizes the project's full build-out demand

4.0 PROJECT WATER AND WASTEWATER TREATMENT AND DISTRIBUTION SYSTEMS

This section summarizes the potable and non-potable water treatment and distribution systems that will supply water for the project. These systems are described in detail in the *Water Treatment Facility Engineering Report* (EKI 2015a) and the *Wastewater Treatment Facilities Engineering Report*, (EKI 2015c) included as Appendices A and D, respectively.

4.1 Project Potable Water System Description

The Grapevine project will utilize all of the disinfected, tertiary-treated recycled water that is generated from indoor water use and collected and treated within facilities to be operated by TCWD (EKI, 2015c). The project's estimated potable water demand assumes that recycled water supplies will be used for all commercial, industrial and institutional outdoor irrigation, except for schools, and all non-residential common area irrigation. Other project water demands including all indoor and residential outdoor uses and a 400 AFY contingency (400 AFY) are conservatively assumed to be served from the potable water system. However, if available, TCWD could supply tertiary-treated recycled water for all outdoor irrigation and non-potable uses consistent with legal requirements.

As discussed in the *Water Treatment Facility Engineering Report* (EKI, 2015a; see Appendix A), the Grapevine project's potable water system will include:

(a) Approximately eight intake pumps at one or more SWP aqueduct turnouts adjacent to the project with the capacity to meet the estimated build-out peak day demand of approximately 13.5 million gallons per day (mgd);

(b) Up to two water treatment facilities to meet all applicable drinking water standards;

(c) Potable water conveyance pipelines and pump stations as needed to serve the project; and

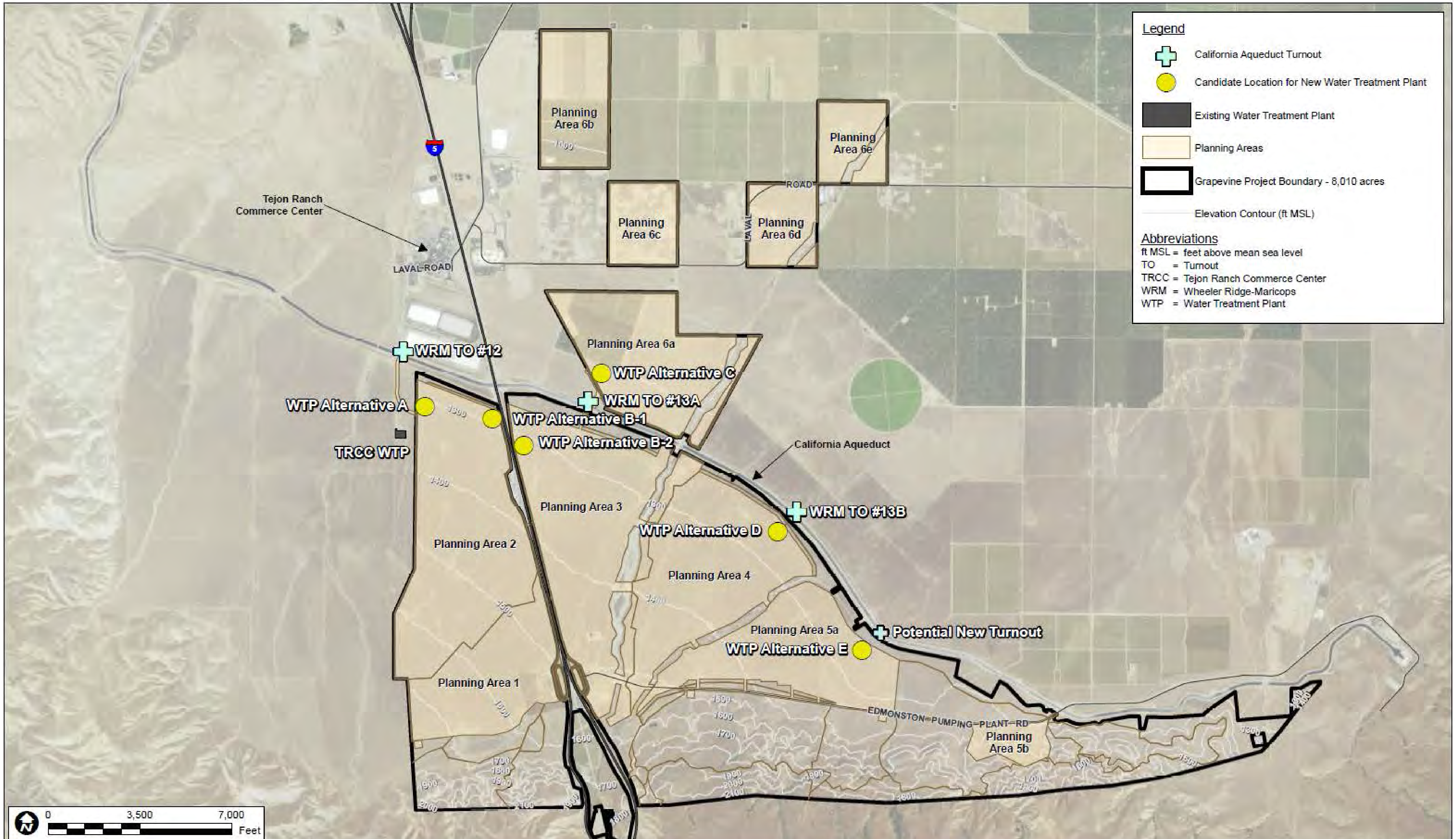
(d) Water system support facilities, including onsite storage of 7.1 million gallons of untreated water (an approximately three-day indoor water demand supply) and an additional 9.4 million gallons of treated water for peaking, fire control and other purposes. Although TCWD may elect to utilize other available means, such as groundwater wells, to meet a portion or all of the project's onsite emergency indoor supply or peaking, fire control or other requirements, this WSA conservatively assumes that onsite surface storage would be used to meet these requirements (see *Water Treatment Facility Engineering Report*, Appendix A).

TCWD operates one of the two raw water pumps located at existing turnout Wheeler Ridge #12, located adjacent to the project's western boundary; the other is operated by the Wheeler Ridge-Maricopa Water Storage District (Wheeler Ridge). There are currently two additional pump bays available at Wheeler Ridge #12. Additional intake pumps could be installed by expanding Wheeler Ridge #12, or improving or replacing existing aqueduct turnouts Wheeler Ridge #13A or Wheeler Ridge #13B, which are also adjacent to the project. Alternatively, TCWD could construct a new turnout along the SWP aqueduct. The potential expansion, replacement or improvement of any existing turnout, and new turnout construction, would require review and approval by KCWA, the SWP contractor for Kern

County, the California Department of Water Resources (DWR), which manages the SWP system for the state, and other parties that have rights to use one or more of the existing turnouts, including Wheeler Ridge. Project water treatment facilities would be located near the pumps used to deliver Nickel Water from the SWP aqueduct. The locations of existing turnouts Wheeler Ridge #12, Wheeler Ridge #13A and Wheeler Ridge #13B, a potential new turnout near the southeast corner of the project, and the potential locations for the project's water treatment facility that would be situated near these turnout(s), are shown in Figure 2.

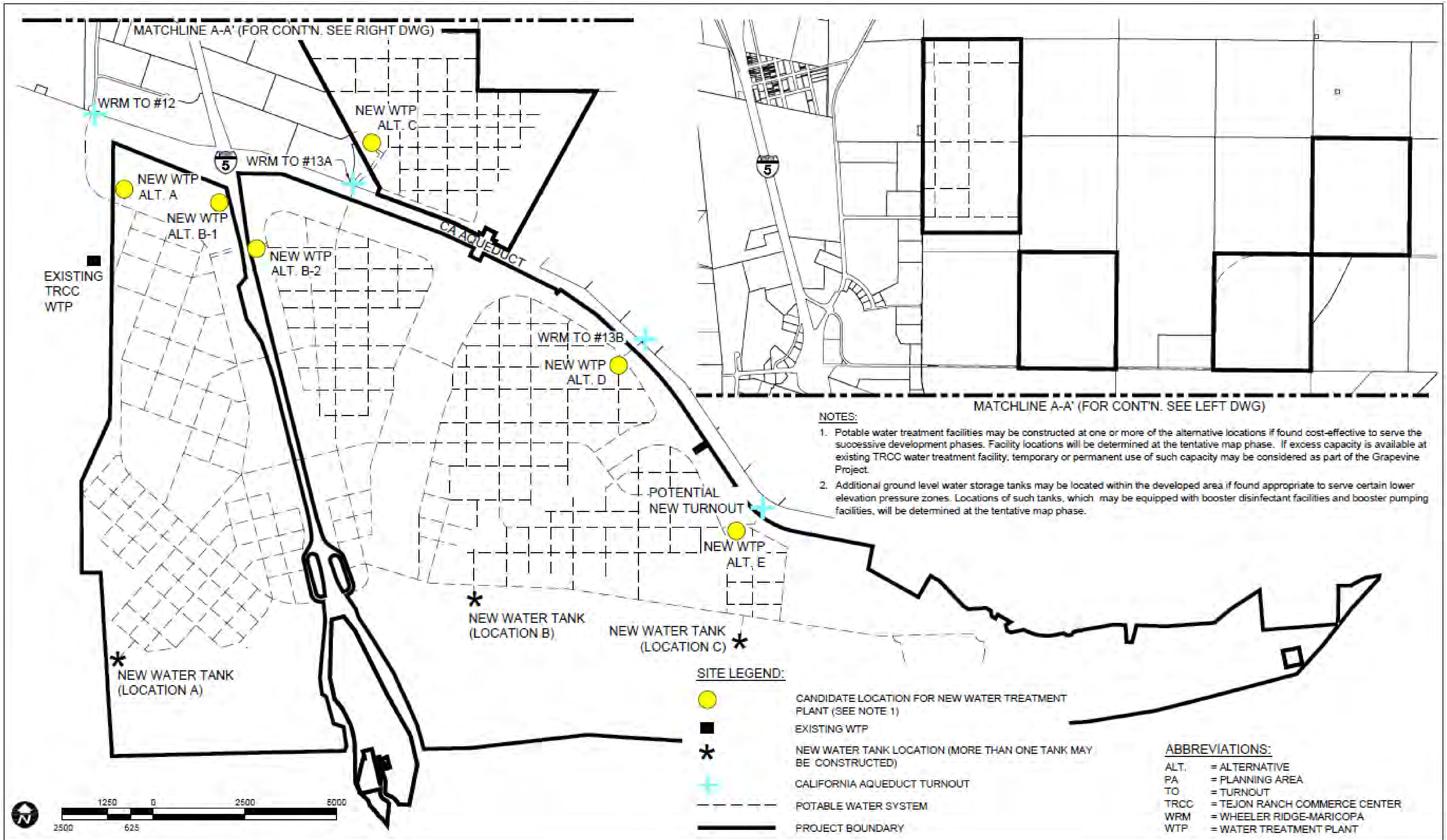
The Grapevine project's potable water system framework plan, including onsite conveyance and storage facilities, are shown in Figure 3.

Figure 2 - Location of Existing and Potential Turnouts and Potential Water Treatment Facilities



Source: *Water Treatment Facility Engineering Report*, Appendix A, Figure 3

Figure 3 - Grapevine Project Potable Water System Framework Plan



Source: *Water Treatment Facility Engineering Report*, Appendix A, Figure 4

4.2 Project Non-Potable Water System Description

Approximately 85% of the project's indoor wastewater treatment flow will be conveyed to and processed by the project's wastewater treatment facilities (WWTFs), accounting for water losses associated with indoor uses and wastewater conveyance and treatment losses, and will be produced as disinfected tertiary-treated recycled water. The produced recycled water will be subject to distribution losses of approximately 5% and additional evaporative storage losses. At full build-out, approximately 1,983 AFY of tertiary-treated recycled water will be available and used onsite for outdoor irrigation purposes (*Water Demand Report*, Appendix C). As discussed in the *Wastewater Treatment Facilities Engineering Report*, (EKI 2015c; Appendix D), the project will use membrane bioreactor technology, conventional tertiary treatment, or equivalent technology to produce recycled water for unrestricted reuse.

To provide a conservative assessment, this WSA assumes that separate wastewater treatment collection and treatment systems would serve the project areas located north and south of the California Aqueduct. Alternatively, a single wastewater collection and treatment system could serve both areas by constructing, subject to applicable DWR and other agency permits and approvals, wastewater conveyance and recycled water distribution lines over or under the California Aqueduct that connect the northern and southern portions of the project.
Wastewater generated in project Planning Areas 6a through 6e, which are located north of the California Aqueduct, would be conveyed to a new facility (Area 6 WWTF) that would be constructed near or adjacent to TCWD East WWTF or the TCWD West WWTF that currently serve the TRCC, see Figure 4. The Area 6 WWTF would have a 0.5 mgd nominal capacity equal to the projected average dry weather flows. The plant is also sized to treat peak flows, which are greater than nominal capacity.

Up to two new WWTFs would be constructed to treat wastewater flows from project Planning Areas 1 through 5b, which are located to the south of the California Aqueduct (see Figure 4). These facilities would include a primary wastewater treatment plant (Grapevine Project WWTF) and, potentially, a smaller scalping facility (Scalping WWTF) that would treat wastewater flows from the southern areas and convey solids for processing at the Grapevine Project WWTF. The Grapevine Project WWTF would have a 2.2 mgd nominal capacity. The nominal treatment capacity of the potential Scalping WWTF will be approximately 0.5 mgd. As in the northern project area, the southern plant's nominal capacity is equal to the projected average dry weather flows, and the plant is also sized to treat peak flows, which are greater than nominal capacity.

As discussed in the *Wastewater Treatment Facilities Engineering Report* (EKI 2015c; Appendix D), the project's wastewater treatment and recycled water distribution system will include:

(a) Influent and wastewater conveyance pipelines;

(b) Influent and recycled water distribution pumps;

(c) Approximately 810,000 gallons of flow equalization storage capacity;

(d) Approximately 14.4 million gallons of emergency treatment storage capacity; and

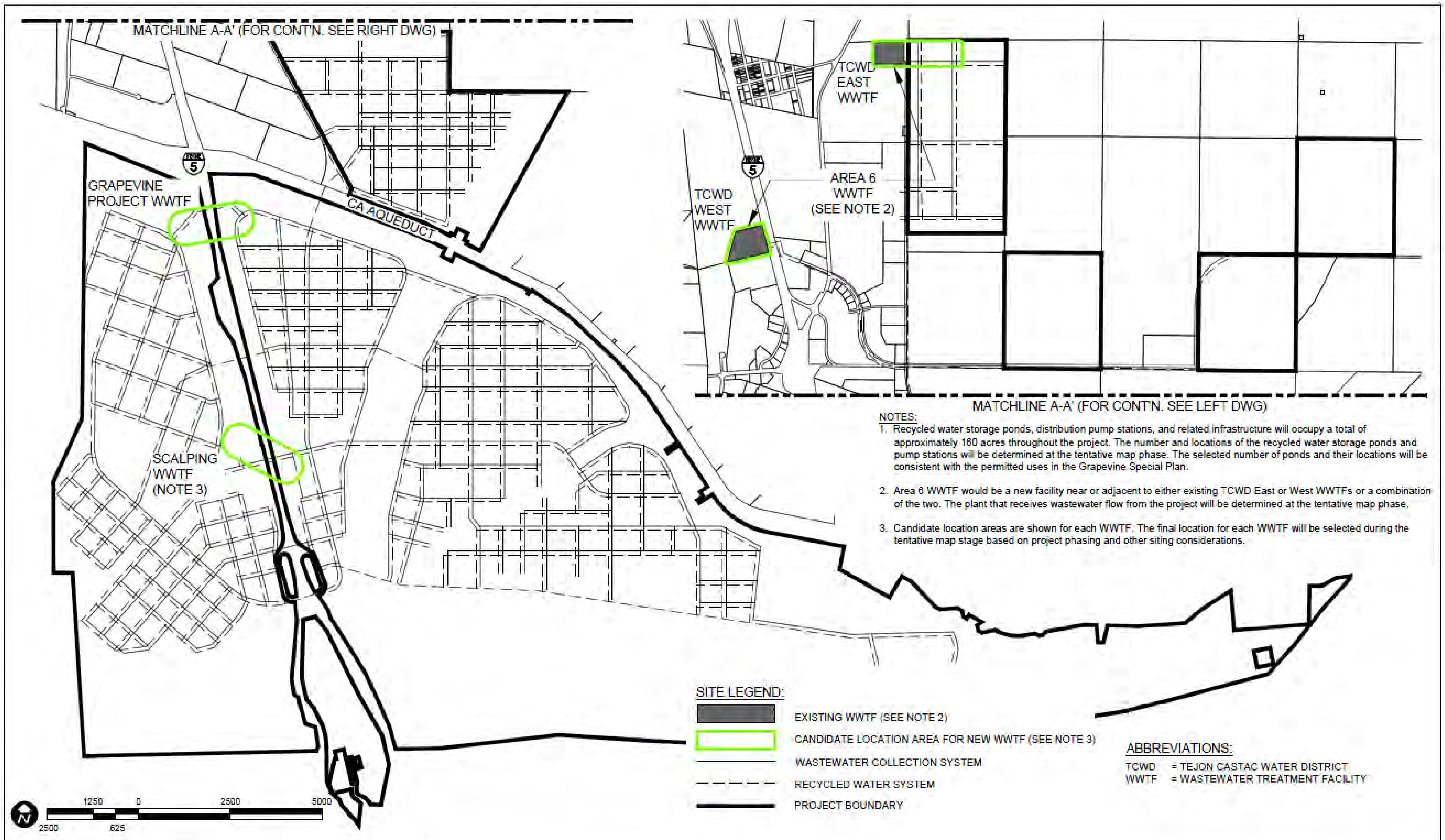
(e) Approximately 950 acre-feet of recycled water storage distributed in approximately 76 acres of ponds or similar surface storage facilities within the site.

The Grapevine project's wastewater treatment and non-potable water system conveyance and storage framework plan are shown in Figure 5.

Figure 4 - Existing and Proposed Wastewater Treatment Facilities

Source: *Wastewater Treatment Facilities Engineering Report*, Appendix D, Figure 4.

Figure 5 - Grapevine Project Wastewater and Non-potable Water System Framework Plan



Source: *Wastewater Treatment Facilities Engineering Report*, Appendix D, Figure 10.

5.0 TCWD WATER SUPPLIES

California Water Code Section 10910(c)(3) requires that a WSA "include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses." This WSA assumes that all water demands in the Grapevine project service area will be met by using Nickel Water and tertiary-treated recycled water generated from the project's indoor water use under a supply contract, assignment or other agreement between Tejon Ranchcorp and TCWD. Other water sources, including but not limited to the supplies discussed in Section 5.0 of this WSA, may become available to meet project demands. TCWD may identify any such water sources for project use during the water supply verification other applicable approval process.

TCWD will use other water supplies to meet demand in the TRCC and TMV service areas.[1] The amount, availability and sufficiency of these supplies to meet existing and future demand in the TRCC and TMV service areas, and for other district requirements, were most recently evaluated in the environmental impact report (EIR) for the TMV project certified by Kern County on October 9, 2009.[2] The TMV WSA prepared by TCWD for the TMV EIR is attached as Appendix E1. Section 7 of the TMV Final EIR (FEIR) included an additional analysis of the amount, availability and sufficiency of TCWD's supplies to meet existing and future demand in the TRCC and TMV service areas assuming SWP delivery rates that were lower than currently estimated by the DWR.[3] Tables A-C of the TMV FEIR are attached as Appendix E2.

[1] TRCC was referred to as the Tejon Industrial Complex (TIC) at the time the TMV EIR was certified by Kern County. The project name was subsequently changed to the Tejon Ranch Commerce Center. All references to the "Tejon Industrial Complex" or "TIC" in the TMV WSA, Appendix E1 and the TMV FEIR, Appendix E2 refer to the TRCC.

[2] The TMV EIR was subject to a CEQA legal challenge, including the WSA prepared by TCWD and the discussion of TCWD demand and supply in the TMV EIR. The TMV EIR was subsequently upheld in its entirety by the California Superior Court in November 2010 and by the California Court of Appeals in April 2012.

[3] The DWR estimates future SWP delivery reliability due to hydrological conditions, regulatory constraints, climate change and other factors every two years. The most recent estimate is included in the 2015 Final Delivery Capability Report published by the DWR in July 2015 (DCR). The DCR estimates annual delivery reliability under five scenarios using an 82-year model: (a) a "base" scenario, which estimates that if existing conditions persist over time average annual delivery reliability will be 62% of maximum levels; (b) an "Early Long-Term climate change" scenario with an average annual delivery reliability of 61%; (c) an "Existing Conveyance High Outflow" scenario with an average annual delivery reliability of 43%; (d) an "Existing Conveyance Low Outflow" scenario with an average annual delivery reliability of 51%; and (e) a "Bay-Delta Conservation Plan Alternative 4" scenario with an average annual delivery reliability of 67%. The DCR does not indicate which model should be used for future reliability projections. Tables A-C in the TMV FEIR analyzed TCWD's supplies for the TRCC and TMV service areas and other district demands assuming that average year SWP delivery reliability would range from 54% to 56% (or 55% on average). The SWP delivery reliability levels used in Tables A-C are below and provide a conservative summary of TCWD's ability to meet TRCC, TMV and other district demands relative to the DCR base scenario (62% annual average delivery). The average SWP reliability estimate used in the TMV FEIR (55%) are also lower than the average of the annual reliability levels in the four potential future scenarios (55.5%) included in the DCR.

This section identifies water supplies that would be used by TCWD to meet the Grapevine project's full build-out demand. Consistent with Water Code requirements, water sources available to TCWD for the purpose of meeting the district's other water service demands are also summarized.

5.1 TCWD Water Supplies for the Grapevine Project

The following sections describe TCWD's rights to use Nickel Water and recycled water produced by treating the project's indoor use wastewater to meet Grapevine project water demand.

5.1.1 Nickel Water

In January 2001, the Nickel Family LLC (Nickel), KCWA and the Olcese Water District entered into a *Contract to Transfer the Kern River Lower River Water Rights* (Water Transfer Contract) in conjunction with KCWA's Kern River Restoration Project. A copy of the Water Transfer Contract is attached as Appendix F. The contract provides KCWA with a perpetual right to receive certain high flow water from the Kern River. This supply is subject to annual variability in response to hydrologic conditions, and KCWA has estimated that the acquired Kern River rights would yield an average of approximately 50,000 AFY, of which approximately 40,000 AFY would be subject to capture and use by the agency. In partial exchange for this right, KCWA agreed to provide Nickel with a perpetual right to receive 10,000 AFY of "Agency Transfer Water," supplies that KCWA is obligated to provide to Nickel each year from the agency's water resources. The KCWA director's resolution approving the Water Transfer Contract determined that because the agreement "provides for the transfer by the Agency to Nickel Family LLP of 10,000 AF/year of Agency water to obtain water rights which historically have yielded far in excess of that amount" and that "the Agency is capable and will be capable of capturing sufficient amount of such water," the Water Transfer Contract will "provide a substantial net benefit to the Agency in terms of water supply, both quality and quantity" (KCWA Resolution 90-00).

Nickel's rights to receive 10,000 AFY in perpetuity from KCWA under the Water Transfer Contract include the following:

- KCWA is obligated to provide 10,000 AFY to Nickel in perpetuity delivered at the Tupman turnout along the SWP aqueduct (located approximately 20 miles southwest of Bakersfield). This water supply is not subject to reduction or adjustment due to hydrological conditions or the annual availability of SWP water to KCWA during normal, dry or multiple dry years (Water Transfer Contract, Appendix F, Section 3.1 and Section 4.4).

- KCWA is obligated to use its best efforts to obtain and maintain approvals from the DWR for delivery of the 10,000 AFY to Nickel, or to any party to which Nickel may assign the right to receive all or portions of this supply, into the SWP aqueduct and to negotiate alternative mechanisms for delivery if any such delivery cannot be made (Water Transfer Contract, Appendix F, Section 4.4).

- KCWA is obligated to ensure that the 10,000 AFY supplied to Nickel is of high quality, including the obligation to treat any non-SWP supplies that may be used by the agency to meet the 10,000 AFY delivery requirement to levels acceptable for delivery into the SWP aqueduct (Water Transfer Contract, Appendix F, Section 4.6).

- KCWA is obligated to transport the 10,000 AFY supplied to Nickel to its intended place of use to the full extent of the agency's rights to use the SWP aqueduct conveyance capacity (Water Transfer Contract, Appendix F, Section 4.7).

- Nickel and KCWA will schedule deliveries of the 10,000 AFY to Nickel with the DWR at the same time and in the same manner as KCWA schedules deliveries of SWP water to the agency's member units (Water Transfer Contract, Appendix F, Section 4.8).

- All or any part of the 10,000 AFY supply may be transferred to one or more third parties at the sole discretion and direction of Nickel. KCWA is obligated to cooperate and assist Nickel, as requested, in any such transfer, including entering into contracts for the sale of all or any part of the 10,000 AFY supply and obtaining the approval, cooperation and assistance of DWR and other SWP contractors and other regulatory agencies to effect any sale or transfer (Water Transfer Contract, Appendix F, Section 4.9).

On May 1, 2007, DMB Communities II LLC (DMB CII) and Nickel entered into an *Option and Water Purchase Agreement* (2007 Agreement) under which DMB CII acquired all of Nickel's rights to 8,393 AFY of the 10,000 AFY supplied to Nickel under the Water Transfer Contract for an initial term of 35 years starting on January 1, 2009 and for an additional term of 35 years at the sole and exclusive discretion of the transferee. The 2007 Agreement is attached as Appendix G of this WSA. DMB Pacific LLC (DMBP) subsequently succeeded to the interests of DMB CII under the 2007 Agreement and with the consent of Nickel. Section 13(j) of the 2007 Agreement states that "Nickel shall use its best efforts to assist DMB to obtain all necessary approvals, including the cooperation of [KCWA] and DWR, for delivery of the [8,393 AFY of water], including by exchange, to up to five public water supply agencies or water companies at points other than Tupman."

In October and November 2013, Tejon Ranchcorp and DMBP entered into a *Purchase and Sale Agreement*, a *First Amendment to the Purchase and Sale Agreement* and a *Second Amendment to Purchase and Sale Agreement and Partial Assignment Agreement* (collectively, the "2013 Agreement") under which Tejon Ranchcorp acquired all of DMBP's rights to 6,693 AFY of the 10,000 AFY supplied to Nickel under the Water Transfer Contract and of the 8,393 AFY assigned by Nickel to DMBP under the 2007 Agreement (Appendix H). Nickel consented in writing to the assignment of the 6,693 AFY to Tejon Ranchcorp. The 2013 Agreement has an initial term of 35 years starting on January 1, 2009, and may be extended for an additional 35 years up to 2079 at the sole and exclusive discretion of Tejon Ranchcorp. The 2013 Agreement is attached as Appendix H.

As discussed in Section 3.0, the Grapevine project would require approximately 8,261 AFY at full build-out. The project will generate approximately 1,983 AFY of tertiary-treated recycled water, all which will be used for outdoor irrigation. Approximately 6,278 AFY of the project's full build-out demand would be met by using Nickel Water provided by Tejon Ranchcorp to TCWD for project use under a supply contract, assignment or similar agreement. This WSA assumes that the full amount of this supply will be available for project use each year starting with year 1 of the analysis period. The Nickel Water will be supplied by KCWA under the terms and conditions of the Water Transfer Contract between Nickel and KCWA. Consistent with the Water Transfer Contract, the water will be a high quality supply that KCWA must treat as necessary to meet aqueduct water quality standards. The water supply will be delivered to the project site with 100% year-to-year reliability.

The project is located downstream from the Tupman turnout along the SWP aqueduct, and water supplied from that location would be conveyed through all or portions of aqueduct reaches 13B, 14A, 14B, 14C, 15A, 16A. No lift facilities would be required to deliver water to the site. KCWA's rights to the aqueduct's capacity in these reaches ranges from 986 cubic feet per second (cfs) in Reach 13B to 214 cfs in Reach 16. The project's maximum monthly demand for Nickel Water at full build-out would be approximately 14.2 cfs, substantially below KCWA's conveyance rights in the aqueduct reaches between the Tupman turnout and the project. The aqueduct's capacity in the reaches the project would utilize is approximately 4,400 cfs. During 2000-2009, average monthly conveyance volumes in the aqueduct measured just downstream from the project site ranged from approximately 1,500 cfs in February to 2,800 cfs in the peak summer months of July and August. Consequently, there is substantial unused capacity in the aqueduct reaches that would be used to deliver Nicker Water to the project during all periods of the year, and KCWA has a priority right to the aqueduct in the reaches where the agency has been allocated conveyance capacity. In accordance with the Water Transfer Contract, KCWA and TCWD will coordinate Nickel Water deliveries to meet project demand on a daily basis (*Water Supply Delivery Evaluation for the Grapevine Project*, Appendix B, pages 3-5).

5.1.2 Recycled Water

The project's wastewater treatment facilities and recycled water supplies are described in Section 4.0 and in the *Wastewater Treatment Facilities Engineering Report* (Appendix D). All project wastewater from indoor use will be collected and treated to disinfected tertiary water quality standards in accordance with Title 22 of the California Code of Regulations. The disinfected tertiary treatment standard is the most stringent under California law, and allows for the unrestricted use of recycled water supplies. An onsite distribution system will provide recycled water for all commercial, industrial and institutional outdoor irrigation requirements except for at schools and for all landscaping irrigation in parks, roadways, roundabouts, windrows, landscaped Interstate-5 buffer zones, landscaped open space and a golf course. If available, TCWD could supply tertiary-treated recycled water for all residential and non-residential outdoor and non-potable uses consistent with applicable legal requirements.

All project wastewater treatment facilities will be constructed and operated to meet the recycled water distribution and use rules and regulations promulgated by the California Department of Public Health (DPH) and the Regional Water Quality Control Board. After annexing the Grapevine service area, TCWD would own and operate the wastewater treatment facilities. California Water Code Section 1210 provides that the owner of a wastewater treatment plant holds the exclusive right to the treated wastewater produced by the plant. The Project's proposed recycled water use is also consistent with the Recycled Water Policy adopted in 2009 by the State Water Resources Control Board (State Board) (Resolution No. 2009-0011, February 3, 2009), which includes: (1) increasing statewide use of recycled water over 2002 levels by at least one million AFY by 2020 and by at least two million AFY in 2030; and (2) substituting as much recycled water for potable water as possible by 2030. To facilitate these goals, the Recycled Water Policy provides direction to each Regional Water Quality Control Board regarding the appropriate criteria for issuing recycled water use permits and to streamline the recycled project permitting process. TCWD will have the exclusive right to use all disinfected tertiary-treated recycled water for project irrigation and such use is consistent with California's recycled water use policies.

5.1.3 Summary of TCWD Supplies for the Grapevine Project

Nickel Water will be supplied by TCWD for Grapevine project use on a priority basis under a supply contract, assignment or similar agreement between TCWD and Tejon Ranchcorp. Indoor wastewater generated by residential and commercial, industrial and institutional use of potable Nickel Water will be captured and treated to tertiary, unrestricted reuse standards for onsite irrigation. As discussed previously, TCWD's supply of Nickel Water and recycled water are sufficient to meet full build-out demand within the Grapevine service area from year 1 of the analysis period. Table 5 summarizes the water sources that will be used by TCWD for Grapevine project purposes.

Table 5
TCWD Supplies for Grapevine Project Use

SUPPLY SOURCE	ANNUAL SUPPLY (AFY)
Nickel Water	6,278
Recycled Water	1,983
TOTAL GRAPEVINE WATER SUPPLY	**8,261**

Sources: *Water Demand Report*, Appendix C

5.2 TCWD Water Supplies for TRCC, TMV and Other District Requirements

The Grapevine project will be served by TCWD with Nickel Water and tertiary-treated recycled water produced from the project's indoor water use. TCWD has identified and has sufficient rights to other supplies that will meet demand in the TRCC and TMV service areas. The supplies available to TCWD to meet demand in the Grapevine service area are separate from the water supplies available to meet demand in the TRCC and TMV service areas and were most recently analyzed in the TMV WSA (Appendix E1) and the TMV FEIR (Appendix E2). The following sections summarize the water supplies discussed in the TMV WSA and the TMV FEIR for the TRCC and TMV service areas and to meet other district demands.

5.2.1 SWP Supplies

TCWD is one of thirteen member units of KCWA that have contractual rights to SWP water through the agency. The SWP is operated by the DWR. The DWR has contractually allocated the SWP's maximum delivery capacity of approximately 4.2 million AFY to each of the system's 29 primary contractors, including KCWA. These allocations are commonly referred to as "Table A" allocations because they are described in Table A of the SWP contracts. TCWD has a contract right to receive 5,278 AFY of SWP Table A amounts from KCWA. The amount of water delivered to SWP system participants each year may vary from the Table A allocations depending on annual precipitation, overall statewide demand, potential regulatory issues, potential climate change effects and other factors discussed in detail in Appendix E1. . Other SWP water supplies may become available to TCWD depending on hydrological and demand conditions, including: (1) excess SWP system supplies as defined in Article 21 of the SWP contracts; (2) surplus supplies sold to other system contractors aggregated into “turnback pools;” or (3) carryover water stored in the San Luis Reservoir, a large SWP storage facility located east of Hollister in the Inner Coast Range west of the San Joaquin Valley, for delivery in a subsequent year. To date, California is still experiencing one of the most severe droughts in the state’s history. As shown in Figure 5-2 of the SWP Final Delivery Capability Report prepared by the DWR in July 2015 (DCR), total SWP deliveries from all sources, including turnback pools, carryovers and Article 21 water were approximately 11.4% of the maximum delivery level for all contractors in 2014, and 40.4% in 2013.

5.2.2 Federal Water Project Supplies

KCWA is a participant in the Central Valley Project (CVP), a federal water supply and distribution system generally located to the east of the SWP facilities in Kern County. KCWA is entitled to receive CVP water under an agreement with the Kern-Tulare and Rag Gulch water districts (the “KT/RG Agreement”) or pursuant to Article 215 of the agency’s CVP contract. Under certain circumstances, it is possible for TCWD to exchange water with a CVP contractor or to have CVP water delivered to banking facilities that are located within the CVP place of use. In general, the amount of federal water potentially available to TCWD is approximately 0.53% of supplies that may be available to KCWA under the KT/RG Agreement or pursuant to Article 215 of the CVP contract. These supplies have been available to TCWD in prior years.

5.2.3 High-Flow Kern River Water

The Kern River flows for approximately 155 miles from the Sierra Nevada Mountains near Mount Whitney to the Tulare Lake basin in the San Joaquin Valley west of Bakersfield. During periods of above-normal precipitation, flows within the Kern River and other streams can exceed the needs of existing users. Under such conditions, certain water districts and other entities, including the Kern Water Bank and Pioneer groundwater storage projects, have captured and used Kern River high-flow water. TCWD has estimated that approximately 187 AFY from the Lower Kern River right may become available to the district in the future.

5.2.4 San Joaquin Valley Groundwater

The TRCC and proposed Grapevine service areas overlie the White Wolf groundwater sub-basin in the southern San Joaquin Valley, an aquifer that has been recognized by the DWR in the department’s official surveys of California groundwater basins. Other districts that overlie the basin include Wheeler Ridge and the Arvin-Edison Water Storage District. Approximately 40 years ago, SWP water began to be used for irrigation in the region. Prior to that time, the White Wolf groundwater sub-basin was being overdrafted. In 1995, Wheeler Ridge commissioned a report that analyzed the status of the basin (Bookman-Edmonston 1995). The report found that groundwater levels had recovered since SWP water use had been initiated and that the White Wolf sub-basin generated a surplus of approximately 2,370 AFY. In 2007, Wheeler Ridge adopted a groundwater management plan pursuant to the California Water Code that includes a portion of the White Wolf basin.

In 2014, California enacted the Sustainable Groundwater Management Act (Water Code §10720 et seq.)(SGMA). SGMA, and related amendments to California law, require that all groundwater basins designated as high or medium priority in the DWR California statewide groundwater elevation monitoring (CASGEM) program, and that are subject to critical overdraft conditions, must be managed under a new groundwater sustainability plan (GSP) or a coordinated set of GSPs, by January 31, 2020. High or medium priority basins that are not subject to a critical overdraft must be regulated under one or more GSPs by 2022. Almost all of the southern San Joaquin Valley basin, including portions of the project area, have been designated as high priority under the CASGEM program (http://www.water.ca.gov/groundwater/casgem/basin_prioritization.cfm, accessed November 2015). Where GSPs are required, one or more local groundwater sustainability agencies (GSAs) must be formed to implement applicable GSPs. A GSA has the authority to require registration of groundwater wells, measure and manage extractions, require reports and assess fees, and to request revisions of basin boundaries, including establishing new subbasins. GSAs must be formed for high and medium priority basins by June 2017.

Each GSP must include a physical description of the covered basin, such as groundwater levels, groundwater quality, subsidence, information on groundwater-surface water interaction, data on historical and projected water demands and supplies, monitoring and management provisions, and a description of how the plan will affect other plans, including city and county general plans. The DWR must adopt regulations for the preparation of a GSP by January 2016. As defined by the Act, "sustainable groundwater management" means that groundwater use within basins managed by a GSP will not cause any of the following "undesirable results:" (a) chronic lowering of groundwater levels (not including overdraft during a drought, if a basin is otherwise managed); (b) significant and unreasonable reductions in groundwater storage; (c) significant and unreasonable seawater intrusion; (d) significant and unreasonable degradation of water quality; (e) significant and unreasonable land subsidence; and (f) surface water depletions that have significant and unreasonable adverse impacts on beneficial uses (Water Code Section 10721(w)).

TCWD has extracted White Wolf sub-basin groundwater from a well located east of Interstate 5 near TRCC. Wells in this location have the capacity to produce approximately 1,500 gallons per minute (gpm), or 2,420 AFY. Production equivalent to approximately 458 AFY was documented at the TCWD well location in 2006. TCWD, and the Tejon Ranch Company and the company's affiliates (TRC), are continuing to identify groundwater sources within the San Joaquin Valley. The district and TRC have existing rights under California law to extract local groundwater, and TRC and TCWD anticipate that groundwater will continue to be available for extraction and use under one or more pending GSPs. As discussed in this WSA, the TMV WSA (Appendix E1), and the TMV FEIR (Appendix E2), TCWD's demand and supply analysis for all service areas conservatively assumes that no groundwater will be used to meet the district's current and future demands.

5.2.5 Water Banking Rights

TCWD currently participates in two Kern County groundwater banks located within the San Joaquin Valley: (1) the Kern Water Bank (KWB); and (2) the Pioneer Project.[4] The KWB and Pioneer Project are located at the lower end of the Kern River to the west of Bakersfield. A groundwater bank allows participating water districts to percolate or inject water obtained during relatively wet hydrological periods into an aquifer for subsequent retrieval, typically during drier periods. Water bank supplies generally complement other sources, such as SWP deliveries, that may be affected by seasonal, regulatory or other operational variability. TCWD has banked more than 30,000 acre-feet of water in the KWB and Pioneer Project. As discussed in the TMV WSA (Appendix E1), banked water that TCWD extracts from the KWB and the Pioneer Project will be utilized to supply the TRCC and TMV service areas within Kern County.

5.2.6 Recycled Water Supplies

TCWD operates a 100,000 gallons per day (gpd) WWTF on the west side of I-5 and will build another 770,000 gpd WWTF on the east side of I-5 within the TRCC service area. The two TRCC wastewater treatment facilities will have the capacity to produce approximately 900 AFY of tertiary-treated wastewater, and TRCC is projected to generate approximately 398 AFY of recycled water at full build-out for use within the TRCC service area. The TMV project will also include an onsite WWTF and a recycled water distribution system. At full build-out, TMV will generate approximately 800 AFY of recycled water for use within the TMV service area.

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[4] The KWB and Pioneer project are subject to ongoing litigation. The KWB was transferred to local Kern County control in conjunction with certain municipal and agricultural SWP contractor agreements in 1994 that are commonly called the "Monterey Amendment." The CEQA analysis of the Monterey Amendment has been repeatedly challenged in court, including lawsuits filed after the DWR certified the most recent analysis, the "Monterey Plus EIR," in 2010. On March 5, 2014, a Sacramento Superior Court issued two rulings that upheld the Monterey Plus EIR against all claims except for the analysis of potential KWB groundwater impacts (Sacramento Superior Court, *Ruling on Submitted Matter*, Case No. 34-2010-80000703 and Case No. 34-2010-80000561). A hearing on the appropriate CEQA remedy following the March 2014 decision was held in September 2014 and a writ of mandate was issued by the court in November 2014. Among other requirements, the mandate directed that: (a) DWR prepare a new environmental analysis of potential KWB groundwater impacts not limited in geographic scope to KWB lands; (b) the Monterey Amendment EIR be decertified pending reconsideration by the DWR after the additional groundwater impact analysis was conducted; (c) continued operation of the SWP system in accordance with the Monterey Amendment; and (d) operation of existing KWB operations without expansion and consistent with an Interim Compliance Plan and applicable permits (Sacramento Superior Court, Case No. 34-2010-80000703 and Case No. 34-2010-80000561, *Joint Ruling on Submitted Matters*, October 2, 2014, and *Findings and Peremptory Writ of Mandate,* November 24, 2014). The analysis of groundwater impacts ordered by the court has not yet been released by the DWR for public review and comment, and the extent to which the bank's operations may be affected by litigation may be unresolved for several months or years. The TMV WSA and EIR addressed the possibility that Monterey Agreement litigation could affect the KWB and determined that the water banking component of TCWD's supplies could be achieved by other means, such as using existing commercial water banking facilities if the district's use of the KWB was constrained. For example, the Semitropic Water Storage District operates a commercial water bank with 1.65 million acre feet of storage just north of TRC landholdings (Semitropic Water Storage District, "Groundwater Banking" http://www.semitropic.com/GroundwaterBanking.htm, accessed November 2015) TCWD could contract to use these facilities to bank water in a manner consistent with the analysis in the TMV WSA (Appendix E1) and the TMV FEIR (Appendix E2). Consequently, ongoing litigation concerning the KWB or the Pioneer Project would not materially affect the analysis of TCWD's supplies in prior project approvals. The Grapevine project would not utilize KWB or Pioneer Project banked water, and would also not be affected by litigation concerning the KWB or the Pioneer Project.

5.2.7 Summary of TCWD Water Supplies for TRCC and TMV Service Area Use

Table 6 summarizes the average year and potential water supplies discussed in the TMV WSA (Appendix E1) and TMV FEIR (Appendix E2) for use by TCWD in the TRCC and TMV service areas and to meet other district demands. Table 6 is conservative and understates the district's water supplies. Among other factors, the summary does not include supplemental supplies from potential SWP and CVP exchanges that have been available to TCWD in the past and that may become available in the future.

Table 6
Summary of TCWD Supplies for TRCC, TMV and Other Demands

WATER SOURCE	Average Year (AFY)	Potential Supply (AFY)
Recycled Water (at full build-out)		
TRCC Service Area	358	900
TMV Service Area	800	800
Subtotal Recycled Water Supplies	*1,158*	*1700*
Surface Water Supplies		
SWP Table A average year	2,903[5]	5,278
SWP Article 21, Turnback Pool or Other Supplemental Supplies	-	variable
High-Flow Kern River Supplies	-	187
Subtotal Surface Water Supplies	*2,903*	*5,465*
Local Groundwater Supplies (TRCC Service Area)		
White Wolf Sub-basin	-	2,420
Water Banks in Kern County		
Kern Water Bank	4,000	6,000
Pioneer Project	750	1,000
Subtotal Water Banking Supplies	*4,750*	*6,750*
Total Available Water Supply	**8,811**	**16,585**

Sources: TMV WSA, Appendix E1 and TMV FEIR, Table A, Appendix E2

[5]The SWP average year delivery amount in Table 6 reflects a reliability level of 55% of TCWD's Table A amount, the average annual delivery rate assumed in the TMV FEIR (see Tables A-C in Appendix E2). This reliability level is lower than the "base" reliability rate under existing conditions and the average of four future scenarios in the most recent Delivery Capability Report (DWR, July 2015).

6.0 TCWD DEMAND ANALYSIS

This section describes the total water supply demands that TCWD will be required to meet over the 20-year WSA analysis period, including the Grapevine project, TRCC and TMV and service area demand, and other district requirements. The Grapevine project's water demands are discussed in Section 3.0 above.

6.1 TRCC Service Area Water Demand

The TRCC service area includes industrial, commercial and retail land uses within a 325-acre development to the west of Interstate 5 (TRCC West), and a 1,109-acre development to the east of the freeway (TRCC East). At full build-out, the TRCC service area will use approximately 1,102 AFY of water. Table 7 summarizes projected build-out water demands for TRCC West and TRCC East.

Table 7
Estimated TRCC Service Area Water Demand at Full Build-out

Land Use/Service Area	Potable Water Demand (AFY)	Non-Potable Water Demand (AFY)	Total Water Demand (AFY)
Commercial	72	133	205
Warehouse	4	96	100
TRCC West Subtotal	*76*	*229*	*305*
Commercial	273	73	346
Industrial	174	177	351
TRCC East Subtotal	*447*	*250*	*697*
Subtotal Water Demand	523	479	1,002
Total TRCC Service Area Water Demand (including system losses)			**1,102**

Source: TMV WSA, Appendix E1, Table 8

6.2 TMV Service Area Water Demand

The TMV project was approved by Kern County in 2009. The project site includes approximately 26,417 acres, of which approximately 21,335 acres, or about 80% of the site, will remain undeveloped, and 5,082 acres would be developed with a mix of residential, commercial, and recreational uses. The proposed uses include 3,450 residences (both single-family and single-family attached units), 160,000 square feet of commercial development, and hotel, spa, and resort facilities, including 750 lodging units and up to 350,000 square feet of facilities in support of two 18-hole golf courses (36 holes of golf total), riding and hiking trails, equestrian facilities, two helipads, a fire station, private community centers, electrical sub-station facilities, water treatment and wastewater treatment facilities as well as associated access and utilities necessary to serve the development.

The TMV project's water demand was analyzed in the WSA prepared by TCWD and in the TMV EIR certified by Kern County in November 2009. As shown in Table 8, at full build-out the TMV project will use approximately 1,000 AFY of potable water for indoor use, and a mix of potable and non-potable water, including approximately 800 AFY of tertiary-treated recycled water produced by onsite wastewater treatment facilities, for outdoor irrigation. The project's total water demand at full build-out will be approximately 2,900 AFY.

Table 8
Estimated TMV Service Area Water Demand at Full Build-out

Land Use	Indoor Water Demand	Outdoor Water Demand (Potable and Non-potable)	Total
Residential	754	751	1,504
Commercial	53	9	62
Golf Course	20	792	812
Other Uses	87	300	387
Total Water Use (including system losses and rounded to nearest 100)	**1,000**	**1,900**	**2,900**

Source: TMV WSA, Appendix E1, Table 3

6.3 Other District Demands

TCWD is required by KCWA to contribute water for various regional and system-wide purposes. The amount of these obligations is approximately 100 AFY (TMV WSA, Appendix E1, Section 4.2). From time to time, TCWD has temporarily transferred surplus water supplies to other water users, including water transfers to assist with agricultural irrigation in adjacent areas during drier periods. These transfers are voluntary and TCWD has no obligation to transfer any of its water supplies to other districts or agencies for any purpose. No temporary transfer will be approved by TCWD unless: (a) there is no demand for the affected water in any of the district's service areas; and (b) the district has no available capacity to bank the water if there is no demand within its service areas. Under these conditions, temporary water transfers that may occur in the future will have no impact on the supply, demand and water banking projections in this WSA.

6.4 Summary of Total TCWD Water Service Demand

Table 9 summarizes TCWD's water service demands over the twenty year period required by the Water Code assuming full build-out of the TRCC, TMV and Grapevine service areas from year 1 of the analysis. This projection overstates the actual water service demand that will occur during the analysis period. TRCC and TMV are not yet complete. The Grapevine project has not yet been approved and full build-out is not likely to occur for several years. Due to these factors, the level of water service that TCWD will be required to provide over the twenty-year WSA analysis period will be significantly less than projected in Table 9.

Table 9
Estimated TCWD Demand Assuming Full Build-out of All Service Areas in Year 1

	2014	2019	2024	2029	2034
Grapevine Service Area					
Grapevine Service Area	8,261	8,261	8,261	8,261	8,261
TRCC and TMV Service Area and Other District Demands					
TRCC Service Area	1,102	1,102	1,102	1,102	1,102
TMV Service Area	2,900	2,900	2,900	2,900	2,900
Other District Operations	100	100	100	100	100

Sources: *Water Demand* Report, Appendix C and TMV WSA, Appendix E1

7.0 GRAPEVINE PROJECT SUPPLY AND DEMAND ANALYSIS

California Water Code Section 10910(c)(3) requires that a WSA analyze whether "total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project in addition to the public water system's existing and planned future uses….". As discussed above, Grapevine, TRCC, TMV and certain additional district demands comprise TCWD's "existing and planned" water service requirements over the WSA analysis period. TCWD will supply all of the Grapevine project's water service demands. To implement the Water Code requirements, this WSA assesses the extent to which TCWD will meet its total water service demands, including from the Grapevine project, over a twenty-year period during normal, single dry and multiple dry years.

This WSA conservatively assumes that TCWD will serve the Grapevine project with Nickel Water and tertiary-treated recycled water produced from onsite indoor use wastewater. TRCC and TMV service area demand, and other district demands, will be met by using unrelated water sources. TCWD's ability to meet TRCC and TMV service area demand over a twenty-year period during normal, single dry and multiple dry years was most recently analyzed in conjunction with the approval of the TMV project and is summarized separately from the analysis of the Grapevine project presented below. The analysis method used in this WSA follows the DWR's *Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001* (2003). Section 7.1 describes these methods and the analysis assumptions in more detail. Sections 7.2-7.4 provide average, single dry, and multiple dry year water supply and demand projections in accordance with the Water Code. Section 7.5 discusses additional supplies potentially available for Grapevine project use. Section 7.6 discusses certain other issues that that were requested by the County.

7.1 Analysis Methodology and Assumptions

This section describes the analysis approach used to project TCWD's future supplies for the Grapevine project. TCWD's future supplies for TRCC and TMV were previously analyzed by Kern County during the TMV project review and approval process.

7.1.1 Grapevine Project Analysis Approach

This WSA conservatively assumes that TCWD will fulfill all of its service demands for the Grapevine project service area by utilizing Nickel Water and recycled water produced from onsite indoor use wastewater during the analysis period. As discussed above, other water supplies may be identified by the district during the water supply verification or other applicable project approval process. Nickel Water is 100% reliable year to year and delivery amounts are not subject to: (a) the shortage provision in Article 18 of KCWA's water supply contract with the DWR and; (b) shortages that can affect the delivery of SWP water to KCWA or to any other SWP system contractor or subcontractor during average, single dry and multiple dry years (see Section 7(c) of the KCWA-Nickel Water Transfer Contract, Appendix G). Nickel Water deliveries will be coordinated in accordance with the Water Transfer Contract by TCWD with KCWA to meet project demand by extracting Nickel Water from one or more adjacent aqueduct turnouts.

The analysis also assumes that TCWD must meet the Grapevine project's full build-out demand that all available supplies, including Nickel Water and recycled water will be used from the start of the analysis period. These assumptions are conservative because the project will be constructed over several years, full build-out demand will not occur during year 1 of the analysis period, and the project's actual demand over the analysis period will be lower than projected. During the project construction period, recycled supplies would become available as indoor water use increases over time to full build-out levels. The MBR technology that will be utilized to produce tertiary-treated recycled water allows for installation in phases in accordance with the amount of wastewater captured from onsite indoor water use (*Wastewater Treatment Facilities Engineering Report*, Appendix C).

Finally, the analysis of TCWD supplies available to meet Grapevine project assumes that other water supplies, including groundwater, that are currently available to TCWD, or potential future supplies, will not be used during the analysis period. Certain of these supplies are discussed in more detail in Section 5.1.

7.1.2 TRCC and TMV Service Area and Other TCWD Demands

The approach used to analyze the sufficiency of TCWD supplies for the TRCC and TMV service areas and other district requirements is discussed in detail in the TMV WSA (Appendix E1). The TMV FEIR included an analysis of TCWD's supplies for these service areas that assumed SWP delivery reliability rates during average, dry, and multiple dry years that are lower than currently estimated by the DWR. As a result, the TRCC and TMV service area analysis is conservative and assumes that TCWD would only use: (a) rights to receive SWP supplies as a member unit of the KCWA, subject to delivery reliability rates lower than currently estimated by the DWR for the SWP system; (b) tertiary-treated recycled water produced from treatment facilities serving the TRCC and TMV service areas; and (c) stored, banked water that would be infiltrated during wetter years and extracted in dry years to meet TRCC, TMV and other district demands. As discussed in the TMV WSA (Appendix E1) other water supplies are currently available and could become available to TCWD in the future for use in the TRCC or TMV service areas.

7.2 Average Year Analysis

Water Code Section 10912 requires an analysis of normal or average year supplies that will be available for use by the proposed Grapevine project and other district requirements over a twenty-year period. Table 10 summarizes the average year projections for years 1, 5, 10, 15 and 20 of the analysis period and conservatively assumes that full build-out demand and water supply use, including recycled supplies, will occur from the start of the analysis. Nickel Water and recycled water supplies will be sufficient to meet the Grapevine project's full build-out demand in all average years. Table 10 also shows that TCWD will be able to meet other district demands in average years using other water sources, including average year SWP delivery levels that are lower than currently projected by the DWR (TMV FEIR, Appendix E2, Table A).

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Table 10
Average Year Analysis

	2014	**2019**	**2024**	**2029**	**2034**
Grapevine Service Area					
Supplies					
Recycled Water	1,983	1,983	1,983	1,983	1,983
Nickel Water	6,693	6,693	6,693	6,693	6,693
Subtotal Supplies	*8,676*	*8,676*	*8,676*	*8,676*	*8,676*
Demands					
Grapevine Service Area	*8,261*	*8,261*	*8,261*	*8,261*	*8,261*
Subtotal Demands	*8,261*	*8,261*	*8,261*	*8,261*	*8,261*
Surplus/Deficit	**415**	**415**	**415**	**415**	**415**
TRCC and TMV Service Areas and Other District Demands					
Supplies					
Recycled Water	1,158	1,158	1,158	1,158	1,158
SWP Water	2,826	2,860	2,893	2,927	2,960
Banked Water/(storage)	118	84	51	17	-16
Subtotal Supplies	4,102	4,102	4,102	4,102	4,102
Demands					
TRCC Service Area	1,102	1,102	1,102	1,102	1,102
TMV Service Area	2,900	2,900	2,900	2,900	2,900
Other District Operations	100	100	100	100	100
Subtotal Demands	*4,102*	*4,102*	*4,102*	*4,102*	*4,102*
Surplus/Deficit	**0**	**0**	**0**	**0**	**0**

7.3 Single Dry Year Analysis

Water Code Section 10912 requires an analysis of single dry year supplies that will be available for use by the proposed Grapevine project over a twenty-year period. Table 11 summarizes the single dry year projections for years 1, 5, 10, 15 and 20 of the analysis period and conservatively assumes that full build-out demand and water supply use, including recycled supplies, will occur from the start of the analysis. Nickel Water and recycled water supplies will be sufficient to meet the Grapevine project's full build-out demand in all single dry years. Table 11 also shows that TCWD will be able to meet other district demands in single dry years using other water sources, including single dry year SWP delivery levels that are lower than currently projected by the DWR (TMV FEIR, Appendix E2, Table B).

Table 11
Single Dry Year Analysis

	2014	**2019**	**2024**	**2029**	**2034**
Grapevine Service Area					
Supplies					
Recycled Water	1,983	1,983	1,983	1,983	1,983
Nickel Water	6,693	6,693	6,693	6,693	6,693
Subtotal Supplies	*8,676*	*8,676*	*8,676*	*8,676*	*8,676*
Demands					
Grapevine Service Area	*8,261*	*8,261*	*8,261*	*8,261*	*8,261*
Subtotal Demands	*8,261*	*8,261*	*8,261*	*8,261*	*8,261*
Surplus/Deficit	**415**	**415**	**415**	**415**	**415**
TRCC and TMV Service Areas and Other District Demands					
Supplies					
Recycled Water	1,158	1,158	1,158	1,158	1,158
SWP Water	269	281	292	303	314
Banked Water	2,675	2,663	2,652	2,641	2,630
Subtotal Supplies	*4,102*	*4,102*	*4,102*	*4,102*	*4,102*
Demands					
TRCC Service Area	1,102	1,102	1,102	1,102	1,102
TMV Service Area	2,900	2,900	2,900	2,900	2,900
Other District Operations	100	100	100	100	100
Subtotal Demands	*4,102*	*4,102*	*4,102*	*4,102*	*4,102*
Surplus/Deficit	**0**	**0**	**0**	**0**	**0**

7.4 Multiple Dry Year Analysis

Water Code Section 10912 requires an analysis of multiple dry year supplies that will be available for use by the proposed Grapevine project over a twenty-year period. Table 12 summarizes the multiple dry year projections assuming 1931-1934 hydrological conditions, the worst four-year drought period of record in Kern County, and that full build-out demand and water supply use, including recycled supplies, will occur from the start of the analysis. Nickel Water and recycled water supplies will be sufficient to meet the Grapevine project's full build-out demand assuming Kern County drought conditions that are the same as occurred in 1931-1934. Table 12 also shows that TCWD will be able to meet other district demands during multiple dry year periods using other water sources, including multiple dry year SWP delivery levels that are lower than currently projected by the DWR (TMV FEIR, Appendix E2, Table C).

Table 12
Multiple Dry Year Drought Analysis

	Year 1	**Year 2**	**Year 3**	**Year 4**
Grapevine Service Area				
Supplies				
Recycled Water	1,983	1,983	1,983	1,983
Nickel Water	6,693	6,693	6,693	6,693
Subtotal Supplies	*8,676*	*8,676*	*8,676*	*8,676*
Demands				
Grapevine Service Area	*8,261*	*8,261*	*8,261*	*8,261*
Subtotal Demands	*8,261*	*8,261*	*8,261*	*8,261*
Surplus/Deficit	**415**	**415**	**415**	**415**
TRCC and TMV Service Areas and Other District Demands				
Supplies				
Recycled Water	1,158	1,158	1,158	1,158
SWP Water	1,122	1,481	1,750	1,481
Banked Water	1,822	1,463	1,194	1,463
Subtotal Supplies	*4,102*	*4,102*	*4,102*	*4,102*
Demands				
TRCC Service Area	1,102	1,102	1,102	1,102
TMV Service Area	2,900	2,900	2,900	2,900
Other District Operations	100	100	100	100
Subtotal Demands	*4,102*	*4,102*	*4,102*	*4,102*
Surplus/Deficit	**0**	**0**	**0**	**0**

7.5 Other Potential Water Supplies

As discussed in Section 5.0, Tejon Ranchcorp has secured rights to 6,693 AFY of Nickel Water for use by the Grapevine project on a priority basis through at least 2079. Nickel Water and tertiary treated recycled water will be sufficient to meet the project's full build-out demand under all of the hydrological conditions analyzed in Sections 7.2-7.4 during the analysis period and for approximately 45 years thereafter. Although not specifically required by the Water Code, this section discusses certain additional water supplies that may become available for Grapevine project use during or after the analysis period.

7.5.1 Potential Groundwater Use

As discussed in Section 5.2.4, the Grapevine project overlies the White Wolf groundwater basin. A 1995 study conducted for neighboring Wheeler Ridge indicated that, at that time, the basin had a surplus safe yield (sustainable unused supply) of more than 2,000 AFY. The Grapevine project overlies the White Wolf groundwater basin and would be entitled to use groundwater under California law as an overlying landowner.

TRC and TCWD are continuing to assess whether other sustainable groundwater supplies, including basins that are hydrologically distinct from the White Wolf basin, may be available for use on TRC's agricultural or other land within the San Joaquin valley. The location, water quality and sustainable yield of any such additional groundwater supplies have not yet been determined. Under California law, the Grapevine project would be entitled to use groundwater in any aquifers located beneath project land as an overlying landowner, and could also appropriate groundwater surplus to the needs of overlying users if available from other groundwater basins. As discussed above, almost all southern San Joaquin Valley groundwater basins are subject to a "high priority" CASGEM designation and regulation under one or more pending GSPs adopted in accordance with the SGMA. The extent to which groundwater supplies may be available for potential project use, including supplies regulated under one or more GSPs, has not yet been determined.

7.5.2 Potential Use of Agricultural Water Supplies

TRC owns approximately 5,496 acres of cropland in the southern San Joaquin Valley that receives irrigation water pursuant to long-term contracts with Wheeler Ridge. Wheeler Ridge is a member unit of KCWA and primarily utilizes SWP and water banking supplies to meet district demands. TCWD's TRCC service area, and most of the proposed Grapevine service area to the north of the Tehachapi foothills, are located in the existing Wheeler Ridge service area.

Wheeler Ridge supplies agricultural water to its customers. TRC has rights to receive approximately 15,000 AFY under contracts with the Wheeler Ridge which is used to irrigate the company's cropland. It is possible that in response to market or other factors, TRC's agricultural water demands may change from existing levels. Under such conditions, a portion of the agricultural water obtained from Wheeler Ridge could potentially become available for Grapevine project use. In general, any such use would require, at a minimum, Wheeler Ridge consent and approval and the completion of a water supply contract between Wheeler Ridge and TCWD for the proposed Grapevine service area. Wheeler Ridge water service contracts, including with TRC, include a provision limiting water furnished under the contracts to agricultural use and allow for municipal and industrial (M&I) use with the written permission of, and subject to terms and conditions imposed by, the district. In May 2015 the Wheeler Ridge Board of Directors amended the district's rules and regulations to provide for conditions under water supplied by the district could be used for M&I use (Wheeler Ridge, Resolution No. 2015-07, adopted May 13, 2015). The amended rules identify 12 terms and conditions under which Wheeler Ridge would consent to M&I uses, including the requirements that (a) a responsible water purveyor be fully responsible for the treatment of supplies provided by Wheeler Ridge; (b) the M&I use must not adversely impact adjacent agricultural operations; (c) the M&I use must not result in any additional demands for water in the district and immediately adjoining locations: and (d) the user requesting the M&I use must waive any priority supply claims or allocations in excess of amounts that have been delivered by Wheeler Ridge if the water had been used exclusively for agriculture. To date, Wheeler Ridge has not received, considered or granted any requests to use district supplies for M&I purposes in accordance with the district's supply contracts and Resolution No. 2015-07. Other agency approvals, including CEQA review, could also be required in conjunction with the use of TRC's existing agricultural water supplies for the Grapevine project.

7.5.3 Potential Use of Rainwater Harvesting

Rainwater harvesting systems capture precipitation flowing from buildings or other onsite areas for storage in cisterns, tanks or similar facilities. The right to capture rainwater was previously subject to significant legal uncertainty in California, including the potential need to obtain a diversion permit from the State Board. In 2013, the California legislature enacted the Rainwater Capture Act of 2012 and amended the Water Code to provide that the installation and operation of rainwater capture systems does not require a SWRCB permit (California Water Code Section 10570 *et seq*.).

Many of the rainwater capture techniques considered by the California legislature in the Rainwater Capture Act, such as the management of runoff from buildings and impervious structures to infiltrate and recharge groundwater aquifers, have been integrated into currently applicable building standards and storm water management requirements. Onsite rainwater retention, for example, will capture almost all runoff from the project during average and moderate storms. Project area homeowners will also have the ability to install household storm water capture systems that could reduce potable water demand for residential irrigation. The extent of rainwater harvesting in the project area, as in most of California, is limited by the relatively infrequent number of storms and the inherently limited capacity of capture systems, which may be unable to retain all available rainwater during more severe rain events. Nevertheless, the project's overall outdoor water demand may be slightly lower than estimated in Section 3.0 of this WSA due to onsite rainwater capture and management measures included in the project design and through homeowner installation of residential systems.

7.5.4 Potential Purchase of Other SWP Water Supplies

The Grapevine project, or TCWD or TRC on behalf of the project, could acquire rights to use other SWP water supplies under several scenarios, including transfers of SWP Table A amounts from other SWP contractors to TCWD. Table A amount transfers between SWP system contractors and subcontractors have occurred in the past. In 2008 and 2010, for example, TRC acquired rights to 3,444 AFY of Table A amounts to meet company water needs in other areas from the Tulare Lake Basin Water Storage District and the Dudley Ridge Water District. In general, Table A amount transfers for Grapevine project use would require approvals by the transferring SWP contractor, KCWA, TCWD and the DWR after appropriate environmental review, and would be subject to payment of all conveyance and other costs associated with the transfer.

California public policy explicitly favors water transfers as means of achieving the most efficient allocation and use of state water resources. California Water Code Section 475 states that:

> The Legislature hereby finds and declares that voluntary water transfers between water users can result in a more efficient use of water, benefiting both the buyer and the seller. The Legislature further finds and declares that transfers of surplus water on an intermittent basis can help alleviate water shortages, save capital outlay development costs, and conserve water and energy. The Legislature further finds and declares that it is in the public interest to conserve all available water resources, and that this interest requires the coordinated assistance of state agencies for voluntary water transfers to allow more intensive use of developed water resources in a manner that fully protects the interests of other entities which have rights to, or rely on, the water covered by a proposed transfer.

Sales of surplus and non-surplus water are also authorized by Water Code Sections 382, 383, and 1745 *et seq.* SWP Table A transfers can be accomplished through a variety of means, including Article 41 of the SWP contracts. Consistent with state policies and water contracts that encourage and allow water transfers, it is reasonably likely that SWP Table A amount transfer opportunities will become available during and after the WSA analysis period that could be acquired for project use.

7.5.5 Non-SWP Water Conveyed Through the Aqueduct

From time to time, public or private entities may also offer for sale non-SWP water, such as groundwater or other surface water supplies that could be purchased for Grapevine project use and delivered by means of the SWP aqueduct. Any such sale and acquisition for project use would require appropriate agency approvals and environmental review. The acquired water must also meet applicable SWP aqueduct water quality standards. Approvals from KCWA, TCWD, DWR and potentially other conveyance facility rights holders would be necessary to deliver third-party water through the aqueduct to the turnouts that serve the project. In general, the conveyance of non-SWP water would occur on a lower priority than the conveyance of SWP supplies in the aqueduct system, and transfers that rely on variable conveyance rights are more difficult to complete.

7.5.6 Potential Irrigation Return Flows

A portion of the external irrigation applied to project land will infiltrate into the ground and become available for extraction as return flows to the basin. Under California law, rights to non-native water infiltrated and stored in an aquifer are retained by the original water user. The owner of a stored water supply has the right to pump an equivalent amount from storage less losses, and this right is separate from the right to extract native groundwater (see *City of Los Angeles v. City of San Fernando* (1975) 14 Cal. 3d 199).

Project-related return flows would not exist but for the Grapevine project's use of onsite water and would be available for extraction and project use. The amount of return flow is determined by surface vegetation use, soil conditions, evaporation losses and other site-specific factors. The Tehachapi-Cummings County Water District (TCCWD) recently prepared a regional urban water management plan (2010 RUWMP) for service areas located to the east of the Grapevine project. The 2010 RUWMP states that 15% of all agricultural water use is returned to groundwater and remains in storage for future extraction (TCCWD 2010, page 75). Excluding contingencies and losses, at full build-out the project will use approximately 4,569 AFY for outdoor irrigation. If 15% of the project's outdoor use consists of return flows, approximately 685 AFY at full build-out would be available for project use.

7.5.7 Nickel Water Contract Extension

Section 5(b) of the 2007 Agreement between DMB CII and Nickel provides that, at least two years prior to the end of the second 35-year extension of the agreement, the parties "may enter into diligent good faith negotiations for a new agreement to extend this Agreement for an additional period" to be negotiated by the parties (2007 Agreement, Appendix G, Section 5(b)). Tejon Ranchcorp acquired all of DBMP's rights and obligations under the 2007 Agreement for the partial assignment of 6,693 AFY of the Nickel Water pursuant to the 2013 Agreement between DMBP and Tejon Ranchcorp. As a result, Tejon Ranchcorp could request that Nickel enter into diligent good faith negotiations to extend the Nickel Water contract beyond 2079. Nickel has a right in perpetuity to receive 10,000 AFY from KCWA under the Water Transfer Contract between Nickel and KCWA. Neither the 2007 Agreement nor the 2013 Agreement requires that Nickel consent to extend Tejon Ranchcorp's rights to the Nickel Water beyond 2079.

7.6 Other Potential Water Supply Issues

This section discusses certain additional water supply issues that are not specifically required by the Water Code, but that the County requested be evaluated in this WSA.

7.6.1 2014 Governor's Emergency Proclamation, Surface Rights Curtailment, and 2015 Executive Order

On January 17, 2014 the Governor of California issued a proclamation declaring that the statewide drought created a state of emergency and identifying several measures that would be implemented in response. On April 1, 2015 the Governor issued an executive order requiring 25% cutbacks in potable water use statewide, additional water conservation and planning measures, and the potential installation of salinity barriers in the Sacramento Delta in response to historically low snowpack levels in the state (State of California 2015).The state's 400 local water supply agencies are responsible for implementing restrictions to cut back on water use and for monitoring compliance under the order. The order imposes varying degrees of cutbacks on water use affecting homeowners, farms, and other businesses, as well as the maintenance of cemeteries and golf courses and requires that CASGEM groundwater elevation monitoring be implemented throughout the state, including the Project Area, by the end of 2015.

In May 2015 the SWRCB adopted an emergency regulation requiring an immediate25% reduction in overall potable urban water use to implement the April 2015 Executive Order. The conservation standards established by the SWRCB regulations were scaled to account for water agencies that had already reduced demand in response to the drought. Each month, all of the state's local water agencies subject to the regulation are required to estimate the total gallons per capita per day of potable water used for residential purposes and report the result to the SWRCB. Using the reports, the SWRCB compares each water supplier's residential potable water use with estimated demand for the same period in 2013. According to the most recent SWRCB analysis, California residential users' reduced potable demand by 26% in September 2015, and by 28% during June-September 2015 combined, compared with 2013 levels (SWRCB 2015).

Paragraph 7 of the 2014 Emergency Proclamation states that "The [State] Board will put water right holders throughout the state on notice that they may be directed to cease or reduce water diversions based on water shortages." On January 17, 2014, the State Board issued a "notice of curtailment" (Curtailment Notice) stating that "… if dry weather conditions persist, the State Water Board will notify water right holders in critically dry watersheds of the requirement to limit or stop diversions of water under their water right, based on their priority. The right to divert surface water in California is based on the type of right being claimed and when the right was initiated. In times of drought and limited supply, the most recent ("junior") right holder must be the first to discontinue use. Some riparian and pre-1914 water right holders may also receive a notice to stop diverting water if their diversions are downstream of reservoirs releasing stored water and there is no natural flow available for diversion." The County has asked that this WSA consider whether the Emergency Proclamation and Curtailment Notice could affect Grapevine project water supplies.

KCWA has a perpetual obligation to supply Nickel with all of the 10,000 AFY identified in the Water Transfer Contract (Appendix F) to Nickel as part of the compensation paid by the agency to obtain certain Kern River higher-flow and period rights. At the time that the Water Transfer Contract was made by KCWA, the agency specifically found that although the amount of water obtained from the acquired Kern River rights would vary from year to year, on average approximately 50,000 AFY of water would be available and approximately 40,000 AFY would be subject to capture and beneficial use by the agency. The KCWA director's resolution approving the Water Transfer Contract considered the obligation to supply 10,000 AFY to Nickel and concluded that because the "transfer by the Agency to Nickel Family LLP of 10,000 AF/year of Agency water" would allow KCWA "to obtain water rights which historically have yielded far in excess of that amount," the Water Transfer Contract would "provide a substantial net benefit to the Agency in terms of water supply, both quality and quantity." (KCWA Resolution 90-00). Nickel's rights to receive 10,000 AFY represents a contract commitment in perpetuity from KCWA in exchange for variable water rights that the agency determined would yield "far in excess of that amount" over time. Nickel's perpetual right to receive 10,000 AFY from KCWA is not dependent on any form of post-1914 diversion right, a riparian right, or a pre-1914 diversion right that could be affected by the Emergency Proclamation or the Curtailment Notice.

Tejon Ranchcorp's rights to receive 6,693 AFY from KCWA derive from the 2007 Agreement between DMB CII and Nickel (Appendix G), and the 2013 Agreement between DMBP and Tejon Ranchcorp (Appendix H). The assignment of the rights to receive 6,693 AFY under the 2007 Agreement to Tejon Ranchcorp was approved in advance and in writing by Nickel. Nothing in the 2007 Agreement, the 2013 Agreement or in Nickel's written approval of the 2013 Agreement's assignment of 6,693 AFY to Tejon Ranchcorp changed the character of the Nickel Water to a form of post-1914 diversion right, a riparian right, or a pre-1914 diversion right that could be affected by the Emergency Proclamation or the Curtailment Notice. The availability of Nickel Water for Grapevine project use under the 2013 Agreement is not affected by Emergency Proclamation or the Curtailment Notice.

7.6.2 Oil and Gas Industry Water Use and Grapevine Project Supplies

The Grapevine Development Area is subject to several oil and gas exploration and production leases including leases between TRC and E&B Natural Resources, Vintage Petroleum (acquired by Occidental Petroleum), Vintage Production (a subsidiary of Occidental Petroleum), and Sojitz Energy. As of December 31, 2013, approximately 7,317 acres of Tejon Ranch were subject to producing oil and gas leases, from which operators produced and sold approximately 539,000 barrels of oil and 423,000 thousand cubic feet of dry gas during 2013 (TRC Form 10K 2014). The County has asked that this WSA consider whether water use associated with oil and gas exploration and production in the Grapevine Development Area could affect Grapevine project water supplies.

Water is used and produced as a byproduct of oil and gas exploration and production. The amount of such use and production in Kern County and other locations of the state, including Tejon Ranch, is not precisely measured at each well or within a well field. According to a 2011 U.S. Bureau of Reclamation study (USBR 2011) approximately 280 to 400 gallons of water are produced for every barrel of crude oil in the United States, and a smaller amount of water is generally associated with gas deposits. Water extracted during oil and gas operations is commonly called “produced water.” Consistent with the U.S. Bureau of Reclamation study, other sources indicate approximately 8-15 barrels of produced water are generated for each barrel of oil extracted in California. Most produced water in California is briny, subject to high levels of total dissolved solids and other contaminants, and unsuitable for municipal, industrial or agricultural use without significant treatment (USBR 2011, Kemp 2013, Adair 2014). The U.S. Bureau of Reclamation study estimated that, in 2002, approximately 168,000 AFY of produced water was generated by oil and gas activity in California (USBR 2011).

In general, produced water is considered by the oil and gas industry as a byproduct for disposal. The most common practices for produced water disposal include land application or discharge, subsurface injection, and offsite trucking. The U.S. Bureau of Reclamation study, quoting other reports, estimated that 98% of water produced by oil and gas activity in the United States was reinjected in waste disposal wells, or treated as necessary and used in the oil recovery process (USBR 2011). If as much as 98% of produced water is reinjected at or near the point of extraction, it is possible that oil and gas extraction activities maintain a reasonably stable water balance in most locations.

Oil and gas well depths in the vicinity of the Grapevine project are typically lower than the shallower freshwater aquifers that have supplied agricultural and municipal users for several decades. Produced water in the region also has been reported to contain high salt and other constituent levels. The depth of oil and gas producing wells relative to freshwater aquifers, and the poor quality of produced water, indicates that groundwater located within and near oil and gas deposits would, in general, not otherwise be suitable for potable or non-potable uses. Consequently, ongoing and future oil and gas extraction near the project area is unlikely to affect local water supply aquifers. As discussed in Section 5.0, this WSA and the TMV WSA (Appendix E1) conservatively assume that TCWD will not use currently available or potential future groundwater resources to meet Grapevine, TMV and TRCC service demand. Even if oil and gas activities were to affect deeper, non-potable aquifers located in or near the project area, any such impacts would not affect the Grapevine project or other TCWD water supplies considered in this WSA, the TMV WSA (Appendix E1) and in the TMV FEIR (Appendix E2).

Certain oil and gas activities, such as well drilling, hydraulic fracturing, secondary and enhanced oil recovery, and sustaining aquifer pressure, use fresh water, including relatively high-quality supplies that cannot be feasibly obtained from the brackish, lower quality water typically produced by oil and gas wells (USBR 2011).TRC has occasionally sold water for oil and gas use in the past, and may provide water to the industry in the future in response to market conditions. All water supplies, including Nickel Water or other reliable, high quality water that TCWD may identify for the Grapevine project, will be reserved as required for project use. None of these supplies would be subject to any contractual or any other obligation, including oil and gas use, that would preclude project use at any time as required to meet project demand. Onsite recycled water will also be managed by TCWD to meet project demands on a priority basis for project use. Potential water sales by TRC or TCWD to oil and gas operators will have no impact on Grapevine project water supplies.

8.0 CONCLUSION

Consistent with the Water Code, this WSA analyzed the Grapevine project's potential water supplies during average, single dry and multiple dry years and projected the project's supplies over a 20-year analysis period. The analysis also summarized other public water system (TCWD) supplies and demands, identified potential water supplies that may become available for project use during or after the WSA analysis period, and considered certain other issues as requested by the County.

As discussed above, the district's water supplies are likely to be greater and water demands lower than assumed in this assessment. The analysis presented in this WSA therefore represents a conservative assessment of future project water supplies. This WSA demonstrates that TCWD can meet all Grapevine project water demands throughout the 20-year analysis period and under each of the hydrologic situations identified in the Water Code using Nickel Water and tertiary-treated recycled water from onsite wastewater sources.

ATTACHMENTS

Appendix A *Water Treatment Facility Engineering Report* (EKI 2015a)

Appendix B *Water Supply Delivery Evaluation for the Grapevine Project* (GEI 2014)

Appendix C *Evaluation of Potable and Recycled Water Demands Report* (EKI 2015b)

Appendix D *Wastewater Treatment Facilities Engineering Report* (EKI 2015c)

Appendix E1 TMV WSA prepared by TCWD and included in the TMV EIR.

Appendix E2 Tables A-C, pages 7-1429 to 7-1431 of the TMV FEIR.

Appendix F *Contract to Transfer the Kern River Lower River Water Rights* between the Nickel Family LLC, KCWA and the Olcese Water District (January 2001)

Appendix G *Option and Water Purchase Agreement* between DMB Communities II LLC and Nickel Family LLC (May 2007)

Appendix H *Purchase and Sale Agreement*, *First Amendment to the Purchase and Sale Agreement*, and *Second Amendment to Purchase and Sale Agreement and Partial Assignment Agreement* between Tejon Ranchcorp, Inc. and DMB Pacific LLC, and Nickel consent, (October-November 2013).

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Appendix A

WATER TREATMENT FACILITY ENGINEERING REPORT

Grapevine Project

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ABBREVIATIONS

AFY	Acre-Feet per year
Btu/hr	British thermal units per hour
CCR	California Code of Regulations
DDW	State Water Resources Control Board Division of Drinking Water
DU	Dwelling Units
DWR	Department of Water Resources
Ft or ft	Feet
gpd	Gallons per day
HDPE	High-density polyethylene
I-5	Interstate 5
KCWA	Kern County Water Agency
Mcf	Thousand cubic feet
MCL	Maximum Contaminant Levels
mgd	Million gallons per day
mg/L	milligrams per liter
MRDL	Maximum Residual Disinfectant Levels
NTU	Nephelometric turbidity units
PVC	Polyvinyl chloride
SR-58	State Route 58
SR-99	State Route 99
TRC	Tejon Ranchcorp
TRCC	Tejon Ranch Commerce Center
TTAL	Treatment Technique Action Levels
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

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1.0 SUMMARY OF PROJECT WATER TREATMENT

This Water Treatment Facility Engineering Report describes the source water quality, the potable water treatment process, the conceptual layout for the on-site potable water treatment plant, and the preliminary storage and distribution facilities for the Grapevine Project.

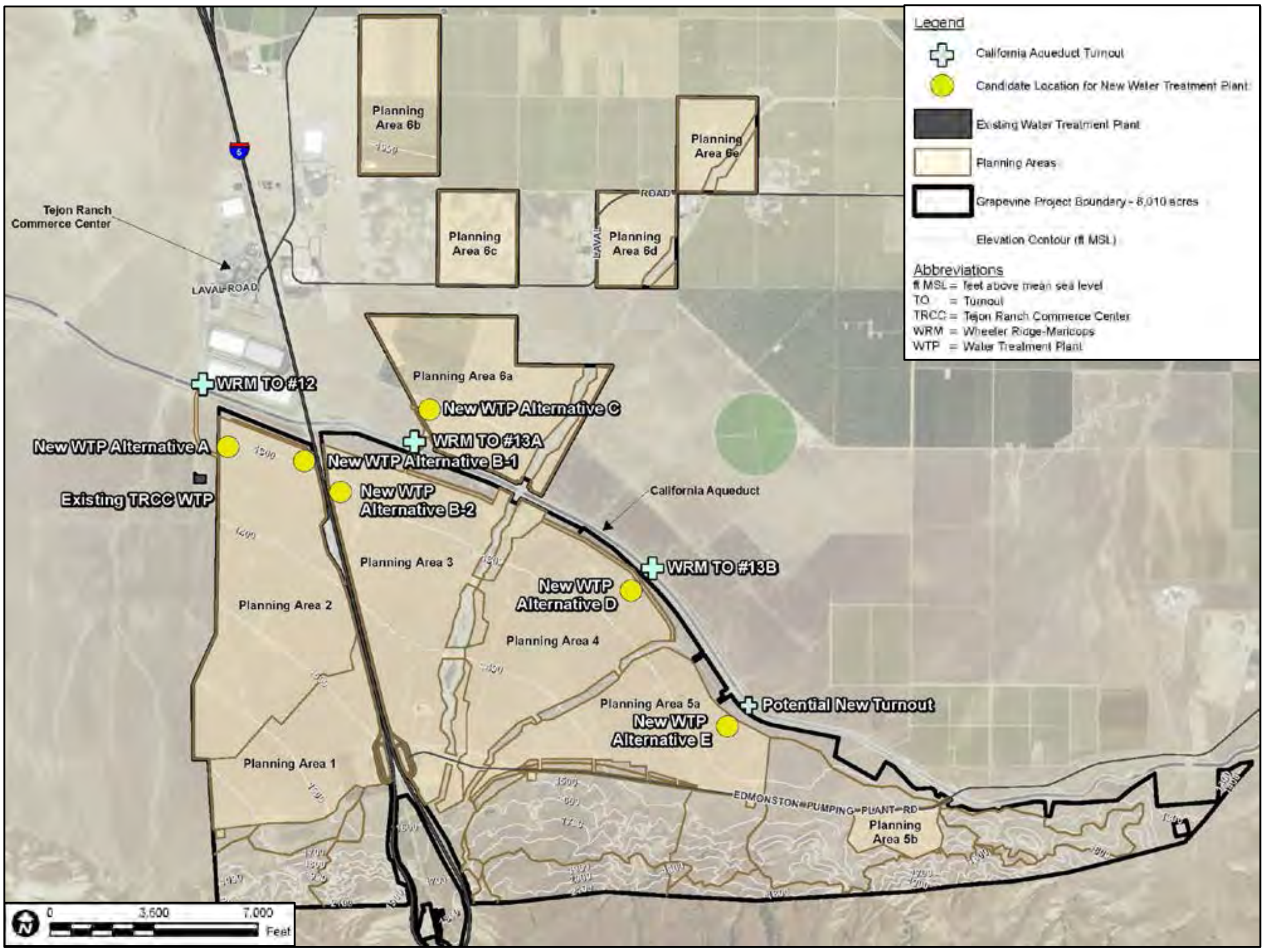
1.1. Grapevine Project Description

The 8,010-acre project site is located entirely within unincorporated Kern County, just south of the junction of highways Interstate 5 and State Route 99. The majority of the project is on the east side of I-5, with a smaller portion situated on the west side of I-5. The project site is bisected by the California Aqueduct. The project site is situated within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement that will permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as Interstate 5.

The Grapevine Project, which would include up to 12,000 residential units and 5.1 million square feet of commercial land uses, is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside these village cores, the project incorporates a mix of residential uses, office, research and development, regional commercial, and light industrial/warehouse uses. The project site is divided into a number of planning areas, with development phased over a period of 19+ years beginning in 2016.

1.2. Facility Location Alternatives

Five (5) potential locations were identified for the water treatment facility, and shown in the figure below. Final site selection would be based on factors including surrounding land uses, proximity to existing or new California Aqueduct turnouts, and the locations and timing of anticipated water demands based on final project phasing. Up to two (2) separate potable water treatment facilities may be constructed if found to be cost-effective or desirable to serve the successive development phases. The optimal number of potable water treatment plants and their locations will be evaluated during tentative tract design.



Source: Figure 3

1.3. Conceptual Design Basis for Water Treatment Facilities

Water and sewer service at the project would be provided by the Tejon–Castac Water District (TCWD). The project would be supplied with surface water under a transfer agreement between the Kern County Water Agency and the Nickel Family LLC, known as "Nickel Water." This water would be delivered through the California Aqueduct and extracted by the project at a turnout along the California Aqueduct. The delivery of Nickel Water is considered to be 100 percent reliable on a year-to-year basis and is not considered subject to hydrological variability, regulatory requirements, or supply constraints.

The project would construct a new potable water treatment plant[1] and associated storage and distribution facilities to meet the potable water demand of the project. The water treatment plant would utilize enhanced coagulation and membrane filtration, or equivalent technology. In the early stages of project construction, it may be practicable to phase construction of the new water treatment plant and/or to use available excess capacity, either temporarily or permanently, at the existing TCWD potable water treatment facility that supplies the nearby Tejon Ranch Commerce Center (TRCC).

1.3.1 Water Treatment Facility Flowrates

Up to 6,020 acre-feet per year (AFY) of treated potable water would be needed to meet the project's total potable water demand at full buildout, which includes a contingency (EKI, 2015a). An annual demand of 6,020 AFY is equivalent to an average daily potable water use of about 5.4 million gallons per day (mgd). For the purposes of this evaluation, it is conservatively assumed that the capacity of the water treatment plant, expressed as the average daily potable water usage, would be 6.0 mgd at project buildout, as shown below.

Water Demand Category	Water Demand (AFY)	Water Demand (MGD)
Potable Water Demand	5,620	5.0
Contingency	400	0.4
Total	*6,020*	*5.4*
Assumed Water Treatment Plant Capacity		*6.0*

1.3.2 Peaking Factors

The California Waterworks Standards typically require that the following peaking factors be taken into account when designing new water supply systems:

- Ratio of maximum day demand to average daily usage: 2.25
- Ratio of peak hour demand to maximum day demand: 1.5

If these factors were applied without adjustment for project-specific conditions (e.g., the planned extensive use of recycled water to meet irrigation demands which would reduce peaking), the project's maximum daily demand would be approximately 13.5 mgd (6.0 mgd average daily demand multiplied by 2.25) and the peak hourly demand would be about 20.3 mgd (13.5 mgd maximum daily demand multiplied by 1.5). Project-specific values for these peaking factors, and the consequential raw water and treated water storage volumes and equipment sizing, would be addressed with regulators prior to detailed design. However, for planning purposes, the potable

[1] Up to two separate potable water treatment plants may be constructed within the project if this approach would result in net cost savings.

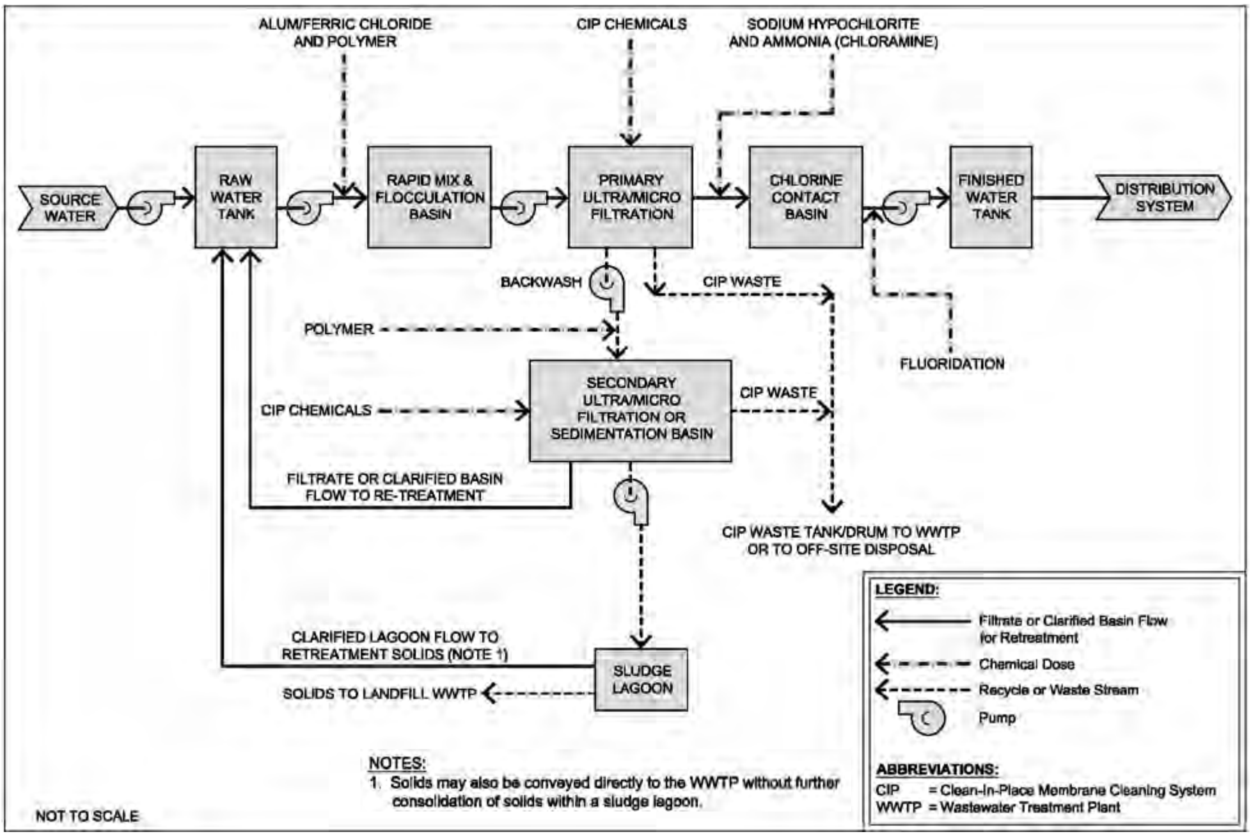
water facilities have been conservatively sized to accommodate the treatment and storage of anticipated maximum daily demand flows at project buildout (13.5 mgd). If determined to be cost-effective, or otherwise desirable, facility components would be designed and constructed in a modular fashion on an as-needed basis through project buildout.

1.3.3 Storage Volumes

At project buildout, the preliminary water treatment plant design incorporates approximately 7.1 million gallons of raw water storage to increase potable supply reliability. This volume of emergency storage is equivalent to three days of the projected indoor potable water demand of 2,634 AFY (EKI, 2015a). A smaller raw water storage volume would be appropriate during the earlier stages of project phasing prior to full buildout. Additional treated water storage of up to approximately 9.4 million gallons would be distributed at various optimized locations throughout the development. If lower peaking factors are established for the project, treated water storage volumes would commensurately decrease.

1.4. Preliminary Water Treatment Process and Water Treatment Facility Components

As shown below, the facility's water treatment process includes a raw water intake tank; a rapid mixing and flocculation chamber; an ultrafiltration or microfiltration unit; primary disinfection within a chlorine contact tank; final (secondary) disinfection with chloramines using in-line injection of ammonia; and fluoridation. Backwash from the micro or ultra filtration system would be treated using a secondary microfiltration or ultrafiltration system or sedimentation basin to further concentrate solids in the backwash water.



Source: Figure 5

The potable water treatment process is preliminarily assumed to include the following major components, sized to treat a flowrate of 13.5 mgd:

Potable Water Treatment Facility Components	Component Size	Unit
Treatment Train		
• New or modified raw water intake structure at a turnout along the California Aqueduct	1	acre
• Rapid mixing and flocculation chamber	2,500	square feet
• Primary ultrafiltration or microfiltration units	5,500	square feet
• Backwash water recovery system		
o Option 1: Secondary filtration system	500	square feet
o Option 2: Sedimentation basin	1,500	square feet
o Lagoons for further concentration of backwash (if not sent to wastewater treatment facility)	63,000	square feet
• Primary disinfection within a chlorine contact tank or buried piping	3,800	square feet
Raw and Treated Water Storage		
• Emergency raw water storage	7.1	million gallons
• Raw water intake tank	1	million gallons
• Clearwell/Treated water storage tanks	9.4	million gallons
Treated Water Distribution		
• Secondary disinfection via creation of chloramines	See Table 3	
• Fluoridation equipment	See Table 4	
• Treated water distribution pumps	Included in total	
Total Land Area	*6 acres*	

Based on the above assumptions, the total electrical energy consumption is estimated to be 11 to 14 million kilowatt-hours per year and the total natural gas consumption is estimated to be 140 thousand cubic feet per year. Each treated water storage tank located outside the treatment facility within the distribution system would occupy an additional area of about one to two acres.

2.0 INTRODUCTION

2.1. Purpose and Scope

This Water Treatment Facility Engineering Report describes the source water quality, the potable water treatment process, the conceptual layout for the on-site potable water treatment plant, and the preliminary storage and distribution facilities for the Grapevine Project.

2.2. Grapevine Project Description

2.2.1 Project Location

The Grapevine Project is located in the west-central portion of Tejon Ranch (the Ranch). The approximately 270,000-acre Ranch is currently held in private ownership by Tejon Ranchcorp (TRC). The Ranch includes a large portion of the Tehachapi Mountains as well as smaller portions of the San Joaquin and Antelope Valleys. Generally, the Ranch extends from Interstate 5 (I-5) on the western side to State Route 58 (SR-58) on the northern side and SR 138 on the southern side (Figure 1).

The 8,010-acre Grapevine Project site is entirely within unincorporated Kern County, just south of the junction of I-5 and SR-99. Downtown Bakersfield is approximately 25 miles north of the project. The majority of the project is on the east side of I-5, with a smaller portion situated on the west side of I-5. The project site is bisected by the California Aqueduct (Figure 1 and Figure 2).

The Grapevine Project site lies mainly in the Grapevine and Pastoria Creek U.S. Geological Survey (USGS) 7.5-minute quadrangles. There is one parcel and a portion of two other parcels in the project site that lie entirely within the Mettler USGS 7.5-minute quadrangle. The latitude and longitude of the approximate center of the site is 34°57′9″ N and 118°55′39″ W. The Universal Transverse Mercator (UTM) coordinates for the approximate center are UTM Easting (meters) 323999 and UTM Northing (meters) 3869472 in Zone 11.

2.2.2 Project Overview

The 8,010-acre project site is within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement, a landmark agreement reached in 2008 with leading environmental organizations (including the Sierra Club, Natural Resources Defense Council, California Audubon Society, Endangered Habitats League, and Planning and Conservation League) to permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as I-5.

The Grapevine Project site includes approximately 8,010 acres, of which approximately 3,232 acres (or about 40%) would be designated for agriculture (with grazing and open space as the predominant land uses) and approximately 4,778 acres (about 60%) would be developed as a new residential community and employment center. The community would leverage and build upon the economic expansion and job growth that has occurred at Tejon Ranch Commerce Center (Figure 2), located immediately north of the project on I-5. The Grapevine Project would feature a series of compact neighborhoods linked by bicycle and pedestrian trails that provide convenient access to grocery and drugstores, professional services, schools, and parks. The project site is located along I-5, at the gateway to the Central Valley, and is immediately adjacent to the extensive open space that was conserved in the Tejon Ranch Land Use and Conservation Agreement.

The project, which would include 12,000 residential units and 5.1 million square feet of commercial and light industrial land uses[2], is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside the village cores, the Grapevine Project includes a mix of residential uses, office, research and development, regional commercial, freeway-oriented commercial, and light industrial/warehouse uses. Other potential public facilities, including fire stations, a sheriff substation, transit facilities/park-and-rides, and water and wastewater treatment facilities, are proposed throughout the community.

Access to the first phases of the Grapevine community will be from Interstate 5 at the existing Grapevine Road and Laval Road interchanges. During later phases of development, the existing Grapevine Road/ Interstate 5 interchange may be expanded and relocated to the north. To allow for the relocation and replacement of the interchange, an existing Vehicle Enforcement Facility may be relocated to a TRC-owned parcel on the west side of the junction of I-5 and CA-99. The project would also improve an existing TRC agricultural road east of the project area to provide access for truck traffic currently using Edmonston Pumping Plant Road to travel to properties east of the project. The circulation network within the project is composed primarily of two- and four-lane arterials, collector streets, and local streets organized in a grid pattern. All roads within the project site will be public. Multipurpose trails are proposed along Grapevine Creek, Cattle Creek, the southern foothills, and the open space adjacent to the California Aqueduct and at other locations throughout the project site. Some of these trails would connect to on-street, Class 2 bike lanes. Water and sewer service will be provided by the Tejon–Castac Water District.

[2] The project could include up to 2,000 additional residential units, for a maximum total of 14,000 units, through a reduction of commercial/industrial square footage based on vehicle trip equivalency ratios.

2.2.3 Project Construction Scenario

The project site is divided into six planning areas ranging in size from approximately 450 to 1,400 acres. Development would be phased over a period of 19+ years, starting with the development of Planning Area 6a and/or 3 and continuing with the balance of the planning areas nearest to the initial phase. Buildout of each phase is projected to take approximately 2 to 4 years (Phase 1: 2 years; Phase 2: 4 years; Phase 3: 3 years; Phase 4: 4 years; Phase 5: 4 years; Phase 6: 2 years), with the first phase commencing in 2016. The portions of the site that are proposed to remain in exclusive agriculture/open space are primarily located along the southern edge of the California Aqueduct, along the southern portion of the project site at the foothills of the Tehachapi Mountains, and along Grapevine and Cattle Creeks.

The potable water treatment plant would also be constructed in phases to meet the potable water demand of each planning area. The plant would be designed to benefit from modular construction. Up to two separate water treatment plants may be constructed if this approach would result in net cost savings. It may also be practicable, either temporarily or permanently, to use available excess capacity at the existing water treatment facility that supplies the Tejon Ranch Commerce Center (TRCC).

2.2.4 Project Operation Scenario

The project operations are described in the Grapevine Specific and Special Plan, and land uses associated with operations are described in the Grapevine Special Planning District Plan.

2.3. Project Water Treatment Facility Overview

Water and sewer service at the project would be provided by TCWD. The project would be supplied with surface water under a transfer agreement between the Kern County Water Agency and the Nickel Family LLC, known as "Nickel Water." This water would be delivered through the California Aqueduct and extracted by the project at a turnout along the California Aqueduct. The delivery of Nickel Water is considered to be 100 percent reliable on a year-to-year basis and is not considered subject to hydrological variability, regulatory requirements, or supply constraints.

The project would construct a new potable water treatment plant[3] and associated storage and distribution facilities to meet the potable water demand of the project. The water treatment plant would utilize enhanced coagulation and membrane filtration, or equivalent technology. In the early stages of project construction, it may be practicable to phase construction of the new water

[3] Up to two separate potable water treatment plants may be constructed within the project if this approach would result in net cost savings.

treatment plant and/or to use available excess capacity, either temporarily or permanently, at the existing TCWD potable water treatment facility that supplies the nearby TRCC.

The following sections describe the basis for and elements of the project's potable water treatment facility design:

- Section 3.0 - Regulatory Setting
- Section 4.0 - Facility Location Alternatives and Phasing
- Section 5.0 - Basis for Water Treatment Facility Conceptual Design
- Section 6.0 - Preliminary Evaluation of Water Treatment Processes

The following sections then present how impacts from the water treatment process and facility will be managed and/or mitigated in the future:

- Section 7.0 - Offsite and Cumulative Impacts
- Section 8.0 - Mitigation Measures

3.0 REGULATORY SETTING

The design, construction, and operation of water treatment and distribution facilities are governed by federal, state, and local laws and regulations. Table 1 lists the statutes and regulations that affect the design and operation of the water treatment facility and distribution system.

At the federal level, the United States Environmental Protection Agency (U.S. EPA) promulgates regulations under the authority of the Safe Drinking Water Act and its amendments. These regulations, published in the Federal Register and codified in Code of Federal Regulations Title 40, establish policies, numerical levels, and goals for allowable concentrations of water constituents. Regulations also set forth operational requirements for water treatment facilities and distribution systems once constructed. Within the State of California, these federal regulations are implemented by the State Water Resources Control Board Division of Drinking Water (DDW).

The DDW also promulgates and enforces state regulations for potable water treatment facilities and distribution systems. These state regulations are codified in California Code of Regulations (CCR) Title 22.

The federal and state drinking water requirements establish maximum contaminant levels (MCLs), maximum residual disinfectant levels (MRDLs), and treatment technique action levels (TTALs). Concentrations of drinking water constituents must not exceed their respective MCLs. Similarly, concentrations of disinfectants must not exceed MRDLs. Water quality parameters detected in the source water above regulatory TTALs initiate specified treatment techniques. Drinking water regulations also include requirements for construction, operation, monitoring, and reporting.

Local regulations for potable water treatment facilities and distribution systems include Kern County Code of Regulations Title 14, Chapter 14.08 – 14.10, as well as the Kern County Development Standards, Division 2. These regulations are promulgated and enforced by Kern County and the Kern County Water Agency.

Local regulations for air emissions are promulgated and enforced by the San Joaquin Valley Air Pollution Control District (District). Analysis of emissions related to the project's potable water treatment facilities and the approach to compliance with District regulations are discussed in a separate report.

4.0 FACILITY LOCATION ALTERNATIVES AND PHASING

Several potential locations for the water treatment facility have been identified at this preliminary stage of the project. Site selection would be based on factors including surrounding land uses, proximity to existing or new California Aqueduct turnouts, and the locations and timing of anticipated water demands. Up to two (2) separate potable water treatment facilities may be constructed if found cost-effective to serve the successive development phases. The number of water treatment plants and their locations will be evaluated during tentative tract design.

4.1. Location Alternatives

Figure 3 shows the identified alternative locations for water treatment facilities. These alternatives are assumed to be located near the Aqueduct, within the project development area. Locating the water treatment plant near the Aqueduct would allow the treated water to be pressurized appropriately for distribution to each of the development's pressure zones, as opposed to pumping all of the raw water for treatment at high elevation and then distributing the treated water to lower zones via pressure-reducing valves.

As shown on Figure 3 and Figure 4, the existing TRCC development has an existing potable water treatment facility located west of I-5 and south of the Aqueduct. We understand that the TRCC complex, recently expanded to include an outlet mall, will be further expanded in the future. Based on information available at this preliminary engineering phase, the existing TRCC water treatment plant cannot be expanded to accommodate the project. However, it may be desirable to construct the new project water treatment plant near this existing TRCC water treatment facility and existing turnout WRM TO #12 to take advantage of existing infrastructure and operational resources (see Alternatives A, B-1, and B-2 on Figure 3 and Figure 4**)**.

If excess treatment capacity is available at the existing TRCC Water Treatment Plant, shown on Figure 4, temporary or permanent use of such excess capacity may be considered as part of the project under certain, specific conditions (e.g., if the project were to use any existing capacity at the TRCC water treatment facility during the early stages of development, the project would pursue construction of its new water treatment facility once 75% of the capacity of the TRCC water treatment facility had been utilized).

4.2. Preliminary Layout and Land Area Requirements

Figure 5 presents the preliminary layout of the project water treatment facility which is expected to include a raw water intake tank; a rapid mixing and flocculation chamber; an ultrafiltration or microfiltration unit; primary disinfection within a chlorine contact tank or buried piping; final (secondary) disinfection with chloramines using in-line injection of ammonia; and fluoridation. Backwash from the micro- or ultra-filtration system would be treated using a secondary microfiltration or ultrafiltration system or sedimentation basin to further concentrate solids in the backwash water. In addition, the water treatment facility would require support buildings to house the staff, laboratory, maintenance areas, and process and ancillary equipment. It is anticipated that one building would house administrative functions, including the control room, locker rooms, offices, and a break room/conference room, as well as a laboratory for routine water analyses. See Section 6.0 for detailed descriptions and sizes of each water treatment facility component.

Based on the above conceptualization of the water treatment facility, a new potable water treatment facility is estimated to occupy about six (6) acres, as shown on Figure 6. Additionally, each treated water storage tank that is constructed throughout the potable water distribution system, shown on Figure 4, would occupy an additional area of about one to two acres.

4.3. Project Phasing

As described in Section 2.2.3, the project is anticipated to be constructed in six phases over a number of years. The water treatment, storage, and distribution facilities could correspondingly be constructed in several phases, or at more than one location, to meet potable demands over time. Water treatment process units would be implemented using equipment modules facilitating phased facility construction, if determined to be desirable.

5.0 BASIS FOR WATER TREATMENT FACILITY CONCEPTUAL DESIGN

5.1. Background

The project has developed a conceptual water treatment facility design based on similar projects and current regulatory requirements. This conceptual design addresses source water quality and drinking water treatment standards, while meeting projected water demands. For planning purposes, the facilities have been assumed to be based on membrane filter technology (or equivalent) and conservatively sized to accommodate treatment and storage of all anticipated flows at project buildout. Facility components would likely be designed and constructed in a modular fashion on an optimized, as-needed basis. In the detailed design stage, sizing will be refined according to the most current flow projections and maximum demand peaking factors, with the final facilities potentially smaller than estimated herein.

5.2. Source Water Quality and Drinking Water Quality Goals

The project would be supplied with Nickel Water that would be delivered through the California Aqueduct[4]. The quality of the project's raw source water would be determined by water quality in the California Aqueduct at the point of delivery. Aqueduct water quality is monitored at (1) Check Station 29 (KA024454), which is located 40 miles upstream from the project near Highway 119; (2) Check Station 41 (KA030341), located 15 miles downstream near the community of Gorman; and (3) the existing TRCC water treatment plant, located adjacent to the project site.

Table 2 compiles water quality data for raw Aqueduct water at Check Stations 29 and 41, between January 2010 and October 2013[5], and at the TRCC water treatment plant, between January 2012 and October 2013. To explore typical parameter values while considering the potential range in quality, this source water quality is presented both as the average (arithmetic mean) of the data set and as the recorded maximum value for each of these two Check Stations.

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[4] Tejon Ranchcorp, an affiliate of the Grapevine Project applicant, has the right to receive 6,693 AFY of water from the Kern County Water Agency (KCWA) through at least 2079 as the assignee of a Kern River water transfer agreement between KCWA and the Nickel Family LLC (the “Nickel Water”). The delivery of Nickel Water is 100 percent reliable on a year-to-year basis and is not subject to hydrological variability, regulatory requirements, or supply constraints that may affect other water sources.

[5] Water quality data collected between October 2013 and October 2015 (the date of this report) at Check Stations 29 and 41 were not substantially different than data collected between January 2010 and October 2013. California Aqueduct water quality data will be reviewed and confirmed prior to detailed design of the water treatment plant.

Assumed project drinking water quality goals are summarized in Table 2 based on Federal and State MCLs, MRDLs, and TTALs; other regulatory requirements; and common water treatment practices.

As shown in Table 2, project source water would occasionally exceed primary MCLs for fecal and total coliform bacteria; secondary, esthetic-based MCLs for color, turbidity, aluminum, iron, manganese; and common treatment hardness objectives. All of these constituents would be fully addressed as part of the planned treatment process.

5.3. Water Treatment Facility Engineering Design Criteria

This section summarizes the conceptual facility design process, flowrates, water storage volumes, treatment chemical requirements, and electrical power consumption.

5.3.1 Engineering Design Guidelines

The conceptual treatment facility design has these objectives:

- Achievement of water quality treatment standards;
- Safe use and storage of treatment chemicals;
- Efficient use of energy;
- Control of water losses at the treatment facility; and
- Sufficient reserve capacity and equipment redundancy to mitigate treatment disruptions and meet peak flow demands.

5.3.2 Process Flowrates and Storage Volumes

5.3.2.1 Project Average Annual Drinking Water Use

A maximum of approximately 6,435 AFY of treated potable water would be needed to meet the project's total potable water demand at full buildout (EKI 2015a)[6]. An annual demand of 6,435 AFY is equivalent to an average daily potable water use of about 5.74 mgd. For evaluation purposes, we have conservatively assumed that the total capacity of the water treatment plant(s), expressed as the average daily potable water demand, would be 6.0 mgd at project buildout, as shown below.

[6] This total projected potable water demand includes the potable water demand (5,620 AFY) and the water demand contingency (400 AFY) described in Table 2 of EKI 2015a.

Water Demand Category	Water Demand (AFY)	Water Demand (MGD)
Potable Water Demand	5,620	5.0
Contingency	400	0.4
Total	*6,435*	*5.4*
	Assumed Water Treatment Plant Capacity	*6.0*

5.3.2.2 Peaking Factors

The California Waterworks Standards[7] typically require that the following peaking factors be taken into account when designing new water supply systems:

- Ratio of maximum day demand to average daily usage: 2.25; and
- Ratio of peak hour demand to maximum day demand: 1.5.

If these factors were applied without adjustment for project-specific conditions, the project's maximum daily demand would be approximately 13.5 mgd (6.0 mgd average daily demand multiplied by 2.25) and the peak hourly demand would be about 20.3 mgd (13.5 mgd maximum daily demand multiplied by 1.5).

As discussed in the Grapevine Project's water demand and wastewater treatment facility engineering reports (EKI 2015a; 2015b), the project's non-residential irrigation demand will be largely met with tertiary-treated recycled water. The regulatory water treatment peaking factors cited above assume a high summer-period irrigation demand. For the project, most of these peak-summer irrigation demands would actually be met with recycled water supplemented by other non-potable sources, thus reducing the potable water peaking factors.

To be conservative, the daily and hourly peak flow estimates included in the current conceptual design are based on application of the standard water treatment peaking factors. However, it is anticipated that more appropriate project-specific values for these peaking factors, and the consequential raw water and treated water storage volumes and equipment sizing, would be addressed with regulators prior to detailed design.

5.3.2.3 Process Flowrates and Storage Volumes

The California Waterworks Standards require that a water treatment facility have the ability to meet maximum day demand at all times, including during equipment failures or maintenance (Californian Waterworks Standards, 22 CCR 64557 – 64604). The conceptual facility design presented in this report includes sufficient treatment capacity, water storage volume, and

[7] 22 CCR, Section 64554.

equipment redundancy to meet the maximum day demand of 13.5 mgd that has been assumed for evaluation purposes. The design at full project buildout also incorporates approximately 7.1 million gallons of raw water storage that would be located at the potable water treatment facility for use in case of an emergency, such as loss of source water (see Figure 6). This volume of emergency storage is equivalent to three days of the projected indoor potable water demand of 2,634 AFY (EKI 2015a). A smaller raw water storage volume would be appropriate during the stages of project phasing prior to full buildout.

Additional treated water storage would be provided by tanks located at the water treatment facility and at suitable locations within the potable water distribution system (see Figure 4). As called for by Division 2 of the Kern County Development Standards, the treated water storage volume at full project buildout would be the sum of (1) one day of indoor maximum day demand (5.3 mgd)[8], or 5.3 million gallons; (2) four hours of the hypothetical peak hour demand of 20.3 mgd, equivalent to 3.4 million gallons; and (3) four hours of fire flow for industrial buildings at 1,500 gallons per minute in each of two assumed pressure zones, equal to a fire flow volume of 0.7 million gallons. The sum of the above volumes yields a hypothetical needed treated water storage volume of 9.4 million gallons at project buildout. A smaller treated water storage volume would be appropriate during the stages of project phasing prior to full buildout.

As noted above in Section 4.3.2.2, lower peaking factors would be appropriate for the Grapevine Project due to the extensive application of recycled water to meet the bulk of summer peak, non-residential irrigation demands. A maximum day indoor demand of 5.3 mgd was used in this analysis to evaluate potential storage needs for treated water. However, if lower peaking factors are established for the Grapevine Project, treated water storage volumes would commensurately decrease.

Prior to approval of each tentative tract map or development of any commercial site, the project planners would verify that sufficient raw water and treated water storage capacity exists or would be constructed to meet requirements set forth in Division 2 of the Kern County Development Standards.

[8] Average day indoor water use is estimated to be 2,634 AFY, equivalent to an average daily flow of 2.35 mgd. (EKI, 2015a). Multiplying this average demand by the regulatory maximum day peaking factor of 2.25 yields a hypothetical maximum day indoor demand of approximately 5.3 mgd. As noted in Section 4.3.2.2, a lower peaking factor is likely appropriate for the Grapevine Project because most of the summer-peak non-residential irrigation demands will be met by recycled water.

6.0 PRELIMINARY EVALUATION OF WATER TREATMENT PROCESSES

This section summarizes a preliminary evaluation of the potable water treatment process, based on assumed application of membrane filter technology. Facility land requirements and energy consumption are also projected. To the extent that different and better technologies are available at the time of project construction, those options will be evaluated as part of detailed design.

6.1. Water Treatment Process and Water Treatment Facility Components

The preliminary treatment process design is shown on Figure 5. The conceptual layout of the water treatment facility is shown on Figure 6. The facility's water treatment process is expected to include a raw water intake tank; a rapid mixing and flocculation chamber; an ultrafiltration or microfiltration unit; primary disinfection within a chlorine contact tank or buried piping; final (secondary) disinfection with chloramines using in-line injection of ammonia; and fluoridation. Backwash from the microfiltration or ultrafiltration system would be treated using a secondary microfiltration or ultrafiltration system or sedimentation basin to further concentrate solids in the backwash water. The concentrated backwash would be managed as described in Section 6.1.3.2. Redundant systems would be included in the final design to enable the maximum daily treated water demand to be met at all times. These redundant systems are included in the conceptual-level treatment facility layout shown on Figure 6.

6.1.1 Water Intake Structure

Water for the existing TRCC Water Treatment Plant is currently supplied from California Aqueduct turnout WRM TO #12 (see Figure 3). The TCWD operates one of the two raw water pumps located at this turnout; the other is operated by the Wheeler Ridge-Maricopa Water Storage District (Wheeler Ridge). According to TCWD, there are currently two open pump bays available, and it is our understanding that TCWD would contract or make arrangements with Wheeler Ridge for project use of the existing turnout and available pump bays, or expansion of the turnout, as needed.

Up to eight (8) raw water intake pumps would be needed to furnish the maximum day treated water demand at project buildout. This number of pumps would allow for phased expansion of the water treatment plant's raw water supply, as well as provide redundant and standby pumping capacity. As an example, if turnout WRM TO #12 were designated as the point of raw water supply, the turnout would be expanded by constructing additional bays to accommodate this number of pumps. Such an expansion beyond the two available open pump bays would likely be feasible within the current turnout property area, subject to all appropriate permits and agreements.

An alternative to expanding existing turnout WRM TO #12 is to construct a new Aqueduct turnout or modify an existing one. Several agricultural turnouts exist near the project site that could be potentially expanded or replaced to accommodate the development; however, these agricultural turnouts, shown on Figure 3, are typically not constructed with pump bays and would need extensive modification to accommodate the raw water pumps for the project.

From a technical perspective, construction of a new or improved turnout on the Aqueduct would require implementing a temporary cofferdam at the Aqueduct to allow construction under dry conditions, while maintaining full water flow in the Aqueduct. It is expected that the design of a new turnout would be similar to existing WRM TO #12, with an intake structure, wetwell, and pump bays designed hydraulically to accommodate the needed number of raw water pumps; above-grade pump motors and associated piping, valves, instrumentation, and controls; a hydropneumatic or hydraulic surge control tank; and a building to house equipment and controls. The turnout sites would be fenced and paved for security and for maintenance access, with a paved access road. In total, construction of a new turnout would disturb approximately 1 acre of land.

From a permitting perspective, modification of existing turnouts and construction of new turnouts are overseen by the Department of Water Resources (DWR) State Water Project Analysis Office. According to a conversation with Lincoln King, Chief of the Turnouts and Special Projects Section of DWR, the following steps are to be followed to obtain approval for such modifications or new construction at turnouts (DWR 2014):

- Submittal of a written request by the local State Water Project Contractor, in this case the Kern County Water Agency, to DWR presenting the conceptual turnout design;
- Review of the conceptual design by DWR;
- Submittal of final plans and specifications, including environmental documentation, permits, and proposed State Water Project outage schedule;
- Approval of these final plans and specifications by DWR; and
- Execution of an agreement between DWR and the construction contractor.

DWR would also inspect the constructed turnout before the as-built drawings are completed. The project (via TCWD) would be required to compensate DWR for these reviews.

6.1.2 Raw Water Intake Tank

Raw water for the project would be delivered by TCWD under contract with the Kern County Water Agency. As shown on Figure 6, the preliminary facility design includes an intake tank that is approximately 25 feet high and 90 feet in diameter and that is capable of storing approximately one (1) million gallons of raw water. As described above in Section 5.3.2.3, the preliminary design at project buildout also incorporates approximately 7.1 million gallons of raw water storage that would be located at the potable water treatment facility for use in case of an emergency, such as loss of source water. This emergency raw water storage is assumed to consist of three, 2.4 million gallon tanks, each approximately 30 feet high and 120 feet in diameter. These emergency raw water storage tanks would be configured such that raw water flows through the tanks prior to the treatment plant intake to help keep the stored water fresh.

6.1.3 Enhanced Coagulation and Membrane Filtration System for Water Treatment

The preliminary potable water treatment process, shown on Figure 5, features enhanced coagulation followed by an ultrafiltration or microfiltration unit. Enhanced coagulation promotes the formation of settleable "floc" particles, with adsorption of organic matter and certain dissolved solids onto the particles. A coagulant, typically alum or ferric chloride, and a flocculant, often a polymer, are added to the water and rapidly mixed. The water then flows through a flocculation chamber where particulate, colloidal, and certain dissolved matter form floc particles.

Organic matter is typically in colloidal or dissolved form and thus is difficult to remove using conventional treatment processes such as settling flocculated water in a clarifier tank. During disinfection, residual organic matter can form undesirable disinfection byproducts such as trihalomethanes and haloacetic acids, which are regulated drinking water analytes. Enhanced coagulation promotes the removal of organic matter and thus tends to reduce the formation of disinfection byproducts.

Floc particles formed during the enhanced coagulation step would be removed by microfiltration or ultrafiltration using membranes with small pores, between about 0.01 to 10 micrometers, to separate the floc particles from the water. Unlike conventional settling within a clarifier, such membranes can remove even non-settling particles.

Microfiltration and ultrafiltration membranes require periodic backwashing to prevent particle buildup on the membrane surface. Backwashing occurs every few minutes or hours, depending on the particle loading. The preliminary facility design assumes that water recovery for the coagulated water stream would be about 95%.[9] The other 5% of the influent water would be used for membrane backwashing. Spent backwash would be piped to a second microfiltration or ultrafiltration system or to a sedimentation basin to further concentrate the backwashed solids, with the clarified water from this secondary filtration or sedimentation basin routed to the head of the plant for retreatment. Solids would be managed as discussed in Section 6.1.3.2.

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[9] According to Pall, a treatment equipment manufacturer, based on experience with microfiltration membranes at other facilities a water recovery of about 97% is typically practicable for coagulation of raw water having <50 nephelometric turbidity units (NTU) of turbidity and <5 milligrams per liter (mg/L) of Total Organic Carbon (Pall 2013).

A sedimentation basin, if implemented to concentrate the backwash solids, would require a hydraulic retention time of approximately four (4) hours (MWH 2005). Assuming a spent backwash flowrate of up to 675,000 gallons per day (gpd), equivalent to 5% of the hypothetical max day demand influent flowrate of 13.5 mgd, and an active water depth of 10 feet, the sedimentation basin would require an area of about 1,500 square feet.

In addition to backwashing, the membranes would need chemical cleaning with a caustic solution several times annually using the equipment's "clean-in-place" system. The spent "clean-in-place" wastewater would be collected in a tank or drum and either disposed off-site at an appropriately licensed facility or conveyed to the project’s wastewater treatment facility.

6.1.3.1 Chemical Use

Enhanced coagulation relies on addition of a coagulant, typically alum or ferric chloride, plus a flocculent, often a polymer. Both treatment agents would be added to the feed water to promote floc particle formation and removal (Figure 5).

For conventional coagulation, the dose of coagulant is about equivalent to the raw water suspended solids concentration (Frenkel 1998). From Table 2, the maximum recorded total suspended solids concentration in the raw Aqueduct water was 46 milligrams per liter (mg/L). Assuming this dosage of coagulant, about 380 pounds of coagulant would be needed for every million gallons of water produced, or about 420 tons annually at the design average flowrate of 6.0 mgd. The dose of the polymer flocculent can be estimated at about 20% of the coagulant dose, equivalent to about 76 pounds per million gallons or about 83 tons of flocculent per year. Additional flocculent would be applied as needed to promote solids separation in the spent backwash.

As described above, microfiltration or ultrafiltration membranes require periodic "cleaning-in-place" with a solution typically combining biocides, enzymes, surfactants, and chelating agents, plus acids or caustics. The cleaning frequency depends on the rate of biological fouling or chemical scaling. Typically, the volume of cleaning solution is not large; therefore, the conceptual design assumes spent cleaning materials would be managed in drums or small tanks for disposal offsite at an appropriately licensed facility or can be directed to the project wastewater treatment facilities.

6.1.3.2 Management of Spent Backwash

As described above in Section 6.1.3, net water recovery from the primary microfiltration or ultrafiltration system is assumed to be 95% of the influent flow, with the remaining 5% used for backwashing and producing a spent backwash flow. As shown on Figure 5, the preliminary water treatment design assumes that a secondary filtration system or sedimentation basin would be implemented to further concentrate the spent backwash solids by an additional 95%. With this approach, the net backwash water volume generated each year would be about 5.5 million gallons assuming an average treatment plant flowrate of 6.0 mgd. The filtrate would be directed back to the plant intake for retreatment. The secondary filtration equipment would be housed at the water treatment facility. Alternately, a sedimentation basin, if used, would be located within the water treatment plant as shown conceptually on Figure 6.

Solids within the concentrated backwash are assumed to be further managed, although it may be practicable to convey the concentrated spent backwash directly to the project wastewater treatment facility. The preliminary design shown schematically on Figure 5 assumes that the concentrated spent backwash would be sent to sludge lagoons at the water treatment plant. The lagoons would constitute separate cells to facilitate solids concentration and removal. From these lagoon cells, concentrated or dried solids would be conveyed to an appropriately-permitted landfill or to the project wastewater treatment plant. The clarified supernatant would be directed to the plant raw water intake for retreatment.

The feed rate to the sludge lagoon cells would equal the net concentrated spent backwash flow, preliminarily estimated at 5.5 million gallons per year. Based on this flow, an assumed hydraulic retention time of 90 days, and a lagoon water depth of 4 feet, the lagoon would cover about 63,000 square feet, including a 40% allowance for sloped berms and access roads.

6.1.3.3 Conceptual Facility Sizing

As noted above in Section 5.3.2.2, lower potable water summertime peak flow factors would be appropriate for the project due to the extensive application of recycled water to meet most non-residential irrigation demands. If lower peaking factors are established, thereby reducing the hypothetical peak treatment flowrates, the facility sizing and raw and treated water storage volumes would commensurately decrease from those described herein.

The rapid mixing and flocculation basin would require approximately 2,500 square feet of basin area, based on the hypothetical maximum day influent flow rate of 13.5 mgd, a contact time of 20 minutes, and a basin depth of 10 feet.

The primary and secondary microfiltration or ultrafiltration systems would occupy about 5,000 to 6,000 square feet of building space based on the size of five 3.25 mgd GE Z-Box ultrafiltration packaged plants and one 1.73 mgd GE Z-Box ultrafiltration packaged plant (General Electric 2013). Additional indoor space would be needed for standby equipment and auxiliary systems such as chemical feed and storage, electrical, controls, and work rooms.

6.1.4 Disinfection and Associated Equipment

Disinfection would be accomplished in two steps, primary disinfection and secondary disinfection. Primary disinfection provides the desired reduction in microorganisms, while secondary disinfection helps prevent rebound in microorganism levels.

6.1.4.1 *Primary Disinfection*

To provide primary disinfection, sodium hypochlorite would be added at the inlet of a contact tank or buried pipeline (Figure 5). The hypochlorite dose would depend on the initial chlorine demand, the desired concentration of chlorine during primary disinfection, initial bacterial levels, and the targeted residual disinfectant concentration in the distributed water. The assumed sodium hypochlorite dose and usage and the conceptual design of the contact chamber are described in Table 3.

6.1.4.2 *Secondary Disinfection*

Chloramination may be used to provide a residual (secondary) level of disinfectant within the water distribution system. Ammonia would be added following the chlorine contact tank to form monochloramine, which can provide longer-lasting secondary disinfection (Figure 5). Monochloramine can also reduce levels of undesirable disinfection byproducts such as trihalomethanes and haloacetic acids compared with use of sodium hypochlorite or free chlorine without ammonia. Table 3 estimates ammonia dosage and use. Booster stations and tank mixers may also be co-located with the treated water tanks within the distribution system to help maintain chloramine levels.

6.1.5 Fluoridation Equipment

The finished water would be fluoridated in compliance with applicable regulations (Table 1 and Figure 5). Fluoridation would utilize sodium fluoride or sodium silicofluoride, with dosage and consumption rates shown in Table 4.

6.1.6 Distribution System

The project's potable water distribution system would be designed in accordance with applicable rules and regulations for potable water, including those described in Section 3.0 and listed in Table 1. The conceptual-level distribution system is shown on Figure 4.

Treated water would be pumped from a clearwell at the water treatment facility into the distribution system. The conceptual distribution system design assumes the establishment of two pressure zones, with one or two storage tanks per zone to furnish the total treated water storage volume described in Section 5.3.2.3. Booster pump stations would be built at those tanks not located at high elevation. Each tank and booster station would require approximately one to two acres.

Potable water distribution pipelines would be polyvinyl chloride (PVC), high-density polyethylene (HDPE), or other material allowed by regulation.

6.1.7 Other Major Facility Components

The water treatment facility would require support buildings to house the staff, laboratory, maintenance areas, and process and ancillary equipment. It is anticipated that one building would house administrative functions, including the control room, locker rooms, offices, and a break room/conference room, as well as a laboratory for routine water analyses. All of these facilities are included in the planned water treatment facility footprint (see Figure 6).

6.2. Other Planning Information

6.2.1 Treatment Chemicals

Treatment agents and other chemicals would be delivered to and stored at the water treatment facility. Chemicals would include coagulants, flocculants, acids, caustics, disinfectants, detergents, and fuels, with a more complete listing provided in Table 5. Storage would comply with applicable environmental health and safety regulations.

6.2.2 Facility Visual, Noise, and Odor Impacts

Aboveground structures would be visually compatible with nearby structures. Outdoor lighting would be shielded to mitigate glare. Noise-producing equipment would be housed in structures with acoustical dampening where necessary.

Based on other water treatment facilities using similar technology and source water, impacts from nuisance odors are not anticipated.

6.2.3 Electrical Energy Consumption

Table 6 estimates electrical energy consumption for raw water management and treatment and for treated water distribution. Energy consumption is estimated to be about 11 to 14 million kilowatt-hours per year.

6.2.4 Natural Gas Consumption

Natural gas would provide hot water and space heating. An average heating demand of roughly 6,000 British thermal units per hour (Btu/hr) is estimated for water heating[10], plus 30,000 Btu/hr for space heating for four winter months. On this basis, the facility's natural gas consumption would be approximately 140 thousand cubic feet (Mcf) per year assuming 1,000 Mcf per million Btu and an annual heating requirement of 140 million Btu.

[10] Assume 150 gallons per day is heated by 70 degrees Fahrenheit at 75% heating efficiency, plus 25% additional allowance to maintain water heater storage tank temperature.

7.0 OFFSITE AND CUMULATIVE IMPACTS

This section describes the offsite and cumulative impacts of the project as they relate to water treatment and storage facilities.

7.1. Offsite Impacts

Offsite land uses identified for this project include:

- Connector and Haul Roads
- California Highway Patrol Weigh Station
- California Aqueduct Turnouts
- Expansion of the TRCC East or West Wastewater Treatment Plants
- Interchange (over I-5)

The only offsite land use related to water treatment is the construction or modification of turnouts on the California Aqueduct. Potential impacts of the turnouts are discussed in Section 6.1.1. Treated water storage tanks are assumed to be constructed within the project site, either at the potable water treatment facility or within the water distribution system.

7.2. Cumulative Impacts

The project would be supplied by Nickel Water, which would be conveyed to the project through the California Aqueduct and treated on-site at the project's water treatment plant or plants. Because the project's potable water needs would be met by a source that is not shared with any other entity, there are no cumulative impacts associated with the project water treatment facilities.

8.0 MITIGATION MEASURES

Mitigation measures are steps taken to reduce an identified environmental impact caused by the project. Impacts due to land use and facility emissions of greenhouse gas and other air pollutants are being mitigated on a project-wide basis and are not addressed in this report. Facility operations, including plant maintenance and chemical handling, will be performed in general accordance with applicable laws and regulations, and therefore do not require mitigation. The following mitigation measures ensure that there would be sufficient water treatment capacity to meet the demand of specific development phases proposed within the overall project.

- **Mitigation Measure #1: Water Service Agreement**. Prior to approval of each tentative tract map or development of any commercial site, the project will obtain a will-serve letter for water service from TCWD.

- **Mitigation Measure #2**: **Use of Tertiary-treated Recycled Water to Meet Most Non-residential Irrigation Demands.** Most summertime non-residential irrigation demands (i.e., peak demands) will be met with recycled water rather than with potable water. The wide-spread use of recycled water will reduce the potable water treatment plant peaking factors, as compared to the standard regulatory peaking factors conservatively assumed in this report. Smaller peaking factors will correspond to reduced storage volumes for raw water and treated potable water, and will result in smaller footprints for the potable water treatment plant and water storage tanks.

- **Mitigation Measure #3**: **Concentration of Spent Backwash Flows.** The solids in the spent screening backwash water will be further concentrated by means of a secondary filtration system or sedimentation basin. In this way, the volume of solids requiring further management and disposal will be reduced, with most of the clarified spent backwash flow returned to the water treatment plant intake for retreatment.

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Table 1

Statutes and Regulations Potentially Applicable to Water Treatment and Distribution

Grapevine Project, Kern County, California

Statute or Regulation	Citation	Description	Implementing Agency	Applicability to Project
Federal Regulations				
Safe Drinking Water Act, as Amended				
National Interim Primary Drinking Water Regulations; Arsenic Rule; Fluoride Rule; Lead and Copper Rule; Phase I, II, and V Standards; Radionuclides Rule; Total Coliform Rule	40 FR 59566, 66 FR 6975, 51 FR 11396, 56 FR 26460, 52 FR 23690, 56 FR 3526, 56 FR 30266, 57 FR 31776, 65 FR 76707, 54 FR 27544	• Set forth federal MCLs for inorganic, organic, radionuclide, and microbial analytes and total coliforms in drinking water • Establish monitoring and general requirements for these analytes • Set treatment techniques with action levels for lead and copper	DDW	• MCLs and action levels applicable to Grapevine Project drinking water quality • California has adopted regulations at least as strict as these regulations
Filter Backwash Recycling Rule; Surface Water Treatment Rule; Interim, Long Term 1, and Long Term 2 Enhanced Surface Water Treatment Rules	66 FR 31085, 54 FR 27486, 63 FR 69477, 67 FR 1811, 71 FR 653	• Set forth surface water treatment requirements for microbial removal or inactivation based on source water turbidity • Establish monitoring of surface water source quality	DDW	• California has adopted regulations at least as strict as the Filter Backwash Recycling Rule and Surface Water Treatment Rule • California has proposed to adopt regulations at least as strict as the Interim Enhanced Surface Water Treatment Rule
Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rule	63 FR 69389, 71 FR 387	• Set forth MCLs for disinfection byproducts in water • Require evaluation of water system to identify treatment process corrections • Establish monitoring of distribution system	DDW	• MCLs applicable to Grapevine Project drinking water quality • California has adopted regulations at least as strict as the Stage 1 Disinfectants and Disinfection Byproducts Rule
Unregulated Contaminants Monitoring 2	72 FR 367	• Identified potential contaminants for monitoring in 2008 through 2010 to evaluate potential future regulation	DDW	• Applicable to drinking water quality or water treatment if regulations are promulgated
Proposed Radon Rule	64 FR 59246	• Intends to establish an MCL, or an alternative MCL with a multimedia mitigation program, for radon in drinking water	-	• MCL or alternative MCL applicable to Grapevine Project drinking water quality once promulgated
Proposed Revisions to Lead and Copper Rule	71 FR 40828	• Intends to clarify language and revise current lead and copper rule to improve notification to the primary agency and the public	-	• Action levels applicable to Grapevine drinking water quality once promulgated
California Regulations				
Regulations Promulgated Under the California Safe Drinking Water Act				
Water Treatment Devices	22 CCR 60400 - 60475	• Requires approved methodology for testing and certification of water treatment devices	DDW	• Applicable to water treatment devices used at the Grapevine Project water treatment facility
Water System Permits	22 CCR 64001 - 64260	• Requires permitting for proposed water system	DDW	• Applicable to permitting of Grapevine Project water treatment facility and distribution system
General Requirements	22 CCR 64412 - 64416	• Sets forth general requirements for water systems	DDW	• Applicable to Grapevine Project water treatment facility in regard to siting requirements
Primary Standards - Bacteriological Quality	22 CCR 64421 - 64427	• Sets forth MCL for total coliforms • Establishes monitoring requirements	DDW	• MCL applicable to Grapevine Project drinking water quality
Primary Standards - Inorganic Chemicals	22 CCR 64431 - 64432.8	• Sets forth MCLs for 19 inorganic analytes • Establishes monitoring requirements	DDW	• MCLs applicable to Grapevine Project drinking water quality
Fluoridation	22 CCR 64433 - 64434	• Requires fluoridation for certain water systems	DDW	• Fluoridation is mandatory because Grapevine Project will have more than 10,000 service connections

Table 1
Statutes and Regulations Potentially Applicable to Water Treatment and Distribution
Grapevine Project, Kern County, California

Statute or Regulation	Citation	Description	Implementing Agency	Applicability to Project
California Regulations (continued)				
Regulations Promulgated Under the California Safe Drinking Water Act (continued)				
Radioactivity	22 CCR 64442 - 64443	• Sets forth MCLs and monitoring requirements for five radionuclides and gross alpha and gross beta particle activities	DDW	• MCLs applicable to Grapevine Project drinking water quality
Primary Standards - Organic Chemicals	22 CCR 64444 - 64445.2	• Sets forth MCLs and monitoring requirements for 27 volatile organic compounds and 33 semi-volatile organic compounds	DDW	• MCLs applicable to Grapevine Project drinking water quality
Secondary Drinking Water Standards	22 CCR 64449 - 64449.5	• Sets forth secondary MCLs and monitoring requirements for additional analytes and water quality parameters	DDW	• Secondary MCLs applicable to Grapevine Project drinking water quality
Disinfectant Residuals, Disinfection Byproducts, and Disinfection Byproduct Precursors	22 CCR 64530 - 64537.6	• Sets forth MCLs for disinfection byproducts and MRDLs for disinfectants • Establishes monitoring requirements, corrective treatment techniques, and other requirements	DDW	• MCLs and MRDLs applicable to Grapevine Project drinking water quality
California Waterworks Standards	22 CCR 64551 - 64604	• Sets forth requirements for distribution systems, including specifications for design, construction, and operation of equipment, piping, and chemical addition facilities	DDW	• Design, construction, and operation requirements applicable to Grapevine Project water treatment facility and potable water distribution system
Surface Water Treatment	22 CCR 64650 - 64666	• Set treatment requirements for microbial removal or inactivation and monitoring of surface water source quality	DDW	• Applicable to Grapevine Project water treatment facility
Lead and Copper	22 CCR 64670 - 64690.80	• Sets forth lead and copper treatment techniques, distribution system requirements, and public education programs	DDW	• Action levels applicable to Grapevine Project drinking water quality
Regulations Promulgated Under the Global Warming Solutions Act				
Greenhouse Gas Emissions Regulations	Assembly Bill 32	• Intends to set forth regulatory requirements for greenhouse gas emissions	SJVAPCD	• Regulations to be evaluated if promulgated

Table 1
Statutes and Regulations Potentially Applicable to Water Treatment and Distribution
Grapevine Project, Kern County, California

Statute or Regulation	Citation	Description	Implementing Agency	Applicability to Project
California Regulations (continued)				
<u>California Clean Air Act, as amended</u>				
Emissions Permitting Regulations	SJVAPCD Regulations	• Sets forth regulatory requirements for standby generators and boilers	SJVAPCD	• Regulations will be applicable for pertinent equipment
Local Ordinances Regulations				
<u>Kern County</u>				
Water Design Standards	Code Title 14 Chapter 14.08 - 14.10	• Establishes water supply system design standards for water systems in Kern County	Kern County	• Applicable to Grapevine Project water distribution facilities
	Kern County Development Standards - Division Two	• Establishes water supply system design standards for water systems in Kern County		
<u>Kern County Water Agency</u>				
Water District Ordinances	Various	• Ordinances and regulations to be compiled and evaluated by communication with Kern County Water Agency during design of water treatment facility	Kern County Water Agency	• Identified ordinances and regulations to be evaluated

<u>Abbreviations:</u>
"AMCL" = Alternative Maximum Contaminant Level
"CCR" = California Code of Regulations
"DDW" = State Water Resources Control Board Division of Drinking Water
"FR" = Federal Register
"SJVAPCD" = San Joaquin Valley Air Pollution Control District
"MCL" = Maximum Contaminant Level
"MRDL" = Maximum Residual Disinfectant Level

Table 2

Summary of Analytical Results for Selected California Aqueduct Samples and Assumed Drinking Water Quality Goals

Grapevine Project, Kern County, California

Water Quality Parameter		TRCC Treatment Plant Raw Water (a)		Check Station 29 (b)		Check Station 41 (b)		Average (c)	Maximum (c)	Assumed Drinking Water Quality Goal (e)	
		Average	Maximum	Average	Maximum	Average	Maximum			Upper Limit (f)	Rationale (g)
Biological (MPN/100 ml)	Coliform, Fecal	18.5	50	-	-	-	-	**18.5**	**50**	0	MCL
	Coliform, Total	42.3	51	-	-	-	-	**42.3**	**51**	See Note (h)	MCL
Physical	pH, laboratory (pH units)	7.8	8.7	8.0	8.4	8.1	8.6	8.0	8.7	See Note (i)	See Note (i)
	Color (Color Units)	22.5	25	-	-	-	-	**22.5**	**25**	15	SMCL
	Turbidity (NTU)	3.1	4.9	6	28	4	14	4.4	**28**	5	SMCL
	Dissolved Organic Carbon (mg/L)	-	-	3.1	5.4	3.1	4.6	3.1	5.4	--	--
	Total Organic Carbon (mg/L)	2.9	4.8	3.2	8.2	3.2	4.4	3.1	8.2	--	--
General Water Quality	Alkalinity (as Calcium Carbonate) (mg/L)	92	92	65	89	71	91	76	92	--	--
	Specific Conductance (µS/cm) (n)	-	-	422	632	496	619	459	632	See Note (k)	SMCL
	Hardness (as Calcium Carbonate) (mg/L)	120	130	90	135	102	123	104	**135**	120 to 150	See Note (j)
	Total Dissolved Solids (mg/L)	-	-	241	352	280	347	261	352	See Note (k)	SMCL
	Total Suspended Solids (mg/L)	-	-	8	46	6	27	7	46	--	--
Inorganic Constituents (mg/L)	Ammonia (as Nitrogen)	-	-	0.02	0.06	0.02	0.03	0.02	0.06	--	--
	Calcium	28	30	19	33	21	30	23	33	--	--
	Chloride	67	76	64	117	78	122	70	122	250	SMCL (See Note (l))
	Cyanide, Total	ND	ND	-	-	-	-	ND	ND	0.15	MCL
	Fluoride	0.125	0.15	-	-	-	-	0.125	0.15	2	MCL
	Magnesium	12.5	13	11	15	12	16	12	16	--	--
	Nitrate (as Nitrate)	4.6	5.3	2.7	7.5	2.7	6.4	3.3	7.5	45	MCL
	Nitrite (as Nitrogen)	ND	ND	-	-	-	-	ND	ND	1	MCL
	Nitrate and Nitrite (as Nitrogen)	1.04	1.2	0.5	1.5	0.53	1.4	0.7	1.5	10	MCL
	Total Kjeldahl Nitrogen	-	-	0.4	0.8	0.5	1.8	0.5	1.8	--	--
	Potassium	2.6	2.8	-	-	-	-	2.6	2.8	--	--
	Sodium	57	65	46	77	56	76	53	77	--	--
	Sulfate	60.5	67	36	67	38	58	45	67	250	SMCL (See Note (l))
Other Analytes (µg/L)	VOCs	ND	ND	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	See Note (m)	MCLs
	Pesticides (only detected are shown)										
	Dacthal (DCPA)	-	-	<0.5	0.04	<0.01	0.02	<0.5	0.04	--	--
	Diuron	-	-	<0.25	1.7	<0.25	1.2	<0.25	1.7	--	--
	Metolachlor	-	-	<0.05	0.1	<0.05	<0.05	<0.05	0.1	--	--
	Simazine	-	-	<0.02	0.06	0.02	0.06	0.02	0.06	4	MCL
Emergent Chemicals	Perchlorate (µg/L)	ND	ND	-	-	-	-	ND	ND	6	MCL

Table 2

Summary of Analytical Results for Selected California Aqueduct Samples and Assumed Drinking Water Quality Goals

Grapevine Project, Kern County, California

Water Quality Parameter		TRCC Treatment Plant Raw Water (a)		Check Station 29 (b)		Check Station 41 (b)		Average (c)	Maximum (c)	Assumed Drinking Water Quality Goal (e)	
		Average	Maximum	Average	Maximum	Average	Maximum			Upper Limit (f)	Rationale (g)
Metals (µg/L)	Aluminum, Dissolved	-	-	<10	<10	<10	23	<10	23	--	--
	Aluminum, Total	125	140	105	429	95	400	108	**429**	200	SMCL
	Antimony, Total	ND	ND	<1	<1	<1	<1	<1	<1	6	MCL
	Arsenic, Dissolved	-	-	<1	<1	2	3	2	3	--	--
	Arsenic, Total	ND	ND	2	4	3	3	3	4	10	MCL
	Barium, Dissolved	-	-	31	40	30	42	31	42	--	--
	Barium, Total	ND	ND	34	43	34	43	34	43	1,000	MCL
	Beryllium, Dissolved	-	-	<1	<1	<1	<1	<1	<1	--	--
	Beryllium, Total	ND	ND	<1	<1	<1	<1	<1	<1	4	MCL
	Boron, Dissolved	-	-	158	300	157	300	158	300	1,000	TT AL
	Bromide, Dissolved	-	-	198	430	249	410	224	430	--	--
	Cadmium, Dissolved	-	-	<1	<1	<1	<1	<1	<1	--	--
	Cadmium, Total	-	-	<1	<1	<1	<1	<1	<1	5	MCL
	Chromium, Dissolved	ND	ND	<1	1	<1	2	<1	2	--	--
	Chromium, Total	-	-	1	2	1	2	1	2	50	MCL
	Copper, Dissolved	-	-	1	2	1	3	1	3	--	--
	Copper, Total	ND	ND	3	20	2	4	3	20	1,000	SMCL
	Hexavalent Chromium	-	-	-	-	-	-	-	-	10	MCL
	Iron, Dissolved	-	-	8	28	6	27	7	28	--	--
	Iron, Total	201	390	157	607	130	356	163	**607**	300	SMCL
	Lead, Dissolved	-	-	<1	<1	<1	<1	<1	<1	--	--
	Lead, Total	ND	ND	<1	5	<1	<1	<1	5	15	TT AL
	Manganese, Dissolved	-	-	<1	7	<1	<1	<1	7	--	--
	Manganese, Total	9.4	32	19	78	18	67	15	**78**	50	SMCL
	Mercury, Dissolved	-	-	<1	<1	<0.2	1	<0.2	1	2	MCL
	Nickel, Dissolved	-	-	1	2	1	1	1	2	--	--
	Nickel, Total	ND	ND	2	3	2	2	2	3	100	MCL
	Selenium, Dissolved	-	-	1	1	1	1	1	1	--	--
	Selenium, Total	ND	ND	1	2	1	2	1	2	50	MCL
	Silver, Dissolved	-	-	<1	<1	<1	<1	<1	<1	--	--
	Silver, Total	ND	ND	<1	<1	<1	<1	<1	<1	100	SMCL
	Thallium	ND	ND	-	-	<1	<1	<1	<1	2	MCL
	Zinc, Dissolved	-	-	6	21	<5	5	3	21	--	--
	Zinc, Total	ND	ND	15	57	<5	13	8	57	5,000	SMCL

Table 2

Summary of Analytical Results for Selected California Aqueduct Samples and Assumed Drinking Water Quality Goals

Grapevine Project, Kern County, California

Abbreviations:
"CCR" = California Code of Regulations
"MCL" = Maximum Contaminant Level
"mg/L" = milligrams per liter
"µg/L" = micrograms per liter
"MPN/100 ml" = Most Probable Number per 100 milliliters
"ND" = Not detected
"NTU" = Nephelometric turbidity units
"SMCL" = Secondary Maximum Contaminant Level
"µS/cm" = microSiemens per centimeter
"TRCC" = Tejon Ranch Commerce Center
"TT AL" = Action level requiring a specified treatment technique
"VOC" = Volatile Organic Compounds

Notes:

(a) Values for the TRCC Water Treatment Plant Raw Water were provided by the California Water Company. Data from January 2012 through October 2013 were used to calculate average values.

(b) Values for Check Stations 29 and 41 were taken from the Department of Water Resources, Water Data Library: http://www.water.ca.gov/waterdatalibrary. Data from January 2010 through October 2013 were used to calculate average values.

(c) "Average" values in this column represent the arithmetic average of the average parameter values reported for the TRCC Treatment Plant Raw Water and for Check Station 41. The "maximum" values are the maximum for each parameter reported for these two sampling locations. Values shown in **bold typeface** exceed the respective assumed Drinking Water Quality Goal.

(d) Source water concentrations should be reevaluated during design of the water treatment facility.

(e) Drinking water quality goals are based on preliminary assessments of federal and state drinking water regulations (see Table 1) and typical water treatment practices. These goals and should be reevaluated during design of the water treatment facility and distribution system.

(f) These are maximum values assumed for this preliminary engineering analysis.

(g) The rationales for the drinking water quality goals include federal and state drinking water regulations.

(h) The upper limit for total coliforms is that less than five percent of samples have detected levels of total coliforms.

(i) Although pH levels are not regulated, typical water treatment practice is that pH is be kept between about 7 to 9.

(j) Typical water treatment experience is that water with hardness above 120 to 150 mg/L as calcium carbonate is undesirable to consumers.

(k) From Table 64449-B found in 22 CCR, Division 4, Chapter 15, Section 64449, the maximum contaminant level range for Specific Conductance is 900 µS/cm "recommended", 1,600 "upper", and 2,200 "short term". The respective levels for Total Dissolved Solids are 500, 1,000, and 1,500 mg/L.

(l) As shown in the table referenced in Note (k),the "recommended" maximum contaminant level range is 250 mg/L, with an "upper" level of 500 and a "short term" level of 600.

(m) MCLs for VOCs vary from 0.5 µg/L to 1,750 µg/L depending on the VOC analyte.

(n) Specific Conductance is also referred to as "Electrical Conductivity."

Table 3

Preliminary Disinfection Requirements for the Water Treatment Facility

Grapevine Project, Kern County, California

Item	Unit	Estimated Value	Comments
Primary Disinfection (Sodium hypochlorite)			
Immediate chlorine demand	mg/L Cl	2.0	Assumed chlorine demand. Chlorine demand should be reevaluated during design of the water treatment facility.
Residual chlorine concentration in contact tank	mg/L Cl	2.0	
Sodium hypochlorite dose rate (as chlorine)	mg/L Cl	4.0	Sum of immediate chlorine demand and residual chlorine concentration in contact tank
Sodium hypochlorite dose rate (as NaOCl)	mg/L NaOCl	4.2	Dose rate (as chlorine) multiplied by ratio of NaOCl molecular weight to Cl_2 molecular weight (1.05)
Design chlorine CT parameter	mg-min/L	20	Preliminary assumed value for 4-log inactivation of viruses (a)
Minimum contact time	min	10	Assumed chlorine CT divided by the chlorine dose rate
Design contact time	min	15	Minimum contact time increased by safety factor of 1.5
Minimum contact tank volume based on maximum day flow	gal	141,000	Maximum throughput flow of 13.5 Mgd multiplied by the design contact time
Area required for contact tank, assuming a water depth of 5 feet	ft^2	3,800	Minimum Contact tank volume divided by the assumed water depth
Secondary Disinfection (Chloramination)			
Chlorine to ammonia mass ratio		3.5	To create monochloramine
Ammonia dose rate	mg/L	0.6	Residual chlorine concentration in contact tank (2 mg/L) divided by chlorine to ammonia mass ratio

Abbreviations:

"CT" = Concentration × Time

"Cl" = Chlorine

"ft^2" = square feet

"gal" = gallons

"Mgd" = million gallons per day

"mg/L" = milligrams per liter

"mg-min/L" = milligrams-minutes per liter

"min" = minutes

"NaOCl" = Sodium hypochlorite

Notes:

(a) Value for 4-log inactivation of viruses with free chlorine was obtained from Viessman, W. and Hammer, M.J., *Water Supply and Pollution Control*, 6th Ed., Addison-Wesley, Menlo Park, CA, 1998.

Table 4

Preliminary Fluoridation Requirements for the Water Treatment Facility

Grapevine Project, Kern County, California

Item	Unit	Value	Comments
<u>Fluoridation with sodium fluoride</u>			
Assumed fluoride dose (as fluoride)	mg/L	1	
Fluoride to sodium fluoride mass ratio		0.45	Ratio of fluoride atomic weight to sodium fluoride molecular weight
Sodium fluoride dose	mg/L	2.2	Assumed fluoride dose divided by above mass ratio
<u>Fluoridation with sodium silicofluoride</u>			
Assumed fluoride dose (as fluoride)	mg/L	1	
Fluoride to sodium silicofluoride mass ratio		0.61	Ratio of fluoride atomic weight to sodium silicofluoride molecular weight
Sodium silicofluoride dose	mg/L	1.6	Assumed fluoride dose divided by above mass ratio

<u>Abbreviations:</u>
"mg/L" = milligrams per liter

Table 5

Preliminary Summary of Potential Chemical Usage for the Water Treatment Facility

Grapevine Project, Kern County, California

Purpose (a)	Product (b)	Physical Form	Incompatible Products at Water Treatment Facility	Environmental Health and Safety Concerns	Mitigation Measures	Anticipated Storage Requirements (c)	Comments
Coagulation and Flocculation	Aluminum Sulfate	Liquid or solid	Ammonia Caustic Diesel Fuel Mineral Acid Sodium Hypochlorite	Corrosive; Health hazard in concentrated form; Vapors from concentrated solutions	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	Approximately 22,000 pounds or 5,500 gallons	Would not be used if ferric chloride is used
	Ferric Chloride	Liquid or solid	Ammonia Caustic Diesel Fuel Mineral Acid Sodium Hypochlorite	Corrosive; Health hazard in concentrated form; Vapors from concentrated solutions	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	Approximately 24,000 pounds or 6,500 gallons	Would not be used if alum is used
	Polymer	Aqueous solution	Ammonia Caustic Diesel Fuel Mineral Acid Sodium Hypochlorite	Slipping hazards in concentrated form	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	Approximately 550 gallons	Could be used to supplement alum or ferric chloride addition
Clean-in-place Chemicals for Micro/Ultra Filtration	Mineral acid Caustic Chelating agents Detergents Enzymes Disinfectants	Aqueous solutions	To be determined during detailed design	Potential fumes; Potential health hazards in concentrated forms; Potential corrosive compounds; Potential oxidizer hazards	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate with potential exhaust neutralization system	To be determined during detailed design	Would be stored as part of the clean-in-place system. Chemicals will be selected during detailed design

Table 5

Preliminary Summary of Potential Chemical Usage for the Water Treatment Facility

Grapevine Project, Kern County, California

Purpose (a)	Product (b)	Physical Form	Incompatible Products at Water Treatment Facility	Environmental Health and Safety Concerns	Mitigation Measures	Anticipated Storage Requirements (c)	Comments
Disinfection	Sodium hypochlorite	Aqueous solution	Ammonia Aluminum Sulfate Caustic Cationic Polymer Diesel Fuel Ferric Chloride Mineral Acid Sodium Fluoride Sodium Silicofluoride	Decays over time; Emits chlorine gas; Corrosive; Health hazard in concentrated form	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate with potential exhaust neutralization system	Approximately 4,000 gallons	
	Ammonia	Liquefied gas or aqueous ammonium hydroxide	Aluminum Sulfate Caustic Cationic Polymer Diesel Fuel Ferric Chloride Mineral Acid Sodium Hypochlorite Sodium Fluoride Sodium Silicofluoride	Health hazard in concentrated form; Anhydrous ammonia may be fire or explosion hazard; Potential vapors	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate with potential exhaust neutralization system	Approximately 3,000 gallons	Would be used to mitigate levels of disinfection byproducts and to form monochloramine as secondary disinfectant
Fluoridation	Sodium fluoride	Granular solid	Ammonia Caustic Diesel Fuel Mineral Acid Sodium Hypochlorite	Health hazard in concentrated form; Hygroscopic	Store in container with appropriate materials; Provide double-containment in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	Approximately 16,000 pounds	Would not be used if sodium silicofluoride is used
	Sodium silicofluoride	Granular solid	Ammonia Caustic Diesel Fuel Mineral Acid Sodium Hypochlorite	Health hazard in concentrated form; Hygroscopic	Store in container with appropriate materials; Provide double-containment in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	Approximately 16,000 pounds	Would not be used if sodium fluoride is used

Table 5

Preliminary Summary of Potential Chemical Usage for the Water Treatment Facility

Grapevine Project, Kern County, California

Purpose (a)	Product (b)	Physical Form	Incompatible Products at Water Treatment Facility	Environmental Health and Safety Concerns	Mitigation Measures	Anticipated Storage Requirements (c)	Comments
Emergency Standby Electrical Generation	Diesel fuel	Liquid	Ammonia Aluminum Sulfate Caustic Cationic Polymer Diesel Fuel Ferric Chloride Mineral Acid Sodium Hypochlorite Sodium Fluoride Sodium Silicofluoride	Liquid and vapors are health hazards; Fire and potential explosion hazard	Store in container with appropriate materials; Provide double-containment in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	To be determined during detailed design	
Laboratory chemicals and general cleaning supplies	To be determined during detailed design	Small containers of solids, liquids, and compressed gases	To be determined during detailed design	Potential fumes; Potential health hazards; Potential corrosive compounds; Potential fire and oxidizer hazards	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate	To be determined during detailed design	Would be stored and used in a laboratory room or storage closet

Notes:

(a) Other substances may be used such as natural gas, liquid petroleum gas, fuels, oils, lubricants, hydraulic fluids, refrigerants, paints, protective coatings, solvents, deicers, pesticides, herbicides, and fire extinguishers.

(b) All chemicals added to potable water would be approved as appropriate by NSF or other organization.

(c) Chemical delivery would occur about once every two weeks.

Table 6

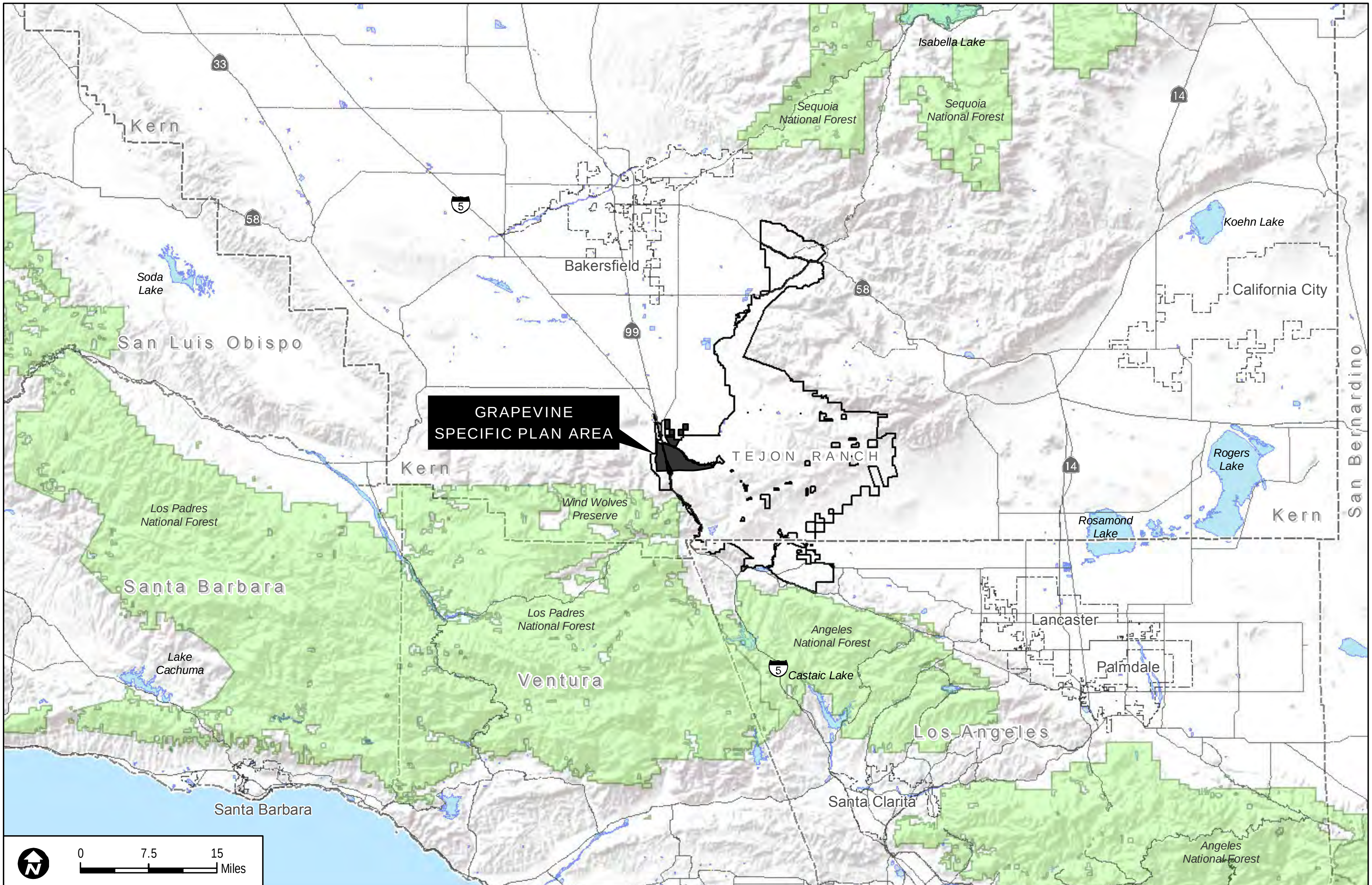
Preliminary Summary of Estimated Electrical Consumption for the Water Treatment Facility and Distribution System

Grapevine Project, Kern County, California

Treatment Facility Component	Estimated Annual Electrical Consumption (kW-hr/year) (a)
Raw Water Intake	2,914,000
Rapid Mix and Flocculation	660,000
Primary UF/MF	1,378,000
Secondary UF/MF	72,000
Transfer to Clearwell	589,000
Distribution	4,659,000
Chemical Injection	86,000
Sludge Handling	22,000
Other (b)	519,000
Subtotal	**10,900,000**
30% Contingency/Allowance for Peak Flows	**3,270,000**
Estimated Total Electrical Consumption (c)	**14,170,000**

Abbreviations:
"kW-hr/year" = kilowatt-hours per year
"MF" = microfiltration
"Mgd" = Million gallons per day
"UF" = ultrafiltration

Notes:
(a) Electrical consumption assumes an average treated water demand of 6.0 Mgd. See Figure 5 for schematic diagram for the preliminary treatment train.
(b) Other electrical consumption at the water treatment facility, including air conditioning, general electrical use for buildings, control system equipment, and other miscellaneous electrical uses, is assumed to be 5% of the total power consumption.

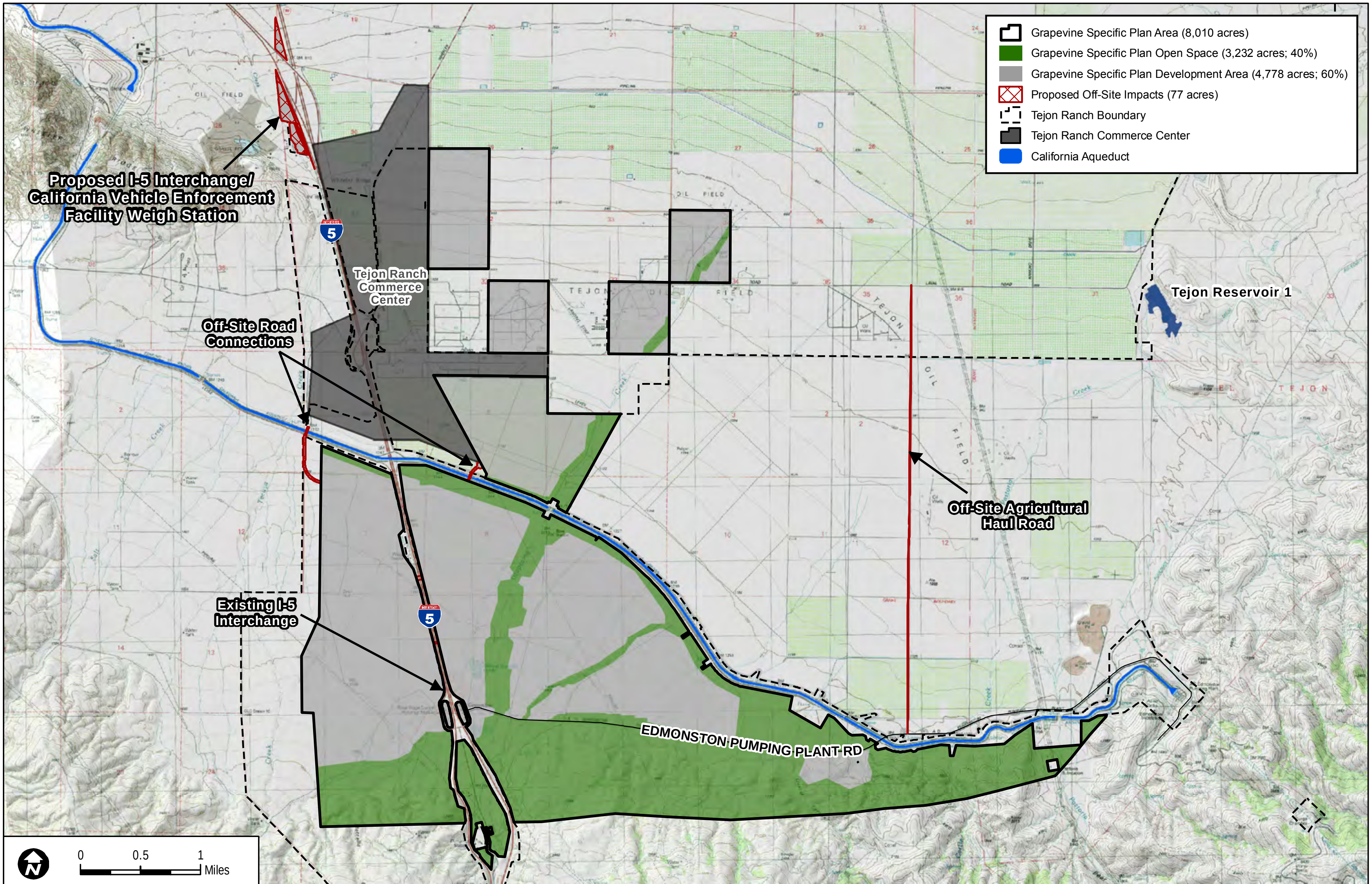


SOURCES: McIntosh & Associates 2013; TRC 2013a

FIGURE 1

Regional Location

GRAPEVINE PROJECT



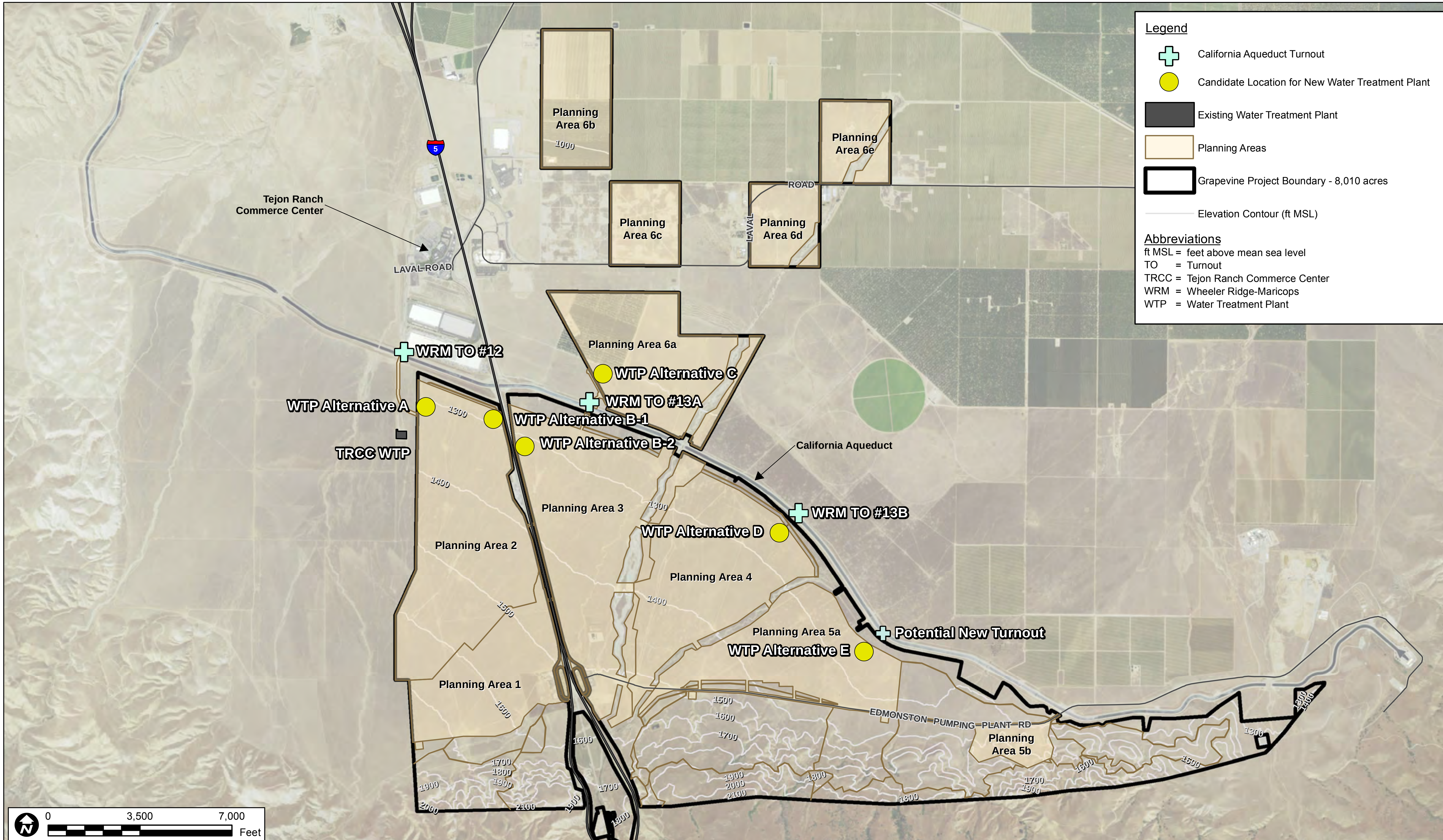
SOURCES: McIntosh & Associates 2014; TRC 2013c

The California aqueduct (TRC 2013c) appears on subsequent figures; the source information will not be provided on subsequent figures.

FIGURE 2

Vicinity Map

GRAPEVINE PROJECT

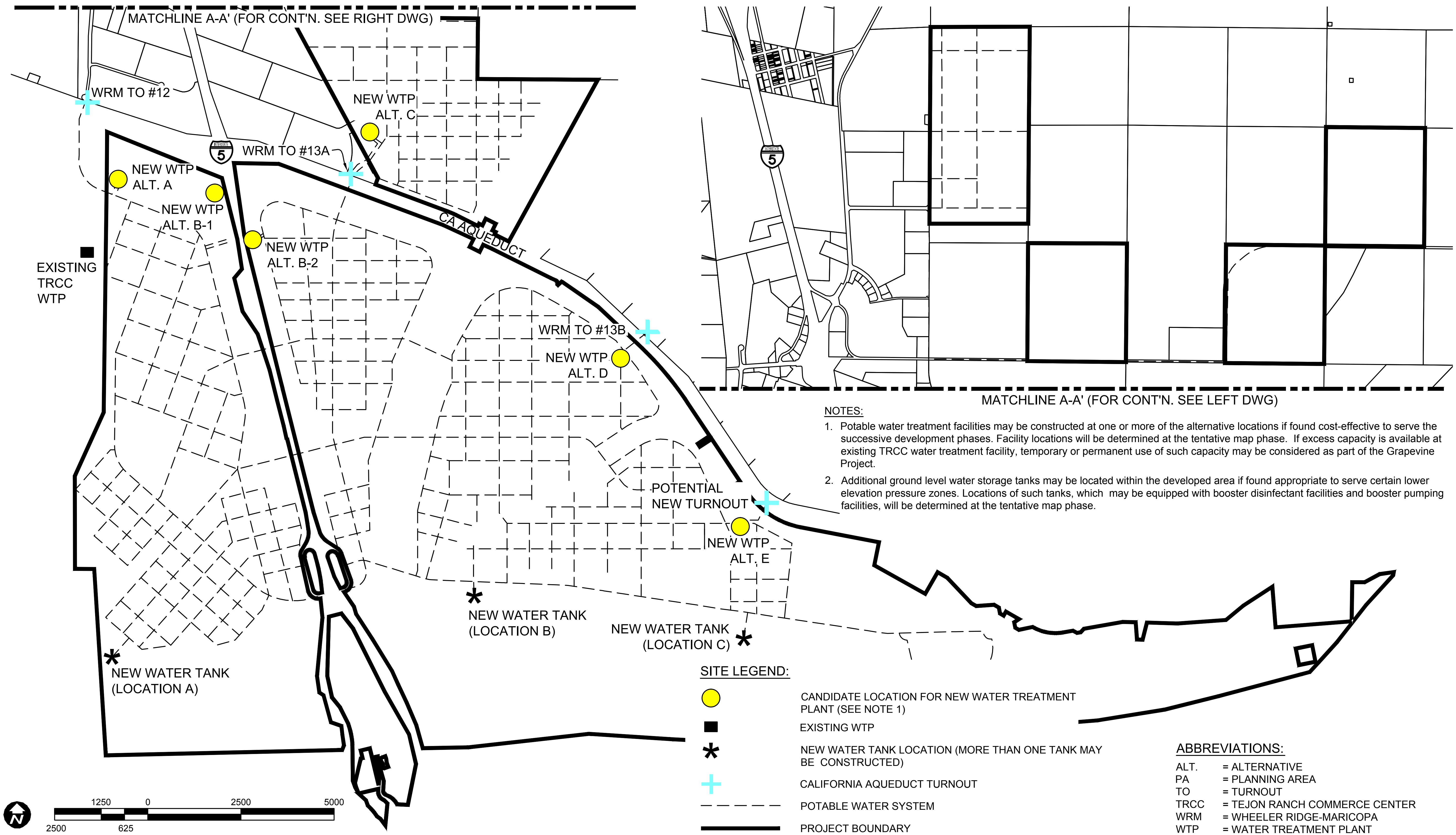


SOURCES: MCINTOSH 2013; TRC 2013; Public Land Survey

FIGURE 3

Water Treatment Plant Location Alternatives

GRAPEVINE PROJECT

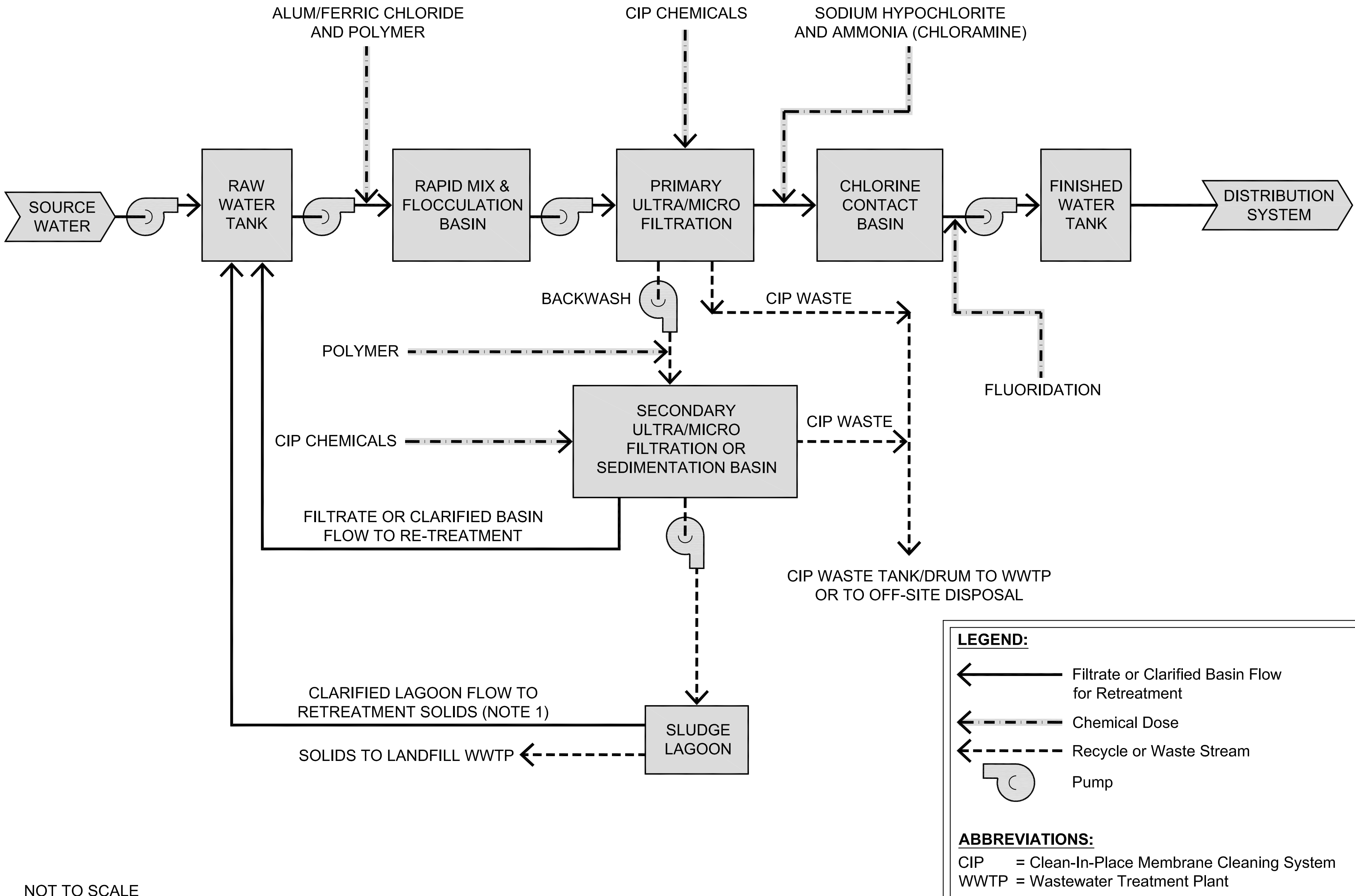


NOTES:

1. Potable water treatment facilities may be constructed at one or more of the alternative locations if found cost-effective to serve the successive development phases. Facility locations will be determined at the tentative map phase. If excess capacity is available at existing TRCC water treatment facility, temporary or permanent use of such capacity may be considered as part of the Grapevine Project.
2. Additional ground level water storage tanks may be located within the developed area if found appropriate to serve certain lower elevation pressure zones. Locations of such tanks, which may be equipped with booster disinfectant facilities and booster pumping facilities, will be determined at the tentative map phase.

ABBREVIATIONS:

ALT.	= ALTERNATIVE
PA	= PLANNING AREA
TO	= TURNOUT
TRCC	= TEJON RANCH COMMERCE CENTER
WRM	= WHEELER RIDGE-MARICOPA
WTP	= WATER TREATMENT PLANT



NOT TO SCALE

NOTES:
1. Solids may also be conveyed directly to the WWTP without further consolidation of solids within a sludge lagoon.

FIGURE 5

Preliminary Treatment Train

GRAPEVINE PROJECT

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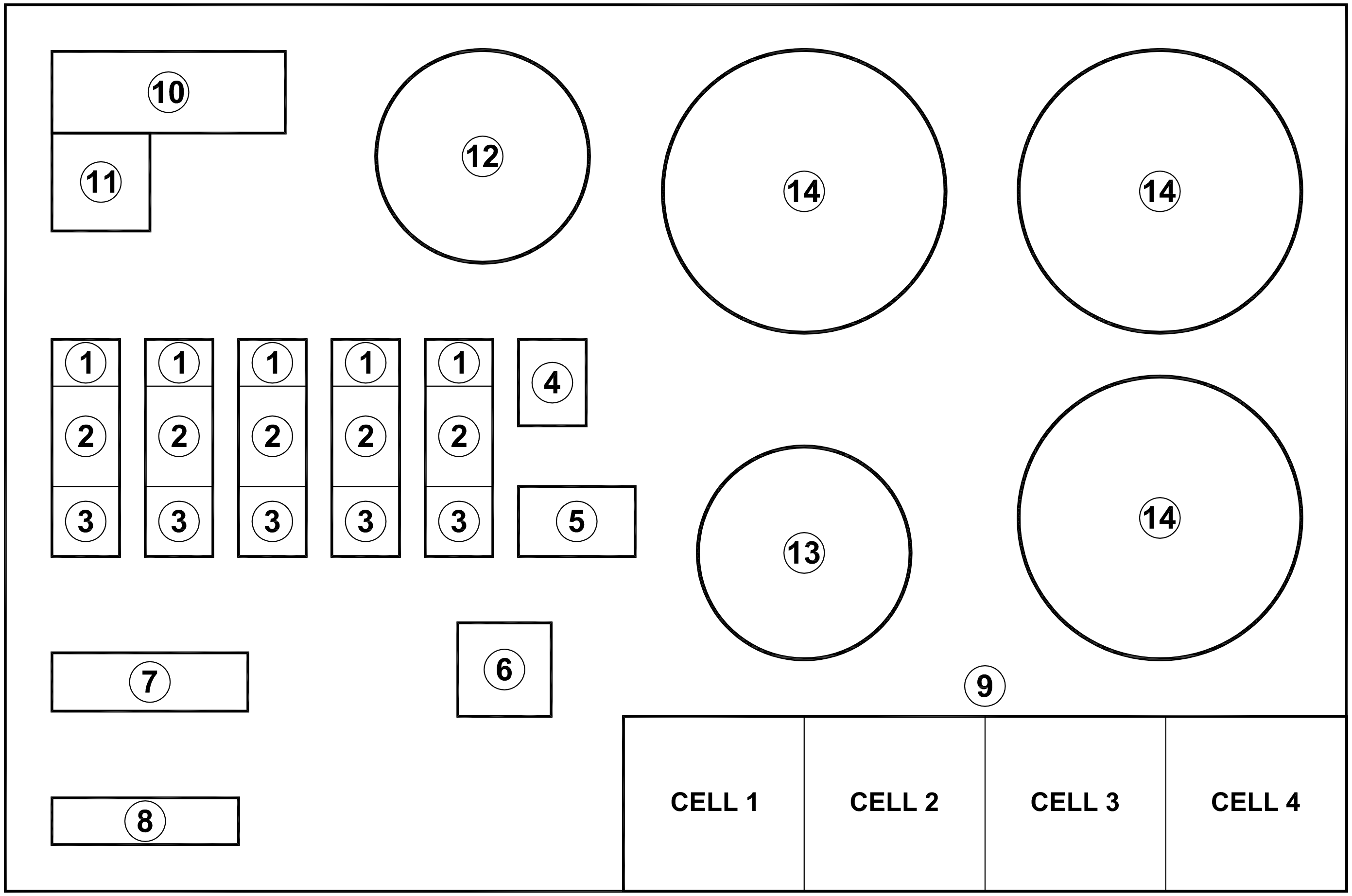

TOTAL AREA PER FACILITY: APPROXIMATELY 6 ACRES

LEGEND:

1. RAPID MIX AND FLOCCULATION CHAMBER
2. PRIMARY UF/MF
3. CHLORINE CONTACT BASIN
4. SECONDARY UF/MF
5. CIP SKID
6. DISTRIBUTION PUMPS
7. CHEMICAL STORAGE
8. SEDIMENTATION BASIN
9. SLUDGE LAGOONS
10. ADMINISTRATIVE/LAB BUILDING
11. MAINTENANCE BUILDING
12. 1.0 MG RAW WATER INTAKE TANK
13. 1.0 MG TREATED WATER CLEAR WELL TANK
14. 2.4 MG RAW WATER EMERGENCY STORAGE TANK

ABBREVIATIONS:

CIP = CLEAN IN PLACE
MG = MILLION GALLONS
MF = MICROFILTRATION
UF = ULTRAFILTRATION

NOTES:

1. Either secondary UF/MF or a sedimentation basin may be used to further concentrate solids from the primary UF/MF unit process. See Figure 5.

NOT TO SCALE

FIGURE 6

Conceptual Layout of Water Treatment Facility

GRAPEVINE PROJECT

Appendix B

DRAFT
Technical Memorandum

Water Supply Delivery Evaluation for the Grapevine Project

The proposed Grapevine Project (Project) is located in the west-central portion of Tejon Ranch, Kern County, California. The Project is located on 8,010 acres, of which approximately 3,232 acres (or about 40%) would be designated as exclusive agriculture with grazing and open space as the predominant land uses and approximately 4,778 acres would be developed as a residential community and employment center.

To serve the Project's water supply needs, the Project has acquired the rights to approximately 6,700 acre-feet of water made available by the Kern County Water Agency (Agency) to the Nickel family as part of a Kern River exchange agreement (the "Nickel Water" and the "Nickel Agreement"). Under the Nickel Agreement, the Agency is obligated to deliver 100% of the Nickel Water at the Tupman turnout along the State Water Project's (SWP) California Aqueduct.

This technical memorandum provides an evaluation of the water supply availability for the Project. The following evaluation is based on a review of applicable agreements and contracts and information available from the Agency, California Department of Water Resources (DWR) and the Project Proponents.

Agency's Obligation and Authority to Deliver Nickel Water

On January 23, 2001 the Agency entered into the Nickel Agreement with the Nickel Family, LLC (Nickel) which committed the Agency to deliver 10,000 acre-feet per year to Nickel in exchange for Nickel's partial interest in Kern River Water Rights. This 10,000 acre-feet, referred to as the Agency Transfer Water, is to be delivered to the State Water Project (SWP) California Aqueduct at Tupman (roughly 20 miles southwest of Bakersfield) and conveyed via the Aqueduct to the location desired by Nickel. Relevant language from this agreement that captures the Agency's obligation to perform the delivery of the Agency Transfer Water is provided below.

> *"Beginning in 2001, the Agency shall deliver to Nickel annually during the term of this Contract, ten thousand (10,000) acre-feet of the Agency Transfer Water at Tupman as partial consideration for Nickel's interest in the Lower River Water Rights. … The Agency shall use its best efforts to obtain and maintain approvals from the DWR for delivery of any Agency Transfer Water into the California Aqueduct, and if such approvals are not obtained after reasonable efforts the parties shall, in good faith,*

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negotiate alternative mechanisms for delivery of the Agency Transfer Water. " - Nickel Agreement: Article 4.4

"The ten thousand (10,000) acre-feet of Agency Transfer Water provided to Nickel shall be transported within the California Aqueduct to the full extent of the Agency's rights to use Aqueduct." - Nickel Agreement: Article 4.7

Since 2001 the Agency has performed its obligations under this agreement. Depending on local and SWP water supply conditions the Agency can either make water available to Nickel through an exchange of its SWP supply in the California Aqueduct, where the Nickel Water available from the Kern River is utilized locally in place of SWP supplies. Alternatively, the Agency may put water into the Aqueduct to meet its obligation for delivery of the Agency Transfer Water to Nickel. Since 2001 the Agency has utilized both methods with the latter being more reflective of low SWP allocation conditions when less water is available in the SWP system for exchanges.

Transferability of Nickel Water

The Nickel Agreement provides a provision that the Agency Transfer Water could be sold to third parties at the sole discretion of Nickel, and Agency is committed to provide assistance and expertise in the sale.

"Any sale of the Agency Transfer Water shall be at the sole discretion and direction of Nickel. Nickel may request Agency's assistance, involvement, and expertise in negotiating and consummation any sale. The agency shall cooperate and assist Nickel, as requested, subject to the Agency's legal powers and duties and the direction of the Agency's Board of Directors." - Nickel Agreement: Article 4.9

The Tejon Ranchcorp has acquired 6,693 acre-feet of the Nickel Water to supply the Project through a purchase agreement with DMB Pacific LLC, (October 3, 2013). This purchase agreement includes and incorporates the Nickel Agreement and is consistent with the Article 4.9 above. This also ensures that the Agency will continue to meet its obligation to deliver Agency Transfer Water.

Scheduling and Deliver of Nickel Water

The Nickel Agreement also provides that delivery of Agency Transfer Water will be consistent with deliveries to the Agency's Member Units.

"The Agency, in consultation with Nickel, shall schedule all Agency Transfer Water deliveries with the DWR at the same time and manner as the Agency schedules deliveries of SWP Entitlement Water to the Agency's Member Units, as set forth in the Agency's contracts with the Member Units as they presently exist or may be changed from time to time." - Nickel Agreement: Article 4.8

The ongoing practice of the Agency is to annually request an estimated delivery schedule from its Member Units that includes a monthly deliver rate at specific turnouts. The monthly rates are the average of the daily deliveries within the month. The Agency uses these estimated delivery schedules to develop an aggregated schedule that is provided to DWR. It's expected that actual deliveries fluctuate from the estimated schedules; however the Agency and the Member Units work closely throughout the year to accommodate changes in the schedule. While a majority of the Agency's deliveries follow an agricultural schedule, with high demands in the summer and little or no demands in the winter months, the Agency does deliver M&I water to Member Units, including Tejon-Castac Water District (TCWD). M&I schedules are typically delivered on a daily basis and the Agency has historically accommodated those schedules as needed by its Member Units.

Agency's Right to Use the California Aqueduct

The Agency, through Article 45 of the Consolidated Water Supply Contract with DWR (October 31, 2003), is allocated certain capacities in the California Aqueduct to accommodate the delivery of its SWP supply. Of interest for the Project is the Agency's allocated capacity for the California Aqueduct between Tupman and the Project. Table 1 shows the Agency's allocated capacity in the Aqueduct between Tupman and the Project.

Table 1. Design and Agency Allocated Capacity in the State Water Project California Aqueduct

Reach	Description	Design Capacity (cfs)	Agency Allocated Capacity[1] (cfs)	Downstream Users Capacity[1] (cfs)
13B	Tupman - Kern River Intertie bisects reach	5,350	986	4,364
14A	Buena Vista P.P. is at the top of the reach	5,050	683	4367
14B	Parallels HWY 166	4,900	614	4,286
14C	Crosses HWY 166	4,700	464	4,236
15A	Includes Teerink and Chrisman P.P.	4,600	374	4,226
16A	Crosses I-5 and ends at the Edmonston P.P.	4,400	214	4,186

Note: 1 – Allocated capacity refers to the capacity available at all times.

Under the Agency's contract with DWR, the Agency has the Authority and first right to utilize the entirety of its allocated capacity to deliver SWP supplies and other non-SWP supplies developed for the benefit of its Member Units. Article 55 of the Consolidated Water Supply Contract between the DWR and the Agency, provides the Agency with the right to

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transport non-project water via the Aqueduct (see excerpt below). Any non-project water delivered via the SWP aqueduct must be transported and delivered according to the provisions described in Article 12, "Priorities, Amounts, Times, and Rates of Deliveries".

> *"Subject to the delivery priorities in Article 12(f), contractors shall have the right to receive services from any of the project transportation facilities to transport water procured by them from any nonproject sources for delivery to their service area."- Consolidate Water Supply Contract: Article 12.*

Capacity to Deliver Nickel Water to the Project

The delivery of the Nickel Water or Agency Transfer Water to the Project is anticipated to be facilitated through TCWD, a Member Unit of the Agency. TCWD currently provides municipal and industry water (M&I) water to retailers in its services area and on schedules consistent with daily M&I demands. Under this arrangement Tejon-Ranchcorp would request TCWD to schedule delivery of the Agency Transfer Water to the Project on a daily schedule. The Agency has indicated (H. Melton, January 16, 2014) that this is the preferred mechanism for scheduling delivery of the Agency Transfer Water to the Project and could make that water available on a daily schedule, consistent with its normal practices. Projects projected demands are shown in Table 2.

Table 2. Monthly Demand for Nickel Water Deliveries at the Project

	Monthly Demands (acre-feet / cfs)												
	Nov	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Total (ac-ft)**
Demands	310 5.2	262 4.3	257 4.2	249 4.5	369 6.0	467 7.8	622 10.1	684 11.5	732 11.9	873 14.2	665 11.2	455 7.2	5,800

The Project's maximum estimated demand, as shown in Table 2, of 14.2 cfs represents roughly one-percent (1%) of the Agency's allocated capacity in reach 13B (the reach with the greatest allocated capacity) and six-percent (6%) of the Agency's allocated capacity in 16A (the reach with the lowest allocated capacity).

The Agency and other downstream SWP Contractors have historically not utilized the full capacity in these reaches of the Aqueduct. This can be shown by reviewing the historical delivery at the Edmonston Pumping Plant, located at the downstream end of Reach 16A. Edmonston Pumping Plant has a design capacity of 4,400 cfs. The historical operations of the plant from 2000-2009, reveals that the average monthly flow remained below 3,000 cfs in all months, leaving a minimum of 1,400 cfs of available capacity in Reach 16A, upstream of the pumping plant. This unused capacity is available to all SWP contractors upon request and approval by DWR. Likewise, the Agency has the right to use any unused capacity in the Aqueduct, and is guaranteed at least its allocated capacity as shown in Table 1 at any time.

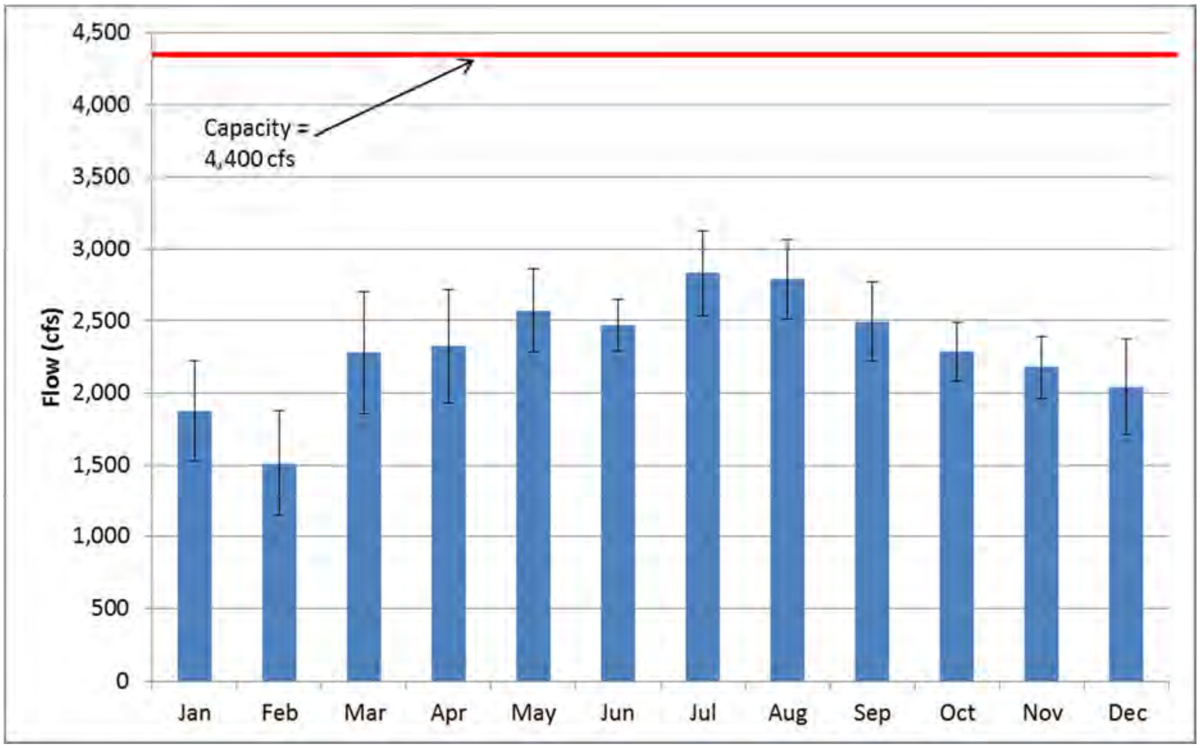

Figure 1. Average Flow at Edmonston Pumping Plant (2000-2009)

Conclusions

The authority of the Agency to deliver the Nickel Water, also referred to as the Agency Transfer Water, is confirmed in its contract with DWR, which specifies the Agency's allocated capacity and its ability to utilize that capacity to deliver both SWP water and non-SWP water for the benefit of its Member Units. Further, the Agency, through the Nickel Agreement, has historically fulfilled its obligation to deliver the Nickel Water and is contractually obligated to utilize its authority and capacity to deliver the Nickel Water. Finally, the physical capacity in the Aqueduct appears to be more than adequate to deliver the estimated daily demand of the project.

The Agency expects that deliveries to the Project would be coordinated to meet the project's daily demands through TCWD. As discussed in the Project's water supply and infrastructure technical reports, sufficient onsite storage capacity will be constructed to meet demand in the event of an unforeseen curtailment of deliveries through reaches 13 to 16.

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Appendix C

EVALUATION OF POTABLE, NON-POTABLE AND RECYCLED WATER DEMANDS

Grapevine Project

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Evaluation of Potable, Non-Potable and Recycled Water Demands Report

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Evaluation of Potable, Non-Potable and Recycled Water Demands Report

1.0 SUMMARY OF GRAPEVINE PROJECT DEMANDS

This engineering report summarizes the estimated potable, non-potable, and recycled water demands for the Grapevine Project in Kern County, California (the project). The demands were estimated for all project elements using well-established methodologies and land use assumptions that are consistent with the Grapevine Specific and Special Plans. The project is also designed to be very water-efficient; specifically, the project's water efficiency standards meet or are more stringent than current regulations and tertiary-treated recycled water is planned to be widely used in order to reduce potable water demands.

1.1 Grapevine Project Description

The 8,010-acre Grapevine Project site is located entirely within unincorporated Kern County, just south of the junction of highways Interstate 5 and State Route 99. The project site is situated within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement that will permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as Interstate 5.

The Grapevine Project, which would include 12,000 residential units and 5.1 million square feet of commercial and light industrial land uses[1], is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside these village cores, the project incorporates a mix of residential uses, office, research and development, regional commercial, and light industrial/warehouse uses. Accordingly, the demands for the project were developed for each of these major land use elements.

1.2 Methodology Used to Estimate Water Use Factors

As described below, the project's average annual water demand was estimated based on: (1) the application of well-established methodologies for estimating indoor and outdoor water use factors on a "per acre" or "per unit" basis, and (2) assumptions regarding water efficiency and the use of recycled water for certain end uses. These project-specific water use factors were then applied to each land use element anticipated by the Grapevine Specific and Special Plans. Additionally, the

[1] The project could include up to 2,000 additional residential units, for a maximum of 14,000 units, through a reduction the commercial and light industrial land uses based on vehicle trip equivalency ratios.

water demand estimates were conservatively increased to account for treatment and distribution system losses and various contingencies.

1.2.1 Residential Indoor Water Use Factors

The residential indoor water use factors were developed using a predictive model of residential water use developed for the United States Environmental Protection Agency (U.S. EPA) and several large water utilities (DeOreo, 2011b). Based on assumptions regarding fixture efficiency, household size, and other key factors, indoor water use factors were estimated for the different housing product types described in the Grapevine Specific and Special Plan. These product types include "Standard Residential" units, which are detached single-family homes, and "Village Center Residential" units, which include higher density and multi-family units.

1.2.2 Commercial, Institutional, and Industrial (CII) Indoor Water Use Factors

The CII indoor water use factors were developed using the data and methodology included in the Pacific Institute's *Waste Not, Want Not: The Potential for Urban Water Conservation in California* (2003), also called the "Pacific Institute study". This study correlated indoor water use in a wide range of CII facilities to the number of employees in that facility based on statewide averages of measured data. Per the study, the resultant "employee water use factors" were then updated to reflect water efficiency standards implemented since the study was completed. The CII indoor water use factors for the project were estimated for the assumed mix of specific CII land uses that are contemplated in the Grapevine Specific and Special Plans.

1.2.3 Outdoor Water Use Factors

The outdoor water use factors were estimated using the landscape irrigation demand model described in the recently-updated Model Water Efficient Landscape Ordinance (MWELO; DWR, 2015). The MWELO requires that the annual estimated total water use (ETWU) for landscape irrigation not exceed a Maximum Applied Water Allowance (MAWA). The MAWA is calculated based on the regional reference evapotranspiration rate, an evaporation adjustment factor, the total landscaped area, and the area of "special landscaped area".[2] For each major land use element within the project (e.g., residential, CII, and community landscaping), a landscape ETWU was estimated based on a combination of four key landscape palettes (e.g., high or low water use

[2] Special Landscaped Area includes areas of the landscape dedicated solely to edible plants, recreational areas, areas irrigated with recycled water, or water features using recycled water.

plantings) and assumptions of recycled or potable water use. In all instances, the ETWU for landscaped areas within the project meet or exceed the efficiency standards of the MWELO.

1.3 Water Demand by Major Sector and End Use

Based on assumptions regarding project land use at build out as described in the Grapevine Specific and Special Plan, and the application of the water demand methodologies described above, the total water demand of the project by major sector and end use was estimated. As described below and shown in Table 1, the total demand of the project development (including contingencies) would be 8,261 acre feet per year (AFY) at full build out. A summary of the water use by sector and the contingencies is provided below.

Land Use Category	Estimated Total Water Use (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Residential	3,637	1,920	1,717
Commercial, Institutional and Industrial	1,180	588	592
Community Landscaping	2,415	-	2,415
Treatment system losses	268	-	-
Distribution system losses	362	125	236
Subtotal Average Annual Water Demand	*7,861*	*2,634*	*4,960*
Contingency	400	-	-
Project Annual Average Water Demand	*8,261*	-	-

Excerpt from Table 1: Estimated Grapevine Project Annual Water Demand

1.3.1 Residential Water Use

Residential water use is comprised of "indoor water use factors" which include water used to shower, wash clothes, and flush toilets, and "outdoor water use factors" which primarily account for landscape irrigation within a residential lot. The project's residential water use was calculated by multiplying the unique water use factors for each housing type by the planned number of units of that type.

Based on application of the U.S. EPA methodology, the average indoor water use factor for the project's residential dwelling units was 0.16 AFY, which multiplied by 12,000 units equated to a total residential indoor water use of approximately 1,920 AFY.

Based on MWELO and the assumed landscaped areas within each residential lot, the outdoor water use factors were estimated as 0.08 AFY/du for Village Center Residential units, and 0.17 AFY/du for Standard Residential units. Multiplied by the respective number of units, the total residential outdoor water use was estimated to be approximately 1,717 AFY.

Total residential water use, therefore, was estimated to be approximately 3,637 AFY (i.e., 1,920 AFY indoor use plus 1,717 AFY outdoor use). It was assumed that potable water would be used to meet all residential demands.

1.3.2 Commercial Industrial and Institutional Water Use

Based on application of the Pacific Institute study methodology, it was estimated that the project's CII indoor water use per employee would range from 53 gallons per day (gpd) for village center offices to 847 gpd for restaurants in the project's high-traffic, highway-serving areas. Based on the assumed distribution and areas of the different CII land uses, it was estimated that total CII indoor use would be approximately 588 AFY. Based on MWELO and the assumed landscaped areas, it was estimated that outdoor water use in the CII portion of the project would be approximately 592 AFY, bringing the total CII water use to approximately 1,180 AFY. It was assumed that recycled or non-potable water would be used for CII landscape irrigation, with the exception of at schools, where potable water would be applied for landscape irrigation.

1.3.3 Community Landscaping Water Use

The project includes significant acreage dedicated to "community landscaping" that includes landscaped areas in parks, roadways, and other community areas. Based on MWELO and the assumed landscaped areas, total community landscaping water use for the project was estimated to be approximately 2,415 AFY. It was assumed that recycled or non-potable water would be used for community landscaping irrigation, with the exception of residential common areas, where potable water would be applied for landscape irrigation.

1.3.4 Treatment and Distribution System Losses

All water treatment and distribution systems experience system losses from drinking water treatment, system maintenance, and leaks. Water treatment and distribution system losses are assumed to be 10% of the total project potable water use and 5% of recycled water use, for a total of 629 AFY. These assumptions are consistent with operation of a new, well-designed and maintained treatment[3] and distribution system[4].

1.3.5 Water Demand Contingency

A water demand contingency of 400 AFY was conservatively added to the overall project water demand to account for unforeseen water uses. Potential uses allowed by the Grapevine Specific include additional housing up to 14,000 total units, urban agriculture, or certain water-intensive industrial land uses.

1.4 Water Demand and Supply By Source

As described below and shown in Table 2, the project's demands will be met by a combination of potable and non-potable water supply sources that will be treated onsite at water and wastewater treatment plants operated by the Tejon-Castac Water District (TCWD) (EKI, 2015a; 2015b).

Water Source	Water Use Category	Estimated Total Water Demand (AFY)
California Aqueduct (Nickel Water)	Potable Water	5,620
	Supplemental Non-Potable Water	258
	Contingency	400
	California Aqueduct Subtotal	*6,278*
Recycled Water	Recycled Non-Potable Water	1,983
Project Average Annual Water Demand		*8,261*

Excerpt from Table 2: Estimated Grapevine Annual Water Demand by Source

1.4.1 Potable Demand and Supply

A total of 5,620 AFY of treated, potable water would be used to meet all indoor demand and residential and school landscaping outdoor demand[5]. The source of this potable supply would be

[3] http://www.pall.com/main/water-treatment/direct-coagulated-water-47223.page

[4] The California standard is 10% allowable water loss in existing water systems (EPA, 2010. *Control and Mitigation of Drinking Water Losses in Distribution Systems*, November 2010). Based on professional experience, we have assumed that the new project water distributions systems will have 5% water loss.

[5] Per the Grapevine Specific and Special Plans recycled water may be used for landscape irrigation throughout the project. However, for purposes of this report we have conservatively assumed that potable water will be used to irrigate residential landscaping.

Nickel Water[6] that is conveyed through the California Aqueduct and treated at the project's potable water treatment plant(s) (EKI, 2015b).

1.4.2 Non-Potable Demand and Supply

A total of 2,241 AFY of non-potable water would be used to meet non-residential, roadway, and selected common area landscape irrigation demand. Approximately 1,983 AFY of recycled water would be generated within the project in an average rainfall year (Attachment A). An additional 258 AFY of supplemental, non-potable water would be used in an average rainfall year to meet selected landscape irrigation demands that exceed the available recycled water supply. The source of this non-potable supply would be Nickel Water that is conveyed through the California Aqueduct, filtered, and delivered into the Grapevine Project's non-potable water distribution system.

1.4.3 Contingency

As discussed above, a water demand contingency of 400 AFY was conservatively added to the estimated project water demand. Depending on its final designated uses, the water demand contingency may be supplied with either fully-treated potable or filtered non-potable Nickel Water (EKI, 2015b). Further, to the extent that the water demand contingency is used to meet additional indoor demands, this would generate additional recycled water that could be used to meet selected non-potable demands within the project (EKI, 2015a).

One potential use of the contingency is to add additional housing up to 14,000 total units consistent with the Grapevine Specific and Special Plans. Water demand estimates for this scenario and the adjusted land use assumptions are included in Attachment B.

[6] Tejon Ranchcorp, an affiliate of the Grapevine Project applicant, has the right to receive 6,693 AFY of water from the Kern County Water Agency (KCWA) through at least 2079 as the assignee of a Kern River water transfer agreement between KCWA and the Nickel Family LLC (the "Nickel Water"). The delivery of Nickel Water is 100 percent reliable on a year-to-year basis and is not subject to hydrological variability, regulatory requirements, or supply constraints that may affect other water sources.

2.0 INTRODUCTION

This engineering report summarizes the estimated potable, non-potable, and recycled water demands for the project based on the proposed housing product mix; commercial, institutional, and industrial (CII) land uses; and landscaping features and palette. This section provides an overview of the Grapevine Project.

2.1 Grapevine Project Description

2.1.1 Project Location

The Grapevine Project is located in the west-central portion of Tejon Ranch (the Ranch). The approximately 270,000-acre Ranch is currently held in private ownership by Tejon Ranchcorp (TRC). The Ranch includes a large portion of the Tehachapi Mountains as well as smaller portions of the San Joaquin and Antelope Valleys. Generally, the Ranch extends from Interstate 5 (I-5) on the western side to State Route 58 (SR 58) on the northern side and SR 138 on the southern side (Figure 1).

The 8,010-acre Grapevine Project site is entirely within unincorporated Kern County, just south of the junction of I-5 and SR 99. Downtown Bakersfield is approximately 25 miles north of the project. The majority of the project is on the east side of I-5, but a smaller portion lies on the west side of I-5. The project site is bisected by the California Aqueduct (Figure 1 and Figure 2).

The Grapevine Project site lies mainly in the Grapevine and Pastoria Creek U.S. Geological Survey (USGS) 7.5-minute quadrangles. There is one parcel and a portion of two other parcels in the project site that lie entirely within the Mettler USGS 7.5-minute quadrangles. The latitude and longitude of the approximate center of the site is 34°57′9″ N and 118°55′39″ W. The Universal Transverse Mercator (UTM) coordinates for the approximate center are UTM Easting (meters) 323999 and UTM Northing (meters) 3869472 in Zone 11.

2.1.2 Project Overview

The 8,010-acre project site is within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement, a landmark agreement reached in 2008 with leading environmental organizations (including the Sierra Club, Natural Resources Defense Council, California Audubon Society, Endangered Habitats League, and Planning and Conservation League) to permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as I-5.

The Grapevine Project site includes approximately 8,010 acres, of which approximately 3,232 acres (or about 40%) would be designated for agriculture (with grazing and open space as the predominant land uses) and approximately 4,778 acres (about 60%) would be developed as a new residential community and employment center. The community would leverage and build upon the economic expansion and job growth that has occurred at Tejon Ranch Commerce Center (Figure 2), located immediately north of the project on I-5. The Grapevine Project would feature a series of compact neighborhoods linked by bicycle and pedestrian trails that provide convenient access to grocery and drugstores, professional services, schools, and parks. The project site is located along I-5, at the gateway to the Central Valley, and is immediately adjacent to the extensive open space that was conserved in the Tejon Ranch Land Use and Conservation Agreement.

The project, which would include 12,000 residential units and 5.1 million square feet of commercial and light industrial land uses[7], is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside the village cores, the Grapevine Project includes a mix of residential uses, office, research and development, regional commercial, freeway-oriented commercial, and light industrial/warehouse uses. Other potential public facilities, including fire stations, a sheriff substation, transit facilities/park-and-rides, and water and wastewater treatment facilities, are proposed throughout the community.

Access to the first phases of the Grapevine community would be from Interstate 5 at the existing Grapevine Road and Laval Road interchanges. During later phases of development, the existing Grapevine Road/ Interstate 5 interchange may be expanded and relocated to the north. To allow for the relocation and replacement of the interchange, an existing Vehicle Enforcement Facility may be relocated to a TRC-owned parcel on the west side of the junction of I-5 and CA-99. The project would also improve an existing TRC agricultural road east of the project area to provide access for truck traffic currently using Edmonston Pumping Plant Road to travel to properties east of the project. The circulation network within the project is composed of primarily two- and four-lane arterials, collector streets, and local streets organized in a grid pattern. All roads within the project site would be public. Multipurpose trails are proposed along Grapevine Creek, Cattle Creek, the southern foothills, and the open space adjacent to the California Aqueduct and at other locations throughout the project site. Some of these trails would connect to on-street, Class 2 bike lanes. Water and sewer service would be provided by TCWD.

[7] The project could include up to 2,000 additional residential units, for a maximum total of 14,000 units, through a reduction of commercial/industrial square footage based on vehicle trip equivalency ratios.

2.1.3 Project Construction Scenario

The project site is divided into six planning areas ranging in size from approximately 450 to 1,400 acres. Development would be phased over a period of 19+ years, starting with the development of Planning Area 6a and/or 3 and continuing with the balance of the planning areas nearest to the initial phase. Buildout of each phase is projected to take approximately 2 to 4 years (Phase 1: 2 years; Phase 2: 4 years; Phase 3: 3 years; Phase 4: 4 years; Phase 5: 4 years; Phase 6: 2 years), with the first phase commencing in 2016. The portions of the site that are proposed to remain in exclusive agriculture/open space are primarily located along the southern edge of the California Aqueduct, along the southern portion of the project site at the foothills of the Tehachapi Mountains, and along Grapevine and Cattle Creeks.

2.1.4 Project Operation Scenario

The project operations are described in the Grapevine Specific and Special Plan, and land uses associated with operations are described in the Grapevine Special Planning District Plan.

2.2 Project Water Demand Estimation

The project's average annual water demand was estimated based on: (1) the application of well-established methodologies for estimating indoor and outdoor water use factors on a "per acre" or "per unit" basis, and (2) assumptions regarding water efficiency and the use of recycled water for certain end uses. These project-specific water use factors were then applied to each land use element anticipated by the Grapevine Specific and Special Plans. Additionally, the water demand estimates were conservatively increased to account for treatment and distribution system losses and various contingencies.

The following sections describe how water the water demands were estimated for the project:

- Section 3.0 - Assumptions Regarding Project Water Efficiency
- Section 4.0 - Indoor Water Use Estimates
- Section 5.0 - Outdoor Water Use Estimates
- Section 6.0 - Projected Water Use By Sector
- Section 7.0 - Assumed Treatment and Distribution System Losses
- Section 8.0 - Additional Factors Impacting Total Water Demand

The following sections then present the results and how water demands will be managed and /or mitigated in the future:

- Section 9.0 - Total Estimated Potable, Non-potable and Recycled Water Demands
- Section 10.0 - Water Conservation Education, Implementation and Enforcement Measures
- Section 11.0 - Offsite and Cumulative Impacts
- Section 12.0 - Mitigation Measures

3.0 ASSUMPTIONS REGARDING PROJECT WATER EFFICIENCY

The project is designed to be water-efficient, and would utilize tertiary-treated recycled water to the maximum extent feasible to reduce potable water demands. The specific water efficiency requirements summarized in the table below and described in Sections 3.1 through 3.3 have been incorporated into the project and are the basis for the water demand estimates presented herein. In all cases the project's water efficiency standards meet or are more stringent than current regulations.

Statue or Regulation	Citation	Description	Applicability to Project
Executive Order (EO) B-29-15	EO B-29-15	• EO B-29-15 was issued on April 1, 2015 with the goal of achieving a statewide reduction in potable urban water usage of 25% relative to water use in 2013.	• Certain EO directives are applicable to the project. • Project meets or exceeds all applicable regulations, see Section 3.4.
California Green Building Standards (CALGreen) Code	CCR Title 24, Part 11 Chapter 17.10 of the Kern County Code of Building Regulations	• Cal Green Code (which Kern County adopts by reference) includes water efficiency requirements for new residential and CII structures.	• Applicable to the planning, design, construction, use, and occupancy of newly-constructed residential and CII buildings. • Project meets or exceeds all applicable water efficiency regulations, see Sections 3.1 and 3.2.
Model Water Efficient Landscape Ordinance (MWELO) July 9, 2015 Final.	CCR Title 23, Division 2, Chapter 2.7	• Establishes an outdoor water budget for new and renovated landscaped areas that are 500 square feet or larger.	• Applicable to all landscaping within the project. • Project meets or exceeds all applicable regulations, see Sections 3.2 and 3.4
CALGreen Code as Adopted by the Building Standards Commission	CCR Title 24, Part 11 Emergency Building Standard DSA-SS EF-02/15	• The Building Standards Commission, which regulates the construction of public schools and community colleges in California, approved a modified version of the MWELO.	• Applicable to public schools and community colleges within the project. • Project meets or exceeds all applicable regulations, see Section 3.2.
Kern County Code of Ordinances – Landscaping Requirements and Water Efficient Landscaping	Title 19, Chapter 19.86, § 19.86.050 and §19.86.060	• Requires that a minimum of five percent (5%) of the total developed lot area shall be landscaped.	• Applicable to landscaping for CII land uses within the project. • Project meets or exceeds the standards in these regulations, see Section 3.2.

Statue or Regulation	Citation	Description	Applicability to Project
Kern County Code of Ordinances – Landscaping Requirements and Water Efficient Landscaping	Title 19, Chapter 19.86, § 065	• The Kern County Code of Ordinances Water Efficient Landscaping section, is currently based on the 2009 version of the MWELO, but is required to be updated to the 2015 version of the MWELO by December 1, 2015.	• Applicable to all landscaping within project. • Project meets or exceeds the standards in these regulations, see Section 3.2.
California Water Code	Division 6, Part 2.10, §10910-10915	• Requires the development of a project-specific Water Supply Assessment.	• Applicable to the project. • Project complies with this regulation, see Section 12.0.

3.1 Indoor Water Use Efficiency

The California Green Building Standards Code, also called the "CALGreen Code,"[8] establishes building requirements for residential and non-residential structures, including water efficiency and conservation requirements. With limited exceptions, the CALGreen Code applies to the planning, design, construction, use, and occupancy of newly-constructed buildings and structures. Chapter 17.10 of the Kern County Code of Building Regulations adopts the CALGreen Code by reference.

For indoor water use, these building codes specify the maximum allowable flowrates for fittings and fixtures consistent with the California Health and Safety Code, California Plumbing Code, and the California Energy Commission's proposed Appliance Efficiency Regulations, including the following standards, which have recently been updated in response to the Governor's Executive Order No. B-29-15:

- Toilets - 1.28 gallons per flush,
- Showers - 2 gallons per minute (gpm) at 80 pounds per square inch (psi) of water pressure,
- Bathroom faucets - 1.2 gpm at 60 psi,
- Kitchen faucets - 1.8 gpm at 60 psi,
- Common area bathroom faucets - 0.5 gpm at 60 psi, and
- Urinals - 0.125 gallons per flush.

[8] California Code of Regulations (CCR) Title 24, Part 11.

The project indoor water demands were estimated based on the following assumptions:

- **Residential Indoor Efficiency.** For residential indoor use, the project would comply with the CALGreen Code standards (CCR Title 24, Part 11) for residential development as implemented by Kern County[9]. Prior to issuance of residential building permits, the applicant shall provide written verification of compliance with these standards.

- **Non-Residential Indoor Efficiency.** For non-residential indoor use, the project would comply with the CALGreen Code standards (CCR Title 24, Part 11) for non-residential development as implemented by Kern County[9]. Prior to issuance of building permits for commercial or industrial development, the applicant shall provide written verification of compliance with these standards.

3.2 Outdoor Water Use Efficiency

The CALGreen Code requires an outdoor water budget that is consistent with the California Department of Water Resources (DWR) Model Water Efficient Landscape Ordinance (MWELO), and requires that automatic irrigation system controllers for landscaping be provided by the builder.

Kern County adopted its own landscaping standards in Chapter 19.86 of the Kern County Zoning Ordinance that guide landscape design criteria and that are largely consistent with the 2009 version of the DWR MWELO. In response to the Governor's Executive Order No. B-29-15, DWR has modified and adopted a revised version of the MWELO that, among other changes, significantly increases the requirements for landscape water use efficiency and broadens its applicability to include new development projects with smaller landscape areas. Local land use agencies (cities and counties) have until December 1, 2015 to adopt the DWR MWELO or adopt their own ordinance, which must be at least as effective in conserving water as the DWR MWELO. We have assumed that, as they did before, Kern County will adopt the 2015 DWR MWELO without revision.

As such, the project outdoor water demands were estimated based on the following assumptions:

- **Residential Landscaping Efficiency.** For residential landscaping, the project would require that a maximum of 40% of each residential lot, not including streets and sidewalks, would be planted and require irrigation. Further, a maximum of 25% of the landscape area (i.e., no more than 10% of the lot) can include high-water use plantings (HWUPs), with

[9] Chapter 17.10 of the Kern County Code of Building Regulations.

the difference consisting of low-water use plantings (LWUPs). This standard complies with the adopted MWELO. Prior to issuance of residential building permits that include landscaping, the applicant shall provide written verification of compliance with these standards.

- **Non-Residential Landscaping Efficiency.** For non-residential landscaping, the project would require that a maximum of 20% of the land use area, not including streets and sidewalks, would be planted and require irrigation. A maximum of 25% of this landscaped area would consist of HWUPs, with the difference consisting of LWUPs. This standard is more stringent than the requirements of the adopted MWELO. Prior to issuance of building permits for CII development that include landscaping, the applicant shall provide written verification of compliance with this standard.

- **School Landscape Efficiency.** For schools landscaping, the project would require that a maximum of 50% of the land use area, would be planted and require irrigation. A maximum of 50% of the landscaped area would consist of HWUPs, and the difference would consist of LWUPs. This standard is more stringent than the requirements of the adopted MWELO. Prior to issuance of building permits for school developments that include landscaping, the applicant shall provide written verification of compliance with this standard.

- **Parks Landscape Efficiency.** For parks landscaping, the project would limit HWUPs to no more than 45% of the total land use area and maximize the use of native and other low water use trees, shrubs, and groundcover to the extent consistent with the intended land use benefits. This standard is more stringent than the requirements of the adopted MWELO. Prior to issuance of building permits for park improvement plans, the applicant shall provide written verification of compliance with this standard.

- **Buffer Zone Landscaping Efficiency.** In buffer zones and other undeveloped open space within the project, irrigated landscaping plantings would be restricted to sparsely-clustered, moderate water use and native trees and shrubs. This standard is more stringent than the requirements of the adopted MWELO. Prior to approval of residential common area landscape improvement plans, the applicant shall provide written verification of compliance with these standards.

- **Residential Common Area Landscaping Efficiency.** For residential common area landscaping, the project would limit HWUPs to no more than 25% of the total land use area and maximize the use of native and other low water use trees, shrubs, and groundcover to the extent consistent with the intended land use benefits. This standard is more stringent than the requirements of the adopted MWELO. Prior to approval of residential common area landscape improvement plans, the applicant shall provide written verification of compliance with these standards.

- **Roadway Landscaping Efficiency.** Irrigated landscaping along project roadways would be limited to a combination of native and low water use trees, shrubs and groundcover and/or irrigated agricultural. Irrigated landscaping in project round-a-bouts would be limited to native and other low water use shrubs and groundcover. This standard is more stringent than the requirements of the adopted MWELO. Prior to approval of common area landscape improvement plans, the applicant shall provide written verification of compliance with these standards.

- **Golf Course Landscaping Efficiency.** Any golf course constructed as part of the project would be designed as a "links-style" course that would include no more than 40% irrigated turf or other high-water use plantings. This standard is more stringent than the requirements of the adopted MWELO. Prior to issuance of permits for golf-course development, the applicant shall provide written verification of compliance with these standards.
- **Urban Agriculture.** Urban agriculture that may be integrated into the project would be required to have average water uses of 5 AFY/acre or less in order to comply with the adopted MWELO. Prior to approval of urban agriculture improvement plans, the applicant shall provide written verification of compliance with these standards.

The demand estimates for the outdoor residential and non-residential portions of the project are consistent with implementation of the project's water efficiency design standards.

3.3 Recycled Water Use

All wastewater produced by indoor water use within the project would be collected and treated to California Title 22 unrestricted reuse standards (EKI, 2015a). The project would make full use of recycled water for appropriate irrigation and other purposes, consistent with the Grapevine Specific and Special Plans' criteria for recycled water use; this includes the ability to use recycled water for irrigation at residential parcels[10].

[10] Per the Grapevine Specific and Special Plans recycled water may be used for landscape irrigation throughout the project. However, for purposes of this report we have conservatively assumed that potable water will be used to irrigate residential landscaping.

3.4 Compliance with Executive Order B-29-15

In response to the ongoing drought in California, Governor Brown issued Executive Order B-29-15 on April 1, 2015 with the goal of achieving a statewide reduction in potable urban water usage of 25% relative to water use in 2013. The term of the Executive Order currently extends through February 28, 2016, although many of the directives have become permanent water-efficiency standards and requirements. The Executive Order includes specific directives which set strict limits on water usage in the State. The following directives are applicable, directly or indirectly, to the project:

- **Directive 2**. Directs the State Water Resources Control Board (SWRCB) to impose restrictions to reduce urban potable water use by 25%. While not directly applicable, all project design features address this directive by incorporating both indoor and outdoor water efficiency measures into the project design to reduce water demands.

- **Directive 5**. Directs the SWRCB to impose restrictions that commercial, industrial and institutional properties, such as campuses, golf courses, and cemeteries, immediately implement water efficiency measures to reduce potable water usage by 25%. While not directly applicable, the project's water efficiency design standards, described above, address this directive by incorporating both indoor and outdoor water efficiency measures to reduce non-residential water demands.

- **Directive 6**. Directs the SWRCB to prohibit use of potable water to irrigate ornamental turf in public street medians. The project's water efficiency design standards, described above, address this directive directly.

- **Directive 7**. Directs the SWRCB to prohibit use of potable water to irrigate at new homes and buildings that is not delivered by drip or microspray. This directive has been superseded by the revised MWELO (see Directive 11).

- **Directive 11**. Directs DWR to update the MWELO (DWR, 2015). The project's water efficiency design standards, described above, address this directive directly by ensuring that all landscaping meets the requirements that are described in the adopted MWELO.

- **Directive 16**. Directs the California Energy Commission to adopt new water efficiency standards for appliances. The project's water efficiency design standards described above address this directive directly by ensuring that the project complies with the CalGreen Code.

4.0 INDOOR WATER USE ESTIMATES

4.1 Residential Indoor Water Use

Average residential unit water use factors were estimated for the different housing product types described in the Grapevine Specific and Special Plan. These product types include the following dwelling unit classifications: (1) "Standard Residential" units, which are detached single-family homes; and (2) "Village Center Residential" units, which include higher density or multi-family units. Table 3 summarizes the planned number of residential units, median housing density, and household size.

The residential water use factors are comprised of "indoor water use factors" which include water used to shower, wash clothes, and flush toilets, and "outdoor water use factors" which primarily account for landscape irrigation within a residential lot. Indoor water use factors were developed using a predictive model of residential water use developed for the U.S. EPA and several large water utilities (DeOreo, 2011b). The development of the residential outdoor water use factors are discussed in detail in Section 5.0.

4.1.1 Residential Indoor Water Use Methodology

The U.S. EPA and several water utilities funded a detailed study of residential water use in single family homes throughout the United States (DeOreo, 2011b). A predictive model was developed from a statistical analysis of the study data. This model is based on residential indoor water use data collected over the years 2006 through 2010 at 300 single family homes constructed since 2001 in nine American cities, including one city in California.

Because this model reflects actual water use patterns observed in recently-constructed and occupied homes, it represents a sound basis for predicting indoor water use in new developments, which would be required to meet even higher standards of efficiency such as the CALGreen Code. The results of this model also compare well with recent residential per capita data being published for communities throughout California by the SWRCB (2015) and residential water use factors developed by others based on studies conducted in Bakersfield, such as that done by Vaughn Water Company (Vaughn Water Company, 2009).

The predictive model allows the projected total residential indoor use to be calculated from these demographic and water conservation inputs:

$$\text{INDOOR} = [71.2 \times \text{RESIDENTS}^{0.63} \times (1 + 0.91 \times \text{LEAK}) \times (1 - 0.23 \times \text{H.EFF.CW}) \times (1 + 0.12 \times \text{SOFTENER})] + 11.8$$

where:

INDOOR =	indoor water use in gallons per home per day
RESIDENTS =	number of residents in household
LEAK =	the fraction of homes with a significant leak greater than 50 gallons per day
H.EFF.CW =	the fraction of homes with a high-efficiency clothes washer that uses less than 30 gallons per load
SOFTENER =	the fraction of homes with a water softening system

4.1.2 Residential Indoor Water Use Estimate

Residential indoor water use factors were developed to reflect the project's water efficiency design standards and the following assumptions:

- A total of 75% of clothes washers installed in residential units would use less than 30 gallons per load.[11]
- Leaks greater than 50 gallons per day would occur in at most 9% of the homes, which represents a conservative assumption (i.e., likely higher than would actually be encountered based on empirical data from existing residential developments, DeOreo, 2011b).
- Based on the most recently available Kern County demographic information, the average project household size is assumed to be 3.2 people.[12]

Based on these assumptions, indoor water use for each residential unit is estimated to be 0.16 acre-feet per year per dwelling unit (AFY/du) and the total residential indoor water use for the project is estimated to be 1,920 AFY (see Table 1 and Table 3).

[11] For context, approximately 39% of existing homes in the United States have clothes washers that use less than 30 gallons per load (DeOreo, 2011b) and the majority of commercially-available home washing machines today use under 30 gallons per load.

[12] http://www.dof.ca.gov/Research/demographic/reports/estimates/e-5/2011-20/view.php

4.2 Commercial, Industrial, and Institutional Indoor Water Use

The CII water use factors were estimated for the CII land uses described in the Grapevine Specific and Special Plans. The CII land uses within the Grapevine Project would encompass a range of facilities, including commercial (retail and restaurant), employment (office, warehouse, light industrial, and research and development), community facilities, schools, and utilities. Though the distribution of these specific CII land uses and facilities will be subject to refinement, the water use factors developed herein and described below are expected to be generally representative of project CII land uses.

The CII water use factors are comprised of "indoor water use factors" which include cooling, selected domestic uses, and industrial processes, and "outdoor water use factors" which primarily account for landscape irrigation within a CII lot. The CII indoor water use factors were primarily derived from the Pacific Institute's *Waste Not, Want Not: The Potential for Urban Water Conservation in California* (2003). In one exception, indoor water use for solar farms was derived from information developed by the Bureau of Land Management (2012). The development of the CII outdoor water use factors are discussed in detail in Section 5.0.

4.2.1 CII Indoor Water Use Methodology

Indoor water use in the CII sector includes showering at gyms and hotels, food preparation, commercial dish washing, laundromats, industrial processes, water fountains, and commercial car washes. Several studies have correlated CII water use with factors such as building area and the number of employees in a facility (Dziegielewski, 1990; Idaho Department of Water Resources, 2001; Santa Monica, 2004; and Soquel Creek Water District, 2013). The primary reference used herein to estimate indoor project CII water use factors is the Pacific Institute's *Waste Not, Want Not: The Potential for Urban Water Conservation in California* (2003), also called the "Pacific Institute study". This study correlated CII water use to the number of employees in a facility based on statewide averages of measured CII water use data during the late 1990s and 2000.

Based on the Pacific Institute study, indoor water use factors were developed for each project CII land use category including commercial facilities such as retail and restaurants; employment-generating uses such as offices, high-tech flex buildings, warehouses, and light industrial uses; community facilities; and schools. Only the demands for the solar farm were calculated separately.

The indoor water use factors developed for each of these CII land uses were generally based on the following parameters[13]:

- The number of employees per area of land use;
- Employee water use factors;
- Water savings from the planned water-efficient design of the CII project land uses; and
- The percentage of total demand allocated to indoor water uses.

Table 4 summarizes the CII land use parameters applied to estimate the CII indoor water use factors. Each of these parameters is discussed in the following sections.

4.2.1.1 Number of Employees

The number of employees for each type of CII land use as shown in Table 4 was estimated using two parameters: (1) the ratio between commercial or institutional floor area to developed land area as obtained from the project land planners; and (2) the average number of employees per floor area by CII category reported by the Federal Energy Information Administration in a 2006 study.[14]

4.2.1.2 Employee Indoor Water Use Factors

The employee water use factors discussed in the Pacific Institute study identified the average indoor water consumption per employee per working day for each type of CII land use and normalized for a 225-day work year. For example, if the applicable employee water use factor is 100 gallons per employee per work day, each employee within the applicable CII land use category would consume 225 multiplied by 100, or 22,500 gallons per year.

[13] For the project's solar farms, an indoor water use factor of 0.0001 AFY/ac was derived using the following the factors from Bureau of Land Management (2012) for photovoltaic solar plants: (a) 80% productive use of the total proposed area, (b) nine acres per megawatt (MW) of power generation, (c) 0.02 full-time equivalents (FTE) employees per MW, and (d) 50 gallons per day per FTE.

[14] Energy Information Administration, 2006. 2003 Commercial Buildings Energy Consumption Survey: Building Characteristics Tables, revised June 2006. The Commercial Buildings Energy Consumption Survey is a comprehensive national survey that collects information on the stock of U.S. commercial buildings, including their energy-related building characteristics, energy usage data, and how many employees there are per square foot for different CII land uses.

It should be noted that the employee water use factors were derived from the Pacific Institute study for comparable facilities based on water use data collected during or prior to the year 2000.[15] The water use efficiency for new CII construction has generally improved since this study was done. As a result, the employee water use factors developed as part of the Pacific Institute study provide a conservative estimate of CII water use for new buildings, a fact that was anticipated in the study and addressed through the development of conservation savings estimates, see Section 4.2.1.3.

For the high-traffic, highway-serving commercial areas along I-5 an escalation factor has been applied to the water use factors provided in the Pacific Institute study and no conservation savings have been assumed; see Section 4.2.1.3. These assumptions reflect the fact that the end uses in the highway-serving commercial areas along I-5 would likely be disproportionately affected by the large and temporary populations that travel the I-5 corridor, such as the fast-food restaurant patrons.

4.2.1.3 *Conservation Savings*

The Pacific Institute study was based on pre-2000 water use data that predate the adoption of the CALGreen Code and other current water efficiency standards that would be implemented by the project. Anticipating these then-impending improvements in water use efficiency, the Pacific Institute study presented logic to support the discounting of the CII water use factors to reflect evolving and ever-more-stringent water efficiency standards. The Pacific Institute study estimated that the implementation of CII water conservation measures, such as those that would be implemented by the project under the CALGreen Code and similar regulations, could reduce measured water demands by 26% to 42% compared with the levels developed in their study, depending on the type of land use. An allowance for this conservation potential has been incorporated into Table 4. The CII water conservation measures discussed in the Pacific Institute study and that would be implemented by the project include:

[15] According to the Pacific Institute study (2003), CII employee water use factors were estimated from data gathered from CII water users around California in several surveys (DWR, 1995 and 2000; Davis et al., 1988; Dziegielewski et al., 1990; and Dziegielewski et al., 2000). To estimate statewide CII water use, these employee water use coefficients were then applied to statewide employment data to project the total water use for each sector. These estimated water usages were then compared with water-delivery data by sector, as reported by nearly 150 water districts across the state. The difference between CII water use estimates developed using these two methods was less than 10 percent.

- Installation of ultra-low flush toilets and urinals, plus low-flow faucet aerators and showerheads[16];
- Improvements to mechanical cooling systems by installation of conductivity controllers, addition of chemical treatments to improve the concentration ratio, and improved energy efficiency of other mechanical components; and
- Other technologies appropriate for kitchens, laundries, and industrial processes such as water-efficient dishwashers and washing machines and industrial water reuse.

Other additional water conservation measures that would be employed for non-residential land uses are discussed in the project's water efficiency design standards in Section 3.0.

As shown in Table 4, the "best potential" water use savings identified in the Pacific Institute study were incorporated into the project demand calculations for all CII categories except for that within high-traffic, highway-serving areas along I-5. As mentioned in Section 4.2.1.2, for these high-traffic areas it was assumed that any conservation savings would be largely negated because the end uses would be disproportionately affected by large and temporary populations. Therefore, no savings from the water use levels identified in the Pacific Institute study are assumed for the project's high-traffic, highway-serving commercial land uses.

4.2.2 CII Indoor Water Use Estimate

Based on the methodology described above, indoor water use factors were estimated for an assumed mix of specific CII land uses and facilities in Table 4. As shown in Table 4, CII indoor water use per employee ranges from 53 gpd for village center offices to 847 gpd for restaurants in the project's high-traffic, highway-serving areas.

The CII indoor water demand results were compared with measured indoor water use at similar CII land uses within the TRCC, a highway-serving commercial area located adjacent to the Grapevine Project.[17] Based on this comparison, a water demand escalation factor was added to the indoor demands calculated for the project's comparable freeway-oriented commercial areas to better match TRCC's indoor water demands. For example, indoor usage at restaurants in the TRCC ranged from 0.75 to 2.4 AFY/1000 square feet of floor area with a median usage of 1.0 AFY/1000

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[16] Effective January 2014, only high-efficiency toilets that use 1.28 gallons per flush will be available for purchase in California. The water savings estimates assumed in the Pacific Institute study only reflected installation of 1.6 gallon per flush toilets. Therefore, these CII conservation savings estimates may be conservative (i.e., underestimate the water savings potential).

[17] Monthly water use data per account at the TRCC for the period July 2012 through June 2013 was provided to EKI by the Tejon-Castac Water District in September 2013.

square feet of floor area; the estimated restaurant water usage for the project's freeway-oriented areas would be approximately 1.2 AFY/1000 square feet of floor area with the escalation factor.

Based on these assumptions, the total CII indoor water use for the project is estimated to be 588 AFY.

5.0 OUTDOOR WATER USE ESTIMATES

Outdoor water use factors were estimated for residential units, CII landscaping, and community landscaping using a methodology consistent with the revised MWELO (DWR, 2015). For new development projects, the MWELO requirements apply to lots with landscape areas equal to or greater than 500 square feet. As such, we assume that all project landscaping will need to comply with the MWELO.

In one exception, to address water availability for potential solar farms on industrial zoned land in the project, outdoor use associated with washing the photovoltaic panels was estimated based on water use factors developed by the Bureau of Land Management (2012).

5.1 Landscape Water Use Methodology

Landscaping water use factors were estimated using the landscape irrigation demand model described in the MWELO (DWR, 2015). The MWELO requires that the annual Estimated Total Water Use (ETWU) for landscape irrigation not exceed a calculated Maximum Applied Water Allowance (MAWA). The calculations used to estimate the project's landscaping water use factors (see Table 5) are consistent with the ETWU calculations, and the resulting landscaping water use factors are compared to (and are less than) the MAWAs for each landscaping area (see Table 6, Table 7, and Table 8).

The ETWU is calculated for each planting type and area using the following equation:

ETWU = ETo × ETAF × Area

Where:

ETo = The regional reference evapotranspiration rate[18]

ETAF = Evapotranspiration Adjustment Factor

= For regular landscapes areas =

Plant Factor (PF)[19] ÷ Irrigation Efficiency (IE)

= For Special Landscape Areas (SLA)[20] = 1

Area = Landscape area of the particular planting type

The total site ETWU is the sum of the ETWUs for the area of each planting type.

The MAWA is calculated using the following equation:

MAWA = ETo × [(ETAF x LA) + (1-ETAF) × SLA]

Where:

ETo = The regional reference evapotranspiration rate

ETAF = Evapotranspiration Adjustment Factor

= For residential areas = 0.55

= For non-residential areas = 0.45

= For schools equals = 0.65 (based on amendments to CALGreen Code approved by the Building Standards Commission on July 21, 2015)

LA = Total landscape area (including SLA)

SLA = Special Landscape Area

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[18] Evapotranspiration is a measure of the total water evaporated from a plant and surrounding soil, plus the effect of biological processes within plants that result in water loss to the atmosphere.

[19] Plant factors are the ratio between the evapotranspiration of plants and the reference evapotranspiration, which when multiplied by the reference evapotranspiration estimated the amount of water needed by plants. Plant factors vary depending on the species of plantings, the density of plantings, and microclimatic conditions.

[20] The SLA includes areas of the landscape dedicated solely to edible plants, recreational areas, areas irrigated with recycled water, or water features using recycled water.

Each of the factors used in the ETWU and MAWA calculations listed above, as they relate to the project, are described below.

5.1.1 Reference Evapotranspiration

As shown above, location-specific reference evapotranspiration (ETo) data is required for calculating the ETWU and the MAWA. Reference evapotranspiration data were obtained from DWR's California Irrigation Management Information System (CIMIS) Station 125 located in Arvin about 17 miles northeast of the project center.[21] Monthly averages of evapotranspiration were calculated from this data and are shown in Table 5, with a total annual reference evapotranspiration of 60.78 inches.

5.1.2 Plant Factors

As shown in Table 5, the project's anticipated planting types include the following: (1) "high water use plantings," assumed to include turf grass and ornamental landscaping; (2) "low water use plantings," assumed to consist of shrubs and native and drought-tolerant vegetation; (3) "combination plantings," which reflects full canopy tree coverage underlain by low water use plantings; and (4) "buffer zone plantings," which represents a landscaping design of very low water use plants that are sparsely clustered.

Plant factors estimated in the MWELO range from 0.7 to 1.0 for high-water-use plantings; from 0.4 to 0.6 for moderate water use plantings; and from 0.1 to 0.3 for low water use plantings. For this report, plant factors for high and low water use plantings are assumed to be 0.8 and 0.3, respectively.

The plant factors for the anticipated project trees included in the combination plantings, such as oaks, elms, cherry, and pine, ranges from 0.4 to 0.6 (UCCE/DWR, 2014). Because the depth to groundwater is very deep, from about 500 to 1,000 feet below ground surface, it is assumed that trees would need to be irrigated, as their roots would not be able to reach the water table apart from localized perched groundwater that may exist in certain locations. Areas where trees are planted, such as along roadways, would also be planted with low water use plants; the effective plant factor for these "combination plantings" areas is assumed to be 0.7.

[21] The Arvin CIMIS Station is the closest CIMIS station to the Grapevine Project that has a significant historical record of evapotranspiration data, in this case dating back to 1995. The average evapotranspiration measured there is 60.78 inches per year, greater than the Reference Evapotranspiration for Grapevine of 49.5 inches per year that is listed in the MWELO, Appendix A. To be conservative, the higher (CIMIS) data was used to develop the outdoor water use estimates.

Buffer zone plantings would comprise the landscaping within designated, otherwise-undeveloped portions of the project such as along the I-5 corridor; they would generally not be used in residential applications. These areas would be sparsely landscaped with rocks, clusters of trees, and moderate water use plantings. The effective plant factor for "buffer zone plantings" is assumed to be 0.4.

5.1.3 Irrigation Efficiencies

"Irrigation efficiency" refers to the percentage of applied water that can be used by irrigated plants net of evaporation, conveyance, soil infiltration, and other losses. As shown in Table 5, irrigation efficiencies were assumed to be 75% for high water use plantings and 81% for all other planting types, which are the values presented in the MWELO for overhead spray irrigation systems and drip irrigation systems, respectively.

5.1.4 Evapotranspiration Adjustment Factor and Evapotranspiration Rate

The evapotranspiration adjustment factor (ETAF), the plant factor divided by the irrigation efficiency, is calculated for each planting type in Table 5.

The ETAF is multiplied by the reference evapotranspiration in Table 5 to calculate the evapotranspiration rate for each planting type. The evapotranspiration rate is the quantity of water evaporated from adjacent soil and other surfaces and transpired by plants over a specific duration and is assumed to be equivalent to the applied irrigation need. The annual evapotranspiration rate per acre would be approximately 5.40 AFY/ac for high water use plantings; 1.88 AFY/ac for low water use plantings; 4.38 AFY/ac for combination plantings; and 2.50 AFY/ac for buffer zone plantings. The evapotranspiration rates are multiplied by landscape areas for each planting type and for each land use in Table 6, Table 7, and Table 8 to calculate the ETWU for each landscape/planting type.

5.1.5 Regular and Special Landscape Areas

"Regular landscape areas" include most landscape areas irrigated by potable water. "Special landscape areas" include landscaped areas dedicated solely to edible plants, recreational areas, areas irrigated with recycled water, or water features using recycled water. With respect to compliance with the MWELO, the ETAF for special landscape areas is equal to 1, which in effect means that any planting type can be used in these areas and not exceed the MAWA. For the purposes of this report, land-use specific MAWAs were calculated assuming: (1) all regular landscape areas at individual residential lots based on the use of potable water for irrigation, (2) 33% regular landscape areas and 67% special landscape areas at schools based on the use of potable water for irrigation and an assumed percentage of landscaped area used for recreation, and

(3) all special landscape areas for commercial and industrial land uses and community landscaping primarily based on the use of recycled water for irrigation.[22] For the purposes of estimating landscaping water demands, however, the ETWUs for all land use types were conservatively estimated using the equations and factors applicable to regular landscape areas (i.e., we have used ETAFs associated with the actual planting instead of the MAWA to better represent actual anticipated demands).

5.2 Residential Outdoor Water Use Estimate

Residential landscaping would include two planting categories, high water use plantings and low water use plantings. Residential ETWU factors for landscaping were calculated in Table 6 by multiplying the evapotranspiration rates for high and low water use plantings by the total planting area for each landscape category within a residential lot. Residential outdoor water use factors were developed to reflect the project's water efficiency design standards and the following conservative assumptions:

- A maximum of 40% of each residential lot, not including streets and sidewalks, would be planted and require irrigation;
- A maximum of 25% of the landscaped area would consist of high water use plantings, and the difference would consist of low water use plantings (see Table 6);
- In order to account for additional outdoor water use, such as car washing and other ancillary uses, 10% was added to the landscaping water use factor and used for calculating the total annual outdoor water use for residential units; and
- Treated potable water would be used for residential landscape irrigation, although the use of recycled water is not precluded.

[22] Landscaping in residential common areas, a subset of the community landscaping, was assumed to be special landscape area, even though it will be irrigated with potable water, because it was considered a recreational area.

Median residential lot sizes would be 2,810 square feet (sf) for Village Center Residential units and 6,050 sf for Standard Residential units. Applying the above assumptions, the area of landscaping for each residential type is listed in the table below.

Residential Product Type	Median Lot Size	Landscaping Area (LA) (40% of Lot)	Area of HWUP (25% of LA)	Area of LWUP (75% of LA)
Village Center Residential	2,810 sf	1,124 sf	281 sf	843 sf
Standard Residential	6,050 sf	2,420 sf	605 sf	1,815 sf

Based on this methodology and assumptions, and as shown in Table 6, the average residential outdoor water use factors would be 0.07 AFY/du for Village Center Residential lots, and 0.15 AFY/du for Standard Residential lots. The resultant MAWA[23] was calculated for each residential lot type using the ETAF of 0.55 for residential areas and assuming 100% regular landscaping area, based on use of potable water. The MAWA was then compared to each residential landscaping ETWU factor to ensure compliance with the MWELO.

Based on these assumptions, the total residential outdoor water use for the project is estimated to be 1,717 AFY.

5.3 CII Outdoor Water Use Estimate

CII landscaping would include two planting categories, high water use plantings and low water use plantings. CII outdoor water use was calculated in Table 7 by multiplying the evapotranspiration rates for high and low water use plantings by the total planting area for each landscape category within a CII land use. Outdoor CII water use was developed to reflect the project's water efficiency design standards and the following conservative assumptions:

- A maximum of 20% of commercial and industrial land use area, not including streets and sidewalks, would be planted and require irrigation;

[23] The calculation for the MAWA is presented in the MWELO. Total outdoor landscaping water use for each lot must be less than or equal to the MAWA.

- A maximum of 50% of school land use area, would be planted and require irrigation . At schools a maximum of 50% of the landscaped area would consist of high water use plantings, and the difference would consist of low water use plantings (see Table 7); and

- Recycled water would be used for CII landscape irrigation, with the exception of landscaping at schools, which would use treated potable water for landscape irrigation.

The ETWU for each CII land use was compared to the MAWA, which was calculated using the evapotranspiration adjustment factor of 0.45 for commercial areas and assuming 100% special landscape area based on the use of recycled water, to ensure compliance with the MWELO.

School landscaping is assumed to consist of 50% high water use plants and 50% low water use plants. On 21 July 2015, the California Building Commission approved amendments to the CALGreen Code that requires a less stringent ETAF of 0.65 for regular school landscaping when calculating the MAWA. The ETWU for schools was compared to the modified MAWA, which was calculated using the ETAF of 0.65 for schools assuming 33% regular landscape area and 67% special landscape area based on the use of treated potable water and an assumed portion of landscaped recreational areas, which is classified as special landscape area.

For project solar farms, an outdoor water use factor, associated with washing the photovoltaic panels, of 0.0044 AFY/ac was derived using the following the factors from Bureau of Land Management (2012) for photovoltaic solar plants: (1) 80% productive use of the total land area, (2) 9 acres per megawatt (MW) of power generation, and (3) a panel washing water use factor of 0.05 AFY/MW.

Based on these assumptions, the project's total CII outdoor water use is estimated to be 592 AFY.

5.4 Community Landscaping Outdoor Water Use Estimate

Community landscaping would include various landscaping types in parks, roadways, and other community areas within the project. Community landscaping outdoor water use was calculated in Table 8 by multiplying the evapotranspiration rates for each planting type by its planting area within a community landscaping category. No project irrigation is assumed for open space areas that are located outside of the project's development footprint, such as for open space areas or existing agriculture[24], or for the undeveloped portions of Planning Areas 6b through 6e.

[24] Existing agriculture will not be served by the project water systems.

Community landscaping demands were developed to reflect the project's water efficiency design standards and the following assumptions:

- The parklands area would be developed as 45% high water use plantings and 45% low water use plantings. The remaining 10% would include trails, picnic tables, pavement, mulch, or other non-water using features. These estimates do not include assumptions regarding the use of artificial turf for play fields, but they may occur.

- A seven-foot-wide irrigated common area would border each side of all new project roads, along approximately 630,000 total linear feet counting both sides of roadways. In addition, one portion of the central east-west roadway, totaling about 13,450 linear feet, would be developed as a windrow, with up to about 35 feet of landscaping on each side of the road. The project would not include roadway medians, except for the centers of four roundabouts.

- A total of 25% of residential common areas would include high water use plantings and 50% would consist of combination plantings. The remaining 25% of the residential common areas would be hardscape that does not require irrigation.

- Urban agriculture that may be integrated into the project shall use plants with average water uses of 5 AFY/acre or less. Irrigation for the urban agriculture is accounted for in the potential uses for the contingency, as discussed further in Section 8.3.

Irrigation water use factors for landscape plantings are listed in Table 5, with estimated community area irrigation demand summarized in Table 8. It is assumed that recycled or non-potable water would be used for common area landscape irrigation, with the exception of within residential common areas and schools, where potable water would be applied. All landscaped residential common areas, however, would be considered recreational areas or meeting spaces and, as such, would be classified as special landscape areas under the MWELO.

The ETWU for each CII land use was compared to the MAWA, which was calculated assuming 100% Special Landscape Area, to ensure compliance with the MWELO.

As shown in Table 8, total project community area landscaping water use is approximately 2,415 AFY.

6.0 PROJECTED WATER USE BY SECTOR

6.1 Residential Water Use

The total residential indoor water use was calculated by multiplying the indoor water use factor for each housing type by the planned number of units of that type. As discussed above in Section 4.1.2, the average indoor water use factor for all project residential dwelling units is 0.16 AFY which is equivalent to a total residential indoor water use of 1,920 AFY (see Table 3).

The total residential outdoor water was calculated by multiplying each Standard Residential unit by 0.17 AFY, and each Village Residential unit by 0.08 AFY (see Table 3). The total residential outdoor water use would be approximately 1,717 AFY.

Total residential water use would therefore be approximately 3,637 AFY (i.e., 1,920 AFY indoor use plus 1,717 AFY outdoor use). The corresponding average per capita residential water use would be approximately 45 gallons per capita day (gpcd) for indoor uses and 40 gpcd for outdoor uses, for a total of 85 gpcd for the assumed 3.2 persons per residential unit. This level of per capita demand is comparable with the current statewide average (SWRCB, 2015) and with measured water use for similar land uses in the same geographic area (Vaughn Water Company, 2009[25]).

6.2 CII Water Use

As shown in Table 4, total CII water use for the project would be approximately 1,180 AFY, including indoor use of 588 AFY and outdoor use of 592 AFY. It is assumed that recycled or non-potable water would be used for CII landscape irrigation, with the exception of schools, where potable water would be applied for landscape irrigation.

6.3 Community Landscaping Water Use

As shown in Table 8, total community landscaping water use for the project would be approximately 2,415 AFY. It is assumed that recycled or non-potable water would be used for community landscaping irrigation, with the exception of residential common areas, where potable water would be applied for landscape irrigation.

[25] In a 2009 Water Supply Assessment prepared on behalf of the Vaughn Water Company, 2005 water use data was presented by lot size for residential homes in the Rosedale portion of Bakersfield. These data showed that water use decreased as lot size decreased, with a 6,010 sf lot using 0.36 AFY per dwelling unit. This demand is comparable with the water demand estimates for the project's Standard Residential units (0.33 AFY per dwelling unit), which are expected to have an median lot size of 6,050 sf and will meet even higher standard of efficiency that reflect the new CALGreen Code requirements, among other things.

7.0 ASSUMED TREATMENT AND DISTRIBUTION SYSTEM LOSSES

All water treatment and distribution systems experience system losses from drinking water treatment, system maintenance, and leaks. Water treatment and distribution system losses are assumed to be 10% of the total project potable water use and 5% of recycled water use. These assumptions are consistent with operation of a new, well-designed and maintained treatment[26] and distribution system[27].

The total estimate of project water losses does not include losses at the wastewater treatment plants or within the recycled water storage ponds. These losses are accounted for as a reduction in the recycled water supply and not as a recycled water use.

As shown in Table 9, water losses are projected to be about 629 AFY.

[26] http://www.pall.com/main/water-treatment/direct-coagulated-water-47223.page

[27] The California standard is 10% allowable water loss in existing water systems (EPA, 2010. *Control and Mitigation of Drinking Water Losses in Distribution Systems*, November 2010). Based on professional experience, we have assumed that the new project water distributions systems will have 5% water loss.

8.0 ADDITIONAL FACTORS IMPACTING TOTAL PROJECT WATER DEMAND

8.1 Interim and Offsite Uses of Water

8.1.1 Construction Water

During project construction, potable or non-potable Nickel Water would supply construction water for uses such as dust control and soil compaction. As shown in Table A-2 of Attachment A, total estimated construction water use is approximately 8,250 AF, which would be used over the 19+ year buildout period at an average rate of approximately 420 AFY. Prior to full project buildout, project water demands will be a fraction of the project's available Nickel Water supply, and the remaining supply will be available for construction water uses and other interim uses.

8.1.2 Project Phasing

As described in Section 2.1.3, project development would be phased over a period of 19+ years, starting with the development of Planning Area 6a and/or 2 and continuing with the balance of the planning areas (1, 3, 4, 5, and 6b-6e) in numerical order. Buildout of each phase is projected to take approximately 2 to 4 years (Phase 1: 2 years; Phase 2: 4 years; Phase 3: 3 years; Phase 4: 4 years; Phase 5: 4 years; Phase 6: 2 years), with the first phase commencing in 2016. Given this approximate phasing, water demands and the accompanying generation of recycled water will necessarily be incremental, at the approximate volumes shown in Table 10 and Table 11.

8.1.3 California Highway Patrol Weigh Station

A California Highway Patrol weigh station ("weigh station") is currently located south of the California Aqueduct. A new interchange servicing the project is planned for the location of the current weigh station. To accommodate the new interchange, a new weigh station will be constructed north of the TRCC, at the intersection of Interstate 5 and State Route 99. The water and wastewater service to the weigh station is discussed in a 25 November 2014 memorandum, included as Attachment C.

8.2 Recycled Water Availability

A water balance was developed to estimate (1) required recycled water storage, and (2) the volume of recycled water available to meet non-potable irrigation demands during an average-rainfall year. Non-potable irrigation demands would include irrigation of most landscaped areas other than residential areas and schools. Table A-1 of Attachment A presents the preliminary average-year rainfall water balance at project buildout.

The needed recycled water storage volume during an average rainfall year is about 436 acre-feet (AF). As shown in Table 11, it is anticipated that recycled water flows can supply most of the projected non-potable irrigation demand during an average rainfall-year, except for approximately 294 AF that would be made up by untreated[28] Nickel Water that is conveyed to the project site through the California Aqueduct. The needed amount of this supplemental water would vary depending on actual rainfall patterns.

8.3 Water Demand Contingency

As shown in Table 1, a contingency (400 AFY) has been added to all project demands to provide a conservative buffer for unforeseen water uses throughout the project as it is built out over time. This contingent demand is inclusive of all treatment and distribution losses.

The Grapevine Specific and Special Plans allow for building of additional housing, and the use of land for urban agriculture, or certain heavy industrial land uses. The contingency may be used to accommodate the possibility of these additional demands in the future. As an example, a scenario is presented in Attachment B in which a portion of the contingency is used for the construction of 2,000 additional housing units.[29] Attachment B includes water demand estimates and adjusted land use assumptions for this scenario.

The source to meet the complete 400 AFY water demand contingency is assumed to be either fully-treated potable or filtered, non-potable Nickel Water; see Table 2.

[28] The Nickel Water used for non-potable irrigation will be filtered, but will not be fully treated at the water treatment plant. Instead, this supplemental non-potable supply will be co-mingled with the recycled water and served via the recycled water distribution system.

[29] To accommodate the additional 2,000 dwelling units, consistent with the Grapevine Specific and Special Plans, this alternative scenario assumes (1) an increase in parkland, (2) a reduction in retail square footage based on the vehicle trip equivalency ratios of 225 square feet per single-family dwelling unit and 155 square feet per multi-family dwelling unit, (3) and increases in landscape water efficiencies for select land use categories.

9.0 TOTAL ESTIMATED POTABLE, NON-POTABLE AND RECYCLED WATER DEMANDS

Table 1 and Table 2 summarize the Grapevine Project's potable, non-potable, and recycled water demands for residential, CII, and landscaping uses. Water demand calculations are summarized in Table 1. Water demand by source is presented in Table 2.

The total potable and non-potable demand of the Grapevine Project development including the contingency is estimated to be approximately 8,261 AFY at full build out.

The total project potable water demand would be 5,620 AFY.

A total of 1,983 AFY of recycled water would be generated in an average rainfall year and used to help meet non-residential, roadway, and selected common area landscape irrigation demand. An additional 258 AFY of supplemental, non-potable water would be used in an average rainfall year to meet commercial and industrial, roadway, and common area landscape irrigation demand that exceeds the available recycled water supply. The projected 1,983 AFY of recycled water plus the 258 AFY of supplemental, non-potable supply amounts to 2,241 AFY of non-potable supply.

The contingent water demand is assumed to be 400 AFY, which could be supplied with either fully-treated potable or filtered, non-potable Nickel Water that would be conveyed to the project through the California Aqueduct.

10.0 WATER CONSERVATION EDUCATION, IMPLEMENTATION AND ENFORCEMENT MEASURES

Water conservation education, implementation, and enforcement would be key to achieving and maintaining the anticipated project water demand efficiencies. To this end, specific measures would be carried out to educate and incentivize residents and employees regarding water conservation, backed up by enforcement actions where needed. For example, it is anticipated that water usage records would be regularly evaluated by TCWD staff to look for and address patterns of high usage that could indicate inefficiencies or leaks, and water budgets would be developed for all residential and CII customers and enforced through water rates or penalties.

Water conservation and design requirements would also be incorporated into all pre-construction and pre-sale and subsequent re-sale documents and agreements, including development agreements; recorded covenants, conditions, and restrictions that would run with the land; and building and landscaping permits. Drafting of these documents would be coordinated by the Master Developer to reflect the Specific and Community Plan and would incorporate input from the TCWD, Kern County, and other relevant parties. The documents would articulate the responsibilities and mechanisms for implementation and enforcement.

On 1 April 2015, the Governor of California issued Executive Order No. B-29-15, which sets strict limits on water usage in the State. The water demands estimated herein have taken into account the requirements of the executive order. Additionally, as shown in Section 3.0, all future designs and construction will comply with the requirements of the executive order and all other applicable land use and water efficiency regulations.

11.0 OFFSITE AND CUMULATIVE IMPACTS

This section describes the offsite and cumulative impacts of the project as they relate to water demand.

11.1 Offsite Impacts

The offsite land uses that have been identified for this project include:

- Connector and Haul Roads
- California Highway Patrol Weigh Station (see Section 8.1.3)
- California Aqueduct Turnouts
- Expansion of the TRCC East or West Wastewater Treatment Plants
- Interchange (over I-5)

None of these offsite land uses have an accompanying Project water demand; therefore they do not impact the findings and conclusions of this report.

11.2 Cumulative Impacts

The project would be supplied by Nickel Water, that would be conveyed to the project through the California Aqueduct and treated on-site at the project's water treatment plant(s), and by recycled water that is generated at the project's on-site wastewater treatment plants. Because the project water needs would be met by these sources that are not shared with any other entity, there are no cumulative impacts associated with the project water demands.

12.0 MITIGATION MEASURES

Mitigation measures are steps taken to reduce an environmental impact caused by the project. As described in Section 3.0, the project includes many water efficient design standards with the goal to maximize water use efficiency and reduce potable water demand within the project, including the extensive use of recycled water and non-potable water. Implementation of the following mitigation measures would further ensure that individual development projects permitted within the project meet the criteria established in Section 3.0 and that there would be sufficient water supply to meet the demands of those projects in normal and dry years over at least a twenty-year time horizon.

- **Mitigation Measure #1:** Prior to issuance of any building permits or other development approvals, the applicant shall provide written verification of compliance with project-specific water efficiency design standards.
- **Mitigation Measure #2:** Pursuant to California Water Code §10910-10915, a Water Supply Assessment will be prepared by TCWD for any proposed development that meets the definition of "project" per the California Water Code §10910(a) and 10912(a).
- **Mitigation Measure #3:** A Water Supply Verification will be prepared by TCWD, as appropriate, at the tentative map stage per California Government Code §65867.5(a) and 66473.7(a), (b), (i).

13.0 REFERENCES

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Table 1

Estimated Grapevine Project Annual Water Demand

Grapevine Project, Kern County, California

Development Category	**Estimated Total Water Use** (AFY)	**Estimated Indoor Water Use** (AFY)	**Estimated Outdoor Water Use** (AFY)
Residential (a)	3,637	1,920	1,717
Commercial, Institutional and Industrial (b)	1,180	588	592
Community Landscaping (c)	2,415	-	2,415
Treatment system losses (d)	268	-	-
Distribution system losses (d)	362	125	236
Subtotal Average Annual Water Demand (e)	7,861	2,634	4,960
Contingency (f)	400	-	-
Project Average Annual Water Demand	***8,261***	-	-

Abbreviations:

"AFY" = acre-feet per year

Notes:

(a) See Table 3 for estimated residential water uses.

(b) See Tables 4 and 7 for estimated indoor and outdoor water use, respectively, for commercial, institutional, and industrial land uses. Includes 318 AFY of outdoor school water demand.

(c) See Table 8 for estimated parks, roads and common area landscaping water use. Includes 554 AFY of residential common area demand.

(d) See Table 9 for water losses associated with the project treatment and distribution systems. System losses associated with all potable outdoor uses are estimated to be 129 AFY, assumed to be 5% of the total of residential outdoor, outdoor school, and residential common area water demands.

(e) The Project Annual Water Demand is the sum of the estimated water uses for the project, plus the assumed treatment and distribution system losses.

(f) A contingency of 400 AFY was added to project demands. The contingency is inclusive of all losses associated with its treatment and distribution.

(g) Totals may not add exactly due to rounding.

Table 2

Estimated Grapevine Project Annual Water Demand by Source

Grapevine Project, Kern County, California

Water Source	Water Use Category	Estimated Total Water Demand (AFY)
California Aqueduct (Nickel Water)	Potable Water (a)	5,620
	Supplemental Non-Potable Water (b)	258
	Contingency (c)	400
	California Aqueduct Subtotal	*6,278*
Recycled Water	Recycled Non-Potable Water (d)	1,983
Project Average Annual Water Demand		***8,261***

Abbreviations:

"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial

Notes:

(a) Potable water demand is equal to all indoor (2,508 AFY), residential outdoor (1,717 AFY), outdoor school (318 AFY), residential common area (554 AFY), associated indoor and outdoor distribution system loss demands (255 AFY), and treatment system losses (268 AFY). See Tables 1, 7, 8, and 9.
(b) The Supplemental Non-Potable Water is equal to the CII landscaping, selected general common area landscaping minus the projected recycled water production (see Table 11). This demand is assumed to be met with filtered Nickel Water that will be served through the recycled water distribution system.
(c) The Contingency water demand was added to Project Annual Water Demands as shown in Table 1. The contingency is assumed to be met with either fully-treated potable or filtered Nickel Water and is inclusive of all losses associated with its treatment and distribution.
(d) See Table 11 for recycled water production and demand.
(e) Totals may not add exactly due to rounding.

Table 3
Estimated Residential Water Use
Grapevine Project, Kern County, California

Project Development Phase and Housing Product Types	Number of Dwelling Units (a)	Median Density (a) (du/ac)	Household Size (c) (people/du)	Water Use Factor (b)			Subtotal Water Use (e)		
				Indoor (c) (AFY/du)	Outdoor (d) (AFY/du)	Total (AFY/du)	Indoor (AFY)	Outdoor (AFY)	Total (AFY)
Area 1									
Standard Residential Units	1,250	7.2	3.20	0.16	0.17	0.33	200	213	413
Village Center Residential Units	230	15.5	3.20	0.16	0.08	0.24	37	18	55
Subtotal	**1,480**	-	-	-	-	-	**237**	**231**	**468**
Area 2									
Standard Residential Units	1,780	7.2	3.20	0.16	0.17	0.33	285	303	587
Village Center Residential Units	980	15.5	3.20	0.16	0.08	0.24	157	78	235
Subtotal	**2,760**	-	-	-	-	-	**442**	**381**	**823**
Area 3									
Standard Residential Units	1,180	7.2	3.20	0.16	0.17	0.33	189	201	389
Village Center Residential Units	730	15.5	3.20	0.16	0.08	0.24	117	58	175
Subtotal	**1,910**	-	-	-	-	-	**306**	**259**	**565**
Area 4									
Standard Residential Units	1,850	7.2	3.20	0.16	0.17	0.33	296	315	611
Village Center Residential Units	570	15.5	3.20	0.16	0.08	0.24	91	46	137
Subtotal	**2,420**	-	-	-	-	-	**387**	**360**	**747**
Area 5a									
Standard Residential Units	1,730	7.2	3.20	0.16	0.17	0.33	277	294	571
Village Center Residential Units	330	15.5	3.20	0.16	0.08	0.24	53	26	79
Subtotal	**2,060**	-	-	-	-	-	**330**	**321**	**650**
Area 5b									
Standard Residential Units	35	7.2	3.20	0.16	0.17	0.33	6	6	12
Village Center Residential Units	0	15.5	3.20	0.16	0.09	0.25	0	0	0
Subtotal	**35**	-	-	-	-	-	**6**	**6**	**12**
Area 6a									
Standard Residential Units	585	7.2	3.20	0.16	0.17	0.33	94	99	193
Village Center Residential Units	750	15.5	3.20	0.16	0.08	0.24	120	60	180
Subtotal	**1,335**	-	-	-	-	-	**214**	**159**	**373**

Table 3
Estimated Residential Water Use
Grapevine Project, Kern County, California

Project Development Phase and Housing Product Types	Number of Dwelling Units (a)	Median Density (a) (du/ac)	Household Size (c) (people/du)	Water Use Factor (b)			Subtotal Water Use (e)		
				Indoor (c) (AFY/du)	Outdoor (d) (AFY/du)	Total (AFY/du)	Indoor (AFY)	Outdoor (AFY)	Total (AFY)
Area 6b									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6c									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6d									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6e									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
TOTAL	**12,000**	-	-	-	-	-	**1,920**	**1,717**	**3,637**

Abbreviations:
"AFY" = acre-feet per year
"AFY/du" = acre-feet per year per dwelling unit
"du" = dwelling units
"du/ac" = dwelling units per acre

Table 3

Estimated Residential Water Use

Grapevine Project, Kern County, California

Notes:

(a) The residential unit types, median residential densities for each product type, and numbers of residential units are based on the 8 June 2015 Project Land Use Program Summary.

(b) Water use factors, expressed as the annual volume of water consumed for each dwelling unit, have been estimated using models of residential indoor and outdoor water uses as discussed in Notes (c) and (d).

(c) Residential indoor water use factors were estimated using a model of total indoor water use developed in *Analysis of Water Use in* New Single-Family Homes dated 20 July 2011, William DeOreo, P.E., M.S. submitted to Salt lake City Corporation and the United States Environmental Protection Agency. The statistical model is based on single family homes that meet the standards for the Federal Energy Policy Act of 1992. The following assumptions were used for estimating water uses for each housing product type:

1. The average household size (i.e., number of residents per home) for each product type is assumed as 3.2 persons/dwelling unit, according to data for Kern County from: *State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties and the State — January 1, 2011- 2013* . Sacramento, California, May 2013.
2. Home water softening systems (e.g., regenerating ion exchange units or reverse osmosis units) are prohibited.
3. High-efficiency clothes washers that use less than 30 gallons of water per load are installed in 75% of residential homes.
4. Significant leaks (i.e., leaks greater than 50 gallons per day) occur at approximately 9% of homes for each housing product type.

(d) Residential outdoor water use factors were estimated in Table 6.

(e) The subtotal water use for a residential unit type is the number of dwelling units multiplied by the corresponding water use factors.

Table 4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 1											
Village Center Retail	28										
51% Grocery	14	0.18	0.3	1.8	1.1	16	122	1,917	1.3	1.00	2.3
21% Drug store	6	0.18	0.13	0.7	0.8	5	69	324	0.2	0.41	0.6
14% Miscellaneous	4	0.18	0.09	0.5	0.8	3	69	216	0.1	0.28	0.4
7% Restaurant	2	0.18	0.04	0.2	2	4	179	703	0.5	0.14	0.6
7% Bank	2	0.18	0.04	0.2	0.8	2	63	99	0.1	0.14	0.2
Village Center Office	22	0.18	0.5	2.8	2.3	51	53	2,669	1.8	1.5	3.4
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	400										
50% High Tech / Bio Tech	200	0.30	4.6	15	2.3	460	92	42,267	29.2	8.4	37.6
50% Other Office	200	0.30	4.6	15	2.3	460	53	24,268	16.8	8.4	25.2
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**50**	**20**	**70**
Area 2											
Village Center Retail	151										
51% Grocery	77	0.18	1.8	9.8	1.1	85	122	10,337	7.1	5.4	12.6
21% Drug store	32	0.18	0.7	4.0	0.8	25	69	1,745	1.2	2.2	3.4
14% Miscellaneous	21	0.18	0.5	2.7	0.8	17	69	1,163	0.8	1.5	2.3
7% Restaurant	11	0.18	0.2	1.3	2	21	179	3,792	2.6	0.7	3.4
7% Bank	11	0.18	0.2	1.3	0.8	8	63	534	0.4	0.7	1.1
Village Center Office	119	0.18	2.7	15	2.3	274	53	14,439	10.0	8.4	18.3
Regional / Freeway-Oriented Comm.	210										
78.5% Miscellaneous Retail	165	0.18	3.8	21	0.8	132	320	42,256	29.2	11.6	40.8
7.5% Restaurant	16	0.18	0.4	2.0	2	32	847	26,679	18.4	1.1	19.5
7.5% Gas Station	16	0.18	0.4	2.0	0.9	14	320	4,542	3.1	1.1	4.2
6.5% Hotel	14	0.18	0.3	1.7	0.48	7	506	3,315	2.3	1.0	3.2
Office / R&D	780										
62% High Tech / Bio Tech	480	0.30	11.0	37	2.3	1104	92	101,440	70.0	20.3	90.3
38% Medical Center	300	0.30	7	23	2.3	690	80	55,155	38.1	12.7	50.7
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	335										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	36.4	41.0
1 High School	240	0.10	5.5	55	1.3	302	55	16,661	11.5	100.1	111.6
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**199**	**203**	**403**

Table 4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] Floor Area (1,000 sf) (a)	[B] Floor Area Ratio (ac/ac) (b)	[C] Floor Area (ac) C = A / 43.56 (c)	[D] Area of Land Use (ac) D = C / B (d)	[E] Employees per 1,000 sf (emp/1,000 sf) (e)	[F] Employees (emp) F = A × E (e)	[G] Employee Indoor Water Use Factor (gpd/emp) (f)	[H] Average Daily Indoor Water Use (gpd) H = F × G (g)	[I] Total Annual Indoor Water Use (AFY) I = A x H (h)	[J] Total Annual Outdoor Water Use (AFY) See Table 7	[K] Total Water Use (AFY) K = I + J
Area 3											
Village Center Retail	95										
51% Grocery	48	0.18	1.1	6.2	1.1	53	122	6,503	4.5	3.4	7.9
21% Drug store	20	0.18	0.5	2.5	0.8	16	69	1,098	0.8	1.4	2.2
14% Miscellaneous	13	0.18	0.3	1.7	0.8	11	69	732	0.5	0.9	1.4
7% Restaurant	7	0.18	0.2	0.8	2	13	179	2,385	1.6	0.5	2.1
7% Bank	7	0.18	0.2	0.8	0.8	5	63	336	0.2	0.5	0.7
Village Center Office	75	0.18	1.7	10	2.3	173	53	9,100	6.3	5.3	11.6
Regional / Freeway-Oriented Comm.	540										
78.5% Miscellaneous Retail	424	0.18	10	54	0.8	339	320	108,659	75.0	29.8	104.9
7.5% Restaurant	41	0.18	0.9	5.2	2	81	847	68,602	47.4	2.8	50.2
7.5% Gas Station	41	0.18	0.9	5.2	0.9	36	320	11,679	8.1	2.8	10.9
6.5% Hotel	35	0.18	0.8	4.5	0.48	17	506	8,524	5.9	2.5	8.4
Office / R&D	650										
50% High Tech / Bio Tech	325	0.30	7.5	25	2.3	748	92	68,683	47.4	13.7	61.1
50% Other Office	325	0.30	7.5	25	2.3	748	53	39,435	27.2	13.7	40.9
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	96										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	36.4	41.0
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**230**	**114**	**343**
Area 4											
Village Center Retail	67										
51% Grocery	34	0.18	0.8	4.4	1.1	38	122	4,587	3.2	2.4	5.6
21% Drug store	14	0.18	0.3	1.8	0.8	11	69	774	0.5	1.0	1.5
14% Miscellaneous	9	0.18	0.2	1.2	0.8	8	69	516	0.4	0.7	1.0
7% Restaurant	5	0.18	0.11	0.6	2	9	179	1,682	1.2	0.3	1.5
7% Bank	5	0.18	0.11	0.6	0.8	4	63	237	0.2	0.3	0.5
Village Center Office	53	0.18	1.2	6.8	2.3	122	53	6,431	4.4	3.7	8.2
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	192										
2 K-8	192	0.11	4.4	40	1.3	241	55	13,329	9.2	72.8	82.0
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**19**	**81**	**100**

Table 4
Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses
Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 5a											
Village Center Retail	22										
51% Grocery	11	0.18	0.3	1.4	1.1	12	122	1,506	1.0	0.8	1.8
21% Drug store	5	0.18	0.11	0.6	0.8	4	69	254	0.2	0.3	0.5
14% Miscellaneous	3	0.18	0.07	0.4	0.8	2	69	170	0.1	0.2	0.3
7% Restaurant	2	0.18	0.04	0.2	2	3	179	552	0.4	0.1	0.5
7% Bank	2	0.18	0.04	0.2	0.8	1	63	78	0.1	0.1	0.2
Village Center Office	18	0.18	0.4	2.3	2.3	41	53	2,184	1.5	1.3	2.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	96									0	
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	36.4	41.0
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**8**	**39**	**47**
Area 5b											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0**	**0**
Area 6a											
Village Center Retail	84										
51% Grocery	43	0.18	1.0	5.5	1.1	47	122	5,750	4.0	3.0	7.0
21% Drug store	18	0.18	0.4	2.2	0.8	14	69	971	0.7	1.2	1.9
14% Miscellaneous	12	0.18	0.3	1.5	0.8	9	69	647	0.4	0.8	1.3
7% Restaurant	6	0.18	0.1	0.7	2	12	179	2,109	1.5	0.4	1.9
7% Bank	6	0.18	0.1	0.7	0.8	5	63	297	0.2	0.4	0.6
Village Center Office	66	0.18	1.5	8	2.3	152	53	8,008	5.5	4.6	10.2
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	270										
50% High Tech / Bio Tech	135	0.30	3.1	10	2.3	311	92	28,530	19.7	5.7	25.4
50% Other Office	135	0.30	3.1	10	2.3	311	53	16,381	11.3	5.7	17.0
Light Industrial / Warehouse	1,400										
75% Light Industrial / Warehouse	1,050	0.30	24	80	0.43	452	77	34,576	23.9	44.3	68.2
25% Community College	350	0.29	8	28	1.3	441	31	13,607	9.4	15.3	24.7
Schools (i)	96										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	36.4	41.0
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**81**	**118**	**199**

Table 4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 6b											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	50										
Light Industrial / Warehouse	50	0.05	1	23	0.4	22	77	1,646	1.1	12.7	10.4
Solar Farm (j)	--	--	--	266	--	--	--	--	0.03	1.2	1.2
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**13.8**	**11.6**
Area 6c											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	190	--	--	--	--	0.02	0.8	0.9
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.9**
Area 6d											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	173	--	--	--	--	0.02	0.8	0.8
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.8**
Area 6e											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	171	--	--	--	--	0.02	0.8	0.8
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.8**
Total School Water Use (including state-of-the-art water conservation technologies and measures)									39	318	358
Total Commercial, Institutional, and Industrial Water Use (including state-of-the-art water conservation technologies and measures) (k)									**588**	**592**	**1,177**

Table 4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Abbreviations:

"1,000 sf" = 1,000 square feet
"ac" = acre
"ac/ac" = acre per developed acre
"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial
"emp" = employees
"emp/1,000 sf" = employees per 1,000 square feet
"gpd" = gallons per day
"gpd/emp" = gallons per day per employee
"K-8" = kindergarten through eighth grade
"R&D" = research and development
"sf" = square feet
"TRCC" = Tejon Regional Commerce Center

Notes:

(a) The CII land uses and areas are based on the 8 June 2015 project Land Use Program Summary.
(b) The floor area ratio is the ratio between floor area to gross land area. The floor area ratios for the different land use categories are based on the 8 June 2015 project Land Use Program Summary.
(c) The floor area expressed in acres is calculated by dividing the floor area expressed in 1,000 square feet by 43.56. Note that 1 acre is equal to 43,560 square feet.
(d) The area of land use is calculated by dividing the floor area expressed in acres, by the floor area ratio.
(e) The employees per 1,000 square feet were based on the data in Reference 2. The number of employees was estimated by multiplying the floor area, expressed in 1,000 square feet, by the employees per 1,000 square feet.
(f) The employee indoor water use factors, derived from Reference 1, relate the indoor water use for a specific CII land use to the number of employees based on a 225-day work year and a conservation potential, which accounts for current water efficiency standards. The conservation potential is the "best potential" estimate of conservation savings based on the use of water efficient fixtures and efficient water management techniques for each industry. Conservation potential for the Regional/Freeway-Oriented Commercial land uses were assumed to be 0%, due to the high traffic volumes that these businesses are likely to receive (similar to high traffic volumes at the TRCC). Additionally, the employee indoor water use factors for the Regional/Freeway-Oriented Commercial land uses are multiplied by an escalation factor of 3.4 which is the average difference between the project indoor water use factors and actual indoor water use at the TRCC in fiscal year 2012 - 2013, weighted by land use category.
(g) The total average daily water use for each land use is estimated by multiplying the number of employees by the CII-specific indoor employee water use factor.
(h) Average Annual Water Use is calculated by multiplying the Average Daily Water Use, from Column H by the 225-day work year cited in Footnote (f) for the employee indoor water use factors, then dividing by 326,000 gallons per acre-foot.
(i) The floor area for schools is based on 11% of the total acreage for kindergarten through eighth grade and 10% of the total acreage for high schools.
(j) Water use for the solar farms are based on the values for photovoltaic solar plants from Reference 3.
(k) Totals may not add exactly due to rounding.

Reference:

1. Pacific Institute, 2003. *Waste Not, Want Not: The Potential for Urban Water Conservation in California,* November 2003.
2 Energy Information Administration, 2006. *2003 Commercial Buildings Energy Consumption Survey: Building Characteristics Tables*, Revised June 2006.
3 Bureau of Land Management, 2012. *Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States*, Appendix M, July 2012.

Table 5

Irrigation Water Needs Estimated Using the California Department of Water Resources Model Water Efficient Landscape Model

Grapevine Project, Kern County, California

Month	Reference Evapotranspiration (in) [A]	HWUP Plant Factor [B]	Irrigation Efficiency (Spray Irrigation Systems) [C]	HWUP Evapotranspiration Adjustment Factor (ETAF) [D]	HWUP Evapotranspiration Rate (in) [E]	LWUP Plant Factor [F]	Irrigation Efficiency (Drip Irrigation System) [G]	LWUP Evapotranspiration Adjustment Factor (ETAF) [H]	LWUP Evapotranspiration Rate (in) [I]	TGP Plant Factor [J]	Irrigation Efficiency (Drip Irrigation System) [K]	TGP Evapotranspiration Adjustment Factor (ETAF) [L]	TGP Evapotranspiration Rate (in) [M]	BZP Plant Factor [N]	Irrigation Efficiency (Drip Irrigation System) [O]	BZP Evapotranspiration Adjustment Factor (ETAF) [P]	BZP Evapotranspiration Rate (in) [Q]
		High Water Use Plantings				**Low Water Use Plantings**				**Combination Tree and Groundcover Plantings**				**Buffer Zone Plantings**			
	(a)	(b)	(c)	D = B / C (d)	E = A x D (e)	(f)	(c)	H = F / G (d)	E = A x D (e)	(g)	(c)	D = B / C (d)	M = A x L (e)	(h)	(c)	P = N / O (d)	E = A x P (e)
January	1.45	0.8	75%	1.07	1.54	0.3	81%	0.37	0.54	0.7	81%	1.01	1.25	0.4	81%	0.58	0.71
February	2.22	0.8	75%	1.07	2.36	0.3	81%	0.37	0.82	0.7	81%	1.55	1.92	0.4	81%	0.89	1.09
March	4.03	0.8	75%	1.07	4.30	0.3	81%	0.37	1.49	0.7	81%	2.82	3.48	0.4	81%	1.61	1.99
April	5.49	0.8	75%	1.07	5.86	0.3	81%	0.37	2.03	0.7	81%	3.84	4.74	0.4	81%	2.20	2.71
May	7.63	0.8	75%	1.07	8.13	0.3	81%	0.37	2.82	0.7	81%	5.34	6.59	0.4	81%	3.05	3.77
June	8.63	0.8	75%	1.07	9.20	0.3	81%	0.37	3.19	0.7	81%	6.04	7.45	0.4	81%	3.45	4.26
July	9.14	0.8	75%	1.07	9.75	0.3	81%	0.37	3.38	0.7	81%	6.40	7.90	0.4	81%	3.66	4.51
August	8.55	0.8	75%	1.07	9.12	0.3	81%	0.37	3.17	0.7	81%	5.99	7.39	0.4	81%	3.42	4.22
September	6.18	0.8	75%	1.07	6.59	0.3	81%	0.37	2.29	0.7	81%	4.32	5.34	0.4	81%	2.47	3.05
October	4.06	0.8	75%	1.07	4.33	0.3	81%	0.37	1.50	0.7	81%	2.84	3.51	0.4	81%	1.62	2.00
November	2.01	0.8	75%	1.07	2.14	0.3	81%	0.37	0.74	0.7	81%	1.41	1.74	0.4	81%	0.80	0.99
December	1.41	0.8	75%	1.07	1.51	0.3	81%	0.37	0.52	0.7	81%	0.99	1.22	0.4	81%	0.56	0.70
Total	**60.78**																
Total Annual Evapotranspiration Rate (i)					**64.83 in (5.40 AFY/ac)**				**22.51 in (1.88 AFY/ac)**				**52.53 in (4.38 AFY/ac)**				**30.01 in (2.50 AFY/ac)**

Abbreviations:

"AFY/ac" = acre-feet per year per acre

"ETAF" = Evapotranspiration Adjustment Factor

"HWUP" = high water use plantings

"in" = inches

"LWUP" = low water use plantings

"BZP" = buffer zone plantings

"TGP" = combination tree and groundcover plantings

Table 5
Irrigation Water Needs Estimated Using the California Department of Water Resources Model Water Efficient Landscape Model
Grapevine Project, Kern County, California

Notes:

(a) Reference evapotranspiration data were obtained from the California Irrigation Management Information Services ("CIMIS") station 125 located in Arvin, CA that measured evapotranspiration from grass. Monthly averages were calculated using all available data from this CIMIS station between 1996 and 2012.

(b) The high water use plantings plant factor is based on the middle of the range of high water use plant factors from Reference 2.

(c) The irrigation efficiencies are taken from Reference 2, assuming use of spray irrigation systems (75% efficiency) for the high water use plants and drip irrigation systems (81% efficiency) for all other plant types.

(d) The planting evapotranspiration adjustment factor (ETAF) is calculated by dividing the plant factor by the irrigation efficiency.

(e) The planting evapotranspiration rate is calculated by multiplying the reference evapotranspiration by the ETAF. The evapotranspiration rate is the quantity of water evaporated from adjacent soil and other surfaces and transpired by plants over a specific duration and represents the total irrigation requirements for the plantings.

(f) The low water use plantings plant factor is conservatively based on the high end of the range for plant factors for low water use plants from Reference 2.

(g) The combination trees and groundcover plant factor is based on the high end of the range for plant factors for moderate water use plants from Reference 2, as well as the high end of the range for density coefficients from Reference 1.

(h) The buffer zone plant factor is based on the low end of the range for plant factors for moderate water use plants from Reference 2.

(i) The total annual evapotranspiration rate is how much water use is necessary for an area of plantings over a year. Note that 1 AFY/ac is equal to 12 inches annually.

References:

1 University of California Cooperative Extension and California Department of Water Resources, *A Guide to Irrigation Water Needs of Landscape Plantings in California,* August 2000.

2 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance* , July 9, 2015 Draft.

Table 6
Estimated Residential Outdoor Water Use Factors
Grapevine Project, Kern County, California

Housing Category / Unit Type (a)	[A] **Median Density** (du/ac) (a)	[B] **Median Size of Lot (without streets)** (sq ft/du) B = 43560 / A (b)	[C] **Area of Landscaping Per Lot** (sq ft/du) C = B x 40%	[D] **Percentage of Landscaping Covered in HWUPs** (c)	[E] **Area of HWUPs** (sq ft/du) E = C x D (c)	[F] **Percentage of Landscaping Covered in LWUPs** (d)	[G] **Area of LWUPs** (sq ft/du) G = C × F (d)	[H] **Estimated Total Water Use for HWUPs** (AFY/du) H = E × 5.4 /43560 (e)	[I] **Estimated Total Water Use for LWUPs** (AFY/du) I = G × 1.88 / 43560 (f)	[J] **Estimated Total Water Use (ETWU) for Landscaping** (AFY/du) J = H + I (g)	[K] **Maximum Applied Water Allowance (MAWA)** (AFY/du) (h)	[L] **Additional Outdoor Water Uses** (AFY/du) L = 0.1 × J (i)	[M] **Total Outdoor Water Use Factor** (AFY/du) M = J + L (j)
Area 1													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 2													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 3													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 4													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 5a													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 5b													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Area 6a													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6b													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6c													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6d													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6e													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08

Abbreviations:
"AFY" = Acre feet per year
"AFY/ac" = Acre feet per year per acre
"du/ac" = dwelling units per acre
"ETWU" = estimated total water use
"HWUPs" = high water use plantings
"LWUPs" = low water use plantings
"MAWA" = maximum allowable water allowance
"sq ft" = square feet

Notes:
(a) Residential unit types and median residential density are based on the 8 June 2015 Project Land Use Program Summary.
(b) The size of residential lots, including the area of associated surrounding streets, is calculated by dividing the residential density into 43,560 square feet per acre.
(c) High water use plantings include turf grasses. Percentage of lot covered in high water use plantings is the area of high water use plantings divided by the lot size (without streets).
(d) Low water use plantings include shrubs and native vegetation. Percentage of lot covered in low water use plantings is the area of low water use plantings divided by the lot size (without streets).
(e) The estimated total water use for high water use plantings is the area of high water use plantings, converted to acres (by dividing by 43,560), multiplied by the annual evapotranspiration rate for high water use plantings (5.4 AFY/ac) provided in Table 5.
(f) The estimated total water use for low water use plantings is the area of low water use plantings, converted to acres (by dividing by 43,560), multiplied by the annual evapotranspiration rate for low water use plantings (1.88 AFY/ac) provided in Table 5.
(g) For residential unit landscaping, the Estimated Total Water Use (ETWU) calculation described in Reference 1 is based on 100% regular landscape area, which equals the sum of the estimated total water use for high water use planting and the estimated total water use for low water use planting. This value must be less than or equal to the Maximum Applied Water Allowance (see note h).
(h) The Maximum Applied Water Allowance (MAWA) calculations are described in Reference 1. The MAWA was calculated assuming 100% regular landscaped area and an evaporation adjustment factor of 0.55 for residential areas.
(i) Additional outdoor water uses include miscellaneous outdoor water uses (e.g. car washing, outdoor cleaning, etc.), which are assumed at 10% of the applied irrigation of high and low water use plantings.
(j) The total annual outdoor water use is the sum of the ETWU for landscaping and additional outdoor water uses.

References:

1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance* , July 9, 2015 Draft.

Table 7

Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] Area of Land Use (acre) (a)	[B] Area of Landscaping (acre) (b)	[C] Percentage of Landscaping Covered in HWUPs (c)	[D] Area of HWUPs (acre) D = B x C (c)	[E] Percentage of Landscaping Covered in LWUPs (d)	[F] Area of LWUPs (acre) F = B x E (d)	[G] Estimated Total Water Use for HWUPs (AFY) G = D × 5.4 (e)	[H] Estimated Total Water Use for LWUPs (AFY) H = F × 1.88 (f)	[I] Estimated Total Outdoor Water Use (ETWU) (AFY) I = G + H (g)	[J] Maximum Applied Water Allowance (MAWA) (AFY) (h)
Area 1										
Village Center Retail										
51% Grocery	1.8	0.36	25%	0.09	75%	0.27	0.5	0.5	1.0	1.8
21% Drug store	0.7	0.15	25%	0.04	75%	0.11	0.2	0.2	0.4	0.8
14% Miscellaneous	0.5	0.10	25%	0.02	75%	0.07	0.1	0.1	0.3	0.5
7% Restaurant	0.2	0.05	25%	0.01	75%	0.04	0.1	0.1	0.1	0.3
7% Bank	0.2	0.05	25%	0.01	75%	0.04	0.1	0.1	0.1	0.3
Village Center Office	2.8	0.56	25%	0.14	75%	0.42	0.8	0.8	1.5	2.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D										
50% High Tech / Bio Tech	15	3.06	25%	0.77	75%	2.30	4.1	4.3	8.4	15.4
50% Other Office	15	3.06	25%	0.77	75%	2.30	4.1	4.3	8.4	15.4
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**20**	
Area 2										
Village Center Retail										
51% Grocery	9.8	1.96	25%	0.49	75%	1.47	2.7	2.8	5.4	9.9
21% Drug store	4.0	0.81	25%	0.20	75%	0.61	1.1	1.1	2.2	4.1
14% Miscellaneous	2.7	0.54	25%	0.13	75%	0.40	0.7	0.8	1.5	2.7
7% Restaurant	1.3	0.27	25%	0.07	75%	0.20	0.4	0.4	0.7	1.4
7% Bank	1.3	0.27	25%	0.07	75%	0.20	0.4	0.4	0.7	1.4
Village Center Office	15	3.04	25%	0.76	75%	2.28	4.1	4.3	8.4	15.3
Regional / Freeway-Oriented Comm.										
78.5% Miscellaneous Retail	21	4.20	25%	1.05	75%	3.15	5.7	5.9	11.6	21.2
7.5% Restaurant	2.0	0.40	25%	0.10	75%	0.30	0.5	0.6	1.1	2.0
7.5% Gas Station	2.0	0.40	25%	0.10	75%	0.30	0.5	0.6	1.1	2.0
6.5% Hotel	1.7	0.35	25%	0.09	75%	0.26	0.5	0.5	1.0	1.8
Office / R&D										
62% High Tech / Bio Tech	37	7.35	25%	1.84	75%	5.51	9.9	10.3	20.3	37.0
38% Medical Center	23	4.59	25%	1.15	75%	3.44	6.2	6.5	12.7	23.1
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	50%	5.00	50%	5.00	27.0	9.4	36.4	44.6
1 High School	55	27.50	50%	13.75	50%	13.75	74.3	25.8	100.1	122.5
Subtotal									**203**	

Table 7

Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] Area of Land Use (acre) (a)	[B] Area of Landscaping (acre) (b)	[C] Percentage of Landscaping Covered in HWUPs (c)	[D] Area of HWUPs (acre) D = B x C (c)	[E] Percentage of Landscaping Covered in LWUPs (d)	[F] Area of LWUPs (acre) F = B x E (d)	[G] Estimated Total Water Use for HWUPs (AFY) G = D × 5.4 (e)	[H] Estimated Total Water Use for LWUPs (AFY) H = F × 1.88 (f)	[I] Estimated Total Outdoor Water Use (ETWU) (AFY) I = G + H (g)	[J] Maximum Applied Water Allowance (MAWA) (AFY) (h)
Area 3										
Village Center Retail										
51% Grocery	6.2	1.24	25%	0.31	75%	0.93	1.7	1.7	3.4	6.2
21% Drug store	2.5	0.51	25%	0.13	75%	0.38	0.7	0.7	1.4	2.6
14% Miscellaneous	1.7	0.34	25%	0.08	75%	0.25	0.5	0.5	0.9	1.7
7% Restaurant	0.8	0.17	25%	0.04	75%	0.13	0.2	0.2	0.5	0.9
7% Bank	0.8	0.17	25%	0.04	75%	0.13	0.2	0.2	0.5	0.9
Village Center Office	10	1.91	25%	0.48	75%	1.43	2.6	2.7	5.3	9.6
Regional / Freeway-Oriented Comm.										
78.5% Miscellaneous Retail	54	10.81	25%	2.70	75%	8.11	14.6	15.2	29.8	54.5
7.5% Restaurant	5.2	1.03	25%	0.26	75%	0.77	1.4	1.5	2.8	5.2
7.5% Gas Station	5.2	1.03	25%	0.26	75%	0.77	1.4	1.5	2.8	5.2
6.5% Hotel	4.5	0.90	25%	0.22	75%	0.67	1.2	1.3	2.5	4.5
Office / R&D										
50% High Tech / Bio Tech	25	4.97	25%	1.24	75%	3.73	6.7	7.0	13.7	25.1
50% Other Office	25	4.97	25%	1.24	75%	3.73	6.7	7.0	13.7	25.1
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	50%	5.00	50%	5.00	27.0	9.4	36.4	44.6
Subtotal									**114**	
Area 4										
Village Center Retail										
51% Grocery	4.4	0.87	25%	0.22	75%	0.65	1.2	1.2	2.4	4.4
21% Drug store	1.8	0.36	25%	0.09	75%	0.27	0.5	0.5	1.0	1.8
14% Miscellaneous	1.2	0.24	25%	0.06	75%	0.18	0.3	0.3	0.7	1.2
7% Restaurant	0.6	0.12	25%	0.03	75%	0.09	0.2	0.2	0.3	0.6
7% Bank	0.6	0.12	25%	0.03	75%	0.09	0.2	0.2	0.3	0.6
Village Center Office	6.8	1.35	25%	0.34	75%	1.01	1.8	1.9	3.7	6.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	40	20.00	50%	10.00	50%	10.00	54.0	18.8	72.8	89.1
Subtotal									**81**	

Table 7

Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] Area of Land Use (acre) (a)	[B] Area of Landscaping (acre) (b)	[C] Percentage of Landscaping Covered in HWUPs (c)	[D] Area of HWUPs (acre) D = B x C (c)	[E] Percentage of Landscaping Covered in LWUPs (d)	[F] Area of LWUPs (acre) F = B x E (d)	[G] Estimated Total Water Use for HWUPs (AFY) G = D × 5.4 (e)	[H] Estimated Total Water Use for LWUPs (AFY) H = F × 1.88 (f)	[I] Estimated Total Outdoor Water Use (ETWU) (AFY) I = G + H (g)	[J] Maximum Applied Water Allowance (MAWA) (AFY) (h)
Area 5a										
Village Center Retail										
51% Grocery	1.4	0.29	25%	0.07	75%	0.21	0.4	0.4	0.8	1.4
21% Drug store	0.6	0.12	25%	0.03	75%	0.09	0.2	0.2	0.3	0.6
14% Miscellaneous	0.4	0.08	25%	0.02	75%	0.06	0.1	0.1	0.2	0.4
7% Restaurant	0.2	0.04	25%	0.01	75%	0.03	0.1	0.1	0.1	0.2
7% Bank	0.2	0.04	25%	0.01	75%	0.03	0.1	0.1	0.1	0.2
Village Center Office	2.3	0.46	25%	0.11	75%	0.34	0.6	0.6	1.3	2.3
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	50%	5.00	50%	5.00	27.0	9.4	36.4	44.6
Subtotal									**39**	
Area 5b										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0**	
Area 6a										
Village Center Retail										
51% Grocery	5.5	1.09	25%	0.27	75%	0.82	1.5	1.5	3.0	5.5
21% Drug store	2.2	0.45	25%	0.11	75%	0.34	0.6	0.6	1.2	2.3
14% Miscellaneous	1.5	0.30	25%	0.07	75%	0.22	0.4	0.4	0.8	1.5
7% Restaurant	0.7	0.15	25%	0.04	75%	0.11	0.2	0.2	0.4	0.8
7% Bank	0.7	0.15	25%	0.04	75%	0.11	0.2	0.2	0.4	0.8
Village Center Office	8	1.68	25%	0.42	75%	1.26	2.3	2.4	4.6	8.5
Regional / Freeway-Oriented Comm.	--		--	--	--	--	--	--	--	--
Office / R&D										
50% High Tech / Bio Tech	10	2.07	25%	0.52	75%	1.55	2.8	2.9	5.7	10.4
50% Other Office	10	2.07	25%	0.52	75%	1.55	2.8	2.9	5.7	10.4
Light Industrial / Warehouse										
75% Light Industrial / Warehouse	80	16.07	25%	4.02	75%	12.05	21.7	22.6	44.3	81.0
25% Community College	28	5.54	25%	1.39	75%	4.16	7.5	7.8	15.3	27.9
Schools										
1 K-8	20	10.00	50%	5.00	50%	5.00	27.0	9.4	36.4	44.6
Subtotal									**118**	

Table 7

Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] **Area of Land Use** (acre) (a)	[B] **Area of Landscaping** (acre) (b)	[C] **Percentage of Landscaping Covered in HWUPs** (c)	[D] **Area of HWUPs** (acre) D = B x C (c)	[E] **Percentage of Landscaping Covered in LWUPs** (d)	[F] **Area of LWUPs** (acre) F = B x E (d)	[G] **Estimated Total Water Use for HWUPs** (AFY) G = D × 5.4 (e)	[H] **Estimated Total Water Use for LWUPs** (AFY) H = F × 1.88 (f)	[I] **Estimated Total Outdoor Water Use (ETWU)** (AFY) I = G + H (g)	[J] **Maximum Applied Water Allowance (MAWA)** (AFY) (h)
Area 6b										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial										
Light Industrial / Warehouse	23	4.59	25%	1.15	75%	3.44	6.2	6.5	12.7	23.1
Solar Farm (h)	266	--	--	--	--	--	--	--	1.2	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**13.8**	
Area 6c										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	190	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Area 6d										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	173	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Area 6e										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	171	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Total School Outdoor Water Use									318	
Total Commercial, Institutional, and Industrial Outdoor Water Use (i)									**592**	

Table 7
Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses
Grapevine Project, Kern County, California

Abbreviations:

"ac" = acre
"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial
"HWUP" = high water use plants
"K-8" = kindergarten through eighth grade
"LWUP" = low water use plants
"MAWA" = maximum applied water allowance
"R&D" = Research and development

Notes:

(a) See Table 4 for area of land use calculation.
(b) Area of landscaping is the area of land use multiplied by the percentage of landscaping. Landscaped percentage is 50% for schools and 20% for non-school CII land uses.
(c) High water use plantings include turf grasses. Percentage of lot covered in high water use plantings is the area of high water use plantings divided by the area of land use (without streets).
(d) Low water use plantings include shrubs and native vegetation. Percentage of lot covered in low water use plantings is the area of low water use plantings divided by the area of land use (without streets).
(e) The estimated total water use for high water use plantings is the area of high water use plantings multiplied by the annual evapotranspiration rate for high water use plantings (5.4 AFY/ac) provided in Table 5.
(f) The estimated total water use for low water use plantings is the area of low water use plantings multiplied by the annual evapotranspiration rate for low water use plantings (1.88 AFY/ac) provided in Table 5.
(g) The ETWU is the sum of the estimated total water use for high water use plantings and estimated total water use for low water use plantings. The estimated total water outdoor water use must not be greater than the MAWA (see note h). The ETWU was calculated assuming all regular landscaped area, which accounts for plant type and irrigation efficiency, to estimate water demands. If special landscaped area was accounted for in the estimated total water use calculations according to Reference 1, the estimated total outdoor water use for non-school CII uses would equal the MAWA regardless of the planting types.
(h) The Maximum Applied Water Allowance (MAWA) calculations are described in Reference 1. For the non-school CII land uses, the MAWA was calculated assuming 100% special landscaped area and an evaporation adjustment factor of 0.45. The MAWA calculations for schools assumes 33% regular landscaped area, 67% special landscaped area (assumed recreational areas), and an evaporation adjustment factor of 0.65 based on amendments to CALGreen Code approved by the Building Standards Commission on July 21, 2015.
(h) Water use for the solar farms are based on the values for photovoltaic solar plants from Reference 2.
(i) Kern County Code of Ordinances, Title 19, Chapter 19.86, sections 19.86.050 and 19.86.060, states that for CII land uses a "*minimum of five percent (5%) of the total developed lot area shall be landscaped.*" Approximately 20% of the total developed land area for CII is assumed to be irrigated landscape, which complies with the minimum Kern County standard.
(k) Totals may not add exactly due to rounding.

Reference:

1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance*, July 9, 2015 Draft.
2 Bureau of Land Management, 2012. *Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States*, Appendix M, July 2012.

Table 8

Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations

Grapevine, Kern County, California

Landscaping Land Use (a)	[A] Total Acres (ac) (a)	High Water Use Plantings [B] Percentage of Land as HWUP (%) (b)	[C] Total Area of HWUP (ac) C = A × B (c)	[D] Annual Evapo-transpiration Rate for HWUP (AFY/ac) (d)	[E] Estimated Total Water Use for HWUP (AFY) E = C × D (e)	Low Water Use Plantings [F] Percentage of Land as LWUP (%) (f)	[G] Total Area of LWUP (ac) G = A × F (c)	[H] Annual Evapo-transpiration Rate for LWUP (AFY/ac) (d)	[I] Estimated Total Water Use for LWUP (AFY) I = G × H (e)	Tree and Groundcover Plantings [J] Percentage of Land as TGP (%) (g)	[K] Total Area of TGP (ac) K = A × J (c)	[L] Annual Evapo-transpiration Rate for TGP (AFY/ac) (d)	[M] Estimated Total Water Use for TGP (AFY) M = K × L (e)	Buffer Zone Plantings [O] Percentage of Land as BZP (%) (h)	[P] Total Area of BZP (ac) K = A × J (c)	[Q] Annual Evapo-transpiration Rate for BZP (AFY/ac) (d)	[R] Estimated Total Water Use for BZP (AFY) M = K × L (e)	[S] Estimated Total Outdoor Water Use (ETWU) (AFY) J = E + I + M + R (i)	[T] Maximum Applied Water Allowance (MAWA) (AFY) (j)
Area 1																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping	26	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	26	4.4	113	--		--	--	113	130
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	22	25%	5.6	5.4	30	0%	0.0	1.9	0	50%	11	4.4	49	--		--	--	80	85
Landscaped I-5 Buffer Zones	16	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	16	2.5	40	40	81
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	237	
Area 2																			
Parks	42	45%	19	5.4	102	45%	18.9	1.9	35	0%	0	4.4	0	--		--	--	138	190
Road Landscaping	42	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	42	4.4	184	--		--	--	184	212
1 Roundabout	1	0%	0.0	5.4	0.0	100%	1.0	1.9	2	0%	0	4.4	0	--		--	--	2	5
Windrow	3	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	3	4.4	13	--		--	--	13	15
Irrigated Residential Common Area (k)	32	25%	8.0	5.4	43	0%	0.0	1.9	0	50%	16	4.4	70	--		--	--	113	120
Landscaped I-5 Buffer Zones	31	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	31	2.5	78	78	158
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	528	
Area 3																			
Parks	4	45%	1.8	5.4	10	45%	1.8	1.9	3	0%	0	4.4	0	--		--	--	13	18
Road Landscaping	32	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	32	4.4	139	--		--	--	139	160
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	8	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	8	4.4	34	--		--	--	34	39
Irrigated Residential Common Area (k)	21	25%	5.3	5.4	29	0%	0.0	1.9	0	50%	11	4.4	46	--		--	--	75	80
Landscaped I-5 Buffer Zones	48	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	48	2.5	119	119	239
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	384	
Area 4																			
Parks	42	45%	19	5.4	102	45%	19	1.9	35	0%	0	4.4	0	--		--	--	138	190
Golf Course (l)	90	40%	36	5.4	194	30%	27	1.9	51	0%	0	4.4	0	30%	27	2.5	68	313	453
Road Landscaping	37	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	37	4.4	160	--		--	--	160	184
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	9	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	9	4.4	38	--		--	--	38	44
Irrigated Residential Common Area (k)	33	25%	8.3	5.4	45	0%	0.0	1.9	0	50%	17	4.4	72	--		--	--	117	125
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	769	
Area 5a																			
Parks	4	45%	1.8	5.4	10	45%	1.8	1.9	3	0%	0	4.4	0	--		--	--	13	18
Road Landscaping	33	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	33	4.4	144	--		--	--	144	166
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	2	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	2	4.4	9	--		--	--	9	11
Irrigated Residential Common Area (k)	31	25%	7.7	5.4	42	0%	0.0	1.9	0	50%	15	4.4	68	--		--	--	110	117
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	276	
Area 5b																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	
Road Landscaping	7	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	7	4.4	30	--		--	--	30	35
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	7	25%	1.6	5.4	8.8	0%	0.0	1.9	0	50%	3	4.4	14	--		--	--	23	25
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	53	

Table 8

Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations

Grapevine, Kern County, California

Landscaping Land Use (a)		High Water Use Plantings				Low Water Use Plantings				Tree and Groundcover Plantings				Buffer Zone Plantings					
	[A] Total Acres (ac) (a)	[B] Percentage of Land as HWUP (%) (b)	[C] Total Area of HWUP (ac) C = A × B (c)	[D] Annual Evapo-transpiration Rate for HWUP (AFY/ac) (d)	[E] Estimated Total Water Use for HWUP (AFY) E = C × D (e)	[F] Percentage of Land as LWUP (%) (f)	[G] Total Area of LWUP (ac) G = A × F (c)	[H] Annual Evapo-transpiration Rate for LWUP (AFY/ac) (d)	[I] Estimated Total Water Use for LWUP (AFY) I = G × H (e)	[J] Percentage of Land as TGP (%) (g)	[K] Total Area of TGP (ac) K = A × J (c)	[L] Annual Evapo-transpiration Rate for TGP (AFY/ac) (d)	[M] Estimated Total Water Use for TGP (AFY) M = K × L (e)	[O] Percentage of Land as BZP (%) (h)	[P] Total Area of BZP (ac) K = A × J (c)	[Q] Annual Evapo-transpiration Rate for BZP (AFY/ac) (d)	[R] Estimated Total Water Use for BZP (AFY) M = K × L (e)	[S] Estimated Total Outdoor Water Use (ETWU) (AFY) J = E + I + M + R (i)	[T] Maximum Applied Water Allowance (MAWA) (AFY) (j)
Area 6a																			
Parks	4	45%	1.8	5.4	10	45%	1.8	1.9	3	0%	0	4.4	0	--		--	--	13	18
Road Landscaping	21	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	21	4.4	93	--		--	--	93	107
1 Roundabout	1	0%	0.0	5.4	0.0	100%	1.0	1.9	2	0%	0	4.4	0	--		--	--	2	5
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	10	25%	2.6	5.4	14	0%	0.0	1.9	0	50%	5	4.4	23	--		--	--	37	39
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	145	
Area 6b																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping	5	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	5	4.4	23	--		--	--	23	26
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	
Area 6c																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Area 6d																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow																			--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Area 6e																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Estimated Total Outdoor Water Use for Parks																		*314*	
Estimated Total Outdoor Water Use for Irrigated Residential Common Area																		*554*	
Estimated Total Outdoor Water Use for Roadways and Other Non-Residential Landscaped Areas																		*1,547*	
Estimated Total Outdoor Water Use for Community Landscaping																		**2,415**	

Table 8

Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations

Grapevine, Kern County, California

Abbreviations:

"ac" = acre
"AFY" = acre-feet per year
"AFY/ac" = acre-feet per year per acre
"BZP" = buffer zone plantings
"HWUP" = high water use plantings
"LWUP" = low water use plantings
"MAWA" = Maximum Applied Water Allowance
"TGP" = combination tree and groundcover plantings

Notes:

(a) Landscaping land uses and acres are based on the 8 June 2015 Land Use Program Summary. Passive open space and unprogrammed land is not included as it will not be irrigated.
(b) High water use plantings include turf grasses.
(c) The area of plantings is the acreage multiplied by the percentage of the land that is covered by that kind of plantings.
(d) The total water application rates for all plantings are estimated in Table 5.
(e) The estimated total water use for each planting type is the area of that planting type multiplied by the annual evapotranspiration rate for that kind of planting.
(f) Low water use plantings include shrubs and native vegetation.
(g) Combination tree and groundcover plantings include trees with full canopy coverage and full coverage of shrubs or low water use groundcover.
(h) Buffer zone plantings include sparsely planted trees and shrubs.
(i) The estimated total outdoor water use is the sum of the estimated total water use for all areas and plantings. The estimated total water outdoor water use must not be greater than the MAWA (see note h). The estimated total water outdoor water use was calculated assuming all regular landscaped area, which accounts for plant type and irrigation efficiency, to estimate water demands. If special landscaped area was accounted for in the estimated total water use calculations according to Reference 1, the estimated total outdoor water use would equal the MAWA regardless of the planting types.
(j) The Maximum Applied Water Allowance ("MAWA") calculations are described in Reference 1. The MAWA was calculated assuming 100% special landscaped area based on use of recycled water in non-residential areas and based on note k for residential areas.
(k) The irrigated residential common area is assumed to be classified as a special landscape area based on use as a recreational area and meeting space per Reference 1.
(l) The golf course is assumed to be a desert style course, which utilizes native vegetation and minimizes the use of turf grass, per verbal communication with staff at Todd Eckenrode Origins Golf Design.
(m) There are no new roadways planned in Areas 6c, 6d, and 6e.

Reference:

1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance* , July 9, 2015 Draft.

Table 9

Summary of Water Treatment and Distribution System Losses

Grapevine Project, Kern County, California

Development Category	**Estimated Water Loss** (AFY)
Losses at potable water treatment facility (a)	268
Losses at wastewater treatment facility (b)	--
Distribution system losses (associated with indoor water uses) (c)	125
Distribution system losses (associated with outdoor water uses) (d)	236
Total water losses (e)(f)	**629**

Abbreviations:

"AFY" = acre-feet per year

Notes:

(a) Losses at the potable water treatment facility are estimated to be approximately 5% of the indoor and outdoor residential, indoor commercial, indoor institutional, indoor industrial, outdoor school, and outdoor irrigated residential common area uses, plus distribution system losses (see Tables 1, 4, 7 and 8)

(b) Losses at the wastewater treatment facility are accounted for in the estimates of recycled water production (see Table 11).

(c) Potable water system distribution system losses are estimated to be 5% of the total potable indoor demand.

(d) Outdoor water system distribution system losses are estimated to be 5% of the sum of the total recycled and non-potable water demand and the potable water demand for outdoor uses (i.e., for residential irrigation).The portion of outdoor water system distribution losses associated with potable water uses is 129 AFY, and the portion associated with non-potable uses is 107 AFY.

(e) Water losses were conservatively estimated for water demand calculations only and should not be used for wastewater treatment design purposes.

(f) Values may not total exactly due to rounding.

Table 10

Estimated Grapevine Project Annual Water Demand by Planning Area

Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 1			
Residential (a)	468	237	231
Commercial, institutional and industrial (b)	70	50	20
Landscaping (c)	237	-	237
Treatment system losses (d)	31	-	-
Distribution system losses (d)	39	14	24
Area 1 Water Demand	***845***	***301***	***513***
Area 2			
Residential (a)	823	442	381
Commercial, institutional and industrial (b)	403	199	203
Landscaping (c)	528	-	528
Treatment system losses (d)	67	-	-
Distribution system losses (d)	88	32	56
Area 2 Water Demand	***1,908***	***673***	***1,168***
Area 3			
Residential (a)	565	306	259
Commercial, institutional and industrial (b)	343	230	114
Landscaping (c)	384	-	384
Treatment system losses (d)	48	-	-
Distribution system losses (d)	65	27	38
Area 3 Water Demand	***1,404***	***562***	***794***

Table 10
Estimated Grapevine Project Annual Water Demand by Planning Area
Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 4			
Residential (a)	747	387	360
Commercial, institutional and industrial (b)	100	19	81
Landscaping (c)	769	-	769
Treatment system losses (d)	50	-	-
Distribution system losses (d)	81	20	61
Area 4 Water Demand	***1,747***	***427***	***1,271***
Area 5a			
Residential (a)	650	330	321
Commercial, institutional and industrial (b)	47	7.9	39.2
Landscaping (c)	276	-	276
Treatment system losses (d)	42	-	-
Distribution system losses (d)	49	17	32
Area 5a Water Demand	***1,064***	***354***	***667***
Area 5b			
Residential (a)	12	5.6	6.0
Commercial, institutional and industrial (b)	0	0	0
Landscaping (c)	53	-	53
Treatment system losses (d)	1.8	-	-
Distribution system losses (d)	3.2	0.3	3.0
Area 5b Water Demand	***70***	***5.9***	***62***
Area 6a			
Residential (a)	373	214	159
Commercial, institutional and industrial (b)	199	81	118
Landscaping (c)	145	-	145
Treatment system losses (d)	28	-	-
Distribution system losses (d)	36	15	21
Area 6a Water Demand	***781***	***310***	***444***

Table 10

Estimated Grapevine Project Annual Water Demand by Planning Area

Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 6b			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	15	1	13.8
Landscaping (c)	23	-	23
Treatment system losses (d)	0.1	-	-
Distribution system losses (d)	1.9	0.1	1.8
Area 6b Water Demand	***40***	***1***	***38.6***
Area 6c			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.9	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6c Water Demand	***0.9***	***0.0***	***0.9***
Area 6d			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.8	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6d Water Demand	***0.8***	***0.0***	***0.8***

Table 10

Estimated Grapevine Project Annual Water Demand by Planning Area

Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 6e			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.8	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6e Water Demand	***0.8***	***0.0***	***0.8***
Project Annual Water Demand (e)(f)	***7,861***	***2,634***	***4,960***

Abbreviations:

"AFY" = acre-feet per year

Notes:

(a) See Table 3 for estimated residential water uses.
(b) See Tables 4 and 7 for estimated indoor and outdoor water use, respectively, for commercial, institutional, and industrial land uses.
(c) See Table 8 for estimated parks, roads and common area landscaping water use.
(d) See Table 9 for water losses associated with the project.
(e) The Project Annual Water Demand is the sum of the estimated water uses for the project, plus the assumed treatment and distribution system losses. The contingency is not included.
(f) Totals may not add exactly due to rounding.

Table 11
Recycled Water Production and Demand by Planning Area
Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 1			
Residential			
Indoor	201	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	43	0	
Outdoor	0	20	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	157	
Subtotal	244	178	66
Area 2			
Residential			
Indoor	375	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	169	0	
Outdoor	0	67	
School Landscaping	0	0	
Parks	0	138	
Road and Other Public Landscaping	0	278	
Subtotal	545	482	63
Area 3			
Residential			
Indoor	260	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	195	0	
Outdoor	0	77	
School Landscaping	0	0	
Parks	0	13	
Road and Other Public Landscaping	0	296	
Subtotal	455	386	69
Area 4			
Residential			
Indoor	329	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	16	0	
Outdoor	0	8	
School Landscaping	0	0	
Parks	0	138	
Road and Other Public Landscaping	0	514	
Subtotal	345	660	-315

Table 11
Recycled Water Production and Demand by Planning Area
Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 5a			
Residential			
Indoor	280	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	7	0	
Outdoor	0	3	
School Landscaping	0	0	
Parks	0	13	
Road and Other Public Landscaping	0	153	
Subtotal	287	169	118
Area 5b			
Residential			
Indoor	5	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	0	0	
Outdoor	0	0	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	30	
Subtotal	5	30	-25
Area 6a			
Residential			
Indoor	182	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	69	0	
Outdoor	0	82	
School Landscaping	0	0	
Parks	0	13	
Road and Other Public Landscaping	0	95	
Subtotal	251	190	61
Area 6b			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	1.0	0	
Outdoor	0	14	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	23	
Subtotal	1.0	37	-36

Table 11
Recycled Water Production and Demand by Planning Area
Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 6c			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.02	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.02	0.8	-0.8
Area 6d			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.01	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.01	0.8	-0.8
Area 6e			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.01	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.01	0.8	-0.7
Recycled Water Pond Net Evaporation and Rainfall (d)	*-149*	*0*	
Recycled Water Distribution System Loss (5%) (e)	*0*	*107*	
Recycled Water Produced, Used, and Surplus/Deficit (f)	1,983	2,241	-258
Total Supplemental Non-Potable Water Needed			**258**

Table 11

Recycled Water Production and Demand by Planning Area

Grapevine Project, Kern County, California

Abbreviations:

"AFY" = acre-feet per year

"CII" = Commercial, Institutional and Industrial

Notes:

(a) Production of recycled water is assumed to be 85% of total indoor water use. See Tables 3 and 4.

(b) Recycled water is assumed to be used for all CII, park and road landscape irrigation.

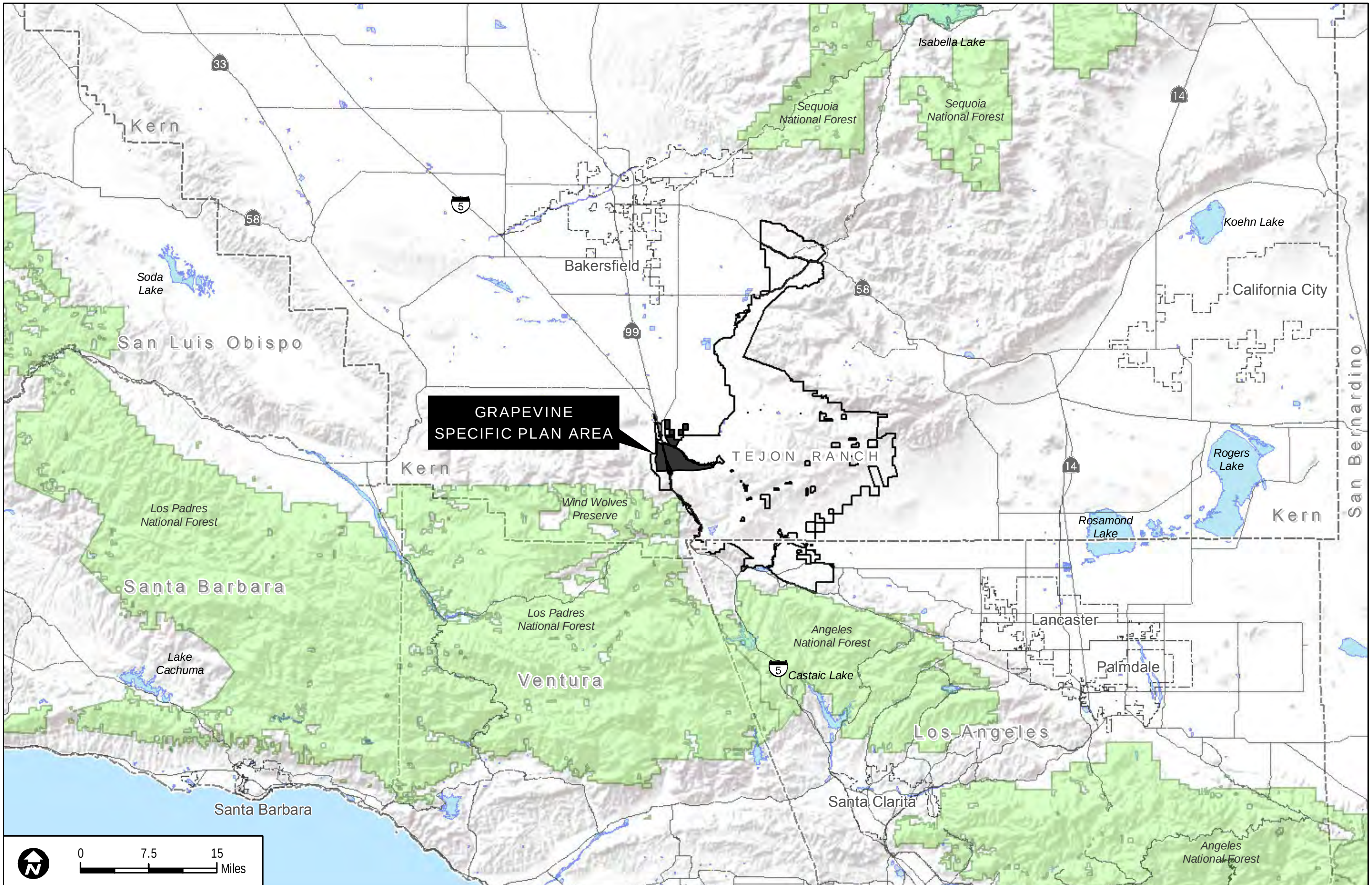
(c) A positive number indicates a surplus of recycled water, and a negative number indicates a deficit. Any deficit will be supplemented with filtered non-potable Nickel Water.

(d) Recycled water pond net evaporation and rainfall are calculated as shown in Table A-1.

(e) Recycled water distribution system loss is assumed to be 5% of the total recycled and non-potable water use in each area.

(f) Values may not total exactly due to rounding.

(g) The demands listed above do not include the contingency. See Table 1.

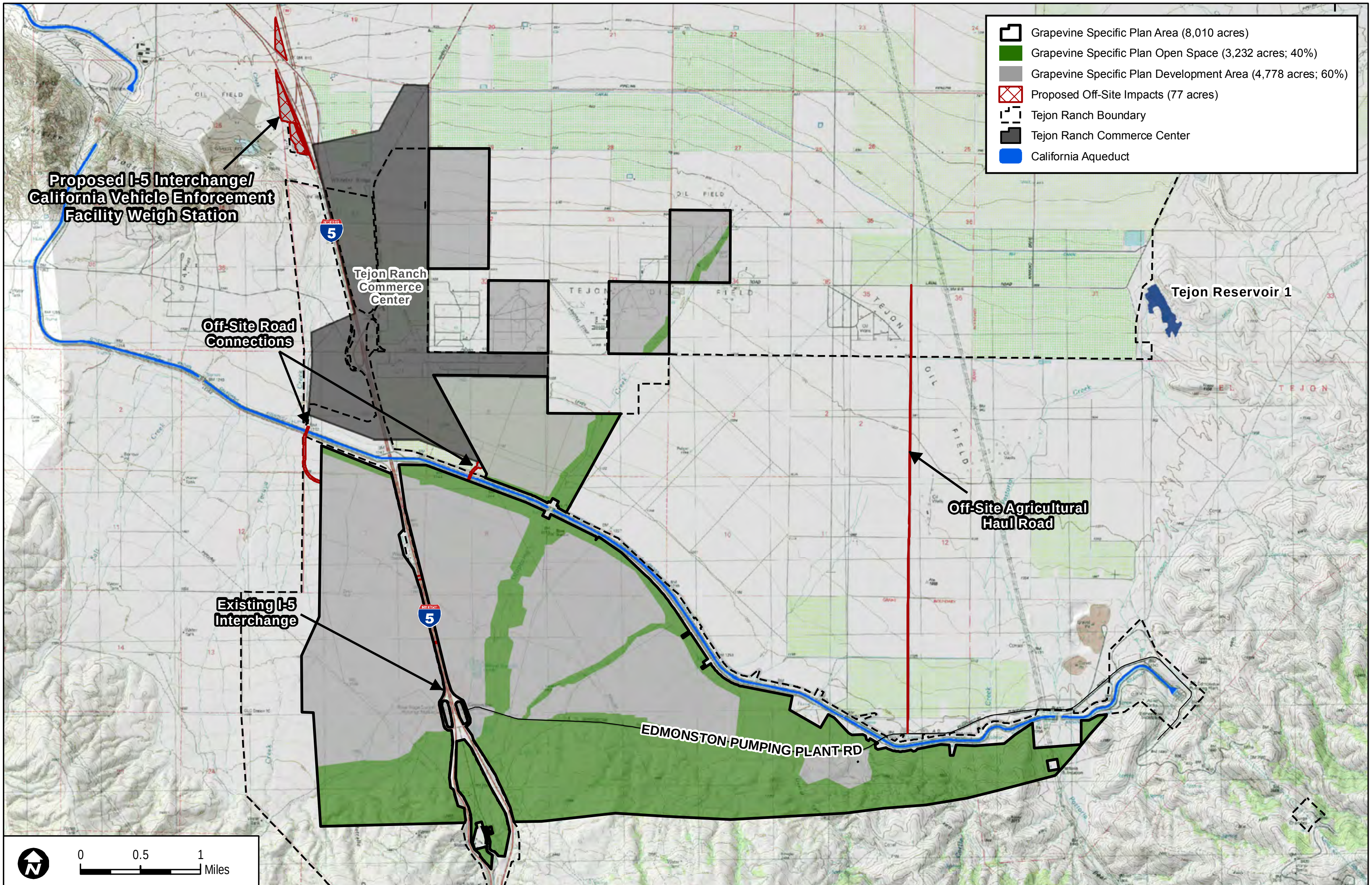


SOURCES: McIntosh & Associates 2013; TRC 2013a

FIGURE 1

Regional Location

GRAPEVINE PROJECT



SOURCES: McIntosh & Associates 2014; TRC 2013c

The California aqueduct (TRC 2013c) appears on subsequent figures; the source information will not be provided on subsequent figures.

FIGURE 2

Vicinity Map

GRAPEVINE PROJECT

ATTACHMENT A

Recycled Water Storage and Disposal Water Balance

Table A-1

Recycled Water Storage and Disposal Water Balance (Average-Year Rainfall)

Grapevine Project, Kern County, California

POND STORAGE NOVEMBER 1 (AF)	0	ASSUMED ACTIVE POND AREA (AC) (a)	36
POND PERCOLATION RATE (IN/DAY)	0	POND CATCHMENT AREA (AC)	36
		NON-POTABLE IRRIGATION AREA (AC) (b)	602
		CALC'D MAX STORAGE VOLUME (AF) (c)	445
		CALC'D MAX STORAGE DEPTH (FT) (d)	12.5
		CALC'D AVG STORAGE DEPTH (FT) (e)	5.7

PARAMETERS/DATA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
RECYCLED WATER FLOW (MGD) (f)	1.93	1.94	1.79	1.78	1.76	1.78	1.85	1.93	1.98	2.05	2.04	1.98	1.90
PRECIPITATION (IN) (g)	0.52	1.15	1.48	1.72	1.93	1.83	1.18	0.47	0.08	0.02	0.05	0.16	10.58
REFERENCE ETo (IN) (h)	4.06	2.01	1.41	1.45	2.22	4.03	5.49	7.63	8.63	9.14	8.55	6.18	60.78
IRRIGATION DEMAND FACTOR (IN) (i)	2.84	1.41	0.99	1.01	1.55	2.82	3.84	5.33	6.03	6.39	5.98	4.32	42.52
POND CALCULATIONS													
BEGINNING POND STORAGE (AF) (j)	0	24	126	244	361	430	445	400	281	120	0	0	--
RECYCLED WATER VOL (AF) (f)	184	179	171	170	152	169	170	183	183	195	195	182	2132
DIRECT PRECIPITATION VOL (AF) (k)	2	3	4	5	6	5	3	1	0	0	0	0	31
POND EVAPORATION VOL (AF) (l)	12	6	4	4	7	12	16	23	26	27	25	18	180
NON-POTABLE IRRIGATION DEMAND (AF) (m)	150	74	52	54	82	149	202	281	318	337	315	228	2241
STORAGE GAIN (AF) (n)	24	102	119	117	69	14	-45	-119	-161	-169	-146	-63	-258
FINAL POND STORAGE (AF) (o)	24	126	244	361	430	445	400	281	120	0	0	0	--
SUPPLEMENTAL IRRIGATION DEMAND (AF) (p)	0	0	0	0	0	0	0	0	0	49	146	63	258

Notes

(a) Assumed active pond area is estimated to maintain a calculated maximum storage depth of approximately 12.5 feet. This area consists of only a portion of the total pond area designed for the 100-year rainfall year (EKI, 2015). It is assumed that the excess pond acreage will only be used during above-average rainfall years.

(b) Non-potable irrigation area is the total landscaped area excluding residential areas and schools.

(c) Calculated maximum storage volume is the largest final pond storage volume from the pond calculations.

(d) Maximum storage depth is the calculated maximum storage volume divided by the active pond area. The calculated maximum storage depth does not include 2 feet for freeboard.

(e) Average storage depth is the average final pond storage volume from the pond calculations divided by the active pond area.

(f) Recycled water flow rate is the average indoor potable water demand less collection system and wastewater treatment losses of 15%. Note that collection system and wastewater treatment losses were not accounted for in the 100-year rainfall water balance in the *Wastewater Facilities Engineering Report* (EKI, 2015) to conservatively size the required total recycled water storage volume.

(g) Average monthly precipitation data were collected from the Western Regional Climate Center (WRCC) for the Bakersfield Airport in Bakersfield, California (1937-2012) and Tejon Rancho, California (1895-1914) and from the CIMIS Station 125 located in Arvin, CA. Precipitation data listed is the inverse-distance weighted monthly averages of the monthly averages for each station based on the distance of each station to the center of the Grapevine Project.

(h) Reference ETo data were obtained from the California Irrigation Management Information Services (CIMIS) station 125 located in Arvin, CA that measured evaporation from pans. Monthly averages were calculated using all available data from this CIMIS station, which has been in operation since 1995.

(i) The irrigation demand factor is the area weighted average irrigation demand factor for each planting type (high water use plantings, low water use plantings, combination trees and ground cover plantings, and buffer zone plantings) for the areas irrigated by non-potable water (all landscaped area except residential areas, parks, and schools). Refer to Table 5.

(j) Beginning pond storage is the final storage from the previous month.

(k) Direct precipitation is the active pond area multiplied by the precipitation.

(l) Pond evaporation is active pond area multiplied by the reference ETo, which is assumed to equal to the pond evaporation rate.

(m) Irrigation demand is the irrigation demand factor multiplied by the irrigation area.

(n) Storage gain is equal to the sum of the beginning pond storage, recycled water volume, and direct precipitation less the sum of the pond evaporation and irrigation demand. A negative storage gain represents a storage loss. The storage gain conservatively accounts for losses due to direct net evaporation when the ponds are empty. Total annual storage loss is approximately 50 AF less if it assumed that there is no net evaporation when the ponds are empty.

(o) Final pond storage is the beginning pond storage plus the storage gain. Final storage is zero when the storage loss is greater than the beginning pond storage.

(p) Irrigation demand includes 5% for distribution system losses. Supplemental irrigation demand is equal to the beginning pond storage less the storage loss (negative storage gain). If the storage loss is less than the beginning pond storage, the supplemental irrigation demand equals zero. It is assumed that the supplemental irrigation demand will be supplied with untreated California Aqueduct water.

Abbreviations

"AC" = acres

"AF" = acre-feet

"ETo" = reference evapotranspiration

"FT" = feet

"IN" = inches

"MGD" = Million Gallons per Day

References

(EKI, 2015) *Wastewater Facilities Engineering Report, Grapevine Project*, Erler & Kalinowski, Inc., October 2015.

Table A-2
Estimated Total Construction Water Use
Grapevine Project, Kern County, California

[A] **Grapevine Project Total Grading Area** (ac) (a)	[B] **ETo Rate** (in/yr) See Table 5	[C] **Bare Soil "Crop" Factor** (b)	[D] **Bare Soil Evaporation Rate** (in/yr) D = B × C (c)	[E] **Duration of Dust Control on Each Acre Graded** (months/ac) (d)	[F] **Total Dust Control Water Demand** (AF) G = A × D/12 × E/12 (e)	[G] **Additional Construction Water Uses** (AF) G = F × 0.25 (f)	[H] **Total Construction Water Use** (AF) H = F + G (g)
5,173	60.8	0.5	30.4	6	6,600	1,650	**8,250**

Abbreviations:

"ac" = acre
"AF" = acre-feet
"in/yr" = inches per year
"ETo" = reference evapotranspiration

Notes:

(a) The total Grapevine Project grading area is based on information provided by Dudek in an email dated 9 November 2015.
(b) Bare soil "crop" factor derived from Reference 1, based on the ETo and assuming a 7-day frequency between significant wetting (greater than 3 x ETo) and a soil hydraulic factor of 2.6.
(c) Bare soil evaporation rate calculated by multiplying the ETo rate by the bare soil "crop" factor. Water use for dust control is assumed to be applied at the same rate as soil evaporation.
(d) Six months of dust control was assumed to be required for each acre graded.
(e) Calculated by multiplying the total grading area by the bare soil evaporation rate and the length of dust control activities, rounded to the nearest hundred AF.
(f) Additional construction water uses were assumed to be 25% of the water used for dust control during grading activities.
(g) Calculated by summing the total dust control water use and additional construction water uses. This total construction water use will be used over a 19+ year period during buildout and supplied with Nickel Water from the California Aqueduct.

Reference:

1. Snyder, et al. 2007. *Crop Coefficients.* UC Davis Biometeorology Program. Updated March 2007. http://biomet.ucdavis.edu/Evapotranspiration/CropCoef/Kc.pdf.

ATTACHMENT B

Estimated Water Demands for 14,000 Residential Units Alternative Scenario

Table B-1
Comparison of Project Development Scenarios and Annual Water Demands
Grapevine Project, Kern County, California

Water Source	Water Supply Category	Estimated Total Water Demand (AFY) **Grapevine Plan** *12,000 Residential Unit Base Scenario*	**Grapevine Plan** *14,000 Residential Unit Alternative Scenario*
California Aqueduct (Nickel Water)	Potable Water	5,620	5,873
	Supplemental Non-Potable Water	258	58
	Contingency	400	350
	California Aqueduct (Nickel Water) Subtotal	*6,278*	*6,281*
Recycled Water	Recycled Non-Potable Water	1,983	2,188
Overall Project Water Demand		***8,261***	***8,469***
Development Land Use Summary			
Residential Number of Units	Standard Residential Units (a)	8,410	9,810
	Village Center Residential Units (a)	3,590	4,190
	Total	*12,000*	*14,000*
Commercial and Industrial Square Footage	Village Center Retail (a)	450,000	42,000
	Village Center Office	350,000	350,000
	Freeway-Oriented Commercial	750,000	750,000
	Office/R&D	2,100,000	2,100,000
	Light Industrial	1,450,000	1,450,000
	Total	*5,100,000*	*4,692,000*
Total School Acreage (b)		175	175
Landscaping and Solar Farm Acreage	Parks (b) (c)	96	112
	Road Landscaping	203	203
	Roundabouts	8	8
	Windrow	22	22
	Irrigated Residential Common Area (b)	156	156
	Landscaped I-5 Buffer Zones	95	95
	Golf Course	90	90
	Solar Farms	800	800
	Total	*1,470*	*1,486*

Abbreviations:
"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial
"SRUs" = Standard Residential Units
"VCRUs" = Village Center Residential Units

Notes:
(a) To accommodate the additional 2,000 dwelling units in the 14,000 Residential Unit Alternative Scenario, village center retail square footage was reduced based on the vehicle trip equivalency ratios of 225 square feet per single-family dwelling unit and 155 square feet per multi-family dwelling unit. Alternatively, other commercial and industrial land areas could be reduced at their respective vehicle trip equivalency ratios.
(b) In 14,000 Residential Unit Alternative Scenario, landscaped water efficiency was increased for noted land uses. Refer to Table B-6

Table B-2
Estimated Annual Water Demand
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Development Category	**Estimated Total Water Use** (AFY)	**Estimated Indoor Water Use** (AFY)	**Estimated Outdoor Water Use** (AFY)
Residential (a)	4,243	2,240	2,003
Commercial, Institutional and Industrial (b)	1,011	556	455
Community Landscaping (c)	2,212	-	2,212
Treatment system losses (d)	280	-	-
Distribution system losses (d)	373	140	234
Subtotal Average Annual Water Demand (e)	8,119	2,935	4,904
Contingency (f)	350	-	-
Project Average Annual Water Demand	***8,469***	-	-

Abbreviations:
"AFY" = acre-feet per year

Notes:
(a) See Table B-3 for estimated residential water uses.
(b) See Tables B-4 and B-6 for estimated indoor and outdoor water use, respectively, for commercial, institutional, and industrial land uses. Includes 210 AFY of outdoor school water demand.
(c) See Table B-7 for estimated parks, roads and common area landscaping water use. Includes 318 AFY of residential common area demand.
(d) See Table B-8 for water losses associated with the project treatment and distribution systems. System losses associated with all potable outdoor uses are estimated to be 127 AFY, assumed to be 5% of the total of residential outdoor, outdoor school, and residential common area water demands.
(e) The Project Annual Water Demand is the sum of the estimated water uses for the project, plus the assumed treatment and distribution system losses.
(f) The contingency was reduced from 400 AFY to 350 AFY under this scenario to accommodate 2,000 additional homes. The contingency is inclusive of all losses associated with its treatment and distribution.
(g) Totals may not add exactly due to rounding.

Table B-3
Estimated Residential Water Use
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Project Development Phase and Housing Product Types	Number of Dwelling Units (a)	Median Density (a) (du/ac)	Household Size (c) (people/du)	Water Use Factor (b)			Subtotal Water Use (e)		
				Indoor (c) (AFY/du)	Outdoor (d) (AFY/du)	Total (AFY/du)	Indoor (AFY)	Outdoor (AFY)	Total (AFY)
Area 1									
Standard Residential Units	1,458	7.2	3.20	0.16	0.17	0.33	233	248	481
Village Center Residential Units	269	15.5	3.20	0.16	0.08	0.24	43	22	65
Subtotal	**1,727**	-	-	-	-	-	**276**	**269**	**546**
Area 2									
Standard Residential Units	2,076	7.2	3.20	0.16	0.17	0.33	332	353	685
Village Center Residential Units	1,144	15.5	3.20	0.16	0.08	0.24	183	92	275
Subtotal	**3,220**	-	-	-	-	-	**515**	**444**	**960**
Area 3									
Standard Residential Units	1,377	7.2	3.20	0.16	0.17	0.33	220	234	454
Village Center Residential Units	852	15.5	3.20	0.16	0.08	0.24	136	68	204
Subtotal	**2,229**	-	-	-	-	-	**357**	**302**	**659**
Area 4									
Standard Residential Units	2,158	7.2	3.20	0.16	0.17	0.33	345	367	712
Village Center Residential Units	665	15.5	3.20	0.16	0.08	0.24	106	53	160
Subtotal	**2,823**	-	-	-	-	-	**452**	**420**	**872**
Area 5a									
Standard Residential Units	2,018	7.2	3.20	0.16	0.17	0.33	323	343	666
Village Center Residential Units	385	15.5	3.20	0.16	0.08	0.24	62	31	92
Subtotal	**2,403**	-	-	-	-	-	**384**	**374**	**758**
Area 5b									
Standard Residential Units	41	7.2	3.20	0.16	0.17	0.33	7	7	14
Village Center Residential Units	0	15.5	3.20	0.16	0.09	0.25	0	0	0
Subtotal	**41**	-	-	-	-	-	**7**	**7**	**14**
Area 6a									
Standard Residential Units	682	7.2	3.20	0.16	0.17	0.33	109	116	225
Village Center Residential Units	875	15.5	3.20	0.16	0.08	0.24	140	70	210
Subtotal	**1,557**	-	-	-	-	-	**249**	**186**	**435**

Table B-3
Estimated Residential Water Use
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Project Development Phase and Housing Product Types	Number of Dwelling Units (a)	Median Density (a) (du/ac)	Household Size (c) (people/du)	Water Use Factor (b)			Subtotal Water Use (e)		
				Indoor (c) (AFY/du)	Outdoor (d) (AFY/du)	Total (AFY/du)	Indoor (AFY)	Outdoor (AFY)	Total (AFY)
Area 6b									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6c									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6d									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
Area 6e									
Standard Residential Units	0	7.2	3.20	0.16	0.17	0.33	0	0	0
Village Center Residential Units	0	15.5	3.20	0.16	0.08	0.24	0	0	0
Subtotal	**0**	-	-	-	-	-	**0**	**0**	**0**
TOTAL	**14,000**	-	-	-	-	-	**2,240**	**2,003**	**4,243**

Abbreviations:
"AFY" = acre-feet per year
"AFY/du" = acre-feet per year per dwelling unit
"du" = dwelling units
"du/ac" = dwelling units per acre

Table B-3
Estimated Residential Water Use
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Notes:
(a) The residential unit types, median residential densities for each product type, and numbers of residential units are based on the 8 June 2015 Project Land Use Program Summary.
(b) Water use factors, expressed as the annual volume of water consumed for each dwelling unit, have been estimated using models of residential indoor and outdoor water uses as discussed in Notes (c) and (d).
(c) Residential indoor water use factors were estimated using a model of total indoor water use developed in *Analysis of Water Use in New Single-Family Homes* dated 20 July 2011, William DeOreo, P.E., M.S. submitted to Salt lake City Corporation and the United States Environmental Protection Agency. The statistical model is based on single family homes that meet the standards for the Federal Energy Policy Act of 1992. The following assumptions were used for estimating water uses for each housing product type:
1. The average household size (i.e., number of residents per home) for each product type is assumed as 3.2 persons/dwelling unit, according to data for Kern County from: *State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties and the State — January 1, 2011- 2013*. Sacramento, California, May 2013.
2. Home water softening systems (e.g., regenerating ion exchange units or reverse osmosis units) are prohibited.
3. High-efficiency clothes washers that use less than 30 gallons of water per load are installed in 75% of residential homes.
4. Significant leaks (i.e., leaks greater than 50 gallons per day) occur at approximately 9% of homes for each housing product type.

(d) Residential outdoor water use factors were estimated in Table B-5.
(e) The subtotal water use for a residential unit type is the number of dwelling units multiplied by the corresponding water use factors.

Table B-4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 1											
Village Center Retail	0										
51% Grocery	0	0.18	0.0	0.0	1.1	0	122	0	0.0	0.00	0.0
21% Drug store	0	0.18	0.00	0.0	0.8	0	69	0	0.0	0.00	0.0
14% Miscellaneous	0	0.18	0.00	0.0	0.8	0	69	0	0.0	0.00	0.0
7% Restaurant	0	0.18	0.00	0.0	2	0	179	0	0.0	0.00	0.0
7% Bank	0	0.18	0.00	0.0	0.8	0	63	0	0.0	0.00	0.0
Village Center Office	22	0.18	0.5	2.8	2.3	51	53	2,669	1.8	1.5	3.4
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	400										
50% High Tech / Bio Tech	200	0.30	4.6	15	2.3	460	92	42,267	29.2	8.4	37.6
50% Other Office	200	0.30	4.6	15	2.3	460	53	24,268	16.8	8.4	25.2
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**48**	**18**	**66**
Area 2											
Village Center Retail	0										
51% Grocery	0	0.18	0.0	0.0	1.1	0	122	0	0.0	0.0	0.0
21% Drug store	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
14% Miscellaneous	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
7% Restaurant	0	0.18	0.0	0.0	2	0	179	0	0.0	0.0	0.0
7% Bank	0	0.18	0.0	0.0	0.8	0	63	0	0.0	0.0	0.0
Village Center Office	119	0.18	2.7	15	2.3	274	53	14,439	10.0	8.4	18.3
Regional / Freeway-Oriented Comm.	210										
78.5% Miscellaneous Retail	165	0.18	3.8	21	0.8	132	320	42,256	29.2	11.6	40.8
7.5% Restaurant	16	0.18	0.4	2.0	2	32	847	26,679	18.4	1.1	19.5
7.5% Gas Station	16	0.18	0.4	2.0	0.9	14	320	4,542	3.1	1.1	4.2
6.5% Hotel	14	0.18	0.3	1.7	0.48	7	506	3,315	2.3	1.0	3.2
Office / R&D	780										
62% High Tech / Bio Tech	480	0.30	11.0	37	2.3	1104	92	101,440	70.0	20.3	90.3
38% Medical Center	300	0.30	7	23	2.3	690	80	55,155	38.1	12.7	50.7
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	335										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	24.0	28.7
1 High School	240	0.10	5.5	55	1.3	302	55	16,661	11.5	66.1	77.6
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**187**	**146**	**333**

Table B-4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 3											
Village Center Retail	0										
51% Grocery	0	0.18	0.0	0.0	1.1	0	122	0	0.0	0.0	0.0
21% Drug store	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
14% Miscellaneous	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
7% Restaurant	0	0.18	0.0	0.0	2	0	179	0	0.0	0.0	0.0
7% Bank	0	0.18	0.0	0.0	0.8	0	63	0	0.0	0.0	0.0
Village Center Office	75	0.18	1.7	10	2.3	173	53	9,100	6.3	5.3	11.6
Regional / Freeway-Oriented Comm.	540										
78.5% Miscellaneous Retail	424	0.18	10	54	0.8	339	320	108,659	75.0	29.8	104.9
7.5% Restaurant	41	0.18	0.9	5.2	2	81	847	68,602	47.4	2.8	50.2
7.5% Gas Station	41	0.18	0.9	5.2	0.9	36	320	11,679	8.1	2.8	10.9
6.5% Hotel	35	0.18	0.8	4.5	0.48	17	506	8,524	5.9	2.5	8.4
Office / R&D	650										
50% High Tech / Bio Tech	325	0.30	7.5	25	2.3	748	92	68,683	47.4	13.7	61.1
50% Other Office	325	0.30	7.5	25	2.3	748	53	39,435	27.2	13.7	40.9
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	96										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	24.0	28.7
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**222**	**95**	**317**
Area 4											
Village Center Retail	0										
51% Grocery	0	0.18	0.0	0.0	1.1	0	122	0	0.0	0.0	0.0
21% Drug store	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
14% Miscellaneous	0	0.18	0.0	0.0	0.8	0	69	0	0.0	0.0	0.0
7% Restaurant	0	0.18	0.00	0.0	2	0	179	0	0.0	0.0	0.0
7% Bank	0	0.18	0.00	0.0	0.8	0	63	0	0.0	0.0	0.0
Village Center Office	53	0.18	1.2	6.8	2.3	122	53	6,431	4.4	3.7	8.2
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	192										
2 K-8	192	0.11	4.4	40	1.3	241	55	13,329	9.2	48.1	57.3
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**14**	**52**	**65**

Table B-4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 5a											
Village Center Retail	0										
51% Grocery	0	0.18	0.0	0.0	1.1	0	122	0	0.0	0.0	0.0
21% Drug store	0	0.18	0.00	0.0	0.8	0	69	0	0.0	0.0	0.0
14% Miscellaneous	0	0.18	0.00	0.0	0.8	0	69	0	0.0	0.0	0.0
7% Restaurant	0	0.18	0.00	0.0	2	0	179	0	0.0	0.0	0.0
7% Bank	0	0.18	0.00	0.0	0.8	0	63	0	0.0	0.0	0.0
Village Center Office	18	0.18	0.4	2.3	2.3	41	53	2,184	1.5	1.3	2.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	96									0	
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	24.0	28.7
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**6**	**25**	**31**
Area 5b											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--	--
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0**	**0**
Area 6a											
Village Center Retail	42										
51% Grocery	21	0.18	0.5	2.7	1.1	24	122	2,875	2.0	1.5	3.5
21% Drug store	9	0.18	0.2	1.1	0.8	7	69	485	0.3	0.6	1.0
14% Miscellaneous	6	0.18	0.1	0.7	0.8	5	69	324	0.2	0.4	0.6
7% Restaurant	3	0.18	0.1	0.4	2	6	179	1,055	0.7	0.2	0.9
7% Bank	3	0.18	0.1	0.4	0.8	2	63	149	0.1	0.2	0.3
Village Center Office	66	0.18	1.5	8	2.3	152	53	8,008	5.5	4.6	10.2
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	270										
50% High Tech / Bio Tech	135	0.30	3.1	10	2.3	311	92	28,530	19.7	5.7	25.4
50% Other Office	135	0.30	3.1	10	2.3	311	53	16,381	11.3	5.7	17.0
Light Industrial / Warehouse	1,400										
75% Light Industrial / Warehouse	1,050	0.30	24	80	0.43	452	77	34,576	23.9	44.3	68.2
25% Community College	350	0.29	8	28	1.3	441	31	13,607	9.4	15.3	24.7
Schools (i)	96										
1 K-8	96	0.11	2.2	20	1.3	121	55	6,665	4.6	24.0	28.7
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**78**	**103**	**180**

Table B-4

Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses (a)	[A] **Floor Area** (1,000 sf) (a)	[B] **Floor Area Ratio** (ac/ac) (b)	[C] **Floor Area** (ac) C = A / 43.56 (c)	[D] **Area of Land Use** (ac) D = C / B (d)	[E] **Employees per 1,000 sf** (emp/1,000 sf) (e)	[F] **Employees** (emp) F = A × E (e)	[G] **Employee Indoor Water Use Factor** (gpd/emp) (f)	[H] **Average Daily Indoor Water Use** (gpd) H = F × G (g)	[I] **Total Annual Indoor Water Use** (AFY) I = A x H (h)	[J] **Total Annual Outdoor Water Use** (AFY) See Table 7	[K] **Total Water Use** (AFY) K = I + J
Area 6b											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	50										
Light Industrial / Warehouse	50	0.05	1	23	0.4	22	77	1,646	1.1	12.7	10.4
Solar Farm (j)	--	--	--	266	--	--	--	--	0.03	1.2	1.2
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**1**	**13.8**	**11.6**
Area 6c											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	190	--	--	--	--	0.02	0.8	0.9
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.9**
Area 6d											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	173	--	--	--	--	0.02	0.8	0.8
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.8**
Area 6e											
Village Center Retail	--	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--	--
Solar Farm (j)	--	--	--	171	--	--	--	--	0.02	0.8	0.8
Schools (i)	--	--	--	--	--	--	--	--	--	--	--
Subtotal	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**0**	**0.8**	**0.8**
Total School Water Use (including state-of-the-art water conservation technologies and measures)									39	210	250
Total Commercial, Institutional, and Industrial Water Use (including state-of-the-art water conservation technologies and measures) (k)									**556**	**455**	**1,008**

Table B-4
Estimated Water Uses for Commercial, Institutional, and Industrial Land Uses
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Abbreviations:

"1,000 sf" = 1,000 square feet
"ac" = acre
"ac/ac" = acre per developed acre
"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial
"emp" = employees
"emp/1,000 sf" = employees per 1,000 square feet
"gpd" = gallons per day
"gpd/emp" = gallons per day per employee
"K-8" = kindergarten through eighth grade
"R&D" = research and development
"sf" = square feet
"TRCC" = Tejon Regional Commerce Center

Notes:

(a) The CII land uses and areas are based on the 8 June 2015 project Land Use Program Summary.
(b) The floor area ratio is the ratio between floor area to gross land area. The floor area ratios for the different land use categories are based on the 8 June 2015 project Land Use Program Summary.
(c) The floor area expressed in acres is calculated by dividing the floor area expressed in 1,000 square feet by 43.56. Note that 1 acre is equal to 43,560 square feet.
(d) The area of land use is calculated by dividing the floor area expressed in acres, by the floor area ratio.
(e) The employees per 1,000 square feet were based on the data in Reference 2. The number of employees was estimated by multiplying the floor area, expressed in 1,000 square feet, by the employees per 1,000 square feet.
(f) The employee indoor water use factors, derived from Reference 1, relate the indoor water use for a specific CII land use to the number of employees based on a 225-day work year and a conservation potential, which accounts for current water efficiency standards. The conservation potential is the "best potential" estimate of conservation savings based on the use of water efficient fixtures and efficient water management techniques for each industry. Conservation potential for the Regional/Freeway-Oriented Commercial land uses were assumed to be 0%, due to the high traffic volumes that these businesses are likely to receive (similar to high traffic volumes at the TRCC). Additionally, the employee indoor water use factors for the Regional/Freeway-Oriented Commercial land uses are multiplied by an escalation factor of 3.4 which is the average difference between the project indoor water use factors and actual indoor water use at the TRCC in fiscal year 2012 - 2013, weighted by land use category.
(g) The total average daily water use for each land use is estimated by multiplying the number of employees by the CII-specific indoor employee water use factor.
(h) Average Annual Water Use is calculated by multiplying the Average Daily Water Use, from Column H by the 225-day work year cited in Footnote (f) for the employee indoor water use factors, then dividing by 326,000 gallons per acre-foot.
(i) The floor area for schools is based on 11% of the total acreage for kindergarten through eighth grade and 10% of the total acreage for high schools.
(j) Water use for the solar farms are based on the values for photovoltaic solar plants from Reference 3.
(k) Totals may not add exactly due to rounding.

Reference:

1. Pacific Institute, 2003. *Waste Not, Want Not: The Potential for Urban Water Conservation in California,* November 2003.
2 Energy Information Administration, 2006. *2003 Commercial Buildings Energy Consumption Survey: Building Characteristics Tables* , Revised June 2006.
3 Bureau of Land Management, 2012. *Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States* , Appendix M, July 2012.

Table B-5
Estimated Residential Outdoor Water Use Factors
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Housing Category / Unit Type (a)	[A] Median Density (du/ac)	[B] Median Size of Lot (without streets) (sq ft/du)	[C] Area of Landscaping Per Lot (sq ft/du)	[D] Percentage of Landscaping Covered in HWUPs	[E] Area of HWUPs (sq ft/du)	[F] Percentage of Landscaping Covered in LWUPs	[G] Area of LWUPs (sq ft/du)	[H] Estimated Total Water Use for HWUPs (AFY/du)	[I] Estimated Total Water Use for LWUPs (AFY/du)	[J] Estimated Total Water Use (ETWU) for Landscaping (AFY/du)	[K] Maximum Applied Water Allowance (MAWA) (AFY/du)	[L] Additional Outdoor Water Uses (AFY/du)	[M] Total Outdoor Water Use Factor (AFY/du)
	(a)	B = 43560 / A (b)	C = B x 40%	(c)	E = C x D (c)	(d)	G = C × F (d)	H = E × 5.4 /43560 (e)	I = G × 1.88 / 43560 (f)	J = H + I (g)	(h)	L = 0.1 × J (i)	M = J + L (j)
Area 1													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 2													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 3													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 4													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 5a													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 5b													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Area 6a													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6b													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6c													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6d													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08
Area 6e													
Standard Residential Units	7.2	6,050	2,420	25%	605	75%	1,815	0.075	0.078	0.15	0.15	0.015	0.17
Village Center Residential Units	15.5	2,810	1,124	25%	281	75%	843	0.035	0.036	0.07	0.07	0.007	0.08

Abbreviations:

"AFY" = Acre feet per year
"AFY/ac" = Acre feet per year per acre
"du/ac" = dwelling units per acre
"ETWU" = estimated total water use
"HWUPs" = high water use plantings
"LWUPs" = low water use plantings
"MAWA" = maximum allowable water allowance
"sq ft" = square feet

Notes:

(a) Residential unit types and median residential density are based on the 8 June 2015 Project Land Use Program Summary.
(b) The size of residential lots, including the area of associated surrounding streets, is calculated by dividing the residential density into 43,560 square feet per acre.
(c) High water use plantings include turf grasses. Percentage of lot covered in high water use plantings is the area of high water use plantings divided by the lot size (without streets).
(d) Low water use plantings include shrubs and native vegetation. Percentage of lot covered in low water use plantings is the area of low water use plantings divided by the lot size (without streets).
(e) The estimated total water use for high water use plantings is the area of high water use plantings, converted to acres (by dividing by 43,560), multiplied by the annual evapotranspiration rate for high water use plantings (5.4 AFY/ac) provided in Table 5.
(f) The estimated total water use for low water use plantings is the area of low water use plantings, converted to acres (by dividing by 43,560), multiplied by the annual evapotranspiration rate for low water use plantings (1.88 AFY/ac) provided in Table 5.
(g) For residential unit landscaping, the Estimated Total Water Use (ETWU) calculation described in Reference 1 is based on 100% regular landscape area, which equals the sum of the estimated total water use for high water use planting and the estimated total water use for low water use planting. This value must be less than or equal to the Maximum Applied Water Allowance (see note h).
(h) The Maximum Applied Water Allowance (MAWA) calculations are described in Reference 1. The MAWA was calculated assuming 100% regular landscaped area and an evaporation adjustment factor of 0.55 for residential areas.
(i) Additional outdoor water uses include miscellaneous outdoor water uses (e.g. car washing, outdoor cleaning, etc.), which are assumed at 10% of the applied irrigation of high and low water use plantings.
(j) The total annual outdoor water use is the sum of the ETWU for landscaping and additional outdoor water uses.

References:

1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance* , July 9, 2015 Draft.

Table B-6

Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] Area of Land Use (acre) (a)	[B] Area of Landscaping (acre) (b)	[C] Percentage of Landscaping Covered in HWUPs (c)	[D] Area of HWUPs (acre) D = B x C (c)	[E] Percentage of Landscaping Covered in LWUPs (d)	[F] Area of LWUPs (acre) F = B x E (d)	[G] Estimated Total Water Use for HWUPs (AFY) G = D × 5.4 (e)	[H] Estimated Total Water Use for LWUPs (AFY) H = F × 1.88 (f)	[I] Estimated Total Outdoor Water Use (ETWU) (AFY) I = G + H (g)	[J] Maximum Applied Water Allowance (MAWA) (AFY) (h)
Area 1										
Village Center Retail										
51% Grocery	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
21% Drug store	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
14% Miscellaneous	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Restaurant	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Bank	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
Village Center Office	2.8	0.56	25%	0.14	75%	0.42	0.8	0.8	1.5	2.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D										
50% High Tech / Bio Tech	15	3.06	25%	0.77	75%	2.30	4.1	4.3	8.4	15.4
50% Other Office	15	3.06	25%	0.77	75%	2.30	4.1	4.3	8.4	15.4
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**18**	
Area 2										
Village Center Retail										
51% Grocery	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
21% Drug store	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
14% Miscellaneous	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Restaurant	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Bank	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
Village Center Office	15	3.04	25%	0.76	75%	2.28	4.1	4.3	8.4	15.3
Regional / Freeway-Oriented Comm.										
78.5% Miscellaneous Retail	21	4.20	25%	1.05	75%	3.15	5.7	5.9	11.6	21.2
7.5% Restaurant	2.0	0.40	25%	0.10	75%	0.30	0.5	0.6	1.1	2.0
7.5% Gas Station	2.0	0.40	25%	0.10	75%	0.30	0.5	0.6	1.1	2.0
6.5% Hotel	1.7	0.35	25%	0.09	75%	0.26	0.5	0.5	1.0	1.8
Office / R&D										
62% High Tech / Bio Tech	37	7.35	25%	1.84	75%	5.51	9.9	10.3	20.3	37.0
38% Medical Center	23	4.59	25%	1.15	75%	3.44	6.2	6.5	12.7	23.1
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	15%	1.50	85%	8.50	8.1	15.9	24.0	44.6
1 High School	55	27.50	15%	4.13	85%	23.38	22.3	43.8	66.1	122.5
Subtotal									**146**	

Table B-6
Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] **Area of Land Use** (acre) (a)	[B] **Area of Landscaping** (acre) (b)	[C] **Percentage of Landscaping Covered in HWUPs** (c)	[D] **Area of HWUPs** (acre) D = B x C (c)	[E] **Percentage of Landscaping Covered in LWUPs** (d)	[F] **Area of LWUPs** (acre) F = B x E (d)	[G] **Estimated Total Water Use for HWUPs** (AFY) G = D × 5.4 (e)	[H] **Estimated Total Water Use for LWUPs** (AFY) H = F × 1.88 (f)	[I] **Estimated Total Outdoor Water Use (ETWU)** (AFY) I = G + H (g)	[J] **Maximum Applied Water Allowance (MAWA)** (AFY) (h)
Area 3										
Village Center Retail										
51% Grocery	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
21% Drug store	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
14% Miscellaneous	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Restaurant	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Bank	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
Village Center Office	10	1.91	25%	0.48	75%	1.43	2.6	2.7	5.3	9.6
Regional / Freeway-Oriented Comm.										
78.5% Miscellaneous Retail	54	10.81	25%	2.70	75%	8.11	14.6	15.2	29.8	54.5
7.5% Restaurant	5.2	1.03	25%	0.26	75%	0.77	1.4	1.5	2.8	5.2
7.5% Gas Station	5.2	1.03	25%	0.26	75%	0.77	1.4	1.5	2.8	5.2
6.5% Hotel	4.5	0.90	25%	0.22	75%	0.67	1.2	1.3	2.5	4.5
Office / R&D										
50% High Tech / Bio Tech	25	4.97	25%	1.24	75%	3.73	6.7	7.0	13.7	25.1
50% Other Office	25	4.97	25%	1.24	75%	3.73	6.7	7.0	13.7	25.1
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	15%	1.50	85%	8.50	8.1	15.9	24.0	44.6
Subtotal									**95**	
Area 4										
Village Center Retail										
51% Grocery	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
21% Drug store	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
14% Miscellaneous	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Restaurant	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Bank	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
Village Center Office	6.8	1.35	25%	0.34	75%	1.01	1.8	1.9	3.7	6.8
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	40	20.00	15%	3.00	85%	17.00	16.2	31.9	48.1	89.1
Subtotal									**52**	

Table B-6
Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] **Area of Land Use** (acre) (a)	[B] **Area of Landscaping** (acre) (b)	[C] **Percentage of Landscaping Covered in HWUPs** (c)	[D] **Area of HWUPs** (acre) D = B x C (c)	[E] **Percentage of Landscaping Covered in LWUPs** (d)	[F] **Area of LWUPs** (acre) F = B x E (d)	[G] **Estimated Total Water Use for HWUPs** (AFY) G = D × 5.4 (e)	[H] **Estimated Total Water Use for LWUPs** (AFY) H = F × 1.88 (f)	[I] **Estimated Total Outdoor Water Use (ETWU)** (AFY) I = G + H (g)	[J] **Maximum Applied Water Allowance (MAWA)** (AFY) (h)
Area 5a										
Village Center Retail										
51% Grocery	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
21% Drug store	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
14% Miscellaneous	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Restaurant	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
7% Bank	0.0	0.00	25%	0.00	75%	0.00	0.0	0.0	0.0	0.0
Village Center Office	2.3	0.46	25%	0.11	75%	0.34	0.6	0.6	1.3	2.3
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools										
1 K-8	20	10.00	15%	1.50	85%	8.50	8.1	15.9	24.0	44.6
Subtotal									**25**	
Area 5b										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Light Industrial / Warehouse	--	--	--	--	--	--	--	--	--	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0**	
Area 6a										
Village Center Retail										
51% Grocery	2.7	0.55	25%	0.14	75%	0.41	0.7	0.8	1.5	2.8
21% Drug store	1.1	0.22	25%	0.06	75%	0.17	0.3	0.3	0.6	1.1
14% Miscellaneous	0.7	0.15	25%	0.04	75%	0.11	0.2	0.2	0.4	0.8
7% Restaurant	0.4	0.07	25%	0.02	75%	0.06	0.1	0.1	0.2	0.4
7% Bank	0.4	0.07	25%	0.02	75%	0.06	0.1	0.1	0.2	0.4
Village Center Office	8	1.68	25%	0.42	75%	1.26	2.3	2.4	4.6	8.5
Regional / Freeway-Oriented Comm.	--		--	--	--	--	--	--	--	--
Office / R&D										
50% High Tech / Bio Tech	10	2.07	25%	0.52	75%	1.55	2.8	2.9	5.7	10.4
50% Other Office	10	2.07	25%	0.52	75%	1.55	2.8	2.9	5.7	10.4
Light Industrial / Warehouse										
75% Light Industrial / Warehouse	80	16.07	25%	4.02	75%	12.05	21.7	22.6	44.3	81.0
25% Community College	28	5.54	25%	1.39	75%	4.16	7.5	7.8	15.3	27.9
Schools										
1 K-8	20	10.00	15%	1.50	85%	8.50	8.1	15.9	24.0	44.6
Subtotal									**103**	

Table B-6
Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Commercial, Institutional, and Industrial Land Uses	[A] **Area of Land Use** (acre) (a)	[B] **Area of Landscaping** (acre) (b)	[C] **Percentage of Landscaping Covered in HWUPs** (c)	[D] **Area of HWUPs** (acre) D = B x C (c)	[E] **Percentage of Landscaping Covered in LWUPs** (d)	[F] **Area of LWUPs** (acre) F = B x E (d)	[G] **Estimated Total Water Use for HWUPs** (AFY) G = D × 5.4 (e)	[H] **Estimated Total Water Use for LWUPs** (AFY) H = F × 1.88 (f)	[I] **Estimated Total Outdoor Water Use (ETWU)** (AFY) I = G + H (g)	[J] **Maximum Applied Water Allowance (MAWA)** (AFY) (h)
Area 6b										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial										
Light Industrial / Warehouse	23	4.59	25%	1.15	75%	3.44	6.2	6.5	12.7	23.1
Solar Farm (h)	266	--	--	--	--	--	--	--	1.2	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**13.8**	
Area 6c										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	190	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Area 6d										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	173	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Area 6e										
Village Center Retail	--	--	--	--	--	--	--	--	--	--
Village Center Office	--	--	--	--	--	--	--	--	--	--
Regional / Freeway-Oriented Comm.	--	--	--	--	--	--	--	--	--	--
Office / R&D	--	--	--	--	--	--	--	--	--	--
Industrial	--	--	--	--	--	--	--	--	--	--
Solar Farm (h)	171	--	--	--	--	--	--	--	0.8	--
Schools	--	--	--	--	--	--	--	--	--	--
Subtotal									**0.8**	
Total School Outdoor Water Use									210	
Total Commercial, Institutional, and Industrial Outdoor Water Use (i)									**455**	

Table B-6
Estimated Outdoor Water Uses for Commercial, Institutional, and Industrial Land Uses
14,000 Residential Unit Alternative Scenario
Grapevine Project, Kern County, California

Abbreviations:

"ac" = acre
"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial
"HWUP" = high water use plants
"K-8" = kindergarten through eighth grade
"LWUP" = low water use plants
"MAWA" = maximum applied water allowance
"R&D" = Research and development

Notes:

(a) See Table B-4 for area of land use calculation.
(b) Area of landscaping is the area of land use multiplied by the percentage of landscaping. Landscaped percentage is 50% for schools and 20% for non-school CII land uses.
(c) High water use plantings include turf grasses. Percentage of lot covered in high water use plantings is the area of high water use plantings divided by the area of land use (without streets).
(d) Low water use plantings include shrubs and native vegetation. Percentage of lot covered in low water use plantings is the area of low water use plantings divided by the area of land use (without streets).
(e) The estimated total water use for high water use plantings is the area of high water use plantings multiplied by the annual evapotranspiration rate for high water use plantings (5.4 AFY/ac) provided in Table 5.
(f) The estimated total water use for low water use plantings is the area of low water use plantings multiplied by the annual evapotranspiration rate for low water use plantings (1.88 AFY/ac) provided in Table 5.
(g) The ETWU is the sum of the estimated total water use for high water use plantings and estimated total water use for low water use plantings. The estimated total water outdoor water use must not be greater than the MAWA (see note h). The ETWU was calculated assuming all regular landscaped area, which accounts for plant type and irrigation efficiency, to estimate water demands. If special landscaped area was accounted for in the estimated total water use calculations according to Reference 1, the estimated total outdoor water use for non-school CII uses would equal the MAWA regardless of the planting types.
(h) The Maximum Applied Water Allowance (MAWA) calculations are described in Reference 1. For the non-school CII land uses, the MAWA was calculated assuming 100% special landscaped area and an evaporation adjustment factor of 0.45. The MAWA calculations for schools assumes 33% regular landscaped area, 67% special landscaped area (assumed recreational areas), and an evaporation adjustment factor of 0.65 based on amendments to CALGreen Code approved by the Building Standards Commission on July 21, 2015.
(h) Water use for the solar farms are based on the values for photovoltaic solar plants from Reference 2.
(i) Kern County Code of Ordinances, Title 19, Chapter 19.86, sections 19.86.050 and 19.86.060, states that for CII land uses a "*minimum of five percent (5%) of the total developed lot area shall be landscaped.*" Approximately 20% of the total developed land area for CII is assumed to be irrigated landscape, which complies with the minimum Kern County standard.
(k) Totals may not add exactly due to rounding.

Reference:

1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance*, July 9, 2015 Draft.
2 Bureau of Land Management, 2012. *Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States*, Appendix M, July 2012.

Table B-7

Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations

14,000 Residential Unit Alternative Scenario

Grapevine, Kern County, California

		High Water Use Plantings				Low Water Use Plantings				Tree and Groundcover Plantings				Buffer Zone Plantings					
Landscaping Land Use (a)	[A] **Total Acres** (ac) (a)	[B] **Percentage of Land as HWUP** (%) (b)	[C] **Total Area of HWUP** (ac) C = A × B (c)	[D] **Annual Evapo-transpiration Rate for HWUP** (AFY/ac) (d)	[E] **Estimated Total Water Use for HWUP** (AFY) E = C × D (e)	[F] **Percentage of Land as LWUP** (%) (f)	[G] **Total Area of LWUP** (ac) G = A × F (c)	[H] **Annual Evapo-transpiration Rate for LWUP** (AFY/ac) (d)	[I] **Estimated Total Water Use for LWUP** (AFY) I = G × H (e)	[J] **Percentage of Land as TGP** (%) (g)	[K] **Total Area of TGP** (ac) K = A × J (c)	[L] **Annual Evapo-transpiration Rate for TGP** (AFY/ac) (d)	[M] **Estimated Total Water Use for TGP** (AFY) M = K × L (e)	[O] **Percentage of Land as BZP** (%) (h)	[P] **Total Area of BZP** (ac) K = A × J (c)	[Q] **Annual Evapo-transpiration Rate for BZP** (AFY/ac) (d)	[R] **Estimated Total Water Use for BZP** (AFY) M = K × L (e)	[S] **Estimated Total Outdoor Water Use (ETWU)** (AFY) J = E + I + M + R (i)	[T] **Maximum Applied Water Allowance (MAWA)** (AFY) (j)
Area 1																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping	26	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	26	4.4	113	--		--	--	113	130
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	22	0%	0.0	5.4	0	50%	11.2	1.9	21	25%	6	4.4	25	--		--	--	46	85
Landscaped I-5 Buffer Zones	16	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	16	2.5	40	40	81
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	203	
Area 2																			
Parks	49	40%	20	5.4	106	50%	24.5	1.9	46	0%	0	4.4	0	--		--	--	152	222
Road Landscaping	42	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	42	4.4	184	--		--	--	184	212
1 Roundabout	1	0%	0.0	5.4	0.0	100%	1.0	1.9	2	0%	0	4.4	0	--		--	--	2	5
Windrow	3	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	3	4.4	13	--		--	--	13	15
Irrigated Residential Common Area (k)	32	0%	0.0	5.4	0	50%	15.9	1.9	30	25%	8	4.4	35	--		--	--	65	120
Landscaped I-5 Buffer Zones	31	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	31	2.5	78	78	158
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	495	
Area 3																			
Parks	5	40%	2.0	5.4	11	50%	2.5	1.9	5	0%	0	4.4	0	--		--	--	15	23
Road Landscaping	32	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	32	4.4	139	--		--	--	139	160
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	8	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	8	4.4	34	--		--	--	34	39
Irrigated Residential Common Area (k)	21	0%	0.0	5.4	0	50%	10.6	1.9	20	25%	5	4.4	23	--		--	--	43	80
Landscaped I-5 Buffer Zones	48	0%	0.0	5.4	0.0	0%	0.0	1.9	0	0%	0	4.4	0	100%	48	2.5	119	119	239
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	354	
Area 4																			
Parks	49	40%	20	5.4	106	50%	25	1.9	46	0%	0	4.4	0	--		--	--	152	222
Golf Course (l)	90	40%	36	5.4	194	30%	27	1.9	51	0%	0	4.4	0	30%	27	2.5	68	313	453
Road Landscaping	37	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	37	4.4	160	--		--	--	160	184
2 Roundabouts	2	0%	0.0	5.4	0.0	100%	2.0	1.9	4	0%	0	4.4	0	--		--	--	4	10
Windrow	9	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	9	4.4	38	--		--	--	38	44
Irrigated Residential Common Area (k)	33	0%	0.0	5.4	0	50%	16.6	1.9	31	25%	8	4.4	36	--		--	--	67	125
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	733	
Area 5a																			
Parks	5	40%	2.0	5.4	11	50%	2.5	1.9	5	0%	0	4.4	0	--		--	--	15	23
Road Landscaping	33	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	33	4.4	144	--		--	--	144	166
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	2	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	2	4.4	9	--		--	--	9	11
Irrigated Residential Common Area (k)	31	0%	0.0	5.4	0	50%	15.5	1.9	29	25%	8	4.4	34	--		--	--	63	117
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	232	
Area 5b																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	
Road Landscaping	7	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	7	4.4	30	--		--	--	30	35
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	7	0%	0.0	5.4	0.0	50%	3.3	1.9	6	25%	2	4.4	7	--		--	--	13	25
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	43	

Table B-7

Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations

14,000 Residential Unit Alternative Scenario

Grapevine, Kern County, California

		High Water Use Plantings				Low Water Use Plantings				Tree and Groundcover Plantings				Buffer Zone Plantings					
Landscaping Land Use (a)	[A] Total Acres (ac) (a)	[B] Percentage of Land as HWUP (%) (b)	[C] Total Area of HWUP (ac) C = A × B (c)	[D] Annual Evapo-transpiration Rate for HWUP (AFY/ac) (d)	[E] Estimated Total Water Use for HWUP (AFY) E = C × D (e)	[F] Percentage of Land as LWUP (%) (f)	[G] Total Area of LWUP (ac) G = A × F (c)	[H] Annual Evapo-transpiration Rate for LWUP (AFY/ac) (d)	[I] Estimated Total Water Use for LWUP (AFY) I = G × H (e)	[J] Percentage of Land as TGP (%) (g)	[K] Total Area of TGP (ac) K = A × J (c)	[L] Annual Evapo-transpiration Rate for TGP (AFY/ac) (d)	[M] Estimated Total Water Use for TGP (AFY) M = K × L (e)	[O] Percentage of Land as BZP (%) (h)	[P] Total Area of BZP (ac) K = A × J (c)	[Q] Annual Evapo-transpiration Rate for BZP (AFY/ac) (d)	[R] Estimated Total Water Use for BZP (AFY) M = K × L (e)	[S] Estimated Total Outdoor Water Use (ETWU) (AFY) J = E + I + M + R (i)	[T] Maximum Applied Water Allowance (MAWA) (AFY) (j)
Area 6a																			
Parks	4	40%	1.6	5.4	9	50%	2.0	1.9	4	0%	0	4.4	0	--		--	--	12	18
Road Landscaping	21	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	21	4.4	93	--		--	--	93	107
1 Roundabout	1	0%	0.0	5.4	0.0	100%	1.0	1.9	2	0%	0	4.4	0	--		--	--	2	5
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	10	0%	0.0	5.4	0	50%	5.2	1.9	10	25%	3	4.4	11	--		--	--	21	39
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	129	
Area 6b																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping	5	0%	0.0	5.4	0.0	0%	0.0	1.9	0	100%	5	4.4	23	--		--	--	23	26
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	
Area 6c																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Area 6d																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow																			--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Area 6e																			
Parks	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Road Landscaping (m)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
0 Roundabouts	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Windrow	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Irrigated Residential Common Area (k)	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Landscaped I-5 Buffer Zones	--	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--	--	--
Subtotal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	
Estimated Total Outdoor Water Use for Parks																		*347*	
Estimated Total Outdoor Water Use for Irrigated Residential Common Area																		*318*	
Estimated Total Outdoor Water Use for Roadways and Other Non-Residential Landscaped Areas																		*1,547*	
Estimated Total Outdoor Water Use for Community Landscaping																		**2,212**	

Table B-7
Estimated Parks, Road and Common Area Landscaping Water Use Inputs and Calculations
14,000 Residential Unit Alternative Scenario
Grapevine, Kern County, California

Abbreviations:
- "ac" = acre
- "AFY" = acre-feet per year
- "AFY/ac" = acre-feet per year per acre
- "BZP" = buffer zone plantings
- "HWUP" = high water use plantings
- "LWUP" = low water use plantings
- "MAWA" = Maximum Applied Water Allowance
- "TGP" = combination tree and groundcover plantings

Notes:
(a) Landscaping land uses and acres are based on the 8 June 2015 project Land Use Program Summary and modified to add 2,000 additional residential units. Passive open space and unprogrammed land is not included as it will not be irrigated.
(b) High water use plantings include turf grasses.
(c) The area of plantings is the acreage multiplied by the percentage of the land that is covered by that kind of plantings.
(d) The total water application rates for all plantings are estimated in Table 5.
(e) The estimated total water use for each planting type is the area of that planting type multiplied by the annual evapotranspiration rate for that kind of planting.
(f) Low water use plantings include shrubs and native vegetation.
(g) Combination tree and groundcover plantings include trees with full canopy coverage and full coverage of shrubs or low water use groundcover.
(h) Buffer zone plantings include sparsely planted trees and shrubs.
(i) The estimated total outdoor water use is the sum of the estimated total water use for all areas and plantings. The estimated total water outdoor water use must not be greater than the MAWA (see note h). The estimated total water outdoor water use was calculated assuming all regular landscaped area, which accounts for plant type and irrigation efficiency, to estimate water demands. If special landscaped area was accounted for in the estimated total water use calculations according to Reference 1, the estimated total outdoor water use would equal the MAWA regardless of the planting types.
(j) The Maximum Applied Water Allowance ("MAWA") calculations are described in Reference 1. The MAWA was calculated assuming 100% special landscaped area based on use of recycled water in non-residential areas and based on note k for residential areas.
(k) The irrigated residential common area is assumed to be classified as a special landscape area based on use as a recreational area and meeting space per Reference 1.
(l) The golf course is assumed to be a desert style course, which utilizes native vegetation and minimizes the use of turf grass, per verbal communication with staff at Todd Eckenrode Origins Golf Design.
(m) Assumes that there are no roadways in Areas 6c, 6d, and 6e.

Reference:
1 California Code of Regulations, *Title 23, Division 2, Chapter 2.7, Model Water Efficient Landscape Ordinance* , July 9, 2015 Draft.

Table B-8

Summary of Water Treatment and Distribution System Losses
14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Category	Estimated Water Loss (AFY)
Losses at potable water treatment facility (a)	280
Losses at wastewater treatment facility (b)	--
Distribution system losses (associated with indoor water uses) (c)	140
Distribution system losses (associated with outdoor water uses) (d)	234
Total water losses (e)(f)	**653**

Abbreviations:

"AFY" = acre-feet per year

Notes:

(a) Losses at the potable water treatment facility are estimated to be approximately 5% of the indoor and outdoor residential, indoor commercial, indoor institutional, indoor industrial, outdoor school, and outdoor irrigated residential common area uses, plus distribution system losses (see Tables B-1, B-4, B-6, and B-7)

(b) Losses at the wastewater treatment facility are accounted for in the estimates of recycled water production (see Table B-10).

(c) Potable water system distribution system losses are estimated to be 5% of the total potable indoor demand.

(d) Outdoor water system distribution system losses are estimated to be 5% of the sum of the total recycled and non-potable water demand and the potable water demand for outdoor uses (i.e., for residential irrigation).The portion of outdoor water system distribution losses associated with potable water uses is 127 AFY, and the portion associated with non-potable uses is 107 AFY.

(e) Water losses were conservatively estimated for water demand calculations only and should not be used for wastewater treatment design purposes.

(f) Values may not total exactly due to rounding.

Table B-9

Estimated Grapevine Project Annual Water Demand by Planning Area
14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 1			
Residential (a)	546	276	269
Commercial, institutional and industrial (b)	66	48	18
Landscaping (c)	203	-	203
Treatment system losses (d)	34	-	-
Distribution system losses (d)	41	16	25
Area 1 Water Demand	***889***	***340***	***515***
Area 2			
Residential (a)	960	515	444
Commercial, institutional and industrial (b)	333	187	146
Landscaping (c)	495	-	495
Treatment system losses (d)	68	-	-
Distribution system losses (d)	89	35	54
Area 2 Water Demand	***1,945***	***738***	***1,139***
Area 3			
Residential (a)	659	357	302
Commercial, institutional and industrial (b)	317	222	95
Landscaping (c)	354	-	354
Treatment system losses (d)	50	-	-
Distribution system losses (d)	66	29	38
Area 3 Water Demand	***1,446***	***607***	***789***

Table B-9

Estimated Grapevine Project Annual Water Demand by Planning Area
14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 4			
Residential (a)	872	452	420
Commercial, institutional and industrial (b)	65	14	52
Landscaping (c)	733	-	733
Treatment system losses (d)	53	-	-
Distribution system losses (d)	84	23	60
Area 4 Water Demand	***1,807***	***489***	***1,265***
Area 5a			
Residential (a)	758	384	374
Commercial, institutional and industrial (b)	31	6.1	25.3
Landscaping (c)	232	-	232
Treatment system losses (d)	45	-	-
Distribution system losses (d)	51	20	32
Area 5a Water Demand	***1,117***	***410***	***662***
Area 5b			
Residential (a)	14	6.6	7.0
Commercial, institutional and industrial (b)	0	0	0
Landscaping (c)	43	-	43
Treatment system losses (d)	1.4	-	-
Distribution system losses (d)	2.8	0.3	2.5
Area 5b Water Demand	***61***	***6.9***	***53***
Area 6a			
Residential (a)	435	249	186
Commercial, institutional and industrial (b)	180	78	103
Landscaping (c)	129	-	129
Treatment system losses (d)	29	-	-
Distribution system losses (d)	37	16	21
Area 6a Water Demand	***811***	***343***	***438***

Table B-9

Estimated Grapevine Project Annual Water Demand by Planning Area

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 6b			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	15	1	13.8
Landscaping (c)	23	-	23
Treatment system losses (d)	0.1	-	-
Distribution system losses (d)	1.9	0.1	1.8
Area 6b Water Demand	***40***	***1***	***38.6***
Area 6c			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.9	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6c Water Demand	***0.9***	***0.0***	***0.9***
Area 6d			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.8	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6d Water Demand	***0.8***	***0.0***	***0.8***

Table B-9

Estimated Grapevine Project Annual Water Demand by Planning Area

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Phase	Estimated Total Water Demand (AFY)	Estimated Indoor Water Use (AFY)	Estimated Outdoor Water Use (AFY)
Area 6e			
Residential (a)	0	0	0
Commercial, institutional and industrial (b)	0.8	0.0	0.8
Landscaping (c)	0	-	0
Treatment system losses (d)	0.0	-	-
Distribution system losses (d)	0.0	0.0	0
Area 6e Water Demand	***0.8***	***0.0***	***0.8***
Project Annual Water Demand (e)(f)	***8,119***	***2,935***	***4,904***

Abbreviations:

"AFY" = acre-feet per year

Notes:

(a) See Table B-3 for estimated residential water uses.
(b) See Tables B-4 and B-6 for estimated indoor and outdoor water use, respectively, for commercial, institutional, and industrial land uses.
(c) See Table B-7 for estimated parks, roads and common area landscaping water use.
(d) See Table B-8 for water losses associated with the project.
(e) The Project Annual Water Demand is the sum of the estimated water uses for the project, plus the assumed treatment and distribution system losses. The contingency is not included.
(f) Totals may not add exactly due to rounding.

Table B-10

Recycled Water Production and Demand by Planning Area

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 1			
Residential			
Indoor	235	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	41	0	
Outdoor	0	18	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	157	
Subtotal	275	176	100
Area 2			
Residential			
Indoor	438	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	159	0	
Outdoor	0	56	
School Landscaping	0	0	
Parks	0	152	
Road and Other Public Landscaping	0	278	
Subtotal	597	486	111
Area 3			
Residential			
Indoor	303	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	189	0	
Outdoor	0	71	
School Landscaping	0	0	
Parks	0	15	
Road and Other Public Landscaping	0	296	
Subtotal	492	382	110
Area 4			
Residential			
Indoor	384	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	12	0	
Outdoor	0	4	
School Landscaping	0	0	
Parks	0	152	
Road and Other Public Landscaping	0	514	
Subtotal	396	670	-274

Table B-10

Recycled Water Production and Demand by Planning Area

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 5a			
Residential			
Indoor	327	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	5	0	
Outdoor	0	1	
School Landscaping	0	0	
Parks	0	15	
Road and Other Public Landscaping	0	153	
Subtotal	332	170	162
Area 5b			
Residential			
Indoor	6	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	0	0	
Outdoor	0	0	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	30	
Subtotal	6	30	-24
Area 6a			
Residential			
Indoor	212	0	
Outdoor	0	0	
Irrigated Residential Common Area	0	0	
Commercial, Institutional and Industrial			
Indoor	66	0	
Outdoor	0	79	
School Landscaping	0	0	
Parks	0	12	
Road and Other Public Landscaping	0	95	
Subtotal	278	186	92
Area 6b			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	1.0	0	
Outdoor	0	14	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	23	
Subtotal	1.0	37	-36

Table B-10

Recycled Water Production and Demand by Planning Area

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Development Phase	[A] **Recycled Water Produced (AFY)** (a)	[B] **Recycled Water Use (AFY)** (b)	[C] **Surplus or Deficit of Water (AFY)** C = A - B (c)
Area 6c			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.02	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.02	0.8	-0.8
Area 6d			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.01	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.01	0.8	-0.8
Area 6e			
Residential			
Indoor	0	0	
Outdoor	0	0	
Commercial, Institutional and Industrial			
Indoor	0.01	0	
Outdoor	0	0.8	
School Landscaping	0	0	
Parks	0	--	
Road and Other Public Landscaping	0	0	
Subtotal	0.01	0.8	-0.7
Recycled Water Pond Net Evaporation and Rainfall (d)	*-188*	*0*	
Recycled Water Distribution System Loss (5%) (e)	*0*	*107*	
Recycled Water Produced, Used, and Surplus/Deficit (f)	2,188	2,246	-58
Total Supplemental Non-Potable Water Needed			**58**

Table B-10

Recycled Water Production and Demand by Planning Area
14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

Abbreviations:

"AFY" = acre-feet per year
"CII" = Commercial, Institutional and Industrial

Notes:

(a) Production of recycled water is assumed to be 85% of total indoor water use. See Tables B-3 and B-4.
(b) Recycled water is assumed to be used for all CII, park and road landscape irrigation.
(c) A positive number indicates a surplus of recycled water, and a negative number indicates a deficit. Any deficit will be supplemented with filtered non-potable Nickel Water.
(d) Recycled water pond net evaporation and rainfall are calculated as shown in Table B-11.
(e) Recycled water distribution system loss is assumed to be 5% of the total recycled and non-potable water use in each area.
(f) Values may not total exactly due to rounding.
(g) The demands listed above do not include the contingency. See Table B-2.

Table B-11

Recycled Water Storage and Disposal Water Balance (Average-Year Rainfall)

14,000 Residential Unit Alternative Scenario

Grapevine Project, Kern County, California

POND STORAGE NOVEMBER 1 (AF)	0	ASSUMED ACTIVE POND AREA (AC) (a)	45
POND PERCOLATION RATE (IN/DAY)	0	POND CATCHMENT AREA (AC)	45
		NON-POTABLE IRRIGATION AREA (AC) (b)	606
		CALC'D MAX STORAGE VOLUME (AF) (c)	562
		CALC'D MAX STORAGE DEPTH (FT) (d)	12.5
		CALC'D AVG STORAGE DEPTH (FT) (e)	6.3

PARAMETERS/DATA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
RECYCLED WATER FLOW (MGD) (f)	2.15	2.16	2.02	2.01	1.99	2.00	2.07	2.14	2.20	2.26	2.25	2.19	2.12
PRECIPITATION (IN) (g)	0.52	1.15	1.48	1.72	1.93	1.83	1.18	0.47	0.08	0.02	0.05	0.16	10.58
REFERENCE ETo (IN) (h)	4.06	2.01	1.41	1.45	2.22	4.03	5.49	7.63	8.63	9.14	8.55	6.18	60.78
IRRIGATION DEMAND FACTOR (IN) (i)	2.82	1.40	0.98	1.01	1.54	2.81	3.82	5.31	6.00	6.36	5.95	4.30	42.31
POND CALCULATIONS													
BEGINNING POND STORAGE (AF) (j)	0	41	162	302	441	529	562	534	429	281	124	0	--
RECYCLED WATER VOL (AF) (f)	204	199	192	191	171	191	191	204	202	215	215	202	2376
DIRECT PRECIPITATION VOL (AF) (k)	2	4	6	6	7	7	4	2	0	0	0	1	40
POND EVAPORATION VOL (AF) (l)	15	8	5	5	8	15	21	29	32	34	32	23	228
NON-POTABLE IRRIGATION DEMAND (AF) (m)	150	74	52	54	82	149	203	282	318	337	316	228	2246
STORAGE GAIN (AF) (n)	41	121	140	139	88	34	-28	-104	-148	-157	-133	-49	-57
FINAL POND STORAGE (AF) (o)	41	162	302	441	529	562	534	429	281	124	0	0	--
SUPPLEMENTAL IRRIGATION DEMAND (AF) (p)	0	0	0	0	0	0	0	0	0	0	9	49	57

Notes

(a) Assumed active pond area is estimated to maintain a calculated maximum storage depth of approximately 12.5 feet. This area consists of only a portion of the total pond area designed for the 100-year rainfall year (EKI, 2015). It is assumed that the excess pond acreage will only be used during above-average rainfall years.

(b) Non-potable irrigation area is the total landscaped area excluding residential areas and schools.

(c) Calculated maximum storage volume is the largest final pond storage volume from the pond calculations.

(d) Maximum storage depth is the calculated maximum storage volume divided by the active pond area. The calculated maximum storage depth does not include 2 feet for freeboard.

(e) Average storage depth is the average final pond storage volume from the pond calculations divided by the active pond area.

(f) Recycled water flow rate is the average indoor potable water demand less collection system and wastewater treatment losses of 15%. Note that collection system and wastewater treatment losses were not accounted for in the 100-year rainfall water balance in the *Wastewater Facilities Engineering Report* (EKI, 2015) to conservatively size the required total recycled water storage volume.

(g) Average monthly precipitation data were collected from the Western Regional Climate Center (WRCC) for the Bakersfield Airport in Bakersfield, California (1937-2012) and Tejon Rancho, California (1895-1914) and from the CIMIS Station 125 located in Arvin, CA. Precipitation data listed is the inverse-distance weighted monthly averages of the monthly averages for each station based on the distance of each station to the center of the Grapevine Project.

(h) Reference ETo data were obtained from the California Irrigation Management Information Services (CIMIS) station 125 located in Arvin, CA that measured evaporation from pans. Monthly averages were calculated using all available data from this CIMIS station, which has been in operation since 1995.

(i) The irrigation demand factor is the area weighted average irrigation demand factor for each planting type (high water use plantings, low water use plantings, combination trees and ground cover plantings, and buffer zone plantings) for the areas irrigated by non-potable water (all landscaped area except residential areas, parks, and schools). Refer to Table 5.

(j) Beginning pond storage is the final storage from the previous month.

(k) Direct precipitation is the active pond area multiplied by the precipitation.

(l) Pond evaporation is active pond area multiplied by the reference ETo, which is assumed to equal to the pond evaporation rate.

(m) Irrigation demand is the irrigation demand factor multiplied by the irrigation area.

(n) Storage gain is equal to the sum of the beginning pond storage, recycled water volume, and direct precipitation less the sum of the pond evaporation and irrigation demand. A negative storage gain represents a storage loss. The storage gain conservatively accounts for losses due to direct net evaporation when the ponds are empty. Total annual storage loss is approximately 50 AF less if it assumed that there is no net evaporation when the ponds are empty.

(o) Final pond storage is the beginning pond storage plus the storage gain. Final storage is zero when the storage loss is greater than the beginning pond storage.

(p) Irrigation demand includes 5% for distribution system losses. Supplemental irrigation demand is equal to the beginning pond storage less the storage loss (negative storage gain). If the storage loss is less than the beginning pond storage, the supplemental irrigation demand equals zero. It is assumed that the supplemental irrigation demand will be supplied with untreated California Aqueduct water.

Abbreviations

"AC" = acres

"AF" = acre-feet

"ETo" = reference evapotranspiration

"FT" = feet

"IN" = inches

"MGD" = Million Gallons per Day

References

(EKI, 2015) *Wastewater Facilities Engineering Report, Grapevine Project*, Erler & Kalinowski, Inc., October 2015.

ATTACHMENT C

Memorandum: Water and Wastewater Infrastructure for the New Weigh Station

25 November 2014

MEMORANDUM

To: Diana Hurlbert, Tejon Ranch

From: Erler & Kalinowski, Inc. (“EKI”)

Subject: Water and Wastewater Infrustructure for the New Weigh Station (EKI B30043.00)

A California Highway Patrol weigh station (“weigh station”) is currently located south of the California Aqueduct, as shown on Figure 1. A new interchange servicing the Grapevine Project development is planned for the location of the current weigh station. To accommodate the new interchange, a new weigh station will be constructed north of the Tejon Regional Commerce Center (“TRCC”), at the intersection of Interstate 5 and State Route 99 (see Figure 1).

Water use at the weigh station is minimal and primarily associated with lavatory use. Potable water for the weigh station is supplied by Tejon-Castac Water District (“TCWD”) free of charge. Wastewater is conveyed to a septic system and treated onsite. TCWD plans to continue to supply potable water to the new weigh station and wastewater will be treated onsite using a new septic system.

A potable water distribution pipeline, owned and operated by TCWD, currently serves the Tejon Industrial Complex West Wastewater Treatment Facility and Kern County fire station (“fire station”), which are located at the northern portion of the currently developed TRCC area (see Figure 1). This water pipeline is the closest existing potable water supply to the proposed weigh station location, which is located approximately 1.25 miles to the north-northwest. The new weigh station could be served by either a new potable water pipeline extending from the fire station, or by a new groundwater well constructed at the weigh station site.

SOURCES: MCINTOSH 2013; TRC 2013; Public Land Survey

FIGURE 1

Existing and Proposed Weigh Station Locations

GRAPEVINE PROJECT

Appendix D

WASTEWATER TREATMENT FACILITIES ENGINEERING REPORT

GRAPEVINE PROJECT

Prepared for:

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ABBREVIATIONS

ADWF	average dry weather flow
AFY	acre-feet per year
BMP	Best Management Practice
BOD	5-day biochemical oxygen demand
BPTC	Best Practicable Treatment or Control
Btu	British thermal unit
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CIMIS	California Irrigation Management Information System
DAU	Detailed Analysis Unit
DU	dwelling units
EC	electrical conductivity, also called "specific conductance"
Eto	Evapotranspiration
ft	feet
gal	gallon
gpd	gallons per day
HDPE	high density polyethylene
HSC	California Health and Safety Code
hp	horsepower
I-5	Interstate 5
KCEHSD	Kern County Environmental Health Services Department
kW	kilowatt
kW-hr	kilowatt-hours
lb	pounds
m	meter
MBR	membrane bioreactor
Mcf	thousand cubic feet
MCL	Maximum Contaminant Level
MG	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
mm	millimeters
MPN/100 ml	Most Probable Number per 100 milliliters
NA	not applicable
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric turbidity units
in	inches

PVC	polyvinyl chloride
RWQCB	Central Valley Regional Water Quality Control Board
SJVAPCD	San Joaquin Valley Air Pollution Control District
SR 58	State Route 58
SR 99	State Route 99
SR 138	State Route 138
TBD	to be determined
TCWD	Tejon-Castac Water District
TDS	total dissolved solids
TKN	Total Kjeldahl Nitrogen
TRC	Tejon Ranchcorp
TRCC	Tejon Ranch Commerce Center
TSS	Total Suspended Solids
μmhos/cm	micromhos per centimeter
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
UV	ultraviolet
VOC	volatile organic compounds
WAS	waste activated sludge
WDR	Waste Discharge Requirements
WTP	water treatment plant
WWTF	wastewater treatment facility
yr	year

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1.0 SUMMARY OF PROJECT WASTEWATER AND RECYCLED WATER FACILITIES

This Wastewater Treatment Facilities Engineering Report describes the proposed wastewater treatment and recycled water systems for the Grapevine Project (the project), includes a description of the project's anticipated wastewater flows and effluent requirements, and identifies design parameters and facility sizing, layouts and land use.

1.1 Grapevine Project Description

The 8,010-acre project site is located entirely within unincorporated Kern County, just south of the junction of highways Interstate 5 and State Route 99. The majority of the project is on the east side of I-5, with a smaller portion situated on the west side of I-5. The project site is bisected by the California Aqueduct. The project site is situated within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement that will permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as Interstate 5.

The project, which would include 12,000 residential units and 5.1 million square feet of commercial and light industrial land uses[1], is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside these village cores, the project incorporates a mix of residential uses, office, research and development, regional commercial, and light industrial/warehouse uses. The project is divided into a number of planning areas planned to be phased over a period of 19+ years beginning in 2016. Water and sewer service would be provided by the Tejon–Castac Water District (TCWD).

1.2 Project Wastewater and Recycled Water Systems Overview

The project would generate wastewater from residential, commercial, and industrial indoor water uses that would be conveyed by the wastewater collection system to the project's wastewater treatment facilities (WWTFs). The project's WWTFs would produce disinfected recycled water suitable for unrestricted reuse. At project buildout, all recycled water would be used onsite in compliance with the project Waste Discharge Requirements (WDRs). Wastewater treatment facilities would likely be designed and constructed in a modular fashion on an as-needed basis to meet wastewater flow demands.

[1] The project could include up to 2,000 additional residential units, for a maximum of 14,000 units, through a reduction the commercial and light industrial land uses based on vehicle trip equivalency ratios.

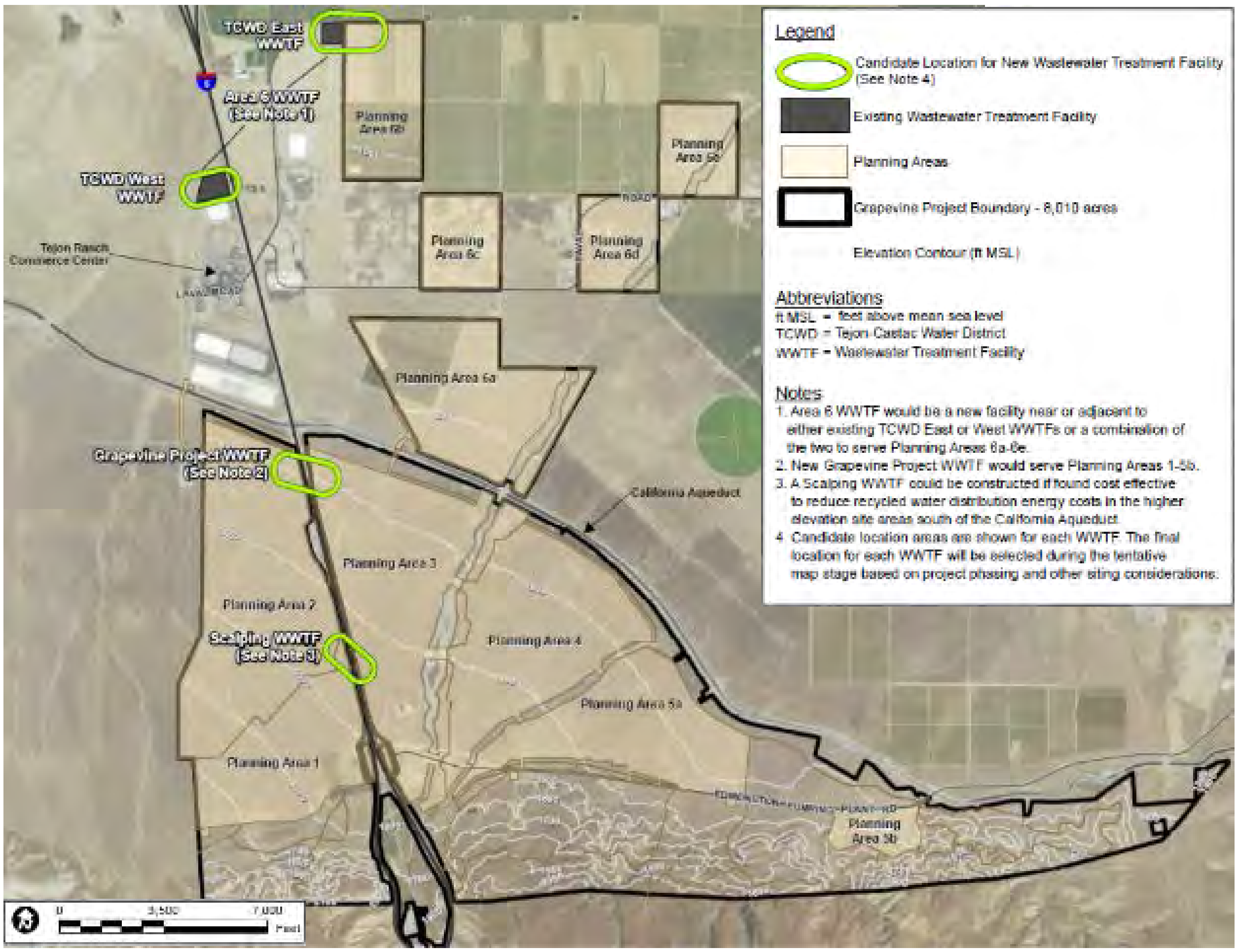
This report assumes that separate wastewater collection and treatment systems would serve the project areas located north and south of the California Aqueduct. Alternatively, a single wastewater collection and treatment system could serve both areas, with a sewer constructed over or under the California Aqueduct to connect the two areas. This potential alternative is discussed below in Section 1.4

North of the Aqueduct, it may be practicable for the project to either temporarily or permanently use available excess capacity at the existing TCWD wastewater treatment facilities that serve the Tejon Ranch Commerce Center (TRCC). South of the Aqueduct, a new primary WWTF and, potentially, a scalping plant would be constructed.

The project's WWTFs will generate dried biosolids, which are assumed to meet Class B biosolids standards for use as soil amendment. Consistent with applicable regulations, dried biosolids would be applied at agronomical rates to land within the project area and/or transported to a licensed solid waste facility for disposal.

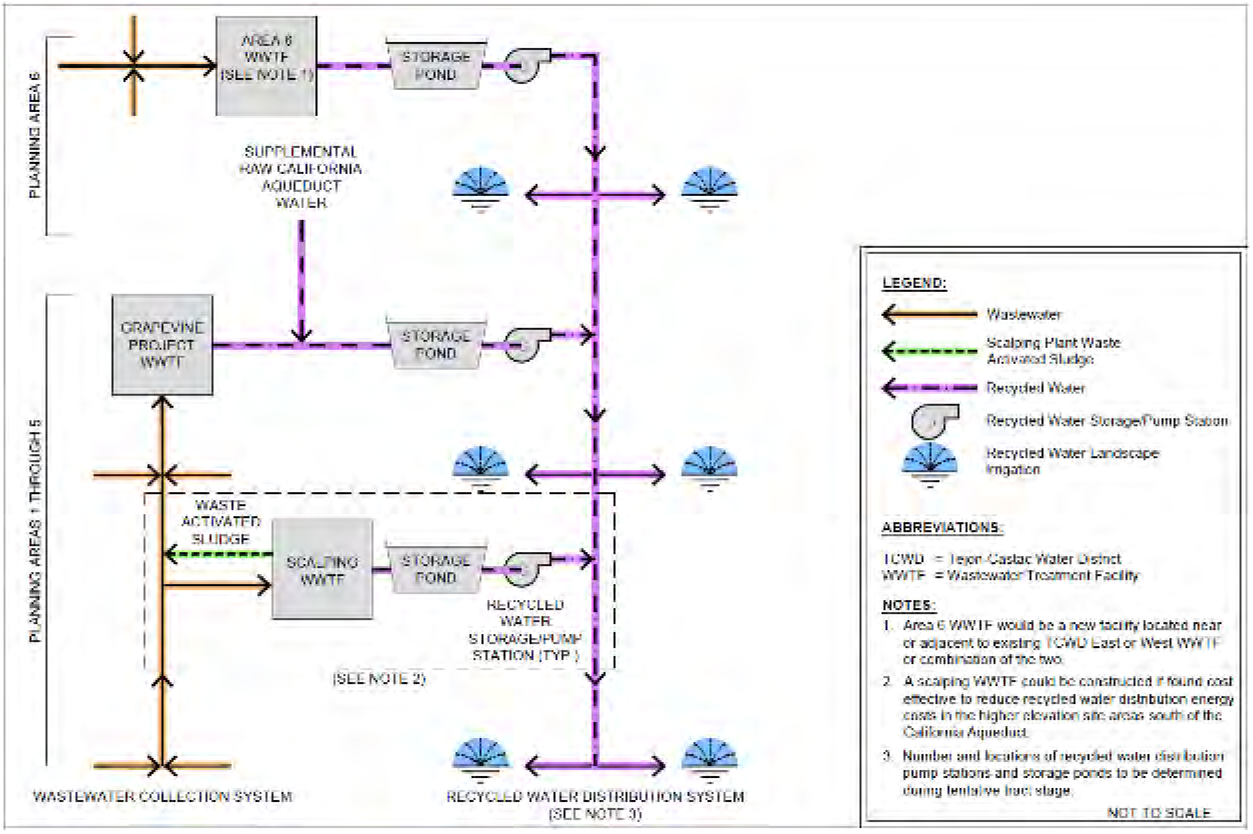
1.3 Wastewater Facility Locations

The figure below shows the planned locations of wastewater treatment facilities that could serve Planning Areas 1 though 5b, located south of the California Aqueduct, and Planning Areas 6a through 6e, located north of the California Aqueduct.



Source: Figure 4

The figure below schematically depicts the planned wastewater collection and recycled water distribution systems at project buildout with separate systems serving the areas north and south of the California Aqueduct.



Source: Figure 5

1.3.1 North of the Aqueduct Wastewater Treatment Facilities – "Area 6 WWTF"

Wastewater generated in project areas 6a through 6e would be conveyed to a new or expanded wastewater treatment facility (i.e., the "Area 6 WWTF") located near or adjacent to either: (1) the TCWD East WWTF, (2) the TCWD West WWTF, or (3) a combination of these two existing facilities that currently serve the TRCC. At build out, the total land area occupied by the Area 6 WWTF would be approximately eight (8) acres.

1.3.2 South of the Aqueduct Wastewater Treatment Facilities – "Grapevine Project WWTF" and "Scalping WWTF"

Up to two (2) new wastewater facilities would be constructed to treat wastewater flows from Planning Areas 1 through 5b. The new "Grapevine Project WWTF" would be the primary wastewater treatment facility serving the south-of-Aqueduct area. A "Scalping WWTF" may also be constructed if such a facility is determined to offer energy cost savings or other benefits related to collecting, treating and distributing recycled water; this evaluation would be conducted during the tentative tract stage. At build out, the land area occupied by these WWTFs would be approximately 20 acres for the Grapevine Project WWTF and two (2) acres for the Scalping WWTF.

1.4 Alternative Wastewater Facility Locations for a Consolidated Wastewater System

As discussed above in Section 1.2, a single, consolidated wastewater collection and treatment system could serve all project areas in lieu of the two separate systems described above. This alternative would involve constructing a sewer over or under the California Aqueduct to connect the planning areas North and South of the Aqueduct. Under this scenario, all the project's wastewater flow would likely be conveyed to the location of the Area 6 WWTF, described in Section 1.3.1. The Area 6 WWTF would be sized to treat all the project wastewater flow. A scalping facility could also be constructed at one of the locations identified south of the California Aqueduct if such a facility is determined to offer energy cost savings or other benefits related to collecting, treating and distributing recycled water. A decision about whether to construct two separate or one consolidated wastewater system would be made during the tentative tract stage.

1.5 Wastewater Treatment Facility Phasing and Interim Facilities

Based on preliminary discussions with TCWD, the project may be able to use all or a portion of the planned and permitted capacity of the TCWD East WWTF on an interim basis during the early development of the project area north of the Aqueduct. Once capacity within the TCWD East WWTF location reaches 75%, the project could construct the Area 6 WWTF adjacent to or near the existing TCWD East or West WWTF footprints.

During the early development of the project area south of the Aqueduct, wastewater flows would be smaller than those required to support the biological processes of a full-scale mechanical facility. Therefore, a potential approach for early-development stages would be to construct an interim, smaller-scale facility that employs conventional pond treatment technologies at the Grapevine Project WWTF location. These lined ponds would be mechanically aerated or would act as facultative treatment ponds. The pond outflow would be filtered, denitrified, and disinfected to meet Title 22 recycled water requirements. When capacity of the interim system reaches 50%, permitting and design would begin for the Grapevine Project WWTF and the lined ponds would be converted to emergency raw wastewater storage.

1.6 Design Basis for Wastewater Treatment Facilities

1.6.1 Facility Flowrates

To preliminarily size the project WWTFs, it was conservatively assumed that all of the project's indoor water use would be collected as wastewater. The project's indoor water use, not including potable water distribution losses, is estimated to be approximately 2,508 acre-feet per year (AFY) at full buildout (EKI, 2015a). The project's water demand estimates also include a contingency (EKI, 2015a). This analysis conservatively assumes that 100% of the contingency would be used to meet additional indoor water demands within the project and contribute to wastewater flows. Therefore, the total annual average wastewater flowrate would be approximately 2,908 AFY or 2.6 million gallons per day (mgd). Approximately 0.5 mgd average dry-weather flow (ADWF) would be treated at the Area 6 WWTF and 2.2 mgd ADWF would be treated at the Grapevine Project and Scalping WWTFs.[2] All project WWTFs would be designed to accommodate peak wastewater flowrates, except for the potential Scalping WWTF, which would only treat the wastewater sidestream needed to meet local recycled water demands.

1.6.2 Wastewater Characteristics and Effluent Quality Goals

All wastewater flows would be subject to tertiary treatment and disinfection suitable for unrestricted reuse as defined in Section 60301.230 of CCR Title 22. All tertiary-treated recycled water would be used in compliance with the project's WDRs that would be issued by the Central Valley Regional Water Quality Control Board (RWQCB) pursuant to the California Water Code (CWC) and consistent with water quality objectives and specific discharge limits established in the Basin Plan (RWQCB 2004) for the White Wolf Subarea of the Tulare Lake Basin, where the project is located.

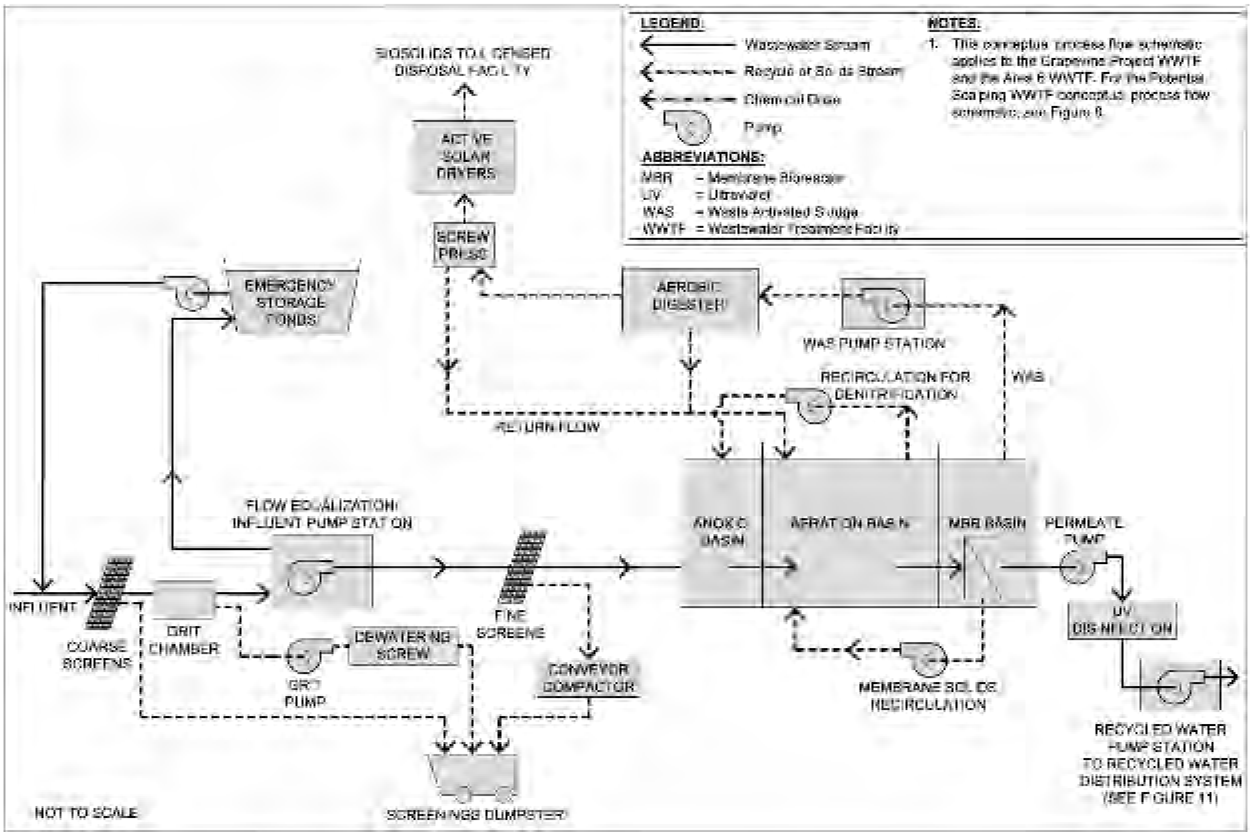
1.7 Treatment Technology

Several wastewater treatment technologies can meet applicable water quality standards for unrestricted recycled water use. The WWTFs could use conventional wastewater treatment, membrane bioreactor (MBR) technology, or an equivalent system. The conceptual wastewater treatment system design assumes that MBR technology would be implemented to treat project raw wastewater. The MBR technology allows wastewater treatment within a compact footprint and simplifies solids management.

The Scalping WWTF, if constructed, would also be an MBR plant or equivalent, but would not include biosolids handling facilities or emergency raw wastewater storage. Biosolids generated at the Scalping WWTF would be pumped into the wastewater collection system for treatment at the new Grapevine Project WWTF and sufficient emergency raw wastewater storage would be located at the Grapevine Project WWTF to meet project needs.

[2] Total ADWF for each WWTF is rounded up to the nearest 0.1 mgd.

The main facility components for the WWTFs using MBR treatment technology are shown in the following conceptual-level process flow schematic.



Source: Figure 7

1.8 Wastewater Collection System

The wastewater collection system, which would generally be constructed within road rights-of-way, would convey wastewater to the WWTFs by gravity sewer or by force main. Raw wastewater pump stations would be constructed when the fall in elevation is insufficient to enable gravity flow or where gravity mains would need to be constructed at impracticably great depths.

To estimate power consumption for wastewater collection, we conservatively assumed that approximately 50% of the total project wastewater ADWF of 2.7 MGD would be pumped at an average total dynamic head of 200 feet of water. Based on the above assumptions, the wastewater collection system's total electrical energy consumption is estimated to be 1.44 million kilowatt-hours per year.

1.9 Recycled Water Storage and Conveyance Facilities

Tertiary treated recycled water generated by the projects WWTFs would supply the project's non-potable water demands in compliance with the WDRs. The supply of recycled water would be supplemented, as needed, with filtered, non-potable Nickel Water from the Aqueduct.

Recycled water storage ponds would be located at several locations on the project site. Total estimated recycled water storage volume, sized to store recycled water generated during the 100-year rainfall year, would be about 950 acre-feet. This volume would require ponds that would be approximately 12.5 feet deep, with a total surface area of approximately 76 acres. A total land area of approximately twice the pond surface area, or about 160 acres, would be needed to accommodate the ponds, berms, access roads, and associated pumping and infrastructure. The ponds would be located throughout the project site at optimized locations considering recycled water storage needs, demand centers, and potential aesthetic benefits.

Pump stations at each of the storage ponds would deliver recycled water and boost system pressure for distribution to higher elevations and for sprinkling. Disinfection booster stations and irrigation disc filters would also be provided at each of the storage ponds.

As with the wastewater collection system, the recycled water distribution system conveyance pipes would typically be constructed within road rights-of-way.

To estimate power consumption for recycled water pumping, we conservatively assumed that the total recycled water volume would equal the total project wastewater ADWF of 2.7 MGD and would be pressurized to an average total dynamic head of 275 feet. Based on the above assumptions, the recycled water distribution system's total electrical energy consumption is estimated to be 3.3 million kilowatt-hours per year.

2.0 INTRODUCTION

2.1 Purpose and Scope

This Wastewater Treatment Facilities Engineering Report describes the proposed wastewater treatment and recycled water reuse systems for the Grapevine Project (the project). This report describes the project's anticipated wastewater flows and effluent requirements, and identifies design parameters, facility sizing, chemical use, electrical use, and facility layouts and land use.

2.2 Grapevine Project Description

2.2.1 Project Location

The Grapevine Project is located in the west-central portion of Tejon Ranch (the Ranch). The approximately 270,000-acre Ranch is currently held in private ownership by Tejon Ranchcorp (TRC). The Ranch includes a large portion of the Tehachapi Mountains as well as smaller portions of the San Joaquin and Antelope Valleys. Generally, the Ranch extends from Interstate 5 (I-5) on the western side to State Route 58 (SR 58) on the northern side and SR 138 on the southern side (Figure 1).

The 8,010-acre Grapevine Project site is entirely within unincorporated Kern County, just south of the junction of I-5 and SR 99. Downtown Bakersfield is approximately 25 miles north of the project. The majority of the project is on the east side of I-5, with a smaller portion situated on the west side of I-5. The project site is bisected by the California Aqueduct (Figure 1 and Figure 2).

The Grapevine Project site lies mainly in the Grapevine and Pastoria Creek U.S. Geological Survey (USGS) 7.5-minute quadrangles. There is one parcel and a portion of two other parcels in the project site that lie entirely within the Mettler USGS 7.5-minute quadrangle. The latitude and longitude of the approximate center of the site is 34°57′9″ N and 118°55′39″ W. The Universal Transverse Mercator (UTM) coordinates for the approximate center are UTM Easting (meters) 323999 and UTM Northing (meters) 3869472 in Zone 11.

2.2.2 Project Overview

The 8,010-acre project site is within the 15,644-acre Grapevine Planning Area identified in the Tejon Ranch Land Use and Conservation Agreement, a landmark agreement reached in 2008 with leading environmental organizations (including the Sierra Club, Natural Resources Defense Council, California Audubon Society, Endangered Habitats League, and Planning and Conservation League) to permanently preserve over 90% of Tejon Ranch as open space and limit development to designated areas near existing infrastructure such as I-5.

The Grapevine Project site includes approximately 8,010 acres, of which approximately 3,232 acres (or about 40%) would be designated for agriculture (with grazing and open space as the predominant land uses) and approximately 4,778 acres (about 60%) would be developed as a new residential community and employment center. The community would leverage and build upon the economic expansion and job growth that has occurred at Tejon Ranch Commerce Center (TRCC; Figure 2), located immediately north of the project on I-5. The Grapevine Project would feature a series of compact neighborhoods linked by bicycle and pedestrian trails that provide convenient access to grocery and drugstores, professional services, schools, and parks. The project site is located along I-5, at the gateway to the Central Valley, adjacent to the extensive open space that was conserved in the Tejon Ranch Land Use and Conservation Agreement.

The project, which would include 12,000 residential units and 5.1 million square feet of commercial and light industrial land uses[3], is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services. Outside the village cores, the Grapevine Project includes a mix of residential uses, office, research and development, regional commercial, freeway-oriented commercial, and light industrial/warehouse uses. Other potential public facilities, including fire stations, a sheriff substation, transit facilities/park-and-rides, and water and wastewater treatment facilities, are proposed throughout the community.

Access to the first phases of the Grapevine community would be from Interstate 5 at the existing Grapevine Road and Laval Road interchanges. During later phases of development, the existing Grapevine Road/ Interstate 5 interchange may be expanded and relocated to the north. To allow for the relocation and replacement of the interchange, an existing Vehicle Enforcement Facility may be relocated to a TRC-owned parcel on the west side of the junction of I-5 and CA-99. The project would also improve an existing TRC agricultural road east of the project area to provide access for truck traffic currently using Edmonston Pumping Plant Road to travel to properties east of the project. The circulation network within the project is composed primarily of two- and four-lane arterials, collector streets, and local streets organized in a grid pattern. All roads within the project site would be public. Multipurpose trails are proposed along Grapevine Creek, Cattle Creek, the southern foothills, and the open space adjacent to the California Aqueduct and at other locations throughout the project site. Some of these trails would connect to on-street, Class 2 bike lanes. Water and sewer service would be provided by the TCWD.

[3] The project could include up to 2,000 additional residential units, for a maximum total of 14,000 units, through a reduction of commercial/industrial square footage based on vehicle trip equivalency ratios.

2.2.3 Project Construction Scenario

As shown on Figure 2, the project site is divided into six planning areas ranging in size from approximately 450 to 1,400 acres. Development would be phased over a period of 19+ years, starting with the development of Planning Area 6a and/or 3and continuing with the balance of the planning areas nearest to the initial phase. Buildout of each phase is projected to take approximately 2 to 4 years (Phase 1: 2 years; Phase 2: 4 years; Phase 3: 3 years; Phase 4: 4 years; Phase 5: 4 years; Phase 6: 2 years), with the first phase commencing in 2016. The portions of the site that are proposed to remain in exclusive agriculture/open space are primarily located along the southern edge of the California Aqueduct, along the southern portion of the project site at the foothills of the Tehachapi Mountains, and along Grapevine and Cattle Creeks.

2.2.4 Project Operation Scenario

The project operations are described in the Grapevine Specific and Special Plan. Land uses associated with operations are described in the Grapevine Special Planning District Plan.

2.3 Project Wastewater and Recycled Water Facilities Overview

The project would generate wastewater from residential, commercial, and industrial indoor water uses. Wastewater would be conveyed by the wastewater collection system to the project's WWTFs. The WWTFs would produce disinfected recycled water such that the effluent would be suitable for unrestricted reuse. Recycled water would be used to meet selected, non-potable water needs throughout the project. The WWTFs would also generate dried biosolids, which are assumed to meet Class B biosolids standards for use as a soil amendment. Consistent with applicable regulations, dried biosolids may be applied at agronomical rates to land within the project area and/or transported to a licensed solid waste facility for disposal.

The wastewater collection system, treatment facilities, and associated recycled water storage and distribution facilities would likely be implemented in phases to meet the wastewater treatment needs of each successive planning area. Separate wastewater treatment collection and treatment systems could serve the areas north and south of the California Aqueduct. Alternatively, a single collection and treatment system could serve both sides. The conceptual wastewater facilities design described herein conservatively assumes that separate systems will serve each side of the California Aqueduct.

It may be practicable north of the Aqueduct to either temporarily or permanently use available excess capacity at the existing TCWD East WWTF. Once capacity within that facility reaches 75%, the project would construct the Area 6 WWTF adjacent to or near the existing facility footprint.

A new Grapevine Project WWTF would be constructed south of the Aqueduct. There is also a possibility of locating a scalping wastewater treatment facility (Scalping WWTF) south of the Aqueduct, if it could offer energy cost savings or other benefits associated with the collection, treatment and distribution of recycled water.

The recycled water systems from each project WWTF would be interconnected to facilitate the distribution of recycled water throughout the project area; therefore, recycled water pipelines would cross over or under the Aqueduct. Recycled water storage ponds and distribution pump stations would be located at several locations on the project site.

The following sections describe the basis for, and elements of, the project's wastewater and recycled water facility design:

- Section 3.0 – Regulatory Setting
- Section 4.0 – Wastewater Treatment Facility Locations and Phasing
- Section 4.0 – Design Basis for Wastewater Treatment Facilities
- Section 6.0 – Description of Wastewater Treatment Facilities
- Section 7.0 – Description of Wastewater Collection System
- Section 8.0 – Description of Recycled Water Use and Facilities

The following sections then present how impacts from the water treatment process and facility would be managed and/or mitigated in the future:

- Section 9.0 – Antidegradation Analysis
- Section 10.0 – Offsite and Cumulative Impacts
- Section 11.0 – Mitigation Measures

3.0 REGULATORY SETTING

Standards for wastewater treatment and recycled water use are based on federal, state, and local statutes, ordinances, and regulations. Table 1 summarizes identified statutes and regulations related to wastewater effluent quality, solids handling, and recycled water use.

3.1 Federal Regulations

3.1.1 Clean Water Act

At the federal level, the United States Environmental Protection Agency (U.S. EPA) promulgates regulations that protect surface waters under the Water Pollution Control Act Amendments of 1972, commonly referred to as the Clean Water Act. These federal regulations, published in the Federal Register and codified in Code of Federal Regulations Title 40, establish wastewater treatment policies, effluent requirements for surface water disposal, and requirements for biosolids management and disposal. Regulations also set forth pretreatment requirements for preventing pollutants from entering publicly owned treatment works at levels that could interfere with treatment operation or solids management.

3.2 State Regulations

3.2.1 Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Control Act (California Water Code Section 13000 et seq.) gives the State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCBs) responsibility for protecting beneficial uses of California's surface water and groundwater. Beneficial uses include domestic, agricultural, recreational, and environmental. Each RWQCB establishes the beneficial uses and water quality objectives and regulates discharges within its jurisdiction. Under the Porter-Cologne Act, parties proposing to discharge wastewaters that could affect waters of the state must file a Report of Waste Discharge with the appropriate regional board. If the proposal is found satisfactory, the RWQCB issues WDRs.

The project is within the Tulare Lake hydrologic region that falls under the jurisdiction of the Central Valley RWQCB. The RWQCB has established qualitative and quantitative standards regarding allowable levels of various constituents, including salts and nutrients, in surface water and groundwater to protect designated beneficial uses within the Tulare Lake basin. These standards are set forth in the “Water Quality Control Plan for the Tulare Lake Basin,” also called the "Basin Plan" (RWQCB 2004). The Basin Plan specifies that wastewater dischargers are to reclaim and reuse wastewater when feasible.

Under the Porter-Cologne Act, the RWQCB issues site-specific WDRs for wastewater treatment facilities to regulate treatment plant operations and treated effluent management. These WDRs describe acceptable effluent quality and quantity, regulate facility operation and future modifications, and establish monitoring and reporting programs. As discussed in Section 3.2.3 below, when administering a recycled water program a wastewater treatment facility may also be eligible to obtain coverage under the SWRCB's General WDRs for Recycled Water Use.

3.2.2 Antidegradation Policy

The SWRCB Resolution No. 68-16, titled "Statement of Policy with Respect to Maintaining High Quality Water of the State" and known as the "Antidegradation Policy," requires that the State's high quality waters be maintained consistent with their beneficial uses and water quality objectives as defined in the Basin Plan. Resolution No. 68-16 prohibits degradation of groundwater by waste discharges unless dischargers meet several conditions. An antidegradation analysis for the proposed Grapevine Project wastewater discharges, required under the Antidegradation Policy, is provided in Section 9.0 below.

3.2.3 Recycled Water Regulations

Chapter 7 of the California Water Code (Section 13500 et seq.), also known as the Water Recycling Law, establishes a statewide goal to encourage wastewater reuse. Such reuse, also called "water recycling," helps to meet the state's water needs. This statute directs the SWRCB, which has primary statewide responsibility for protecting public health, to create water-recycling criteria and to develop reporting and permitting requirements for implementation by the SWRCB and regional boards.

The SWRCB establishes statewide criteria for the production, distribution, and use of recycled water in Title 22 of the California Code of Regulations (CCR), Section 60301 et seq. Title 22 establishes minimum water quality criteria for specific use categories, and sets minimum separation distances between domestic water supply wells and areas irrigated with recycled water. Title 22, Section 60323, requires wastewater recyclers to submit an engineering report to SWRCB detailing the proposed use of recycled water, contingency plans, and safeguards. The SWRCB must approve the Title 22 report before dischargers implement WDRs for recycled water.

In February 2009, the SWRCB adopted its Recycled Water Policy, promulgated by SWRCB Resolution No. 2009-0011. This policy, amended in January 2013 by SWRCB Resolution No. 2013-0003, promotes the use of recycled water and streamlines the regional board permitting process.

In April 2009, the RWQCB adopted Resolution No. R5-2009-0028, titled "In support of Regionalization, Reclamation, Recycling and Conservation for Wastewater Treatment Plants," also known as the "Regionalization Resolution." The Regionalization Resolution encourages water recycling, water conservation, and regionalization of wastewater treatment facilities. It requires dischargers to document efforts to promote wastewater recycling, water conservation, and regional wastewater management.

In June 2014, the SWRCB adopted Water Quality Order 2014-0090, the "General WDRs for Recycled Water Use," also called the "General WDRs." The General WDRs are potentially applicable to the Grapevine Project pending confirmation from the RWQCB, which has discretion over enrolling dischargers under the General WDRs. The General WDRs are intended to streamline the permitting process for recycled water programs compared with a site-specific WDR process. Under the General WDRs, the applicant submits a Notice of Intent with supporting information at least 90 days prior to the project start. The applicant also prepares a Title 22 Engineering Report for the Production, Distribution, and Use of Recycled Water, as is also required for site-specific WDRs.

The General WDRs cover direct beneficial uses of recycled water permitted under Title 22, including landscape irrigation, agricultural irrigation, and certain industrial processes, subject to the listed monitoring requirements. The General WDRs do not cover using recycled water for groundwater recharge or wastewater disposal via injection or percolation; neither recharge, injection, nor percolation are proposed as part of the project.

3.2.4 Biosolids Regulations

Biosolids generated during wastewater treatment are regulated by the state under SWRCB Water Quality Order No. 2004-0012-DWQ, titled the "Final General Waste Discharge Requirements for Land Application of Biosolids for Use as a Soil Amendment in Agricultural, Silvicultural, Horticultural, and Land Reclamation Activities." This order, implemented under the federal biosolids rules set forth in 40 CFR Part 503, applies to all land application of Class A and Class B biosolids as well as “exceptional quality” biosolids-derived mixtures consisting of 50% or more biosolids. The order establishes permitting, monitoring, and reporting requirements. Local ordinances, described below, would also regulate the disposal of biosolids in Kern County.

3.2.5 Emissions Regulations

The San Joaquin Valley Air Pollution Control District (SJVAPCD) would regulate emissions to the atmosphere from the project’s wastewater treatment facilities. Analysis of emissions related to the project’s WWTFs and compliance with SJVAPCD regulations is provided under a separate report.

3.3 Local Regulations

Kern County has issued several local policies and ordinances applicable or potentially applicable to the project's wastewater and water recycling facilities. The Kern County General Plan includes policies related to sewers, wastewater treatment facilities, and recycled water distribution. These polices are set forth in Chapter 1 of the General Plan, titled "Land Use, Open Space, and Conservation Element."

The Kern County Environmental Health Services Department (KCEHSD) promulgates and enforces the "Standards and Rules and Regulations for Land Development—Sewage Disposal, Water Supply, and Preservation of Environmental Health." Under its Land Development program, KCEHSD reviews new and tentative land uses to evaluate the proposed water supply, sewage disposal methods, and environmental mitigation measures.

The Kern County Ordinance Code includes ordinances pertinent to wastewater collection and treatment. Title 14, Utilities, includes codes related to the design, construction, and regulation of sewer systems.

4.0 WASTEWATER TREATMENT FACILITY LOCATIONS AND PHASING

4.1 Existing Wastewater and Recycled Water Infrastructure

Three (3) wastewater facilities are currently in operation within or near the project boundaries. Where practicable, the project would endeavor to use available capacity at existing wastewater treatment facilities, either permanently or temporarily.

The TCWD currently owns and operates the TCWD East WWTF and the TCWD West WWTF. These existing facilities, which serve the TRCC, are located northwest of the project site as shown on Figure 3.

The TCWD East WWTF, located east of I-5, is a MBR treatment plant with a design capacity of 0.1 mgd. The TCWD East WWTF was designed and permitted such that the capacity could be expanded incrementally up to 0.8 mgd. Recycled water produced by the TCWD East WWTF, which meets Title 22 requirements for unrestricted reuse, is supplied to the TRCC for non-potable uses (RWQCB 2011; Black & Veatch 2013).

The TCWD West WWTF, located west of I-5, is permitted for a treatment capacity of 0.1 mgd. Currently, the TCWD West WWTF processes approximately 0.03 MGD of wastewater with a packaged conventional activated sludge treatment system (Black and Veatch 2013). TCWD reportedly intends to replace the TWCD West WWTF with an MBR system to produce recycled water meeting Title 22 effluent requirements for unrestricted reuse (RWQCB 2008; Black and Veatch 2013). The new plant would be located within the existing facility footprint.

A third existing WWTF, the Grapevine WWTF (see Figure 3), is owned and operated by Tejon Ranchcorp to serve the Grapevine commercial area south of the Aqueduct. The existing Grapevine WWTF consists of unlined percolation/evaporation ponds with a total water surface area of up to 6.62 acres. This WWTF, with a permitted treatment capacity of 0.235 mgd, is located within Planning Area 3. As a beneficial project impact, this existing facility and its unlined wastewater ponds would be decommissioned during development. After decommissioning, flows previously conveyed to the existing Grapevine WWTF would be directed to the new Grapevine Project WWTF.

4.2 Planned Grapevine Project Wastewater Treatment Facility Locations

This report assumes that Planning Areas 1 though 5b, located south of the Aqueduct, and Planning Areas 6a through 6e, located north of the Aqueduct, would be served by separate wastewater collection and treatment facilities. However, the project could alternatively construct a single, consolidated wastewater system. This alternative is discussed in Section 4.2.3.

The WWTFs proposed for each project area are described below, with facility locations shown on Figure 4. Figure 5 schematically depicts the project's planned wastewater collection and recycled water distribution systems at buildout. In all cases, treated effluent from the project WWTFs would supply recycled water for use in compliance with the project WDRs, potentially both north and south of the Aqueduct. Pending discussions with the RWQCB, either new WDRs would be obtained, or existing WDRs would be revised to reflect the new project wastewater demands. Alternatively, subject to RWQCB discretion, the project WWTFs could be enrolled under the SWRCB General WDRs.

4.2.1 Wastewater Treatment Facility North of the California Aqueduct (Planning Areas 6a though 6e)

Wastewater generated in Planning Areas 6a through 6e would be conveyed to a new or expanded wastewater treatment facility (i.e., the "Area 6 WWTF") located near or adjacent to either: (1) the existing TCWD East WWTF, (2) the TCWD West WWTF, or (3) a combination of these two WWTFs. Figure 4 shows the location of the existing and planned existing facilities and the Area 6 WWTF is shown schematically on Figure 5. The final Area 6 WWTF location would be determined during the tentative tract stage based on project phasing and other considerations.

4.2.2 Wastewater Treatment Facilities South of the California Aqueduct (Planning Areas 1 through 5b)

As shown on Figure 4 and Figure 5, up to two (2) new wastewater facilities would be constructed to treat wastewater flows from Planning Areas 1 through 5b, located south of the California Aqueduct. These facilities consist of the new "Grapevine Project WWTF", which would be the primary WWTF for the project area south of the Aqueduct, and potentially a smaller facility called the "Scalping WWTF".

As shown on Figure 4, the new Grapevine Project WWTF would be constructed near the northern, lower elevation end of the project area south of the Aqueduct. Because there is an approximately 500-foot elevation difference between the Grapevine Project WWTF and the project's far southern boundary, the Scalping WWTF, if built, would be located at the approximate mid-point of these high and low elevations. The intended function of the Scalping WWTF would be to more energy-efficiently receive and treat the wastewater flows from, and distribute recycled water to, the southern, higher elevation portions of the project.

The final project WWTF locations, and the decision whether or not to incorporate a scalping plant would be determined during the tentative tract stage based on project phasing and other considerations.

4.3 Alternative Wastewater Facility Locations for a Consolidated Wastewater System

As discussed above in Section 4.2, a single, consolidated wastewater collection and treatment system could serve all project areas in lieu of the two separate systems described above. This alternative would involve constructing a sewer over or under the California Aqueduct to connect the planning areas North and South of the California Aqueduct. Under this scenario, all the project's wastewater flow would likely be conveyed to the location of the Area 6 WWTF, described in Section 4.2.1. The Area 6 WWTF would be sized to treat all the project wastewater flow. A scalping facility could also be constructed at one of the locations identified south of the California Aqueduct if such a facility is determined to offer energy cost savings or other benefits related to collecting, treating and distributing recycled water. A decision about whether to construct two separate or one consolidated wastewater system would be made during the tentative tract stage.

4.4 Wastewater Treatment Facility Phasing and Interim Facilities

The proposed approach to WWTF phasing is shown as a flowchart on Figure 6. Based on preliminary discussions with TCWD, the project may be able to use all or a portion of the planned and permitted expanded capacity of the TCWD East WWTF on an interim basis during early phases of development. When about 75% of this available capacity is utilized, permitting and design would begin for constructing the permanent Area 6 WWTF. This new Area 6 WWTF would come online as the existing capacity is utilized by the TRCC. The Area 6 WWTF would then be progressively expanded as needed to meet wastewater treatment needs north of the Aqueduct.

Figure 6 also includes a flowchart depicting a potential approach to phasing wastewater treatment for the project areas located south of the California Aqueduct. During the early development of the area south of the Aqueduct, wastewater flows would be low. A minimum flow is required to support the biological processes of a full-scale mechanical treatment facility (e.g., such as the planned MBR facility). Therefore, a potential approach for early-development stages, prior to construction of the permanent Grapevine Project WWTF, would be to construct an interim, smaller-scale facility employing conventional pond treatment technologies. Under this approach, mechanically-aerated or facultative ponds would be constructed at the future Grapevine Project WWTF location, with a suitable setback from the Aqueduct. These lined ponds would be mechanically aerated or would act as facultative treatment ponds. The pond outflow would be filtered, denitrified if necessary, and disinfected to meet Title 22 recycled water requirements.

The capacity of the interim system would be approximately 200,000 gallons per day. When about 50% of the pond treatment capacity is utilized, as development proceeds in the southern project area, permitting and design would begin for constructing the permanent Grapevine Project WWTF. The lined ponds would be converted to emergency raw wastewater storage. The Grapevine Project WWTF and the emergency raw wastewater storage would be progressively expanded as needed to meet wastewater treatment needs for the project's southern project area. The potential Scalping WWTF could be constructed, if found cost-effective to reduce recycled water distribution energy costs, after the initial phase of the Grapevine Project WWTF is constructed and as development progresses in the higher-elevation site areas south of the Aqueduct.

5.0 DESIGN BASIS FOR WASTEWATER TREATMENT FACILITIES

5.1 Background

The project would generate wastewater from residential, commercial, and industrial indoor water uses. Wastewater would be conveyed by the wastewater collection system to the project's WWTFs. The WWTFs would produce disinfected recycled water as defined in Section 60301.230 of CCR Title 22 such that the effluent would be suitable for unrestricted reuse. At project buildout, all recycled water produced by the WWTFs would be used in compliance with the project's WDRs. Recycled water use criteria are described in the Grapevine Specific and Special Plan.

Wastewater treatment facilities would likely be designed and constructed in a modular fashion on an as-needed basis. During the detailed design stage, sizing would be refined to reflect current demands and flow projections.

5.2 Wastewater Flowrates

To preliminarily size the project wastewater facilities, this analysis assumes that all of the project's indoor water use would be collected as wastewater and flow to the project WWTFs. The project's estimated indoor water use, not including potable water distribution losses, is estimated to be approximately 2,508 AFY at full buildout (EKI 2015a). The project's water demand estimates also include a contingency (EKI 2015a). This analysis conservatively assumes that 100% of the contingency would be indoor water demands and be collected as wastewater flows.[4] The total annual average wastewater flowrate used for facility sizing purposes is approximately 2,908 AFY or 2.6 mgd.

The ADWF of raw wastewater to each project WWTF at buildout, assuming separate north and south collection systems, is preliminarily estimated in the table below.

[4] Future environmental impact review and analysis would be conducted if the uses associated with the contingency generate more wastewater than assumed, requiring material expansion of the project WWTFs, or if significant additional land or more intensive irrigation is needed to dispose of the resulting additional recycled water.

Preliminary Wastewater ADWFs for Project WWTFs

WWTF	Service Area	ADWF (a) (mgd)		
		Planned Indoor Demands	*Assumed Indoor Portion of Contingency*	*Total*
Area 6 WWTF	Planning Areas 6a through 6e (North of the California Aqueduct)	0.3	0.2	0.5
Grapevine Project WWTF	Planning Areas 1 through 5b (South of the California Aqueduct)	2.0	0.2	2.2

Notes:
(a) The total ADWF to each WWTF is rounded up to the nearest 0.1.

The Scalping WWTF, if constructed, is preliminarily designed to treat a wastewater flow of 0.5 mgd based on the projected average annual recycled water demand for the Scalping WWTF's service area (EKI 2015a).[5] Raw wastewater flows exceeding recycled water needs within this service area would bypass the Scalping WWTF and flow directly to the new Grapevine Project WWTF.

All project WWTFs would be designed to accommodate peak wastewater flowrates, except for the potential Scalping WWTF, which would only treat the wastewater sidestream needed to meet local recycled water demands. The designs would also reflect that residential water use is higher during the morning and evening hours, commercial and industrial building water use is typically higher during the day, and indoor water uses are generally higher during the summer.

Table 2 lists the assumed influent wastewater "peaking factors" relative to ADWF based on data from similar communities. On this basis, the capacities of the WWTFs have been preliminarily sized to accommodate a peak month flowrate of 1.3 times ADWF, a peak day flowrate of 1.5 times

[5] In comparison to the potential Scalping WWTF's treatment capacity of 0.5 mgd, the average annual raw wastewater flow estimated to be generated from the Scalping WWTF's upstream collection system area is approximately 0.65 mgd at full project buildout.

ADWF, and a peak hour flowrate of 2.5 times ADWF.[6] Groundwater infiltration and stormwater infiltration/inflow into the wastewater collection system are expected to be negligible given that the collection system will be new and groundwater depths range between 500 and 900 feet below ground surface (RWQCB 2011).

Project buildout would occur over several years, such that construction of each WWTF and related infrastructure would likely be phased to accommodate increases in wastewater flows over time.

5.3 Wastewater Characteristics

Project wastewater flows would be generated by indoor residential, commercial, light industrial, and institutional water use. Table 3 compiles estimated wastewater flows, quality, and mass loadings based on data from similar projects (Eco:LOGIC 2006) and published guidelines (Metcalf & Eddy 2003).

The project's potable water needs would be met by Nickel Water delivered via the California Aqueduct and treated for potable use.[7] The highest reported total dissolved solids (TDS) concentration in Aqueduct water near the project site between January 2010 and October 2013 was 352 milligrams per liter (mg/L) (EKI 2015b). TDS concentrations added by domestic water use have been measured between 150 to 380 mg/L above the source water TDS levels (Metcalf & Eddy 2003). The conceptual WWTF system design for the Grapevine Project assumes that project indoor use could increase TDS to a level as much as 275 mg/L above the source water concentration.[8] This degree of TDS increase to reflects the planned high level of water conservation within the project development, which would increase salt concentrations in the resulting low volume of wastewater. Under these assumptions, the TDS concentration in project wastewater could be as high as 627 mg/L.

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[6] The Scalping WWTF, if constructed, would not be designed to capture and treat peak wastewater flows or to provide flow equalization. For this report, the new Grapevine Project WWTF is assumed to be sized large enough to accommodate the entire peak wastewater flowrate generated in the project areas located south of the California Aqueduct—that is, Planning Areas 1 through 5b.

[7] Tejon Ranchcorp, an affiliate of the Grapevine Project applicant, has the right to receive 6,693 AFY of water from the Kern County Water Agency (KCWA) through at least 2079 as the assignee of a Kern River water transfer agreement between KCWA and the Nickel Family LLC (the "Nickel Water"). The delivery of Nickel Water is 100 percent reliable on a year-to-year basis and is not subject to hydrological variability, regulatory requirements, or supply constraints that may affect other water sources.

[8] A salinity source study for a development built in Lathrop, California, a San Joaquin Valley city, estimated that residential indoor use added approximately 200 mg/L of TDS (EKI 2007).

5.4 Basis for Assumed Effluent Quality Goals

5.4.1 General Effluent Quality Goals

All wastewater flows would be subject to tertiary treatment and disinfection suitable for unrestricted reuse as defined in Section 60301.230 of CCR Title 22. All tertiary-treated recycled water would be used for onsite uses in compliance with recycled water quality standards and monitoring requirements be defined in the project’s WDRs. The effluent standards set in the WDRs would be consistent with water quality objectives and specific discharge limits established in the Basin Plan (RWQCB 2004) for the White Wolf Subarea of the Tulare Lake Basin, where the project is located.

Table 4 summarizes the treated effluent water quality goals assumed to be met at each project WWTF based on applicable regulations and on permits for comparable facilities.

5.4.2 Salt Management Requirements

The Basin Plan establishes several salt management requirements, described in terms of electrical conductivity (EC), a surrogate for salinity, and other parameters.[9] The Basin Plan's salinity requirements include the following:

- The incremental increase in salts from use and treatment must be controlled to the extent possible. The maximum EC of the effluent discharged to land is not to exceed the EC of the source water plus 500 micromhos per centimeter (µmhos/cm).
- In the White Wolf Subarea, discharges to Class I irrigation water[10] are s not to exceed an EC of 1,000 µmhos/cm, a chloride content of 175 mg/L, or a boron content of 1.0 mg/L.
- Discharges to Class II irrigation water are not to exceed an EC of 2,000 µmhos/cm, a chloride content of 350 mg/L, or a boron content of 2.0 mg/L. The Basin Plan specifies that Class II irrigation water have an EC between 1,000 and 3,000 µmhos/cm, chlorides between 175 and 350 mg/L, sodium between 60 and 75 (percent base constituents), and boron between 0.5 and 2.0 mg/L.

Based on available water quality data, underlying groundwater at the project site is considered Class II for EC (RWQCB 2011). The Basin Plan requires that discharges to land in areas overlying Class II or poorer groundwater shall not exceed an EC of 2,000 µmhos/cm.

[9] One mg/L of TDS is approximately equivalent to 1.4 to 1.8 micromhos per centimeter (µmhos/cm) of EC.

[10] For the project case, "irrigation water" pertains to underlying groundwater.

As discussed above in Section 5.3, the salinity concentration added by project domestic use is preliminarily projected to be at or below 275 mg/L TDS, equivalent to about 500 μmhos/cm EC, which would be in general compliance with the Basin Plan objectives. As described in Section 10.0, to limit the salinity addition by indoor uses, the project would implement a pretreatment program for commercial and industrial properties and a salinity education and reduction program for residents. Salt-regenerating water softeners would also be prohibited.

6.0 DESCRIPTION OF THE WASTEWATER TREATMENT FACILITIES

This section provides a conceptual-level description of the major components of the project's planned wastewater treatment facilities, the layout and sizing of the plant areas, projected chemical and electricity uses, and biosolids generation. Section 7.0 describes the wastewater collection system. Section 8.0 describes the recycled water distribution system and storage ponds.

6.1 Wastewater Treatment Technologies

Several existing wastewater treatment technologies can meet applicable water quality standards for unrestricted recycled water use. One option is to implement conventional treatment steps to produce recycled water; this optional approach is discussed below in Section 6.2.10.[11] The conceptual wastewater treatment system design described below assumes that MBR technology (or equivalent) would be implemented to treat project raw wastewater. MBR technology has the following advantages:

- The MBR process allows secondary treatment, secondary sedimentation, and tertiary filtration process to occur simultaneously in the same modular treatment structure and within a smaller footprint.

- While influent screening and grit removal are necessary for both MBR and conventional treatment, primary sedimentation and primary sludge management are typically not required in an MBR facility. Waste activated sludge can typically be managed without a thickening step, requiring only digestion, dewatering, drying, and disposal.

- MBR treatment is typically furnished in modules, such that modules can conveniently be added when wastewater flows increase as the development proceeds.

6.2 Wastewater Treatment Facilities Components and Processes

This section describes the major components and unit processes for the WWTFs using MBR technology. Conceptual-level process flow schematics are shown on Figure 7 for the new Grapevine Project and Area 6 WWTFs and on Figure 8 for the potential Scalping WWTF. The Scalping WWTF would not include solids handling facilities, flow equalization, or emergency raw wastewater storage, as these functions would be handled by the new Grapevine Project WWTF. Preliminary design criteria for each WWTF's main process units are shown in Table 5 with

[11] For wastewater treatment during the earlier development phases south of the California Aqueduct, it may be feasible to implement mechanically-aerated or facultative lined ponds at the new Grapevine Project WWTF location shown on Figure 4. This interim pond treatment approach is described above in Section 4.3 and shown on Figure 6.

redundancy in accordance with regulatory requirements. Peak flow factors appropriate for the project will be discussed with regulatory authorities as part of the detailed design effort.

6.2.1 Headworks

Raw wastewater would first be mechanically screened at the WWTF headworks. Coarse screens, such as a mechanical bar screen, would remove large solids, rags, and debris ahead of the influent pump station. Wastewater pumped from the influent pump station, described below, would pass through fine screens to remove smaller solids that could interfere with downstream MBR processes. Backup screens would be installed for redundancy at each WWTF, except at the Scalping WWTF. If the screens at the Scalping WWTF need servicing, the Scalping WWTF would be taken offline, and wastewater would bypass it and flow to the Grapevine Project WWTF.

The recovered screenings would be washed, compacted, and collected in a dumpster for disposal at a licensed solid waste disposal site. The compactor drainage would be sent back to the influent pump station.

Grit removal chambers may be appropriate downstream of the coarse screens prior to flow equalization and influent pumping to remove entrained sand that can damage pumps and membranes. Grit chambers may be horizontal flow, aerated, or vortex-type units. The grit would be dewatered and collected with the screenings.

Odor control may be implemented at the headworks. Headworks components can be covered so that odorous gases are contained under a negative pressure. If needed, collected odorous gases can be treated using activated carbon, biofilters, or a scrubber.

6.2.2 Influent Pump Stations

The coarse screened and degritted wastewater at each WWTF would be discharged from the influent pump station into the MBR system. The influent pumps would be designed for the peak-month average flowrates, with provision for standby units. The conceptual treatment system designs assume that the influent pump station structures would be below-grade concrete wet wells equipped with submersible sewage pumps. Flows in excess of the influent pump capacity at the Grapevine Project and Area 6 WWTFs would be diverted to the flow equalization basins and returned gradually to the wet well when flows subside. Flows in excess of the Scalping WWTF influent pump capacity would bypass the Scalping WWTF.

6.2.3 Flow Equalization

Flow equalization facilities at the Grapevine Project and Area 6 WWTFs would detain wastewater flows exceeding the design average peak month flowrates. The Scalping WWTF would not include flow equalization, as the Grapevine Project WWTF would manage flows bypassing the Scalping WWTF. Stored equalized wastewater would be discharged at a controlled rate back into the influent pump station when influent flows subside. Flow equalization would reduce variations in wastewater flowrates, benefiting performance and reducing the size of downstream treatment processes.

To preliminarily size flow equalization storage, the conceptual wastewater design assumes a required flow equalization volume of 20% of the peak day flow based on literature values and observation of facilities at similar communities (Veolia & Eco:LOGIC 2005). This equalization volume is equivalent to 300,000 gallons per 1.0 mgd ADWF.[12] Table 5 shows the total active storage required for each WWTF and Figure 9 shows the locations of flow equalization storage in the conceptual wastewater facilities layouts.

6.2.4 Membrane Bioreactor System

An MBR facility typically requires less area than does a conventional activated sludge WWTF and is expandable in modular increments. MBR facilities can typically produce recycled water that meets Title 22 standards for unrestricted use.

The conceptual MBR facility design assumes that ammonia-nitrogen would be removed through a nitrification/denitrification process. Nitrification biologically converts ammonia-nitrogen into nitrite and then nitrate within the MBR system's aerobic basins. Blowers aerate these basins, maintaining appropriate dissolved oxygen concentrations.

Denitrification converts nitrate to inert nitrogen gas in an anoxic (non-oxygenated) microbial process that requires a carbonaceous energy source. Denitrification would occur in the anoxic MBR system's anoxic basin by combining the recirculation from the MBR aerobic basins with the influent wastewater, which provides a carbonaceous energy source. A supplemental energy source, such as methanol, may also be added if needed.

Following nitrification/denitrification, the wastewater would be filtered through the MBR ultrafiltration membrane assemblies. The remaining biological solids would be separated by drawing the treated water through the ultrafiltration membranes by a mild vacuum induced by rotary-lobe blowers. Excess biological material suspended in liquid, called "waste activated sludge" or "WAS," would exit the MBR tank and be routed to the solids handling facilities.

At buildout, each WWTF would include an appropriate number of MBR modules to process peak month flowrates. The conceptual facility design assumes that the MBR modules would have

[12] For 1.0 mgd ADWF, the design peak day flow is 1.5 mgd based on the peaking factor listed in Table 5. Storage volume of 20% of the 1.5 mgd peak day flow is equivalent to 300,000 gallons.

capacities of 0.5 mgd at the new Grapevine Project WWTF and the Scalping WWTF and 0.22 at the Area 6 WWTF. For example, at full build-out the Grapevine Project WWTF would have a projected peak month flowrate of 2.9 MGD. As a result, the conceptual facility design assumes that the Grapevine Project WWTF includes six online 0.5 MGD MBR modules with a total capacity of 3.0 MGD.[13]

6.2.5 Disinfection

Wastewater disinfection is commonly achieved by chlorination or by UV light:

- Chlorination involves sending the MBR effluent through a chamber where chlorine is added at an appropriate concentration and remains in contact for a designated time. Chlorine is often added in the form of liquid sodium hypochlorite.

- The UV disinfection process uses UV light to inactivate microorganisms. Unlike chlorination, UV disinfection does not add any treatment agents or dissolved solids to the effluent and can be accomplished within a smaller physical volume, plus it does not produce undesirable disinfection byproducts. UV disinfection by itself does not provide residual disinfection within the recycled water distribution system, such that secondary disinfection would be needed. The electrical power required is greater for UV than for chlorine disinfection, as electricity powers the UV lamps.

Disinfection would be designed to meet CCR Title 22, Section 60301.230 requirements for recycled water suitable for unrestricted use. The conceptual project design assumes UV disinfection as the primary disinfection process.

Secondary disinfection via chlorination would also be implemented to provide a residual disinfectant level throughout the recycled water distribution to retard regrowth of microorganisms.

6.2.6 Recycled Water Pump Stations

Recycled water would be pumped from the WWTFs to storage facilities, discussed in Section 7.2, to meet project needs. Vertical turbine pumps with variable frequency drives would draw treated recycled water from below-grade concrete wet wells at the WWTFs to provide the pressurization needed for distribution and sprinkling.

[13] As described in Section 5.2, future environmental impact review and analysis would be conducted if the uses associated with the contingency generate more wastewater than assumed, requiring material expansion of the project WWTFs, or if significant additional land or more intensive irrigation is needed to dispose of the resulting additional recycled water.

6.2.7 Biosolids Handling and Disposal

The WAS (waste activated sludge) generated by a MBR process is typically digested, dewatered, and dried before disposal. The MBR process generally produces WAS at a flowrate of approximately 2% of the total influent flow, with a 1% solids concentration.

The WWTF solids handling facilities would stabilize, concentrate, and dry the WAS prior to disposal with the objective of meeting Class B biosolids agricultural soil amendment standards as defined in 40 CFR Parts 501 and 503. Production of Class A biosolids may also be an option, which would minimize the land application and disposal requirements compared to Class B biosolids. The conceptual facility design includes solids handling facilities at the Grapevine Project WWTF and the Area 6 WWTF. The WAS generated at the Scalping WWTF, if constructed, would be directed back to the raw wastewater collection system for treatment at the Grapevine Project WWTF. Biosolids disposal would comply with Kern County, state, and federal requirements.

As shown preliminarily on Figure 7, WAS biosolids would be managed in three steps:

- First, aerobic digesters would stabilize and thicken the WAS, oxidize organic matter, and reduce pathogens. Periodically, the biosolids would be allowed to settle, with the clarified supernatant decanted to increase the solids content in the digester. The supernatant would be returned to the MBR system aeration basin.

- Second, digested biosolids would be pumped to a screw press, chemically conditioned with a polymer, and fed through the press by a rotating screw. Water would drain through perforated screens surrounding the screw as sludge is conveyed through the press. The product from the screw press is a sludge cake that is typically 14% to 25% solids. The drained filtrate would be returned to the MBR system aeration basin.

- In the third step, the sludge cake would be dewatered further using sludge drying beds, heat drying, or active solar dryers. It is assumed that active solar dryers, which typically require less land area than sludge drying beds and lesser energy inputs, would be used for final drying of the biosolids.

Active solar dryers are steel structures with transparent polycarbonate cellular sheets for the walls. Acting similarly to a greenhouse, the active solar dryer maintains a warm environment to promote sludge digestion and drying. Solar dryers often use a mechanical rototill called a “mole” to turn over the sludge to facilitate drying. The active solar dryers are roofed to protect the sludge cake from rain.

Consistent with applicable federal, state, and local regulations discussed above in Section 3.0, biosolids may be applied at agronomical rates to land within the project area or transported for disposal to a licensed solid waste facility.

6.2.8 Emergency Storage Basins

Title 22 CCR, Section 60341 requires that wastewater facilities provide either (1) short-term emergency wastewater retention, under the assumption that all equipment can be replaced within 24 hours, or (2) long-term retention, for 20 days, to allow for extended treatment system outages. The short-term retention option, which requires that backup equipment be pre-located within or near the WWTF, is not commonly implemented except for small facilities.

The conceptual facility design assumes that long-term (20-day) raw wastewater retention would be put in place to meet emergency storage requirements. Emergency storage capacity would be located at the new Grapevine Project WWTF for planning areas south of the Aqueduct and at the Area 6 WWTF for the planning areas north of the Aqueduct. Figure 9 shows the locations of emergency storage ponds in the conceptual WWTF layouts.

Under applicable regulations, the 20-day emergency storage requirement applies to the treatment capacity of any discrete treatment modules or subunits in a WWTF. As shown in Table 5, the Grapevine Project WWTF would include multiple, independent 0.5 MGD treatment modules or trains. The emergency storage requirement would thus be the 0.5 mgd modular capacity multiplied by 20 days, equivalent to an emergency storage capacity of 10 million gallons. Emergency raw wastewater storage at the Grapevine Project WWTF would also serve the Scalping WWTF, which would have the same treatment module size of 0.5 mgd, if constructed.

The Area 6 WWTF would require 4.4 million gallons of emergency storage, calculated as 20 days storage at the 0.22 MGD per-module design flowrate. The conceptual design assumes lined basins would be built to meet these requirements.

6.2.9 Laboratory, Administration, and Maintenance Buildings

Each project WWTF would require support buildings to house the staff, laboratory, and maintenance facilities. One building can house administration functions, including the control room, locker rooms, offices, and a break room, as well as a laboratory to monitor WWTF operations. A maintenance building would store tools and equipment and have space for minor vehicle and equipment repairs. The conceptual design assumes that all administrative and maintenance functions for the project WWTFs would be located at the Grapevine Project WWTF, with smaller support buildings at the other WWTFs.

6.2.10 Potential Application of Conventional Wastewater Treatment Technology

Several existing "conventional" wastewater treatment technologies can also meet applicable water quality standards for unrestricted recycled water use. One option other than MBR technology is to implement conventional treatment steps to produce recycled water. Such a conventional treatment approach could be implemented in lieu of MBR at one or more of the new project WWTFs.

In a typical conventional treatment approach, the first step would be primary treatment to remove most of the suspended solids and a portion of the organic matter through screening or sedimentation. The second step, secondary treatment, reduces suspended solids and biodegradable organic concentrations through biological treatment by activated sludge or aerated biotowers, or through lagoon systems followed by sedimentation.

The final step, tertiary treatment, often includes filtration to remove suspended particulates followed by disinfection with either chlorine or ultraviolet (UV) light. Removal of nitrogen and phosphorous can also be accomplished if needed to meet discharge standards and limit biological regrowth within the recycled water distribution system.

Biosolids handling would include anaerobic or aerobic digestion, dewatering, drying, and disposal via transport to an appropriate landfill or application to land as a soil amendment.

Another potential application of conventional wastewater treatment technologies is as follows. As discussed above in Section 4.3, during the early development phases in the southern project area, wastewater flows would be small, suggesting that a smaller-scale facility employing conventional treatment technologies could provide adequate treatment for some time. Under the potential approach summarized on Figure 6, mechanically-aerated or facultative ponds would be constructed at the new Grapevine Project WWTF location. These lined ponds would be mechanically aerated or would act as facultative treatment ponds. The pond outflow would be filtered, denitrified if necessary, and disinfected to meet Title 22 recycled water requirements. As wastewater flows increase during project development, these ponds could be converted to emergency raw wastewater storage ponds, with wastewater treatment needs taken over by new MBR or conventional treatment equipment.

6.3 Site Work

Figure 9 illustrates conceptual layouts for the Grapevine Project, Scalping, and Area 6 WWTFs.

The new Grapevine Project WWTF would occupy approximately 20 acres, constructed where shown on Figure 4 to enable a buffer of approximately 600 feet between the WWTF and the California Aqueduct.

The conceptual layout of the Scalping WWTF, if built, would cover about 2 acres located where shown on Figure 4. The Area 6 WWTF[14], located either in the existing TCWD West WWTF footprint or adjacent to the existing TCWD East WWTF, would occupy approximately 8 acres.[15] Facilities would be visually compatible with nearby buildings.

Recycled water storage ponds and distribution pump stations, discussed in Section 8.0, would be distributed throughout the site and are not included in the conceptual WWTF layouts. The required recycled water storage volume and land requirements are discussed in Section 8.2.2.

6.4 Wastewater Facility Chemical and Energy Use and Biosolids Production

6.4.1 Chemical, Electrical, and Natural Gas Consumption

Chemicals anticipated for WWTF operations are compiled in Table 6. Chemicals would be delivered about every two weeks to two months.

Table 7 estimates electricity and natural gas use for each WWTF. Natural gas would be used for building hot water heating and space heating. Table 7 estimates energy consumption for the wastewater collection, treatment, and recycled water distribution systems.

6.4.2 Biosolids Production

This report assume that 2% of the influent flow would be generated from the MBR system as WAS, equivalent to 20,000 gallons per day (gpd) per 1.0 mgd of influent flow. Based on comparable projects, the conceptual facility design assumes a mixed liquor suspended solids concentration of 12,000 mg/L for the MBR aerobic basin's activated sludge and a 75% solids concentration in the dried biosolids produced by the active solar dryers. On this basis, approximately 1.3 tons of Class B biosolids would be produced daily per 1.0 mgd treated, or about 3.5 tons per day at full buildout.

[14] The acreage listed for the Area 6 WWTF represents the area required for treating Planning Areas 6a through 6e wastewater flows and does not include the acreage of existing TCWD facilities.

[15] Additional analysis would be conducted if significant expansion of the wastewater treatment facilities would be needed to treat the increased wastewater volume due to unanticipated uses of the contingency.

7.0 DESCRIPTION OF WASTEWATER COLLECTION SYSTEM

This section describes the project's wastewater collection system, shown schematically on Figure 5.

7.1 Collection System

The collection system would convey wastewater to the WWTFs mainly via gravity sewers designed for peak flows in accordance with the Kern County Development Standards and Ordinance Code. Sewers would be constructed within the project's streets with appropriate clearance from other utilities. Manholes would be placed at sewer main intersections and other appropriate locations as required by county standards. The conceptual-level collection system framework is shown on Figure 10.

7.2 Wastewater Pump Stations and Force Mains

Gravity sewers would be supplemented by wastewater pump stations and force mains. Wastewater pump stations could be appropriate where the fall in elevation is insufficient to allow gravity flow or where gravity mains would need to be constructed at impracticably great depths to maintain gravity flow. Pump stations would be designed for peak flow conditions, using submersible centrifugal sewage pumps installed within a wet well. The pumps would convey the wastewater in a pressurized force main to a downstream gravity sewer line or directly to the WWTF.

If the project constructs a single, consolidated wastewater collection system in lieu of separate north and south collection system, as discussed in Section 4.3, a force main would be constructed over or under the California Aqueduct to connect the service areas on either side of the Aqueduct.

7.3 Site Work

The wastewater collection system would largely be constructed within the project's streets as shown on Figure 10. Where crossings under I-5 or the California Aqueduct are needed, the sewer would be installed by trenchless construction methods and contained within a casing pipe in accordance with California Department of Transportation and California Department of Water Resources requirements, respectively.

7.4 Electrical Consumption

Table 7 estimates electricity use by the wastewater collection, treatment, and recycled water systems. To estimate power consumption for wastewater collection, we conservatively assumed that approximately 50% of the total project wastewater ADWF of 2.7 MGD would be pumped at an average total dynamic head of 200 feet of water.

8.0 DESCRIPTION OF RECYCLED WATER USE AND FACILITIES

This section describes the project's tertiary-treated recycled water distribution system and recycled water use. The recycled water distribution system is shown schematically on Figure 5 and Figure 11.

8.1 Recycled Water Use

Tertiary treated recycled water would furnish non-potable water needs in compliance with the project WDRs. Application of recycled water for irrigation purposes would not exceed reasonable agronomic demand. Recycled water would be supplemented as needed with filtered, non-potable Nickel Water to meet demands (EKI 2015a).

8.2 Recycled Water Facilities

8.2.1 Distribution System

Recycled water from the WWTFs would be distributed within a separate piping system for use throughout the site. Piping would be polyvinyl chloride (PVC) or high-density polyethylene (HDPE) or similar non-corroding material, colored purple to help prevent cross-connections. All pipelines would be installed with appropriate clearance from other utilities. The conceptual-level distribution system framework is shown on Figure 10.

8.2.2 Storage Ponds

Storage ponds for recycled water would be located at several project site locations. The storage ponds would be necessary in most years to store recycled water during the rainy season, when less recycled water would be needed.

Regulations require that storage ponds provide adequate storage capacity during a high-rainfall year with 100-year return frequency, plus two feet of freeboard. Table 8 presents a preliminary water balance developed to estimate the recycled water storage volume required during a 100-year rainfall year for managing the anticipated total recycled water flow at buildout. This balance further assumes no loss of recycled water during collection, treatment, and distribution in order to conservatively size the recycled water storage ponds. The conservative storage sizing approach of Table 8 is different from that used in the Grapevine Project water demand report (EKI 2015a), which incorporates losses and assumes an average year rainfall, and not a high-rainfall year, to conservatively estimate recycled water availability in average rainfall years.

As shown in Table 8, the total estimated recycled water storage volume is approximately 950 acre-feet, requiring approximately 76 acres of ponds at an assumed maximum water depth of 12.5 feet, not counting the two feet of freeboard. The total storage volume would likely be distributed in several ponds throughout the project site. As discussed below in Section 8.2.5, a total land area of approximately twice the pond surface area, or about 160 acres, would be required to accommodate the storage ponds, sloped berms, distribution pump stations, access roads, fencing, and related infrastructure.

Table 8 also demonstrates that during the 100-year rainfall-year a volume of recycled water remains in storage at the end of the year without additional demands for recycled water. During wet years excess recycled water would be used for crop irrigation or other non-potable uses, the location of which will be identified during the tentative map phase.

8.2.3 Distribution System Pump Stations

Pumping stations would deliver water from the storage ponds and boost system pressure for distribution to higher elevations. A typical recycled water distribution system is shown schematically on Figure 11.

8.2.4 Disinfection Booster Station and Disc Filters

Disinfection booster stations located at the storage ponds would maintain residual disinfectant concentrations to retard regrowth of microorganisms in the recycled water storage and distribution system. Disinfectant would be added as needed to recycled water as it is pumped into or out from each storage pond. It is assumed that sodium hypochlorite would be applied as the disinfectant to maintain a chlorine residual in the distribution system on the order of 1 to 3 mg/L[16], consistent with current guidance documents (WateReuse 2010).

Irrigation disc filters would also be included at the storage ponds to remove any sediment or debris from the recycled water before it reenters the distribution system.

8.2.5 Site Work

The recycled water distribution system conveyance pipes would typically be constructed within road rights-of-way as shown on Figure 10. Where recycled water pipeline crossings under I-5 are required, the pipe would be installed by trenchless construction methods in accordance with California Department of Transportation standards.

We assume that recycled water pipeline crossings over or under the California Aqueduct would be acceptable and suitable to obtain necessary permits and encroachments. Buried crossings would

[16] The sodium hypochlorite dose necessary to maintain this chlorine residual will increase TDS in the recycled water by approximately 1%, given that the recycled water has been denitrified and filtered.

be accomplished using horizontal directional drilling or other trenchless techniques. Such crossings could be needed to enable the recycled water supply to be balanced with project site demands, which in some cases could be situated on the opposite side of the Aqueduct.

8.2.6 Electrical Consumption

Table 7 estimates electricity use for the recycled water distribution system. To estimate power consumption for recycled water pumping, we conservatively assumed that the total recycled water volume would equal the total project wastewater ADWF of 2.7 MGD and would be pressurized to an average total dynamic head of 275 feet.

9.0 ANTIDEGRADATION ANALYSIS

As discussed in Section 3.2.2, the SWRCB Antidegradation Policy requires that high quality waters of the California be maintained "consistent with the maximum benefit to the people of the State." Resolution No. 68-16 prohibits degradation of groundwater by waste discharges unless it has been shown that:

- The degradation does not result in water quality poorer than that prescribed in state and regional policies, including violation of one or more water quality objectives;
- The degradation will not unreasonably affect present and anticipated future beneficial uses;
- The discharger employs BPTC (Best Practicable Treatment or Control) to mitigate degradation; and
- The degradation is consistent with the maximum benefit to the people of California.

9.1 Basin Plan, Beneficial Uses, and Water Quality Objectives

The Basin Plan designates beneficial uses and establishes narrative and numerical water quality objectives for all waters of the Basin. The WWTFs and the recycled water use areas are in Detailed Analysis Units (DAUs) No. 258 and No. 261, within the Kern County Basin hydrologic unit. The Basin Plan identifies the beneficial uses of groundwater in both DAUs as municipal and domestic supply, agricultural supply, and industrial service supply. The Basin Plan also identifies DAU No. 258 as having industrial process supply beneficial uses.

The Basin Plan requires that analyte concentrations in waters designated as domestic or municipal supply comply with the maximum contaminant levels (MCLs) specified in CCR Title 22. The Basin Plan also establishes narrative water quality objectives for chemical constituents, taste and odors, and toxicity, and includes salt management requirements. Salt management requirements are described above in Section 5.4.2.

9.2 Antidegradation Analysis

Salts and nutrients are the constituents of concern in project WWTF effluent that have the potential to degrade groundwater quality. At the same time, application of the treated effluent generated at the Grapevine Project WWTFs for WDR-compliant uses such as non-residential irrigation would not unreasonably affect present and anticipated future beneficial uses of groundwater, for these reasons:

a. For salts, as described above in Section 5.4.2, the Basin Plan specifies that the incremental EC of a discharge cannot exceed the EC of the source water plus 500 µmhos/cm. The Basin Plan considers groundwater in the White Wolf Subarea of the Tulare Lake Basin to be Class II irrigation waters, and discharges to the White Wolf Subarea cannot exceed an EC limit of 2,000 µmhos/cm (see Section 5.4.2).

   The measured maximum EC of source water was 630 µmhos/cm between 2010 and 2013 (EKI 2015b). Based on the assumption that the EC addition from domestic use is 500 µmhos/cm or less (see Section 5.3), the EC in WWTF effluent would be no higher than 1,130 µmhos/cm, which meets both the Basin Plan limit for EC of source water plus 500 µmhos/cm and the Basin Plan discharge limit for EC of 2,000 µmhos/cm in the White Wolf Subarea. Underlying groundwater has an EC that ranges from 1,500 µmhos/cm to 2,300 µmhos/cm. Therefore, the EC of the WWTF effluent would meet the water quality objectives for the White Wolf Subarea and the EC of underlying groundwater.

b. Nitrogenous nutrients in water can be assessed as total nitrogen, which can be defined as the sum of nitrate, nitrite, organic nitrogen, and ammonium (all expressed as nitrogen). The project WWTFs would be designed to remove total nitrogen to an effluent limit of 10 mg/L or less. Irrigation with recycled water produced by the project WWTFs that applies residual total nitrogen at agronomic rates would reduce the likelihood of groundwater impacts by applied nitrogen.

c. Monitoring specified by WDRs would verify that recycled water use does not violate water quality objectives or impair beneficial uses.

As described above in Section 3.2.3, the SWRCB concludes in its General WDRs that recycled water used for irrigation and applied at agronomic rates complies with the Antidegradation Policy. The General WDRs find that use of recycled water in place of raw or potable water supplies for non-potable uses such as irrigation improves water supply availability and helps allocate higher quality water for human uses and for fish and wildlife. The SWRCB establishes that the limited degradation of groundwater that may occur due to recycling is in accord with the principle of providing maximum benefit to the people of California.

With respect to the Grapevine Project, it is anticipated that approximately 8,700 new jobs (Stanley R. Homan Assoc. 2015) and 12,000 new housing units would be created at full project buildout. The project would also support the local economy by purchasing construction materials from local merchants and by hiring local contractors. As such, the economic benefits associated with the development of the Grapevine Project, and the associated use of recycled water, is of maximum benefit to the people of California, provided water quality objectives are met and beneficial uses are preserved.

9.3 Treatment and Control Practices

The project WWTFs would provide treatment and control of the wastewater effluent discharge that features the following:

- Nitrate reduction to less than the MCL of 10 mg/L (as nitrogen);
- Total coliform treatment at most times to less than 2.2 most probable number per 100 mL;
- UV disinfection;
- Application of recycled water at rates that would not exceed agronomic demand in areas where recycled water would be used for irrigation;
- Sludge handling and hauling off-site or use as soil amendment onsite;
- Certified operators experienced with operation and maintenance;
- Source water and discharge monitoring; and
- Salinity control.

Employment of these measures represents Best Practicable Treatment or Control.

10.0 OFFSITE AND CUMULATIVE IMPACTS

This section describes the offsite and cumulative impacts of the project as they relate to wastewater treatment.

10.1 Offsite Impacts

The offsite land uses that have been identified for this project include:

- Connector and Haul Roads
- California Highway Patrol Weigh Station
- California Aqueduct Turnouts
- Expansion of the TRCC East or West Wastewater Treatment Plants
- Interchange (over I-5)

The only offsite land uses related to wastewater treatment are the interim use of TRCC East WWTF and the potential expansion of the TRCC East WWTF or replacement of the TRCC West WWTF to treat all project wastewater flows generated in Planning Areas 6a through 6e north of the California Aqueduct. Potential impacts from interim use and expansion or replacement of existing WWTFs are discussed in Section 4.3 and Section 6.2.

10.2 Cumulative Impacts

10.2.1 North of the California Aqueduct.

Wastewater generated in project areas 6a through 6e would be conveyed to a new or expanded wastewater treatment facility (i.e., the "Area 6 WWTF") located near or adjacent to either: (1) the TCWD East WWTF, (2) the TCWD West WWTF, or (3) a combination of these two existing facilities that currently serve the TRCC.

Based on preliminary discussions with TCWD, the project may be able to use all or a portion of the planned and permitted expanded capacity of the TCWD East WWTF on an interim basis during early phases of development. Once capacity within the TCWD East WWTF location reaches 75%, the project could construct the Area 6 WWTF adjacent to or near the existing TCWD East WWTF footprint or within or near the existing TCWD West WWTF footprint to serve Planning Areas 6a through 6e.

10.2.2 South of the California Aqueduct.

As a beneficial project impact, the existing Grapevine WWTF and its unlined wastewater ponds (discussed in Section 4.1) would be decommissioned during project development. The project would construct new facilities for collecting and treating all project wastewater generated south of the Aqueduct. Since new facilities would be constructed solely for use by the project, no other cumulative impacts related to wastewater treatment are noted in this report.

11.0 MITIGATION MEASURES

Mitigation measures are steps taken to reduce an environmental impact caused by the project. Impacts due to land use and facility emissions of greenhouse gas and other air pollutants are being mitigated on a project-wide basis and are not addressed in this report. Facility operations, including plant maintenance and chemical handling, would be performed in general accordance with applicable laws and regulations, and therefore do not require mitigation. Implementation of the following mitigation measures would promote wastewater treatment capacity sufficient to meet the wastewater production and recycled water demands of specific development projects proposed within the project, and promote facility management to reduce the environmental impact.

- **Mitigation Measure #1: Wastewater Service Agreement.** Prior to approval of each tentative tract map or development of any commercial or industrial site, the applicant will provide a will-serve letter for wastewater service from the TCWD, which will operate the project WWTFs.

- **Mitigation Measure #2**: **Treatment of Contingency.** An independent environmental impact review and analysis would be conducted if significant expansion of a project WWTF is needed to treat additional wastewater associated with greater use than assumed of the demand contingency.

- **Mitigation Measure #3: Biosolids Disposal and Handling**. Prior to issuance of building permits for the first residence or for commercial or industrial development, the applicant will provide written verification of an agreement with the TCWD for the method of managing and disposing of the project-generated biosolids.

- **Mitigation Measure #4: Wastewater Pretreatment Program.** Prior to issuance of building permits for commercial or industrial development, the applicant will provide written verification of an agreement with the TCWD for a pretreatment program that establishes wastewater pretreatment standards for commercial and industrial properties under Code of Federal Regulations Title 40, Part 403.

- **Mitigation Measure #5: Vector Control.** The wastewater treatment facility operator will implement appropriate Best Management Practices (BMPs) for control of vectors such as mosquitos, rodents, and flies at the WWTFs and recycled water storage ponds.

  The BMPs will include:
  - Elimination of stagnant water;
  - Removal of emergent vegetation from edges of recycled water ponds;
  - Promotion of circulation within all recycled water ponds; and
  - Adequate stabilization of biosolids.

- **Mitigation Measure #6: Best Practicable Treatment or Control (BPTC).** The wastewater treatment facility operator will ensure that the Grapevine Project wastewater treatment facilities employ BPTCs to control degradation of groundwater. BPTCs would include nitrate reduction, UV disinfection to Title 22 standards, application of recycled water at rates not in excess of reasonable agronomic demand in areas where the project uses recycled water for non-residential irrigation, sludge handing and hauling off-site, certified operators, source water and discharge monitoring, and salinity management.

- **Mitigation Measure #7: Salinity Education and Management Program.** Prior to issuance of building permits for the first residence or for commercial or industrial development, the applicant will provide written verification of an agreement with the TCWD to implement a salinity education and management program discouraging or prohibiting the use of products that may increase salinity in wastewater, such as self-regenerative water softeners and high-salts-containing cleaning products.

- **Mitigation Measure #8: Odor Control.** Prior to issuance of building permits for the first residence or for commercial or industrial development, the applicant will provide written verification of an agreement with the TCWD for the method of odor control at the wastewater treatment facilities.

12.0 REFERENCES

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Table 1
Recycled Water and Wastewater Treatment Statutes and Regulations
Grapevine Project, Kern County, California

Regulation	Citation	Description	Implementing Agency	Applicability to Project
Federal Regulations				
Clean Water Act				
Regulations pertaining to the National Pollutant Discharge Elimination System	40 CFR Parts 122 - 125; 40 CFR Parts 129 - 136	• Defines regulations pertaining to the National Pollutant Discharge Elimination System ("NPDES") • Establishes effluent and water quality standards	SWRCB/ RWQCB	• Not applicable to discharge standards for the Grapevine Project wastewater treatment facility because only pertains to surface water discharges and not to discharge by land application.
General Provisions and General Pretreatment	40 CFR Parts 401 and 403	• Describe requirements for controlling pollutants entering publicly owned treatment works that could interfere with operation, treatment, or sludge disposal	SWRCB/ RWQCB	• Applicable to the Grapevine Project wastewater treatment facility operations • Requirements will be incorporated by reference into WDRs
Regulations pertaining to biosolids	40 CFR Parts 501 and 503	• Describes sludge management programs for states • Sets requirements for the disposal or use of biosolids	SWRCB/ RWQCB	• Applicable to disposal of biosolids from the Grapevine Project wastewater treatment facility • Requirements will be incorporated by reference into WDRs
California Statutes and Regulations				
Porter-Cologne Act				
Waste Discharge Requirements	California Water Code Section 13000 et seq.	• Regulates land disposal of treated effluent • Sets limits on effluent quality and quantity • Establishes monitoring and reporting program • Regulates operation and future modifications	RWQCB	• Applicable to Grapevine Project wastewater treatment facilities operation and discharge standards
Basin Plan	Water Quality Control Plan for the Tulare Lake Basin	• Establishes overall management guidelines for groundwater and surface water in the Tulare Lake Basin	RWQCB	• Applicable to the Grapevine Project wastewater treatment facility effluent quality for reuse as irrigation water • Requirements will be incorporated into WDRs
Antidegradation Policy				
Antidegradation Policy	SWRCB Resolution No. 68-16	• Protects water bodies where existing quality is higher than necessary for the protection of beneficial uses • Requires preparation of an antidegradation analysis for wastewater discharges	RWQCB	• Applicable to the permitting for the Grapevine Project wastewater treatment facilities
California Recycled Water-Related Statues, Regulations, Policies, and General Permit				
Water Recycling Law	California Water Code Section 13500 et seq.	• Establishes statewide goal to encourage use of recycled water • Directs SWRCB to develop water-recycling criteria	SWRCB/ RWQCB	• Applicable to recycled water use at the Grapevine Project
Environmental Health - Drinking Water	HSC 116551	• Mandates that recycled water cannot be used directly as a drinking water supply	SWRCB	• Applicable to recycled water use at the Grapevine Project
Environmental Health - Water Recycling Criteria	22 CCR § 60001 - 60357	• Regulations related to production and use of recycled water	SWRCB/ RWQCB	• Applicable to treatment standards for the Grapevine Project wastewater treatment facilities
Public Health, Sanitation - Drinking Water Supplies	17 CCR § 7583 - 7630	• Regulations pertaining to backflow prevention requirements for public water supplies	SWRCB/ RWQCB	• Applicable to backflow prevention for the potable water system • Requirements will be incorporated by reference into WDRs
In Support of Regionalization, Reclamation, Recycling and Conservation for Wastewater Treatment Plants	RWQCB Resolution No. R5-2009-0028	• Policies promoting water recycling, water conservation, and regionalization of wastewater treatment facilities • Requires dischargers to document efforts to expand water recycling, water conservation, and regional management.	RWQCB	• Applicable to the permitting for the Grapevine Project wastewater treatment facilities

Table 1
Recycled Water and Wastewater Treatment Statutes and Regulations
Grapevine Project, Kern County, California

Regulation	Citation	Description	Implementing Agency	Applicability to Project
California Statutes and Regulations (Continued)				
California Recycled Water-Related Statues, Regulations, Policies, and General Permit (Continued)				
Recycled Water Policy	SWRCB Resolutions and Nos. 2009-011 & 2013-003	• Policies promoting the increased use of recycled water from municipal wastewater sources • Provides permitting criteria intended to streamline recycled water project permitting process by RWQCB	SWRCB/ RWQCB	• Applicable to the permitting for the Grapevine Project wastewater treatment facilities
General WDRs for Recycled Water Use	SWRCB Water Quality Order 2014-0090	• General Permit for eligible wastewater treatment facilities that use recycled water in accordance with Title 22. • Issued by SWRCB to streamline recycled water permitting process	SWRCB	• Potentially applicable to the permitting for the Grapevine Project wastewater treatment facilities
Biosolids General Order				
Land Application of Biosolids	SWRCB Order No. 2004-10-DWQ	• General Order for land application of biosolids from Municipal Wastewater Treatment Plants, in compliance with 40 CFR Part 503.	RWQCB	• Applicable to criteria for the land application of biosolids • Requirements will be incorporated by reference into WDRs
California Clean Air Act, as amended				
Ambient Air Quality Requirements	SJVAPCD Regulations	• Requires permitting for wastewater treatment facilities, including analysis of air contaminant discharges	SJVAPCD	• Applicable to the Grapevine wastewater treatment facilities
Local Ordinances and Regulations				
Kern County General Plan				
Land use, Open Space, and Conservation Element	General Plan, Chapter 1	• Policies related to sewers, wastewater treatment facilities, and recycled water distribution	Kern County	• Applicable to the Grapevine Project's wastewater and recycled water facilities
Kern County Development Standards				
Standards and Rules and Regulations for Land Development	Standards and Rules and Regulations for Land Development – Sewage Disposal, Water Supply, and Preservation of Environmental Health	• Standards for sewage disposal for new development • Requires KCEHSD review of land uses for proposed sewage disposal systems	KCEHSD	• Applicable to the Grapevine Project's wastewater and recycled water facilities
Kern County Ordinance Code				
Biosolids Rule	Title 8.05	• Prohibits the application of biosolids in unincorporated areas within Kern County	Kern County	• Potentially applicable to the criteria for land application of biosolids
Utilities	Title 14	• Regulations related to wastewater collection systems	Kern County	• Applicable to the criteria for the wastewater collection system

Abbreviations:
CCR: California Code of Regulations
CFR: Code of Federal Regulations
DPH: California Department of Public Health
HSC: California Health and Safety Code
KCEHSD: Kern County Environmental Health Services Department
NPDES: National Pollutant Discharge Elimination System
RWQCB: Regional Water Quality Control Board, Central Valley Region
SJVAPCD: San Joaquin Valley Unified Air Pollution Control District
SWRCB: State Water Resources Control Board
WDR: Waste Discharge Requirements

Table 2
Wastewater Influent Flow Peaking Factors
Grapevine Project, Kern County, California

Flow Ratio	Assumed Peaking Factor
Peak Month/ADWF	1.3
Peak Day/ADWF	1.5
Peak Hour/ADWF	2.5

Abbreviations
ADWF: average dry weather flow

Table 3
Projected Wastewater Influent Flows and Loadings
Grapevine Project, Kern County, California

Parameter	Planning Areas 1-5b: Grapevine Project WWTF (a)	Planning Areas 1-5b: Scalping WWTF (a,b)	Planning Areas 6a-6e: Area 6 WWTF (c)
Flows (MGD)			
ADWF (d)	2.20	0.50	0.50
Peak Month	2.90	0.50	0.65
Peak Day	3.30	0.50	0.75
Peak Hour	5.50	0.50	1.25
Average Constituent Influent Concentration (mg/L) (e)			
BOD	350	350	350
TSS	350	350	350
TKN	70	70	70
TDS	625	625	625
Average Constituent Load (lb/day) (f)			
BOD	6,400	1,500	1,500
TSS	6,400	1,500	1,500
TKN	1,300	300	300
TDS	11,500	2,600	2,600
Peak Month Constituent Load (lb/day) (f)			
BOD	8,500	1,500	1,900
TSS	8,500	1,500	1,900
TKN	1,700	300	400
TDS	15,100	2,600	3,400
Peak Day Constituent Load (lb/day) (f)			
BOD	9,600	1,500	2,200
TSS	9,600	1,500	2,200
TKN	1,900	300	400
TDS	17,200	2,600	3,900

Notes

(a) Flows and loads listed for the Grapevine Project WWTF are the total of those generated in Planning Areas 1-5b. Flows listed for the potential Scalping WWTF are based on the average annual recycled water demand for the Scalping WWTF service area. When the Scalping WWTF is operating, the flows and loads to the Grapevine Project WWTF would be reduced by those treated at the Scalping WWTF, and WAS generated at the Scalping WWTF (approximately 2% of the influent flow to the Scalping WWTF) would be conveyed to the Grapevine Project WWTF.

(b) The potential Scalping WWTF would not capture peak flowrates above ADWF. When operating, flows above the ADWF would bypass the Scalping WWTF and be conveyed to the Grapevine Project WWTF.

(c) Flows and loads listed for the Area 6 WWTF, located near or adjacent to the existing TCWD East WWTF or TCWD West WWTF, are limited to those generated in Planning Areas 6a-6e and do not include flows and loads from TRCC.

(d) Except the potential Scalping WWTF, ADWF is based on the estimated indoor potable water demand (MGD) in each WTTF's service area plus 100% of the water demand contingency, distributed evenly between service areas, rounded to the nearest tenth of an MGD (EKI 2015a). Flows for the potential Scalping WWTF are described in notes a and b.

(e) Average constituent concentration based on anticipated wastewater characteristics and constituent concentrations from similar communities.

(f) Mass loading (lb/day) = Flowrate (MGD) x Constituent concentration (mg/L) x (8.34 [lb/Mg]/[mg/L]) rounded to the nearest 100.

Abbreviations

ADWF: average dry weather flow
BOD: 5-day biochemical oxygen demand
lb/day: pounds per day
mg/L: milligrams per liter
MGD: million gallons per day
TCWD: Tejon-Castac Water District
TDS: Total Dissolved Solids
TKN: Total Kjeldahl Nitrogen
TRCC: Tejon Ranch Commerce Center
TSS: Total Suspended Solids
WTP: Water Treatment Plant
WWTF: wastewater treatment facility

Table 4
Assumed Effluent Water Quality Goals
Grapevine Project, Kern County, California

Constituent	Units	Average or Median	Maximum or Range
Turbidity (a)	NTU	NA	- < 0.2 NTU 95% of time in 24 hour period - Always < 0.5 NTU
Total Coliform Bacteria (a)	MPN/100 ml	Running 7-day median < 2.2 MPN/100 ml	- Only once every 30 days > 23 MPN/100 ml - At all times < 240 MPN/100 ml
BOD (b)	mg/L	< 10 monthly	<20 daily
TSS (b)	mg/L	< 10 monthly	<20 daily
TKN (b)	mg/L	< 10 monthly	NA
EC [TDS] (b,c)	as noted	- The running 12-month average effluent EC should be less than or equal to the sum of the running 12-month average in the raw source plus 500 µmhos/cm. Also see Note (d). - < 2,000 µmhos/cm EC monthly	NA
Chlorides (b)	mg/L	NA	350
Boron (b)	mg/L	NA	2.0
pH (b)	-	NA	6.5 - 8.5

Notes

(a) Minimum water quality requirements for Disinfected Tertiary Recycled Water for unrestricted use per California Code of Regulations Title 22.

(b) Effluent limitations are assumed for Disinfected Tertiary Recycled Water for unrestricted use based on the Basin Plan and existing Waste Discharge Requirements for similar communities with residential, commercial, and light industrial land uses. See Section 3.4 of the text.

(c) The Grapevine Project would receive Nickel Water from the California Aqueduct. Average EC and TDS concentration measured in this source water were 459 µmhos/cm and 261 mg/L, respectively. The maximum EC and TDS concentrations measured during the same period were 632 µmhos/cm and 352 mg/L, respectively (EKI 2015b).

(d) An incremental additional EC of 500 µmhos/cm is roughly equivalent to adding 275 mg/L of fixed TDS.

Abbreviations

BOD: 5-day biochemical oxygen demand
EC: Electrical Conductivity
mg/L: milligrams per liter
MPN/100 ml: Most Probable Number per 100 milliliters
NA: Not Applicable
NTU: Nephelometric turbidity units
TDS: Total Dissolved Solids
TKN: Total Kjeldahl Nitrogen
TSS: Total Suspended Solids
µmhos/cm: micromhos per centimeter

Table 5
Wastewater Treatment Plant Conceptual Design Criteria
Grapevine Project, Kern County, California

Parameter	Planning Areas 1 through 5b: Grapevine Project WWTF (a)	Planning Areas 1 through 5b: Scalping WWTF (a)(b)	Planning Areas 6a-6e: Area 6 WWTF (c)
Flows and Loadings (d)			
Flows (MGD)			
ADWF	2.20	0.50	0.50
Peak Month	2.90	0.50	0.65
Peak Day	3.30	0.50	0.75
Peak Hour	5.50	0.50	1.25
BOD Loading (lb/day)			
Average Day	6,400	1,500	1,500
Peak Month	8,500	1,500	1,900
TSS Loading (lb/day)			
Average Day	6,400	1,500	1,500
Peak Month	8,500	1,500	1,900
TKN Loading (lb/day)			
Average Day	1,300	300	300
Peak Month	1,700	300	400
Fixed TDS Loading (lb/day)			
Average Day	11,500	2,600	2,600
Peak Month	15,100	2,600	3,400
WAS Production (e)			
WAS Production at ADWF (gpd)	44,000	10,000	10,000
WAS Production at Peak Month (gpd)	58,000	10,000	13,000
Assumed Effluent Water Quality Goals (f)			
Headworks			
Flow Measurement			
Type	Parshall Flume or Magnetic Flow Meter	Parshall Flume or Magnetic Flow Meter	Parshall Flume or Magnetic Flow Meter
Coarse Screen			
Number	6	1	2
Screening Opening Size (mm)	6	6	6
Capacity Each (MGD)	1.40	1.00	1.25
Grit Chamber			
Number	4	1	1
Capacity Each (MGD)	1.40	1.00	1.25
Fine Screen			
Number	6	1	2
Screening Opening Size (mm)	2.0	2.0	2.0
Capacity Each (MGD)	0.75	0.50	0.65
Flow Equalization			
Active Volume (gal) (g)	660,000	(h)	150,000
Influent Pumping			
Type	Submersible Variable Frequency Drive	Submersible Variable Frequency Drive	Submersible Variable Frequency Drive
Number	6	1	2
Capacity Each (MGD) (Peak)	0.75	0.50	0.65
Total Dynamic Head (ft)	TBD	TBD	TBD
Individual Power (hp)	TBD	TBD	TBD

Table 5

Wastewater Treatment Plant Conceptual Design Criteria

Grapevine Project, Kern County, California

Parameter	Planning Areas 1 through 5b: Grapevine Project WWTF (a)	Planning Areas 1 through 5b: Scalping WWTF (a)(b)	Planning Areas 6a-6e: Area 6 WWTF (c)
Membrane Bioreactor			
MBR Module Size (MGD)	0.50	0.50	0.22
MBR Aeration Basin with Anoxic Zone			
Number	6	1	3
Capacity Each (MGD)	0.50	0.50	0.22
MBR Filtration Basins			
Number	6	1	3
Capacity Each (MGD)	0.50	0.50	0.22
Ultraviolet Disinfection			
Type	Inline UV disinfection	Inline UV disinfection	Inline UV disinfection
Number of Channels	6	1	2
Capacity Each (MGD)	0.75	0.50	0.65
Recycled Water Pumping			
Number	TBD	TBD	TBD
Individual Capacity (gpm)	TBD	TBD	TBD
Individual Power (hp)	TBD	TBD	TBD
Solids Storage and Dewatering			
Aerobic Digester			
Number of Units	2	(i)	2
Capacity Each (gpd)	30,000	(i)	6,500
Solids Dewatering			
Type	Screw Press	(i)	Screw press
Number of Units	2	(i)	2
Capacity Each (gpd)	9,000	(i)	1,950
Solids Conveyance			
Type	Screw Pump	(i)	Screw Pump
Active Solar Dryers			
Number	TBD	(i)	TBD
Diameter (ft)	TBD	(i)	TBD
Total Depth (ft)	TBD	(i)	TBD
Volume (gal)	TBD	(i)	TBD
Emergency Storage/Stormwater Detention			
Volume (MG) (j)(k)	10.0	(j)	4.4

Table 5
Wastewater Treatment Plant Conceptual Design Criteria
Grapevine Project, Kern County, California

Notes

(a) The Grapevine Project WWTF is designed to capture and treat the total flows and loads generated in Planning Areas 1-5b. The potential Scalping WWTF is designed to treat a flow equivalent to the average annual recycled water demand for the Scalping WWTF service area. When the Scalping WWTF is operating, the flows and loads to the Grapevine Project WWTF would be reduced by those treated at the Scalping WWTF, and WAS generated at the Scalping WWTF would be conveyed to the Grapevine Project WWTF.
(b) Sizes of each component at the potential Scalping WWTF are all less than those at the Grapevine WWTF. Therefore, design criteria listed for the Scalping WWTF do not include any redundancy. When the Scalping WWTF requires service, the Scalping WWTF would go offline and all flows will be bypassed to the Grapevine Project WWTF.
(c) Design criteria listed for the Area 6 WWTF, which would consist of a new facility adjacent to the existing TCWD East WWTF or replacement of the existing TCWD West WWTF, are only for the facilities required to treat wastewater generated in Planning Areas 6a-6 and do not cover existing facilities or future facilities planned for the Tejon Ranch Commerce Center.
(d) From Table 3-2.
(e) WAS production is assumed to be 2% of the influent flow.
(f) See Table 3-3 for assumed effluent water quality goals.
(g) Flow equalization volume is assumed equivalent to 20% of peak daily flowrate.
(h) The potential Scalping WWTF would not be designed to capture and treat peak flows and therefore is not anticipated to include flow equalization. When the Scalping WWTF is operating, flows above the ADWF would bypass the Scalping WWTF and be conveyed to the Grapevine Project WWTF.
(i) The potential Scalping WWTF is not anticipated to include solids handling processes. All WAS produced at the Scalping WWTF is assumed to be conveyed to the Grapevine Project WWTF.
(j) Emergency storage at the Grapevine Project WWTF would serve both the Grapevine Project and Scalping WWTFs.
(g) The total volume of emergency storage is assumed to be equivalent to 20 days of wastewater flow through the largest single treatment unit in the MBR process (0.50 MGD for the Grapevine Project WWTF and Scaling WWTF and 0.22 MGD for the Area 6 WWTF).

Abbreviations

ADWF: average dry weather flow
BOD: 5-day biochemical oxygen demand
ft: feet
gal: gallons
gpd: gallons per day
gpm: gallons per minute
hp: horsepower
lb/day: pounds per day
lb: pound
m: meter
MBR: membrane bioreactor
MG: million gallons
MGD: million gallons per day
mg/L: milligrams per liter
mm: millimeter
TCWD: Tejon-Castac Water District
TDS: Total Dissolved Solids
TKN: Total Kjeldahl Nitrogen
TSS: Total Suspended Solids
TBD: To Be Determined
WAS: waste activated sludge
WWTF: wastewater treatment facility

Table 6
Summary of Potential Chemical Usage for the Wastewater Treatment Facilities
Grapevine Project, Kern County, California

WWTF Process	Product	Physical Form	Incompatible Products at WWTF	Environmental Health and Safety Concerns	Mitigation Measures	Comments
Denitrification	Acetate or similar electron donor	Aqueous solution	Strong oxidants Strong caustics	Flammable; Eye and skin irritant Inhalation hazard	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used as a bacterial food source for the denitrification process.
MBR	Citric Acid	Aqueous solution	Caustics	Flammable (dust form); Eye irritant.	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used to clean MBR membranes.
	Sodium Hypochlorite	Aqueous solution	Polymeric scale inhibitor Ammonia	Corrosive; Eye and skin irritant; Inhalation hazard	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used to clean MBR membranes. May also be used for disinfection of for biological process control.
	Sodium Hydroxide	Aqueous solution	Acids	Eye and skin irritant; Health hazard in concentrated form; Fumes from concentrated solutions; Hygroscopic.	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used for pH control.

Table 6
Summary of Potential Chemical Usage for the Wastewater Treatment Facilities
Grapevine Project, Kern County, California

WWTF Process	Product	Physical Form	Incompatible Products at WWTF	Environmental Health and Safety Concerns	Mitigation Measures	Comments
MBR (Continued)	Hydrochloric Acid	Aqueous solution	Hydroxides Bases	Corrosive; Eye and skin irritant; Health hazard in concentrated form; Inhalation hazard	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used to clean MBR membranes.
Disinfection	Sodium Hypochlorite	Aqueous solution	Polymeric scale inhibitor Ammonia	Corrosive; Eye and skin irritant; Inhalation hazard	Store in container with appropriate materials; Provide double-containment and sump in storage and delivery areas; Isolate from incompatible products in covered and secured room or storage building; Ventilate as appropriate.	Used for disinfection or for biological process control.
Solids dewatering	Polymer	Powder or liquid.	None	Slipping hazard.	Store in container with appropriate materials; Isolate from incompatible products in covered room or storage building;	Used to promote drying of wet sludge as part of screw press process.

Notes:
(a) Other substances may be used such as natural gas, liquid petroleum gas, fuels, oils, lubricants, hydraulic fluids, refrigerants, paints, protective coatings, solvents, coolants, antifreezes, deicers, pesticides, herbicides, laboratory reagents, and fire extinguishers.

Abbreviations
MBR: membrane bioreactor

TABLE 7
Preliminary Estimated Energy Consumption for Conceptual Wastewater and Recycled Water Facilities
Grapevine Project, Kern County, California

	Grapevine Project WWTF (a)	Scalping WWTF	Area 6 WWTF (b)	Total	Notes
Wastewater Treatment Electrical Energy Consumption					
ADWF (MGD):	2.2	0.5	0.5	--	
Estimated Electrical Power Consumption/Volume Wastewater Treated (kW-hr/MG)	8,000	8,000	8,000	--	(c)
Estimated Annual Electrical Energy Consumption (kW-hr/yr)	**6,400,000**	**1,500,000**	**1,500,000**	**9,400,000**	
Wastewater Treatment Natural Gas Consumption					
Estimated Heating Requirements/ADWF (Btu/yr/MGD)	140,000,000	140,000,000	140,000,000	--	(d)
Estimated Heating Requirements (Btu/yr):	**308,000,000**	**70,000,000**	**70,000,000**	--	
Assumed Natural Gas Heat Content (Btu/Mcf)	1,000,000	1,000,000	1,000,000	--	
Estimated Natural Gas Consumption (Mcf/yr)	**308**	**70**	**70**	**448**	
Wastewater Collection System Electrical Energy Consumption					
Assumed Pumped ADWF (MGD):	--	--	--	1.35	(e)
Assumed Average RW Distribution Pressure (ft of water)	--	--	--	200	
Assumed Combined RW Pump and Motor Net Efficiency (%)	--	--	--	50%	
Estimated Average RW Pumping Power (kW):	--	--	--	164	
Estimated Annual Electrical Energy Consumption (KW-hr/yr):	--	--	--	**1,440,000**	
Recycled Water Distribution Electrical Energy Consumption					
Assumed Total Average Daily RW Pumped Flow (MGD):	--	--	--	2.7	(f)
Assumed Average RW Distribution Pressure (ft of water)	--	--	--	275	
Assumed Combined RW Pump and Motor Net Efficiency (%)	--	--	--	60%	
Estimated Average RW Pumping Power (kW):	--	--	--	375	
Estimated Annual Electrical Energy Consumption (KW-hr/yr):	--	--	--	**3,300,000**	

Notes:
(a) Energy consumption shown for the Grapevine Project WWTF assumes that the potential Scalping WWTF is not operating and Grapevine Project treats all wastewater generated in Planning Areas 1-5b.
(b) Energy consumption shown for the Area 6 WWTF is limited to consumption associated with treating wastewater generated in Planning Areas 6a-6e and does not include energy consumption for the existing WWTFs.
(c) Based on plant-wide electrical use reported at similarly sized WWTFs that use a similar MBR treatment process (Tetra Tech, 2013).
(d) WWTF heating requirements per 1.0 ADWF were assumed to be approximately 6,000 Btu/hr throughout the year for water heating, plus 30,000 Btu/hr for four months during the winter. This is equivalent to an annual average heating demand of 16,000 Btu/hr, or 140 million Btu/MGD/yr.
(e) The ADWF of pumped wastewater was assumed to be approximately 50% of the total ADWF.
(f) The ADWF of pumped recycled water was assumed to be approximately 100% of the total ADWF.

TABLE 7
Preliminary Estimated Energy Consumption for Conceptual Wastewater and Recycled Water Facilities
Grapevine Project, Kern County, California

Abbreviations:
ADWF: average dry weather flow
Btu: British thermal unit
ft: feet
kW: kilowatt
kW-hr: kilowatt-hours
hr: hours
Mcf: thousand cubic feet
MGD: million gallons per day
MG: million gallons
WWTF: wastewater treatment facility
yr: year

References:
Santroch, J. & Vargas R. (Tetra Tech). 2012. "Energy Use at MBRs and Jefferson County's Port Hadlock MBR Treatment Plant" [PowerPoint presentation]. Tetra Tech. Presented at the Pacific Northwest Clean Water Association 2012 Annual Conference, 21-24 October 2012.

Table 8
Recycled Water Storage and Disposal Water Balance (100-Year Rainfall)
Grapevine Project, Kern County, California

POND STORAGE OCTOBER 1 (AF)	0	ASSUMED ACTIVE POND AREA (AC) (a)	76
POND PERCOLATION RATE (IN/DAY)	0	POND CATCHMENT AREA (AC)	76
		NON-POTABLE IRRIGATION AREA (AC) (b)	602
		CALC'D MAX STORAGE VOLUME (AF) (c)	950
		CALC'D MAX STORAGE DEPTH (FT) (d)	12.5
		CALC'D AVG STORAGE DEPTH (FT) (e)	8.7

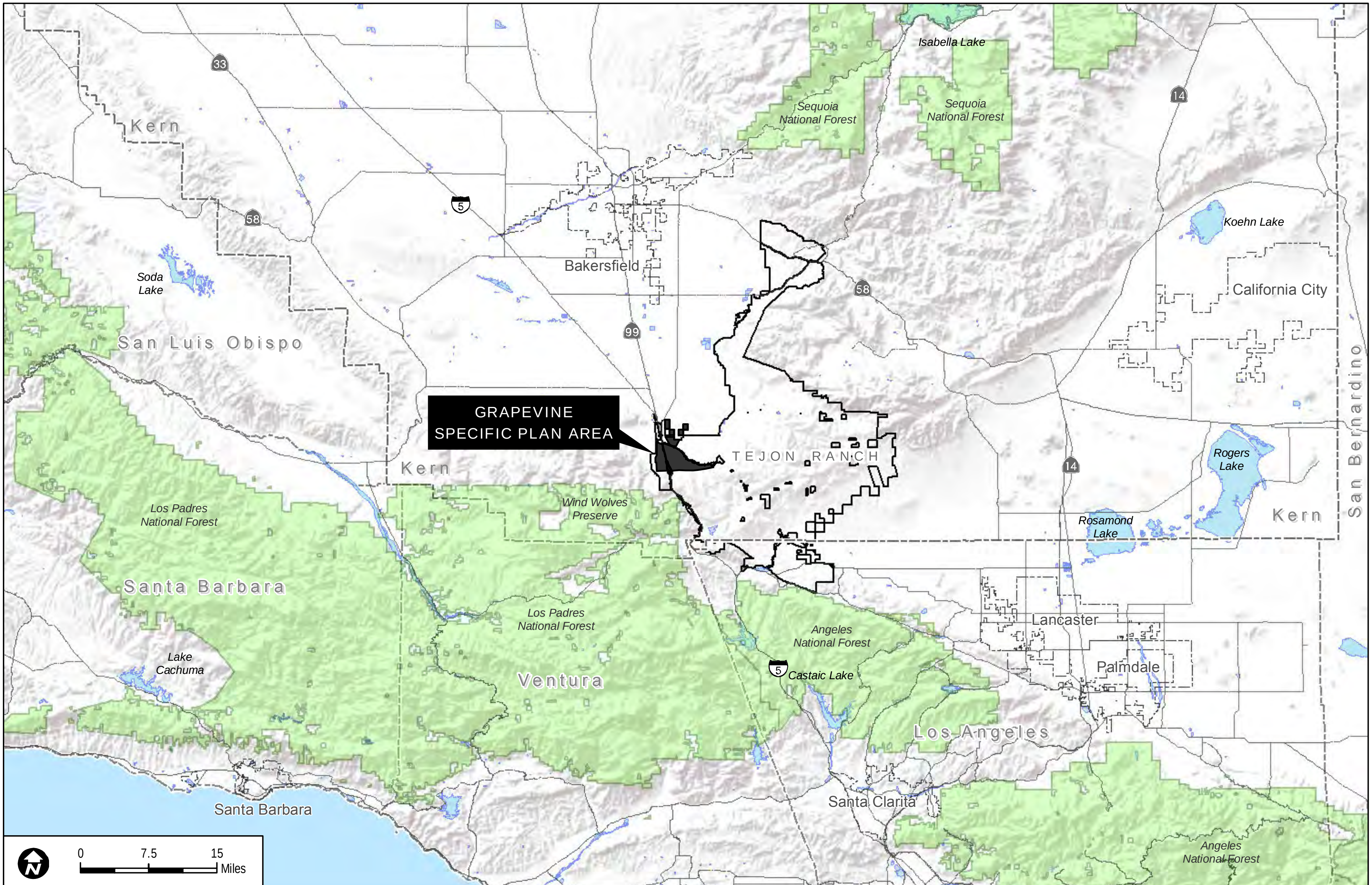
PARAMETERS/DATA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
RECYCLED WATER FLOW (MGD) (f)	2.63	2.65	2.45	2.43	2.40	2.43	2.52	2.63	2.70	2.79	2.79	2.70	2.59
PRECIPITATION (IN) (g)	0.45	1.55	1.98	1.76	6.43	3.30	2.46	1.69	0.36	0.01	0.00	0.76	20.74
REFERENCE ETo (IN) (h)	3.89	1.88	1.48	1.46	1.52	3.56	5.03	5.56	7.48	9.00	8.47	5.61	54.94
IRRIGATION DEMAND FACTOR (IN) (i)	2.72	1.32	1.04	1.02	1.06	2.49	3.52	3.89	5.23	6.30	5.92	3.92	38.43
POND CALCULATIONS													
BEGINNING POND STORAGE (AF) (j)	0	85	258	439	619	800	898	929	950	878	755	654	--
RECYCLED WATER VOL (AF) (f)	251	244	233	232	207	231	232	250	249	266	265	248	2908
DIRECT PRECIPITATION VOL (AF) (k)	3	10	13	11	41	21	16	11	2	0	0	5	131
POND EVAPORATION VOL (AF) (l)	25	12	9	9	10	23	32	35	47	57	54	36	348
NON-POTABLE IRRIGATION DEMAND (AF) (m)	144	70	55	54	56	131	185	205	276	332	312	207	2026
STORAGE GAIN (AF) (n)	85	172	181	180	182	98	30	21	-72	-123	-100	11	665
FINAL POND STORAGE (AF) (o)	85	258	439	619	800	898	929	950	878	755	654	665	--
SUPPLEMENTAL IRRIGATION DEMAND (AF) (p)	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes

(a) Assumed active pond area is estimated to maintain a calculated maximum storage depth of approximately 12.5 feet.
(b) Non-potable irrigation area is the total landscaped area excluding residential areas and schools. Refer to the *Evaluation of Potable, Non-Potable, and Recycled Water Demands* (EKI 2015a).
(c) Calculated maximum storage volume is the largest final pond storage volume from the pond calculations.
(d) Maximum storage depth is the calculated maximum storage volume divided by the active pond area. The calculated maximum storage depth does not include 2 feet for freeboard.
(e) Average storage depth is the average monthly final pond storage volume from the pond calculations divided by the active pond area.
(f) Recycled water flow rate is assumed equal to the sum of the average indoor potable water demand and 100% of the contingency. Note that collection system and wastewater treatment losses of 15% were accounted for in the average-year rainfall water balance in the *Evaluation of Potable, Non-Potable, and Recycled Water Demands* (EKI 2015a) to conservatively calculate the amount of supplemental California Aqueduct water needed for non-potable irrigation.
(g) Monthly average precipitation data were collected from the Western Regional Climate Center ("WRCC") for the Bakersfield Airport in Bakersfield, California (1937-2012) and Tejon Rancho, California (1895-1914) and from CIMIS Station 125 located in Arvin, California during 1998 (the wettest year on record for each station). Precipitation data listed is the inverse-distance weighted monthly averages of the monthly averages for each station based on the distance of each station to the center of the Grapevine Project.
(h) Reference ETo data were obtained from CIMIS Station 125 located in Arvin, CA that measured evaporation from pans. Reference ETo data listed are values from 1998 (wettest year on record).
(i) The irrigation demand factor is the area weighted average irrigation demand factor for each planting type (high water use plantings, low water use plantings, combination trees and ground cover plantings, and buffer zone plantings) in the 100-year rainfall-year for the areas irrigated by non-potable water (all landscaped area except residential areas, parks, and schools). Refer to EKI (2015a).
(j) Beginning pond storage is the final storage from the previous month.
(k) Direct precipitation is the active pond area multiplied by the precipitation.
(l) Pond evaporation is active pond area multiplied by the reference ETo, which is assumed to equal to the pond evaporation rate.
(m) Irrigation demand is the irrigation demand factor multiplied by the irrigation area. Irrigation demand includes 5% for distribution system losses.
(n) Storage gain is equal to the sum of the beginning pond storage, recycled water volume, and direct precipitation less the sum of the pond evaporation and irrigation demand. A negative storage gain represents a storage loss.
(o) Final pond storage is the beginning pond storage plus the storage gain. Final storage at the end of September during the 100-year rainfall-year (671 AF) would be used for crop irrigation or non-potable uses in commercial and industrial buildings.
(p) Supplemental irrigation demand is equal to the beginning pond storage less the storage loss (negative storage gain). Supplemental irrigation demand may be negligible during the 100-year rainfall-year. In lower rainfall years, supplemental irrigation water will be Nickel Water from the California Aqueduct.

Abbreviations

AC: acres
AF: acre-feet
CIMIS: California Irrigation Management Information System
ETo: evapotranspiration
FT: feet
IN: inches
MGD: million gallons per day

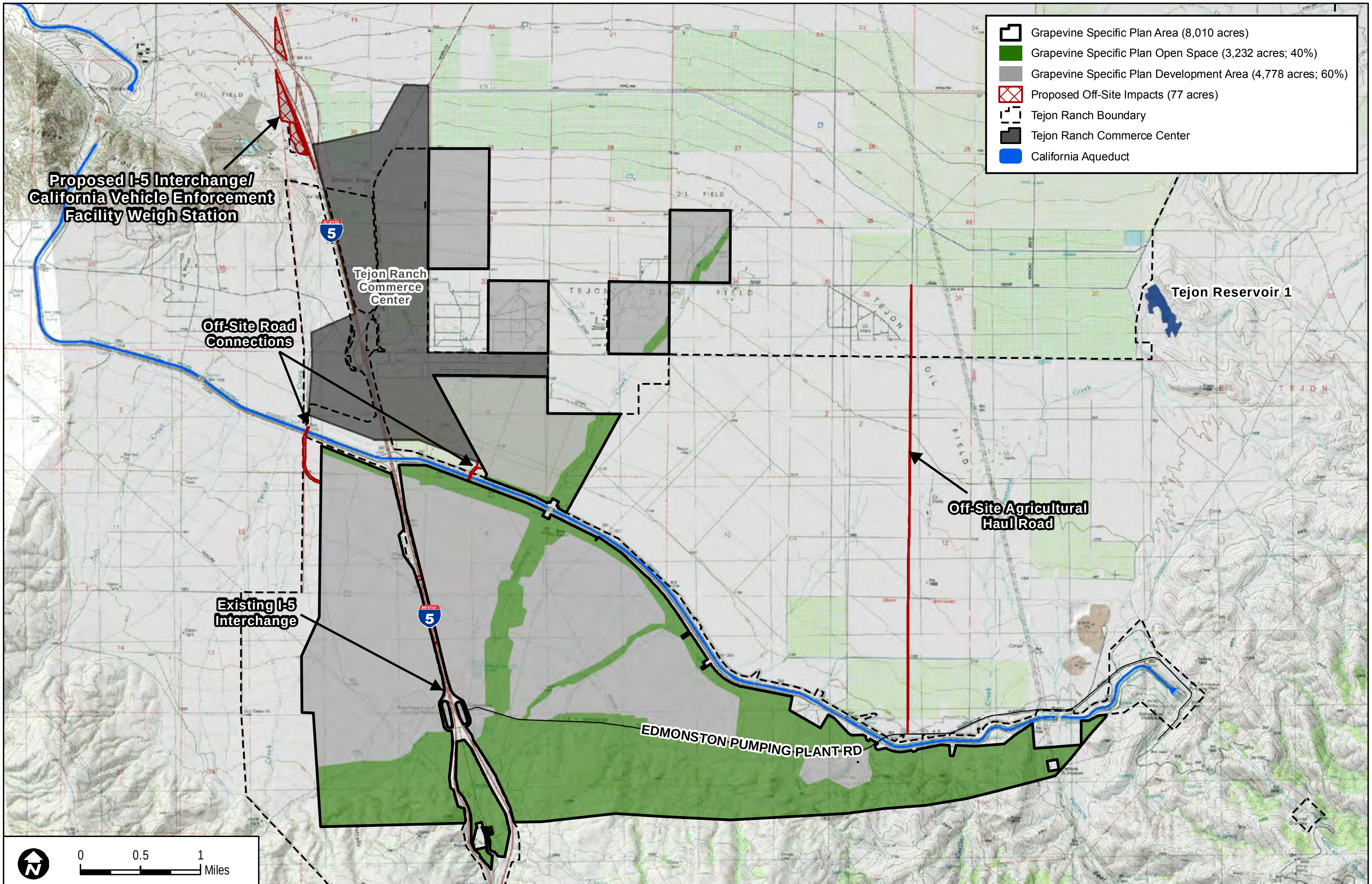


SOURCES: McIntosh & Associates 2013; TRC 2013a

FIGURE 1

Regional Location

GRAPEVINE PROJECT



SOURCES: McIntosh & Associates 2014; TRC 2013c

The California aqueduct (TRC 2013c) appears on subsequent figures; the source information will not be provided on subsequent figures.

FIGURE 2

Vicinity Map

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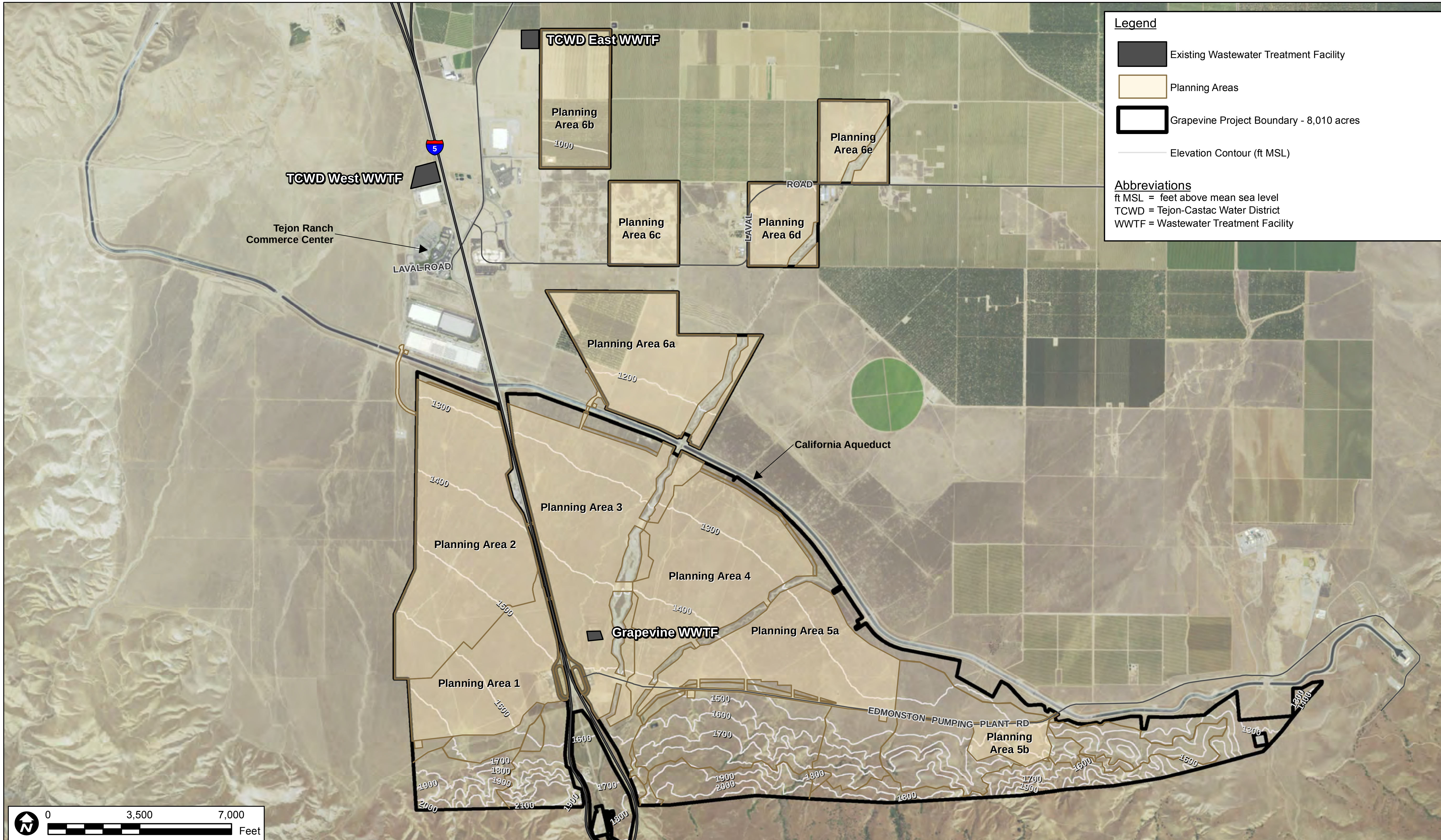
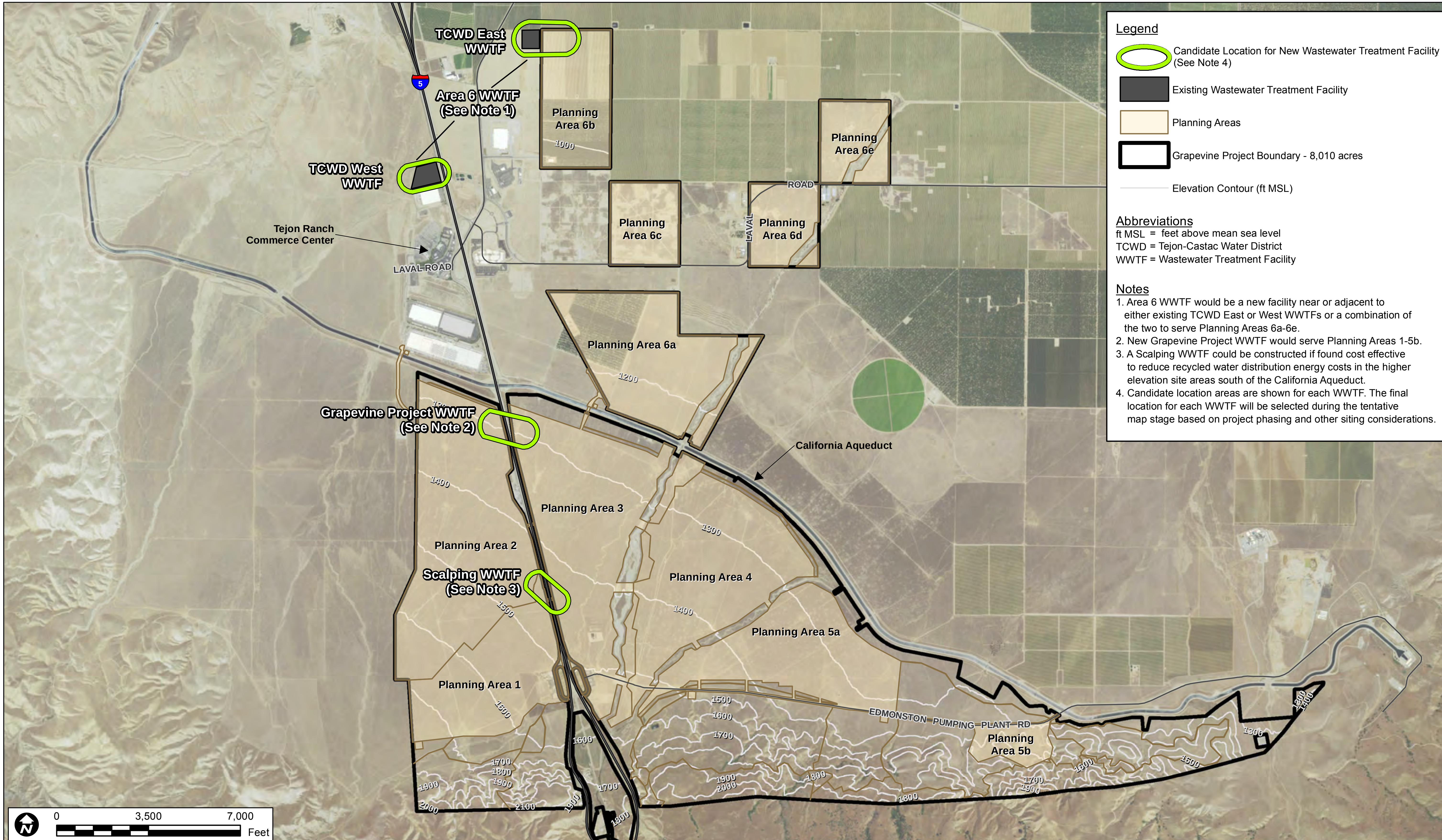


SOURCES: MCINTOSH 2013; TRC 2013; Public Land Survey

FIGURE 3

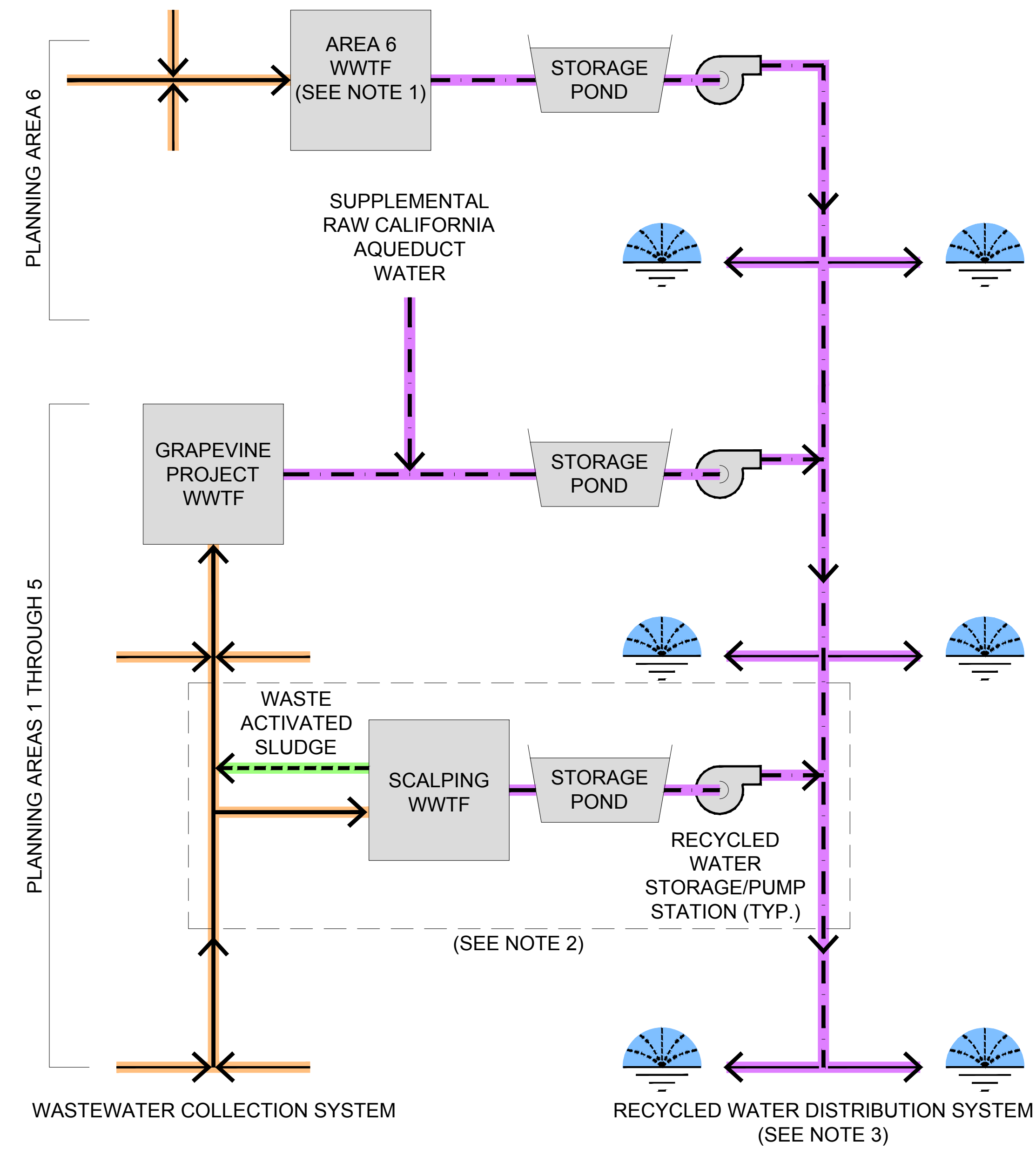
Existing Wastewater Treatment Facilities Location Map



SOURCES: MCINTOSH 2013; TRC 2013; Public Land Survey

FIGURE 4

Proposed Wastewater Treatment Facilities Location Map



LEGEND:

- Wastewater
- Scalping Plant Waste Activated Sludge
- Recycled Water
- Recycled Water Storage/Pump Station
- Recycled Water Landscape Irrigation

ABBREVIATIONS:

TCWD = Tejon-Castac Water District
WWTF = Wastewater Treatment Facility

NOTES:

1. Area 6 WWTF would be a new facility located near or adjacent to existing TCWD East or West WWTF or combination of the two.
2. A scalping WWTF could be constructed if found cost effective to reduce recycled water distribution energy costs in the higher elevation site areas south of the California Aqueduct.
3. Number and locations of recycled water distribution pump stations and storage ponds to be determined during tentative tract stage.

NOT TO SCALE

FIGURE 5

Conceptual Wastewater Collection System and Recycled Water Distribution System Schematic

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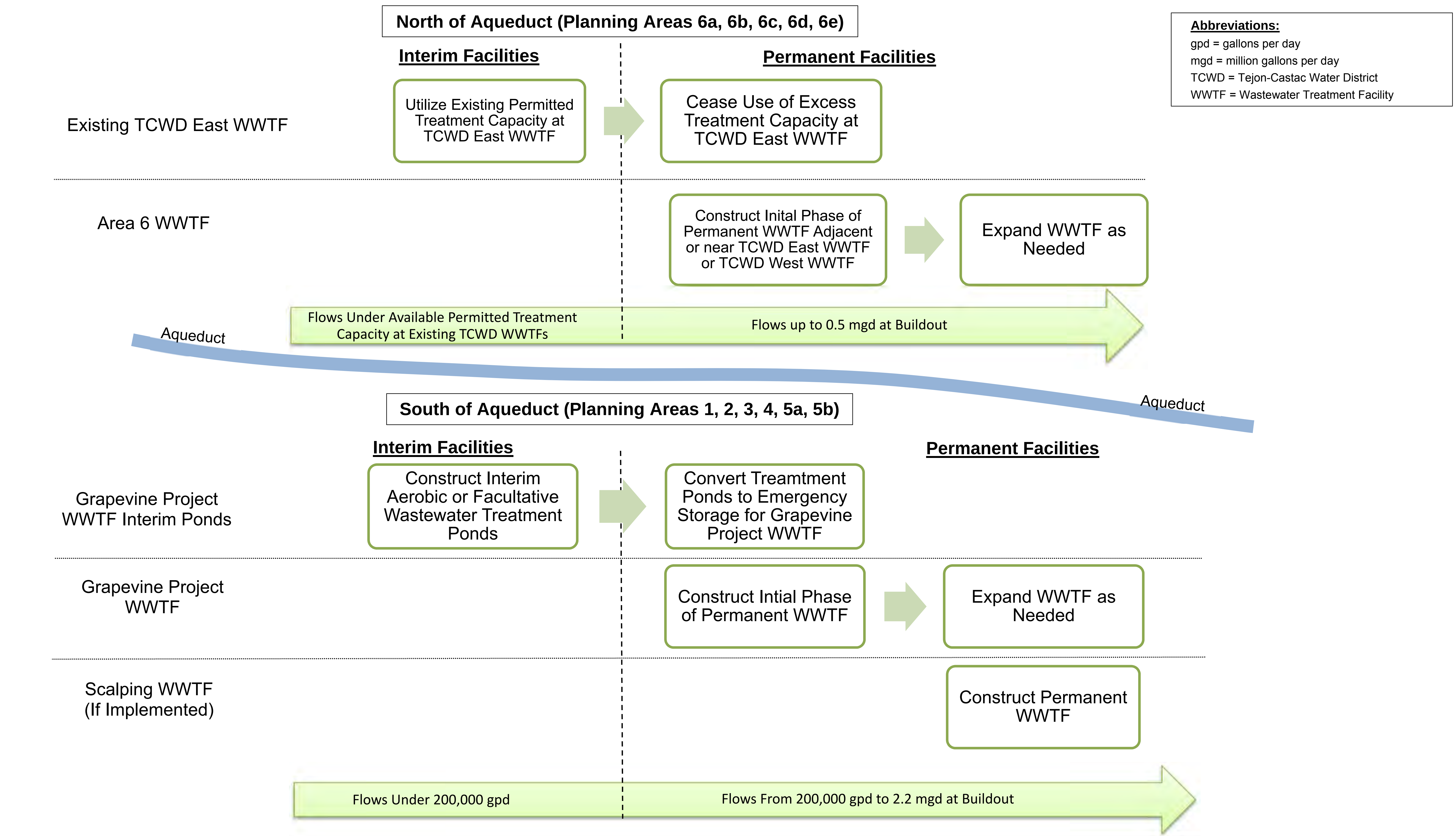

FIGURE 6

Approach to Wastewater Treatment Facility Phasing

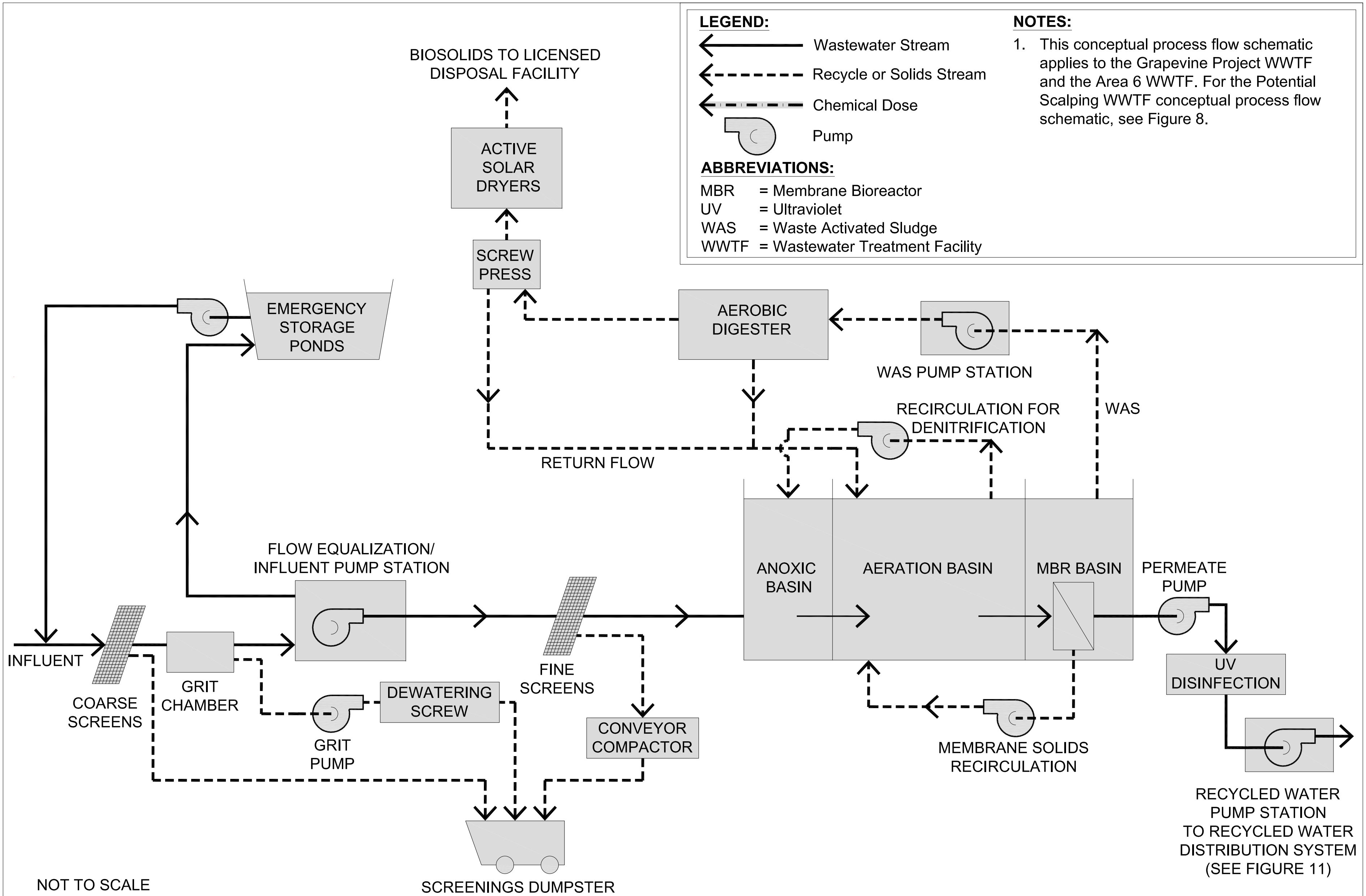

FIGURE 7

Conceptual Primary Wastewater Treatment Facility Process Flow Schematic

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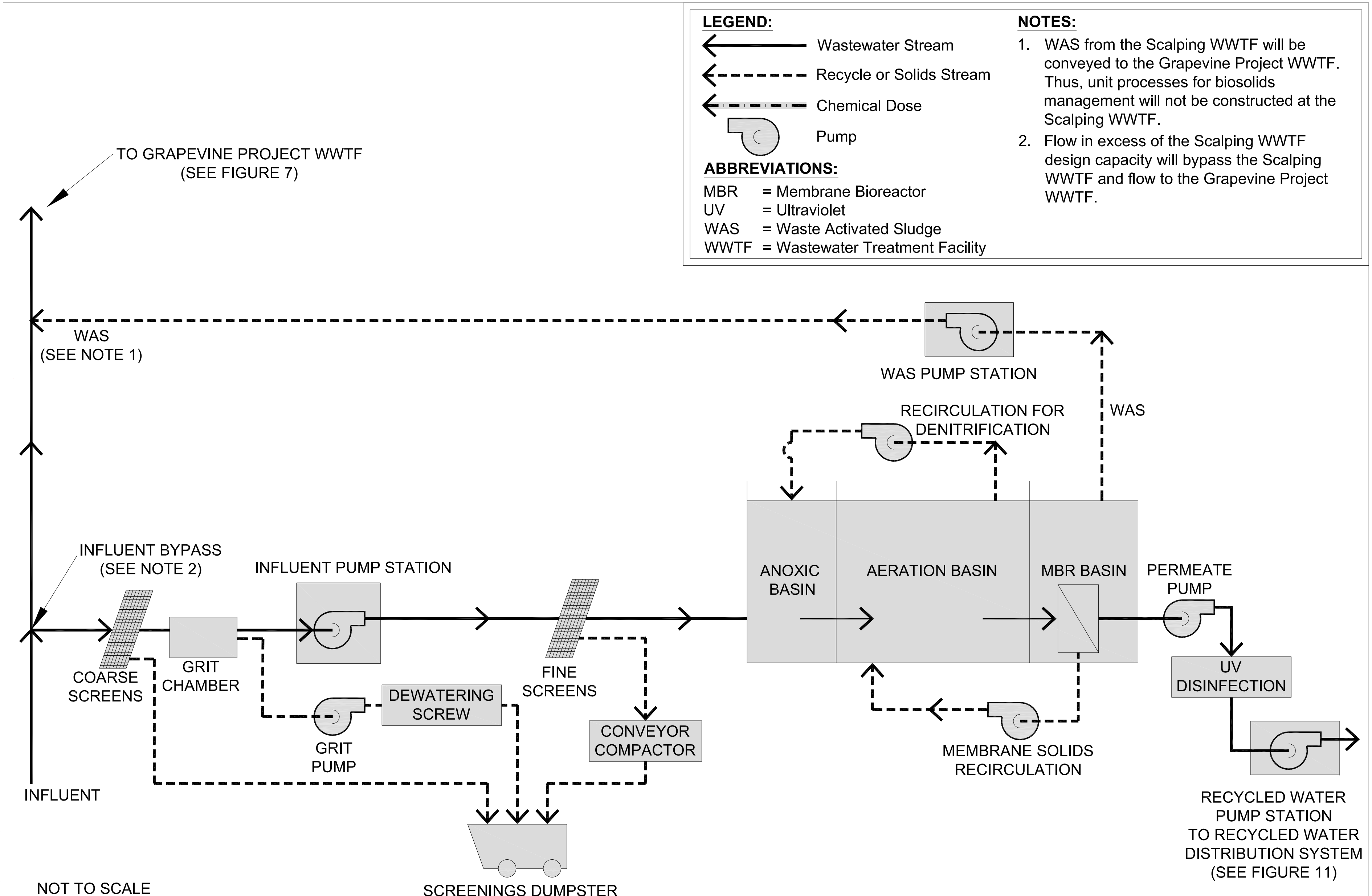

FIGURE 8

Conceptual Scalping Wastewater Treatment Facility Process Flow Schematic

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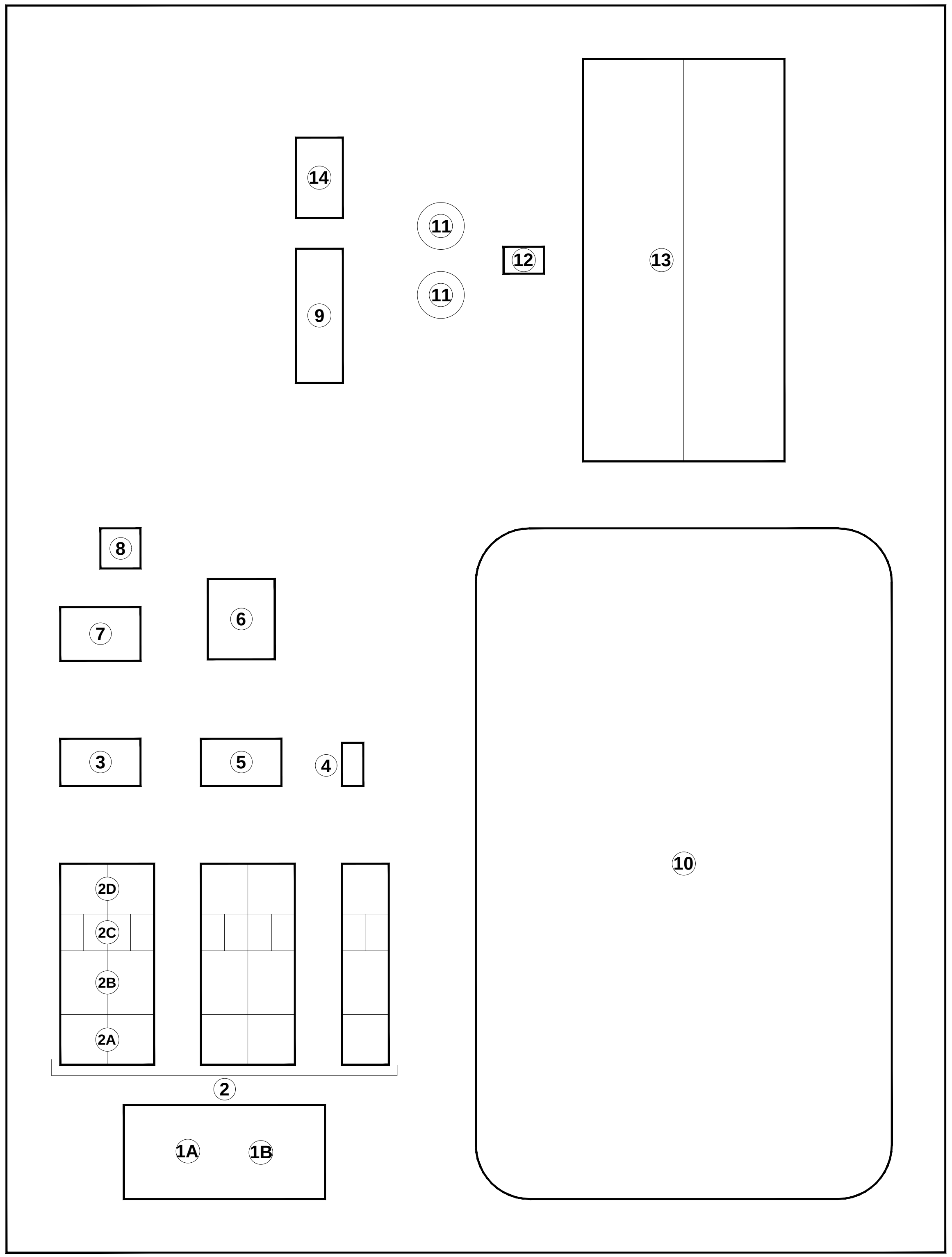
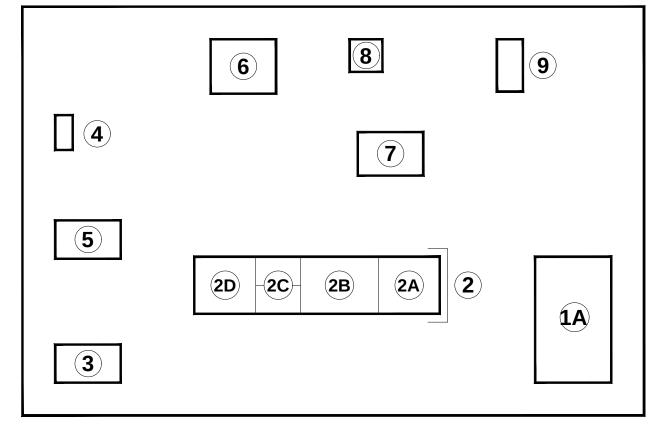


GRAPEVINE PROJECT WWTF

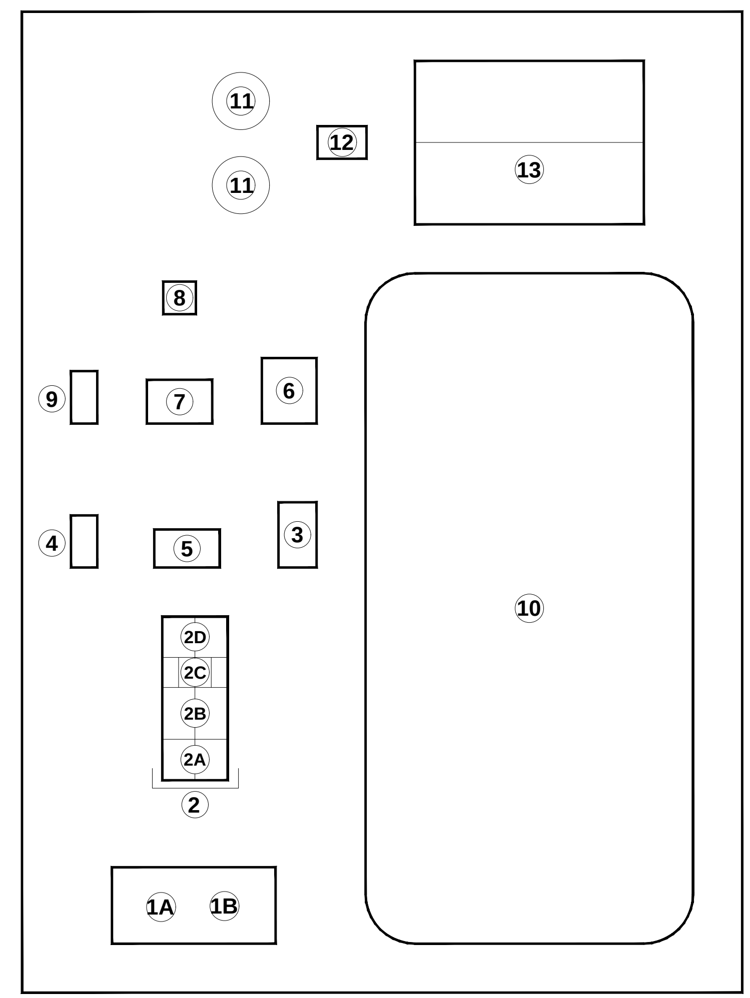
Total Area: Approximately 20 Acres



SCALPING WWTF

(SEE NOTE 2)

Total Area: Approximately 2 Acres



AREA 6 WWTF

(SEE NOTE 3)

Total Area: Approximately 8 Acres

LEGEND:

- 1A Headworks/Influent Pump Station
- 1B Flow Equaliztion
- 2 MBR Modules
- 2A Anoxic Basins
- 2B Aerobic Basins
- 2C Membrane Basins
- 2D Mechanical Equipment/Permeate Pumps/In-Line UV Disinfection
- 3 Recycled Water Pump Station
- 4 WAS Pump Station
- 5 Chemical Storage
- 6 Electrical Building
- 7 Transformer
- 8 Emergency Generator
- 9 Administrative Building/Laboratory
- 10 Emergency Storage Ponds
- 11 Aerobic Digester
- 12 Screw Press
- 13 Active Solar Dryers
- 14 Maintenance Building

ABBREVIATIONS:

MBR = Membrane Bioreactor
TCWD = Tejon-Castac Water District
UV = Ultraviolet
WAS = Waste Activated Sludge
WWTF = Wastewater Treatment Facility

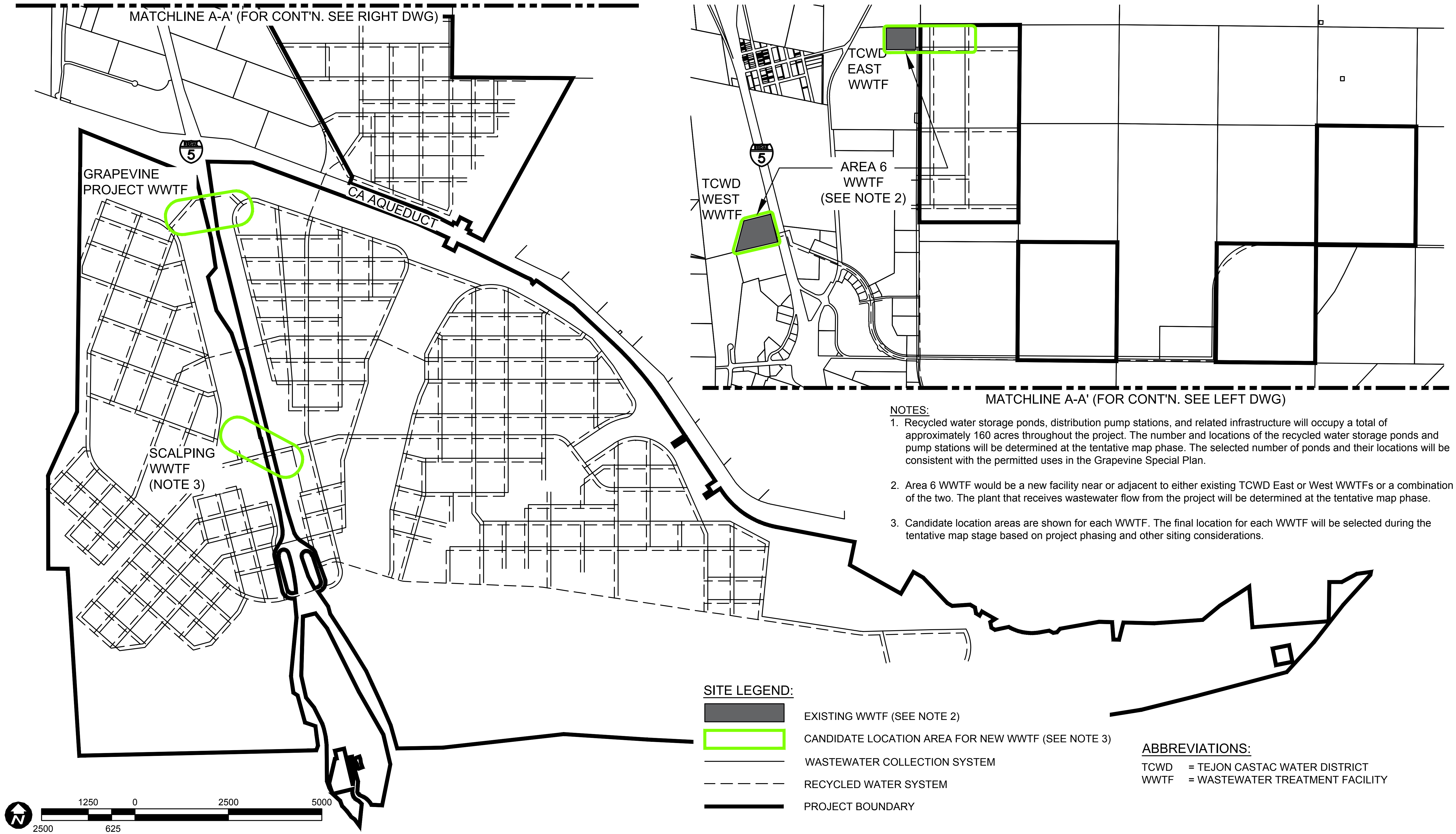
NOTES:

1. Recycled water storage ponds and distribution pump stations are not shown. Recycled water storage ponds, distribution pump stations, and related infrastructure will occupy approximately 170 acres distributed at various locations throughout the project.
2. A scalping WWTF could be constructed if found cost effective to reduce recycled water distribution energy costs in the higher elevation site areas south of the California Aqueduct.
3. Area 6 WWTF will be constructed either adjacent to the existing TCWD East WWTF footprint or within the existing TCWD West WWTF footprint. Existing facilities are not shown in the conceptual WWTF layout.

NOT TO SCALE

FIGURE 9

Conceptual Wastewater Treatment Facility Layouts



NOTES:

1. Recycled water storage ponds, distribution pump stations, and related infrastructure will occupy a total of approximately 160 acres throughout the project. The number and locations of the recycled water storage ponds and pump stations will be determined at the tentative map phase. The selected number of ponds and their locations will be consistent with the permitted uses in the Grapevine Special Plan.
2. Area 6 WWTF would be a new facility near or adjacent to either existing TCWD East or West WWTFs or a combination of the two. The plant that receives wastewater flow from the project will be determined at the tentative map phase.
3. Candidate location areas are shown for each WWTF. The final location for each WWTF will be selected during the tentative map stage based on project phasing and other siting considerations.

SITE LEGEND:

- EXISTING WWTF (SEE NOTE 2)
- CANDIDATE LOCATION AREA FOR NEW WWTF (SEE NOTE 3)
- WASTEWATER COLLECTION SYSTEM
- RECYCLED WATER SYSTEM
- PROJECT BOUNDARY

ABBREVIATIONS:

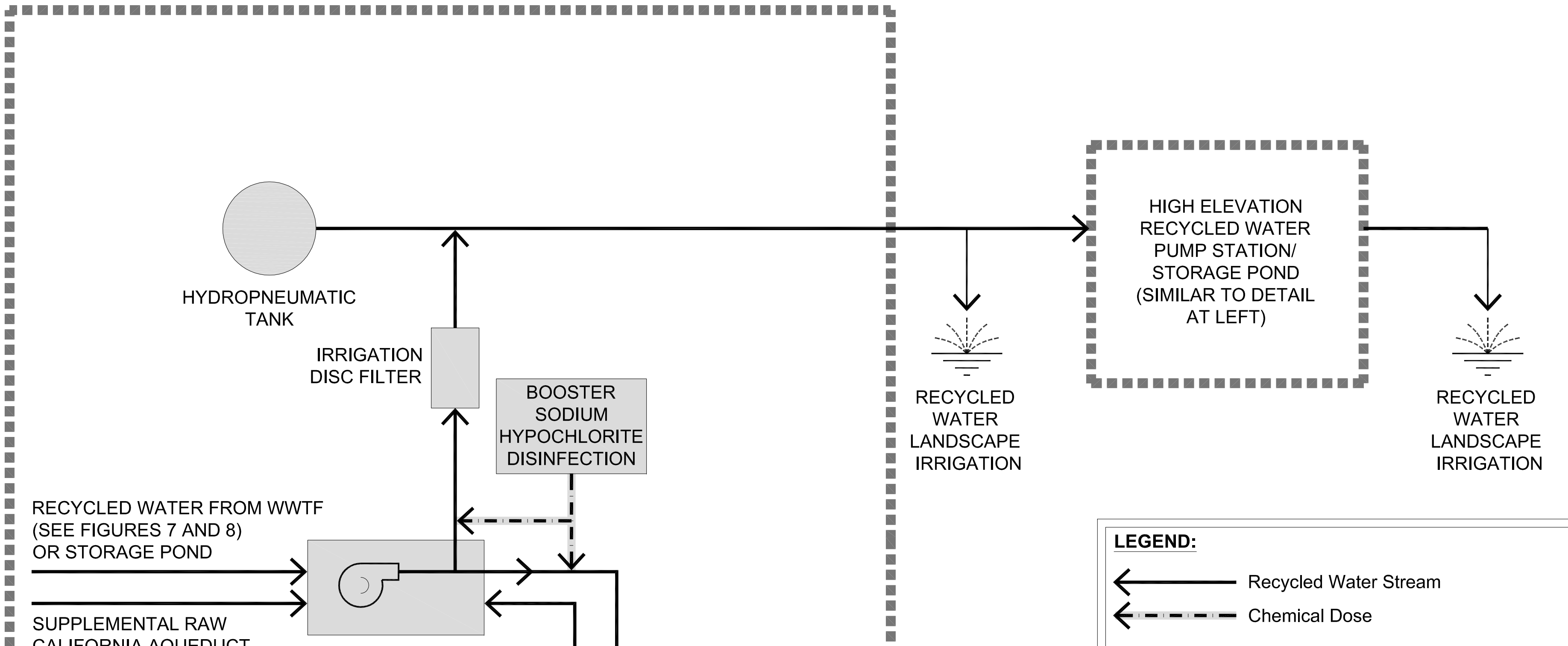
TCWD = TEJON CASTAC WATER DISTRICT
WWTF = WASTEWATER TREATMENT FACILITY

GRAPEVINE PROJECT

FIGURE 10

SOURCE: McINTOSH 2014

FRAMEWORK: WASTEWATER SYSTEM PLAN



ABBREVIATIONS:

WWTF = Wastewater Treatment Facility

NOTES:

1. Number and locations of recycled water distribution pump stations and storage ponds will be determined during the tentative tract stage.

NOT TO SCALE

FIGURE 11

Conceptual Recycled Water Distribution System Process Flow Schematic

GRAPEVINE PROJECT

Appendix E-1

Appendix N1

Tejon Mountain Village Water Supply Assessment

Tejon Mountain Village

Water Supply Assessment

Date: **July 18, 2008**

Prepared by:

Tejon-Castac Water District
P.O. Box 1000
Lebec, CA 93243

1. INTRODUCTION

1.1. Background and Purpose

This water supply assessment (WSA) has been prepared for Kern County (County) by the Tejon-Castac Water District (TCWD) in accordance with California Water Code Section 10910 *et seq*. The County is the California Environmental Quality Act (CEQA) lead agency for the proposed Tejon Mountain Village (TMV) project. TCWD is the applicable public water system as defined in the Water Code with respect to the TMV project, which includes approximately 3,450 single family and single-family attached residential dwelling units. Pursuant to the Water Code, the County requested that TCWD prepare this WSA as part of the CEQA review of the proposed TMV project.

A WSA provides the CEQA lead agency with an analysis of a project's water supply availability and reliability over a twenty-year planning period, including average rainfall and hydrologic years, a single dry year, and multiple dry years. The WSA is a technical, informational, advisory opinion prepared by the project's water provider for use by the CEQA lead agency. Under the Water Code, a WSA must be included in the environmental impact report (EIR) prepared by the CEQA lead agency.

As discussed more fully below, TCWD has rights to certain State Water Project (SWP) supplies and rights to store and retrieve water from water banking facilities in the County. This WSA analyzes the availability and reliability of these supplies for the purpose of serving the proposed TMV project in accordance with the Water Code. The analysis is conservative. It assumes that: (a) water supplies available to the project will be more limited; and (b) TCWD's water service demands will be greater than will likely occur during the analysis period. At the request of the County, this WSA is also based on maintaining a minimum groundwater bank reserve of 7,000 acre feet. This level of storage would allow TCWD to meet the TMV project's indoor potable water demand in the event that a severe drought were to occur over a seven year period. The WSA demonstrates that TCWD will be able to supply the TMV project with sufficient water supplies and to maintain the water bank reserve recommended by the County throughout the analysis period.

Section 2 of this WSA discusses the TMV project's water demand. Section 3 describes the water supplies that are available to TCWD to serve the proposed project and to meet the district's other service obligations. Section 4 identifies TCWD's total water service requirements over the WSA analysis period. Section 5 analyses the district's ability to meet anticipated demands in accordance with the Water Code, including an analysis of normal year, single dry year and multiple dry year conditions. Section 5 also discusses certain other potential supply issues that were identified by the County. Section 6 provides a summary of the WSA analysis results.

Under California Government Code Section 66473.7 *et seq.*, the County may also be required to obtain water supply verifications from TCWD prior to approving certain tentative tract or other TMV project maps. TCWD will provide water supply verifications for the project based on this WSA and other district water supply and demand analyses upon request by the County.

1.2. District Overview

TCWD is a California water district formed and operated under the provisions of California Water Code Section 34000, *et seq.* The district's current service area includes portions of the proposed Tejon Mountain Village project, and the previously annexed Tejon Industrial Complex (TIC) site. TCWD will annex the rest of the proposed TMV project site following the completion of the project's CEQA analysis by the County. The annexation is subject to approval by the Kern County Local Agency Formation Commission.

TIC and TMV are the district's two water service areas. TCWD will serve the proposed TMV project through an existing turnout along the SWP California aqueduct near the California Department of Water Resources (DWR) service facilities located at the southern terminus of Bear Trap Canyon. TCWD is a member unit of the Kern County Water Agency (KCWA). KCWA has a contract with the DWR to receive SWP water. Pursuant to the district's contracts with KCWA, TCWD has the right to deliver a maximum of 9 cubic feet per second (cfs) and a monthly maximum of 550 acre-feet of water through the Bear Trap Canyon turnout. The peak monthly demand for the TMV project at full build-out is estimated at approximately 358 acre-feet. TCWD's delivery capacity through the Bear Trap Canyon turnout is sufficient to meet the project's peak demand level. TCWD will also operate a dedicated onsite wastewater treatment and recycled water facility that will be located in the western portion of the TMV project. The services TCWD will provide to the TMV project include supplying, treating, and delivering potable and recycled water, and sewer collection and wastewater treatment.

2. TMV PROJECT WATER DEMAND

This section describes the proposed TMV project and the estimated water demands associated with each of the project's proposed land uses. Water demands are summarized in terms of "potable" and "non-potable" use. Potable water refers to all indoor and outdoor uses other than those that will be supplied with recycled water. Non-potable water refers to demand that will be met by the use of recycled water supplies. At full build-out, the TMV project will require approximately 2,100 acre-feet per year (AFY) of potable water and approximately 800 AFY of non-potable water. Non-potable water will primarily be used to irrigate the proposed golf courses. Total project water demand at full build-out, including both potable and non-potable supplies, will be approximately 2,900 AFY.

2.1. Project Description

TMV is located in southwestern Kern County, California east of Interstate 5 approximately 40 miles south of Bakersfield and 60 miles north of Los Angeles. The project site includes approximately 26,417 acres, of which approximately 21,335 acres, or about 80% of the site, would remain undeveloped, and 5,082 acres would be developed with a mix of residential, commercial, and recreational uses. The proposed uses include 3,450 residences (both single-family and single-family attached units), 160,000 square feet of commercial development, and hotel, spa, and resort facilities, including 750 lodging units and up to 350,000 square feet of facilities in support of two 18-hole golf courses (36 holes of golf total), riding and hiking trails, equestrian facilities, two helipads, a fire station, private community centers, electrical sub-station facilities, water treatment and waste water treatment facilities as well as associated access and utilities necessary to serve the development (see Figure 1, "Proposed Project Land Uses"). The proposed water and wastewater treatment facilities will be operated by TCWD.

2.2. Project Land Uses

The attached report, *Preliminary Water Use Estimates for the Tejon Mountain Village Project* (April 2008) ("Water Use Report") **analyzes** the water demand associated the project's proposed land uses (see Appendix A). These proposed land uses are summarized in Table 1.

Table 1

Summary of TMV Proposed Land Uses

Land Use	**Units Number or square feet (sf)**
Residential	
6 dwelling units per acre	1,496
4 dwelling units per acre	1,048
1 dwelling unit per 0.3 acres	96
1 dwelling unit per 1.5 acres	769
1 dwelling unit per 2.5 acres	41
Commercial—retail and office	160,000 sf
Hotels	750 rooms
18-Hole Golf Course	2
Clubhouses	119,950 sf (2 total)
Wastewater Reclamation Facility	15,000 sf
Water Treatment Facility	15,000 sf
Fire Station	6,954 sf
Ranch Compound	50,000 sf
Equestrian Facilities	5,000 sf

Existing Vineyard	-
Landscape Screening	-

Source: Water Use Report (April 2008).

2.3. Potable Water System Demand (Excluding Recycled Supplies)

As presented in Section 2.4, the proposed TMV project will utilize all the tertiary treated recycled water generated from indoor water use that is collected and treated within facilities to be operated by TCWD. Recycled water supplies will primarily be used for golf course irrigation. Other project water demand, including indoor and outdoor uses, will be served from the potable water system operated by TCWD. The potable water system will obtain raw water from the SWP turnout at the southern end of Bear Trap Canyon. These supplies will be conveyed to the project's water treatment facility located to the west of the turnout and treated to applicable standards for potable use. Potable water supplies will be distributed throughout the project as required to meet demand (see Figure 2, "Proposed Water Treatment and Distribution System").

The Water Use Report summarizes the TMV project's total indoor and outdoor potable water demand at full build-out. Indoor domestic water demand includes drinking, bathing, bathroom and other internal building uses. Outdoor demand includes landscaping, common area maintenance and residential yard and garden uses. At full build out, the project's potable water system will supply approximately 1,000 AFY for indoor use and approximately 1,100 AFY for outdoor uses. The project's full build-out potable water demand will be approximately 2,100 AFY. Table 2 summarizes the indoor and total potable water demand associated with the project's proposed land uses.

Table 2

Summary of TMV Project Potable Water System Demand

Land Use	**Indoor Demand** Gallons per Day (gdp) per Dwelling Unit (Du), 1,000 Square Feet (ksf), or Room	**Potable Water Demand Factor** AFY per Du or Acre	**Total Potable Water Demand** AFY
Residential			
6 dwelling units per acre	195 gpd/Du	0.33 AFY/Du	490
4 dwelling units per acre	195 gpd/Du	0.37 AFY/Du	392
1 dwelling unit per 0.3 acres	195 gpd/Du	0.44 AFY/Du	42
1 dwelling unit per 1.5 acres	195 gpd/Du	0.66 AFY/Du	507
1 dwelling unit per 2.5 acres	195 gpd/Du	1.78 AFY/Du	73
Commercial:			
Retail	160 gpd/ksf	2.82 AFY/Acre	62
Office	60 gpd/ksf		
Grocery/Market/Specialty Food	230 gpd/ksf		
Restaurant	1,000 gpd/ksf		
Gas Station w/Car Wash	160 gpd/ksf		
Dry Cleaner	160 gpd/ksf		
Hotel	80 gpd/room	3.41 AFY/Acre	92
Clubhouse (2)	160 gpd/ksf	2.86 AFY/Acre	20
Fire Station	160 gdp/ksf	1.33 AFY/Acre	2
Wastewater Reclamation Facility	160 gpd/ksf	0.30 AFY/Acre	3
Water Treatment Facility	160 gpd/ksf	0.27 AFY/Acre	3
Ranch Compound	160 gpd/ksf	0.71 AFY/Acre	24
Equestrian Facilities	160 gpd/ksf	0.32 AFY/Acre	6
Existing Vineyard	-	4.20 AFY/Acre	21
Landscape Screening	-	3.42 AFY/Acre	236
Total Potable Water System Demand (including water losses and rounded to nearest 100)			**2,100**

Source: Water Use Report (April 2008)

2.4. Nonpotable Water Use

The TMV project will include a wastewater reclamation facility that will capture and treat approximately 80% of the project's total indoor use. At full build out, the project's indoor potable water demand will be approximately 1,000 AFY (see Table 3). As a result, the project will generate approximately 800 AFY of recycled water. All project recycled water supplies will be treated to tertiary water quality standards in accordance with Title 22 of the California Code of Regulations. The tertiary treatment standard is the most stringent under California law and allows for the unrestricted outdoor irrigation use of recycled water supplies.

At full build-out, the project's two 18-hole golf courses will encompass approximately 400 acres. Based on applicable hydrological, seasonal and climate factors, golf course irrigation will require approximately 792 AFY. Golf course irrigation requirements will primarily be met by utilizing the project's anticipated recycled water supplies of approximately 800 AFY.

2.5. Total TMV Water Demand at Full Build-out

At full build-out, the TMV project's total water demand is estimated at 2,900 AFY. The annual indoor and outdoor water demands associated with each of the project's proposed land uses are summarized in Table 3.

Table 3
Estimated TMV Total Water Demand at Full Build-out by Land Use Category

Land Use	Indoor Water Demand AFY	Outdoor Water Demand (Potable and Nonpotable) AFY	Total Water Demand AFY
6 dwelling units per acre	327	164	490
4 dwelling units per acre	229	163	392
1 dwelling unit per 0.3 acres	21	21	42
1 dwelling unit per 1.5 acres	168	339	507
1 dwelling unit per 2.5 acres	9	64	73
Commercial	53	9	62
Hotel	70	22	92
Fire Station	1	1	2
Wastewater Reclamation Facility	3	-	3
Water Treatment Facility	3	-	3
Ranch Compound	9	15	24
Equestrian Facilities	1	5	6
Existing Vineyard	-	21	21
Landscape Screening	-	236	236
Golf—(indoor use for clubhouses and outdoor irrigation using recycled water)	20	792	812
Total Water Use (including estimated system losses and rounded to nearest 100)	**1,000**	**1,900**	**2,900**

Source: Water Use Report, Table 1 (April 2008)

3. TCWD WATER SUPPLIES

This section identifies water supplies that are potentially available to TCWD for the purpose of meeting the district's water service demands. These supplies include: (1) surface water, including imported SWP supplies; (2) groundwater, primarily in the TIC service area; (3) water banking storage and retrieval rights; and (4) recycled water. As discussed below, certain of these supplies, such as groundwater, are not included in the WSA projections to assure that the analysis reflects conservative assumptions.

3.1. TCWD's Rights to Surface Water

TCWD is one of thirteen member units of KCWA that have contractual rights to SWP water through the agency. During high flow or flood conditions, TCWD may also receive a certain volume of water from the Kern River. This section describes the nature and extent of the surface water supplies that are available to TCWD to meet TMV project demand.

3.1.1. SWP System Overview

The SWP system is designed to convey approximately 4.2 million AFY and includes 600 miles of aqueduct and conveyance facilities. SWP supplies primarily consist of fresh water flows generated by melting snow in the Sierra Nevada Mountains and other precipitation. The SWP system generally obtains fresh water supplies through a pumping facility located along the southern edge of the Sacramento Delta. SWP water serves urban and agricultural areas in the San Francisco Bay area, Silicon Valley, the San Joaquin Valley, the Central Coast, and in Southern California.

The SWP is operated by the DWR. The DWR has contractually allocated the SWP's maximum delivery capacity of 4.2 million AFY to each of the system's 29 primary contractors, including KCWA. These allocations are commonly referred to as "Table A" allocations because they are described in Table A of the SWP contracts. KCWA has a maximum Table A allocation of 998,730 AFY, or approximately 25% of the SWP system's total Table A allocation. As discussed in Section 3.1.2, the amount of water delivered to each SWP contractor may vary from the Table A allocations due to hydrological conditions, regulatory constraints, or other SWP operational factors.

Other water supplies may become available to SWP system contractors depending on hydrological and demand conditions, including the following:

- ***Article 21 Water*** – Article 21 water refers to certain excess SWP system supplies as defined in Article 21 of the SWP contracts. These supplies are available when SWP reservoirs are full and excess water from the Delta can be pumped. If available, Article 21 water may be purchased by SWP contractors and KCWA member units. Article 21 water is typically available in December through March. Such water is available on an instantaneous basis and cannot be stored in surface reservoirs. In Kern County, Article 21 water is typically used for storage in local water banks.

- ***Turnback Pool Water*** – When a SWP contractor is allocated Title A water in amounts greater than its demands the SWP Contractor may sell the excess to other SWP contractyors at certain prices defined in the SWP Contracts. If such excess water exists, the supplies are aggregated into "turnback pools" that are managed by the DWR and made available to other SWP contractors. This type of water can be scheduled any time during the year.

- ***Carryover Water –*** Under certain conditions, SWP contractors, and member units through KCWA, may store SWP water for delivery in the following year in the San

Luis Reservoir, a large SWP storage facility located east of Hollister in the western range of the San Joaquin Valley. Although carryover water use is often included with Article 21 or turnback pool water in SWP system water use summaries, carryover water is technically not a new source of supply. Carryover rights are created when a SWP contractor or KCWA member unit does not use all of its allocated Table A supply in a given year. Such carryover rights are subordinate to SWP storage requirements and may be unavailable if reservoir capacity is required for other system uses.

Table 4 summarizes the amount of SWP Table A, Article 21, Turnback Pool and Carryover water that was delivered to KCWA during the period 1995-2006.

Table 4

Kern County Water Agency
SWP Water System Deliveries and Utilization
AFY

	Table A	Article 21	Turnback Pool	Carryover	Total
1995	1,089,063	59,671	0	2,792	1,151,526
1996	1,117,060	15,653	0	52,350	1,185,063
1997	1,092,543	10,264	0	0	1,102,807
1998	856,906	0	0	1,684	858,590
1999	1,077,755	58,241	42,154	0	1,178,150
2000	825,856	78,908	233,202	13,193	1,151,159
2001	363,204	23,233	6,502	92,052	484,991
2002	670,884	21,951	20,543	15,680	729,058
2003	841,697	27,891	8,419	22,380	900,387
2004	640,190	86,513	5,075	40,120	771,898
2005	893,439	453,078	22,397	9,851	1,378,765
2006	961,882	256,634	18,610	5,418	1,242,544

Sources: DWR, " The State Water Project Delivery Reliability Report 2007 (Draft)" (December 2007) (years 1997-2006) and DWR, “The State Water Project Delivery Reliability Report” (April 2005) (years 1995-1996).

DWR prepares an assessment of future SWP delivery reliability every two years. The most recent version of this assessment is the “The State Water Project Delivery Reliability Report 2007 (Draft)” released by the DWR in December 2007 (the “SWP Reliability Report”). A copy of the SWP Reliability Report is attached to this WSA (see Appendix B). The SWP Reliability Report is the most comprehensive source of information regarding future SWP delivery projections and is utilized by system contractors for planning purposes throughout California.

3.1.2. Table A Allocations

TCWD is a member unit of KCWA and has contractual rights to receive a maximum of 5,278 AFY of SWP Table A water from KCWA. TCWD’s share of KCWA’s total Table A allocation is approximately 0.53%. The district has a right to approximately 0.13% of all SWP Table A allocations.

The amount of water delivered to SWP system participants each year may vary from the Table A allocations depending on annual precipitation, overall statewide demand, potential regulatory issues, potential climate change effects and other factors. The operation of the SWP pumps has been subject to lawsuits concerning potential impacts to endangered fish in the Delta. In 2007, this litigation resulted in court-ordered limitations on SWP pumping operations. Recent studies suggest that long-term climate change trends could affect the duration and intensity of the rainfall and snowmelt that generates the SWP system’s fresh water supplies. Climate change and other factors can potentially influence the amount of water available to SWP contractors.

The SWP Reliability Report provides the most current and comprehensive projections of SWP delivery reliability over the next 20 years considering potential operational challenges, climate change and other factors. The report considers several future scenarios, including an extrapolation of future reliability based on "current conditions" as of late 2007, and future scenarios that reflect several different climate change and greenhouse gas emission models. The results of these projections are summarized in Table 5.

Table 5

**Projected SWP Table A Delivery Reliability
Percent of Maximum Table A Allocations**

Year	Average Year (based on average SWP system deliveries during 1922-2003)	Single Dry Year (based on 1977 conditions)	2-Year Drought (based on 1976-1977 conditions)	4-Year Drought (based on 1931-1934 conditions)	6-Year Drought (based on 1987-1992 conditions)	6-Year Drought (based on 1929-1934 conditions)
2007	63%	6%	34%	35%	35%	34%
2012	64-65%	6%	32%	34-36%	35%	34-35%
2017	65-66%	7%	30-31%	34-36%	34-35%	34-35%
2022	66-68%	7%	28-29%	33-37%	34-35%	33-36%
2027	66-69%	7%	26-27%	32-37%	33-35%	33-36%

Source: SWP Reliability Report, Table 7-1 (December 2007).

The SWP Reliability Report indicates that average (normal) year deliveries will range from 63% to 69% of SWP Table A allocation levels over the next 20 years. Single dry year deliveries will range from 6% to 7% of SWP Table A allocations, and multiple drought year deliveries are estimated to range from an average of 26% to 37% of SWP Table A allocations per year. The reliability levels projected in the SWP Reliability Report are lower than previously predicted. KCWA, for example, has historically received an average 76% of its Table A allocation each year. Under the SWP Reliability Report average year estimates, TCWD would receive approximately 3,325 AFY if the average SWP reliability rate is 63% and approximately 3642 AFY if the average SWP reliability rate is 66%. The use of the SWP Reliability Report projections in this WSA is described in more detail in Section 5.

3.1.3. Article 21, Turnback Pool, and Carryover Water

Under the terms of its contracts with KCWA, TCWD has the right to receive approximately 0.53% of the Article 21 water that may become available to KCWA. TCWD has a contractual right to 0.53% of turnback pool that may be available to KCWA. TCWD also has a contractual right to carryover storage rights for Table A water not used in the correct year but which can be stored and delivered the following year.

TCWD has obtained Article 21 and other SWP supplemental water sources in previous years. It is possible that some or all of these supplies may become available in future years. Chapter 6 of the SWP Reliability Report, for example, predicts that Article 21 water will be available to SWP contractors in future years, although at reduced volumes than in the past. Nevertheless, to ensure that this WSA provides a conservative assessment, the analysis assumes that no Article 21 or other SWP supplemental water will be available to TCWD during the 20-year analysis period.

3.1.4. Federal Water Project Supplies

KCWA is a participant in the Central Valley Project (CVP), a federal water supply and distribution system generally located to the east of the SWP facilities in Kern County. KCWA is entitled to receive CVP water under an agreement with the Kern-Tulare and Rag Gulch water districts (the "KT/RG Agreement") or pursuant to Article 215 of the agency's CVP contract.

TCWD has no direct contract right to receive CVP water and the district is located outside of the CVP's service area. Under certain circumstances, it is possible for TCWD to exchange water with a CVP contractor or to have CVP water delivered to banking facilities that are located within the CVP place of use. In general, the amount of federal water potentially available to TCWD is approximately 0.53% of supplies that may be available to KCWA under the KT/RG Agreement or pursuant to Article 215 of the CVP contract. These supplies have been available to TCWD in prior years. Nevertheless, to ensure that this WSA provides a conservative assessment, the analysis assumes that no supplemental federal water supplies will be available to TCWD during the 20-year analysis period.

3.1.5. High-Flow Kern River Water

The Kern River flows for approximately 155 miles from the Sierra Nevada mountains near Mount Whitney to the Tulare Lake basin in the San Joaquin Valley west of Bakersfield. During periods of above-normal precipitation, flows within the Kern River and other streams can exceed the needs of existing users. Under such conditions, certain water districts and other entities, including the Kern Water Bank and Pioneer groundwater storage projects referenced below, have in the past and it is expected will continue to capture and use such high-flow water.

In addition, KCWA is the owner of certain Lower River Kern River water rights. KCWA is currently in the process of characterizing the conditions and amount of Kern River flows that may be available to its member units from such rights. For planning purposes, TCWD has estimated that on average approximately 187 AFY from the Lower Kern River right may become available to the district in the future. To ensure that this WSA provides a conservative assessment, the analysis assumes that no Kern River water is available to TCWD for project use during the analysis period.

3.2. TCWD's Rights to San Joaquin Valley Groundwater (TIC Service Area)

A portion of the TCWD service area in the San Joaquin Valley overlies the White Wolf groundwater sub-basin, an aquifer that has been recognized by the DWR in the department's official surveys of California groundwater basins. The White Wolf groundwater sub-basin encompasses approximately 52,000 acres and ranges from 6,500 to 9,800 feet in depth. Other districts that overlie the basin include the Wheeler Ridge-Maricopa Water Storage District and the Arvin-Edison Water Storage District.

Approximately 40 years ago, the Wheeler Ridge-Maricopa Water Storage District (WRMWSD), the Arvin-Edison Water Storage District, and other local water districts began importing SWP water for irrigation. Prior to that time, the White Wolf groundwater sub-basin was being overdrafted. In 1995, the WRMWSD commissioned a report that analyzed the status of the basin (Bookman-Edmonston, *Groundwater Study of White Wolf Basin* (1995)). The report found that groundwater levels had recovered since SWP water use had been initiated and that the White Wolf sub-basin generated a surplus of approximately 2,370 AFY. In 2007, the WRMWSD adopted a groundwater management plan pursuant to the Water Code that includes the portion of the White Wolf basin that lies within the district's boundaries.

TCWD obtains White Wolf sub-basin groundwater from the Rose Station well located east of Interstate 5 near the TIC project. The well was originally drilled by the DWR in 1964 and has a capacity of 1,500 gallons per minute (gpm); i.e., approximately 2,420 AFY. TCWD has estimated that the Rose Station well could be operated at 50% of capacity and yield approximately 1,210 AFY. The well produced approximately 90-200 AFY during the period 1999-2003. Production equivalent to approximately 458 AFY was documented for the well in 2006.

Rose Station well water is not connected to the California Aqueduct and cannot supply the TMV service area. In 2008, TCWD designated the Rose Station well as an emergency source of supply for the TIC service area. Certain rehabilitation requirements were identified in a 2007 assessment of the well, and water extracted from the well must be treated before it can be supplied to the TIC service area.

To ensure that this WSA provides a conservative assessment, the analysis assumes that no groundwater from the San Joaquin Valley will be available to TCWD and supplied to TIC during the analysis period. The WSA also assumes that groundwater extracted from aquifers located within the TMV project area will not be utilized during the analysis period (see section 5.5.5)

3.3. TCWD's Water Banking Rights

TCWD currently participates in two Kern County groundwater banks located within the San Joaquin Valley: (1) the Kern Water Bank (KWB); and (2) the Pioneer Project. The KWB and Pioneer Project are located at the lower end of the Kern River to the west of Bakersfield.

A groundwater bank allows participating water districts to percolate or inject water obtained during relatively wet hydrological periods into an aquifer for subsequent retrieval, typically during drier periods. Water bank supplies generally complement other sources, such as SWP deliveries, that may be affected by seasonal, regulatory or other operational variability. TCWD has currently banked approximately 29,728 acre-feet of water in the KWB and Pioneer Project. All banked water that TCWD will extract from the KWB and the Pioneer Project will be utilized to supply the TMV service area and the TIC service area within Kern County.

3.3.1. KWB Storage and Retrieval

Planning for a water bank at the current location of the KWB was initially pursued by the DWR in 1988. The project subsequently experienced several difficulties and was not substantially developed. Following a severe drought in the early 1990s, DWR and certain SWP contractors met in Monterey, California to consider revising the system's long-term water supply contracts. In 1995, the parties agreed to amend the SWP contracts in several respects (the "Monterey Agreement"), including the transfer of the rights to develop the KWB to the Kern Water Bank Authority (KWBA). The KWBA is a California joint powers authority consisting of five water districts and one mutual water company. TCWD is one of the water districts that participates in the joint powers authority.

The KWB consists of approximately 20,000 acres, of which approximately 5,000 acres are routinely used to percolate water into the underlying aquifer. Water is conveyed to and from the KWB using available capacity in several canals and conveyance facilities, including the Kern River, the California Aqueduct, the Cross Valley Canal (CVC), the Kern Water Bank Canal and other local and federal water project facilities. TCWD has rights to store and recover water from the KWB, convey recovered supplies to the California Aqueduct, and deliver the water through the aqueduct to the TMV project turnout at the southern end of Bear Trap Canyon. High flow water from the Kern River can be diverted directly to the eastern end of the KWB for percolation and storage.

TCWD has the right to store and extract up to 2% of the KWB's capacity. Under current KWB operational parameters, TCWD can store approximately 20,000 acre-feet in the bank and has an annual extraction capacity of approximately 4,000 AFY. It is possible that the KWB can support a greater level of storage and extraction and that TCWD's share of this capacity will be greater than 20,000 acre-feet of storage and 4,000 AFY of extraction. For planning purposes, TCWD has estimated that it could potentially extract up to 6,000 AFY from the KWB in the future. As of January 2008, TCWD had a storage balance of 28,381 acre feet in the KWB. For the purposes of this WSA, it is conservatively assumed that TCWD will be limited to a maximum storage capacity of 20,000 AFY in the KWB and have the ability to extract up to 4,000 AFY from the facility during the analysis period.

3.3.2. TCWD's Rights to the Pioneer Project

The Pioneer Project consists of approximately 2,253 acres adjacent to the KWB purchased by the KCWA in 1992. Seven agencies, including TCWD, are Pioneer Project "recovery participants" and have the right to store and recover water from the project. Under current operational parameters, TCWD has a maximum storage right of approximately 4,000 acre-feet, although additional supplies can be percolated and stored during non-peak periods. As of January 2008 TCWD had a storage balance of 1,347 acre-feet in the Pioneer Project.

TCWD has the right to use 1%, or approximately 1,000 AFY of the bank's annual recovery capacity. KCWA has an option to utilize up to 25% of the Pioneer Project's capacity. If the agency exercises this right, TCWD's extraction capacity would be reduced to 750 AFY, or 25% lower than the current maximum of 1,000 AFY. To date, KCWA has not indicated that it intends to exercise its option to use 25% of the Pioneer Project. To ensure that this WSA provides a conservative assessment, the analysis assumes that TCWD's extraction capacity from the Pioneer Project is 750 AFY during the analysis period.

3.4. TCWD's Recycled Water Supplies

TCWD operates a 100,000 gallons per day (gpd) wastewater treatment facility (WWTF) in the TIC service area on the west side of I-5. TCWD plans to build another 770,000 gpd WWTF on the east side of I-5 within the TIC service area. The TIC-East WWTF would be built in phases, while the TIC-West WWTF would be upgraded to produce tertiary treated wastewater for recycling. This WSA assumes that 358 AFY of recycled water will be available to meet landscape needs within the TIC service area, although the maximum potential recycled water supply for the project assuming full build out of the TIC wastewater treatment facilities is approximately 900 AFY. The TMV project will include an onsite WWTF and a recycled water distribution system. At full build-out, TMV will generate approximately 800 AFY of recycled water. The following sections describe the TIC and TMV recycled water facilities in more detail.

3.4.1. TIC Service Area Recycled Water Supplies

TCWD presently operates a wastewater recycling facility that provides recycled water for landscape irrigation within the TIC-West portion of the TIC service area. TCWD is upgrading the TIC-West WWTF to treat to Disinfected Tertiary Recycled Water standards as set forth in Title 22 of the California Code of Regulations. That level of treatment allows for the use of recycled water without access limitations.

The TIC-West WWTF consists of a comminutor, an influent bar screen, a flow equalization basin, a dissolved air flotation unit, four activated sludge reactor tanks with a diffused and a package aerator activated sludge system, clarifiers, tertiary sand filtration, a UV disinfection unit with backup chlorination, and sludge storage tanks. The plant also includes a 3.7 million gallon lined storage pond and a 4.5 million gallon unlined storage pond. These ponds store recycled water during periods of low demand. The permitted capacity of the TIC-West WWTF is 100,000 gallons per day (gpd) capacity. The TIC-West development has installed a dual piping system to convey recycled water to landscaped areas.

At present, the flow of wastewater from the TIC-West development is not large enough to allow for the use of recycled water. As the TIC-West and other phases of the TIC project mature, additional wastewater will be generated and the total volume of recycled water will increase. The near-term phased combined capacity of the TIC facilities is approximately 400,000 gpd, or approximately 448 AFY prior to evaporation losses. Evaporation losses associated with seasonal storage are estimated to be approximately 20% of the recycling facility's output, and approximately 358 AFY of recycled water will be utilized within the TIC service area. The TIC project's long-term plans include the potential generation of up to 900 AFY of recycled water. This WSA conservatively assumes that 358 AFY is available for use within the TIC service area during the analysis period.

3.4.2. TMV Service Area Recycled Water Supplies

At full build-out, the TMV project will use an estimated 1,000 AFY to meet indoor demand (see Table 3). This level of demand will produce approximately 800 AFY of recycled water. Nonpotable water demand generated by the two golf courses proposed for the project is estimated to be approximately 792 AFY (see Table 3). The project's recycled water supplies will be used to irrigate the proposed golf course facilities. Water from the potable supply system serving TMV may be utilized for golf course irrigation for a temporary period until sufficient recycled supplies become available. Recycled water will be stored near the wastewater treatment facility in lined ponds during periods of low demand (see Figure 1). To assure that available recycled water produced by the treatment plant will be fully utilized, the TMV project will prohibit the construction of wells for the purpose of irrigating the golf courses or other external landscaped areas.

3.5. Summary of TCWD Water Supplies

Table 6 summarizes TCWD's average year and potential water supplies under the conservative scenarios assumed in this WSA. The conservative estimates presented in Table 6 understate the district's water supplies because, among other factors, they do not include supplemental supplies from potential SWP and CVP exchanges that have been available to TCWD in the past and that may become available in the future.

Table 6
Summary of TCWD's Water Supplies (acre-feet)

	Average Annual Year	Maximum Annual Supply
Recycled Water (at full build-out)		
TIC Service Area	358	900
TMV Service Area	800	800
Subtotal Recycled Water Supplies	*1,158*	*1700*
Surface Water Supplies		
SWP Table A (Average year based on the lowest level projected in the SWP Reliability Report)	3,325	5,278
SWP Article 21, Turnback Pool or Other Supplemental Supplies	-	variable
High-Flow Kern River Supplies	-	187
Subtotal Surface Water Supplies	*3,325*	*5,465*
Local Groundwater Supplies (TIC Service Area Only)		
White Wolf Basin	-	2420
Water Banks in Kern County		
Kern Water Bank	4,000	6,000
Pioneer Project	750	1000
Subtotal Water Banking Supplies	*4,750*	*6,750*
Total Available Water Supply	***9,233***	***16,585***

4. TCWD Demand Analysis

This section describes the total water supply demands that TCWD will be required to meet over the 20-year WSA analysis period, including the TIC service area and other district requirements. The TMV project's water demands are discussed in Section 2 above.

4.1. TIC Service Area

The TIC service area includes two industrial parks, TIC-West and TIC-East. TIC-West is a 325-acre industrial warehouse and commercial development that commenced construction in 1999 and is approaching buildout. TIC-East is a 1,109-acre industrial warehouse and commercial development that was approved by Kern County in 2006 and that will begin in 2008. The TIC-West service area's water use since 1999 is summarized in Table 7.

Table 7
TIC West Service Area Water Use (AFY)

Land Use	1999	2000	2001	2002	2003	2004	2005
Commercial	36	36	36	48	64	58	57
Industrial	0	0	1	2	3	3	4
Landscaping	54	54	105	148	121	115	142
Total	*90*	*90*	*141*	*198*	*187*	*176*	*203*

TCWD will continue to provide water services to the TIC-West and TIC-East developments as the projects are further developed. Future water demands in the TIC service area were estimated in the TCWD 2005 Urban Water Management Plan and updated to reflect water use data derived from operational TIC-West buildings and current project plans. At full build-out, the TIC service area will use approximately 1,102 AFY. Table 8 summarizes projected build-out water demands for the TIC-West and TIC-East portions of the service area.

Table 8
Estimated TIC Service Area Water Demand at Full Build-out (AFY)

Land Use/Service Area	Potable Water	Non-Potable Water	Total Water
Commercial	72	133	205
Warehouse	4	96	100
TIC West Area Subtotal	76	229	305
Commercial	273	73	346
Industrial	174	177	351
TIC East Area Subtotal	447	250	697
Subtotal Water Demand	523	479	1,002
Total TIC Service Area Water Demand (including estimated system losses)			**1,102**

4.2. Other District Demands

From time to time, TCWD contributes water for various regional, users "pay-back" or other system-wide purposes. The amount of these obligations varies and is assumed to be approximately 100 AFY in this WSA. .

From time to time, TCWD has temporarily transferred surplus water supplies to other water users, including assisting with agricultural irrigation in adjacent areas during drier periods. These transfers are voluntary and TCWD has no obligation to transfer any of its water supplies to other districts or agencies for any purpose. No temporary transfer will be approved by TCWD unless: (a) there is no demand for the affected water in any of the district's service areas; and (b) the district has no available capacity to bank the water if there is no demand within its service areas. Under these conditions, temporary water transfers that may occur in the future will have no impact on the supply, demand and water banking projections in this WSA.

4.3. Summary of Total TCWD Water Service Demand

Table 9 summarizes TCWD's water service demands over the twenty year period required by the Water Code assuming full build-out of the TIC and TMV service areas. As discussed above, TIC-West is not yet complete and TIC-East construction will commence in 2008. The TMV project has not yet been approved by Kern County and full build-out is not likely to occur for several years. Due to these factors, the level of water service that TCWD will be required to provide over the twenty-year WSA analysis period could be significantly less than projected in Table 9.

Table 9
TCWD Total Projected Water Demands (AFY)
Assuming Full Build-Out of All Service Areas In Analysis Year 1

Service Area	**2008**	**2013**	**2018**	**2023**	**2028**
TIC Service Area	1,102	1,102	1,102	1,102	1,102
TMV Service Area	2,900	2,900	2,900	2,900	2,900
Other District Operations	100	100	100	100	100
Total TCWD	**4,002**	**4,002**	**4,002**	**4,002**	**4,002**

5. TMV Supply and Demand Analysis

Under the Water Code, a WSA must analyze whether "total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project in addition to the public water system's existing and planned future uses . ." (Cal. Water Code Section 10910(c)(3)). As discussed above, TMV, TIC, and certain additional district demands comprise TCWD's "existing and planned" water service requirements over the WSA analysis period. TCWD will supply all of the TMV project's water service demands. To implement the Water Code requirements, this WSA assesses the extent to which TCWD will meet its total water service demands, including TMV, over a twenty-year period during normal, single dry and multiple dry years.

The analysis method used in this WSA follows the DWR's *Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001* (2003) and the approaches discussed in the SWP Reliability Report. Section 5.1 describes these methods and the analysis assumptions in more detail. Sections 5.2-5.4 provide average, single dry, and multiple dry year water supply and demand projections in accordance with the Water Code. Section 5.5 discusses certain additional potential supply issues that were requested by the County.

5.1. Analysis Methodology and Assumptions

This section describes the analysis approach used to project TCWD's future supplies, including modeling future hydrological variability, estimates of future SWP system reliability, and potential climate change effects.

5.1.1. Analysis Approach

This WSA assumes that TCWD will fulfill all of its service demands by utilizing: (a) rights to receive SWP supplies as a member unit of the KCWA; and (b) conjunctively managing its supplies in the KWB and the Pioneer Project water banks. The analysis assumes that TCWD will first use SWP supplies that are available each year to meet TMV project and other district demands. During drier periods, stored groundwater will be retrieved from the water banks to supplement available SWP supplies. In subsequent wetter years, TCWD will fulfill its supply obligations by using available SWP water and replenish the water banks.

The most significant factors that may affect TCWD's supplies during the twenty-year analysis period include: (a) hydrological variability and annual changes in rainfall and snow accumulations within the SWP watershed; (b) SWP operational limitations due to endangered species or other regulatory constraints; and (c) the potential effects of climate change. To address these issues, TCWD requested that KCWA assist with the preparation of a quantitative model that facilitates an assessment of the district's future supplies under various hydrological, SWP operational and climate change conditions. The model incorporates the SWP Reliability Report projections and other pertinent long-term water supply analyses. The key elements of the approach used in this WSA include the following:

(1) *Use of the DWR CalSim II model to project hydrological variability over time.* As discussed in the SWP Reliability Report, annual variation in the amount of rain and snow that accumulates within the SWP watershed can significantly affect the volume of water available to SWP contractors and member units. In very dry years, SWP deliveries can be much lower than the Table A allocations. In wetter periods, the full amount of the Table A allocations may be delivered. The SWP Reliability Report models future SWP system hydrology variability by using the historical rain, snow and other water system data that occurred during the 82-year period 1922-2003. This data is further adjusted by the DWR to reflect current development patterns and is incorporated into a quantitative statistical

model, the most recent of which is called the “CalSim II” model. The CalSim II model was utilized by KCWA at the request of TCWD to provide the statistical basis for analyzing potential hydrological conditions during average years, a single dry year, and multiple dry years in this WSA. The CalSim II model provides the most comprehensive data currently available for projecting potential SWP system supply variability over time.

(2) *Use of the SWP Reliability Report analysis to project future SWP operational reliability.* Recent litigation and newly adopted regulations designed to protect certain endangered fish have limited the extent to which the SWP system pumps can extract water from the Sacramento Delta. The long-term future supply implications associated with these developments are uncertain. New conveyance facilities may be constructed around the Delta that could allow for greater water extraction capacity and reduce or eliminate protected species impacts. Alternatively, the existing pumping system may be maintained and could potentially become subject to increasingly more stringent operational constraints. The SWP Reliability Report provides the most recent and comprehensive discussion of these long-term operational issues. The report projects that the SWP system’s average delivery reliability will be below levels that were projected in previous DWR assessments. In 2005, for example, the DWR estimated that future average year SWP deliveries would be approximately 77% of the Table A allocations. Due in large part to endangered species protection issues, the SWP Reliability Report lowered this estimate to approximately 66%-69% of the Table A allocations (SWP Reliability Report, Table 6-21). The analysis in this WSA is based on the most conservative future SWP reliability projections discussed in the SWP Reliability Report.

(3) *Use of most conservative DWR climate change model.* Current research suggests that global climate change could affect the SWP system by raising sea levels in the Delta or modifying the timing and extent of snow melt and precipitation within the SWP watershed. The SWP Reliability Report provides the most recent and detailed assessment of potential climate change impacts on the SWP system. The report analyzed four climate changes and greenhouse gas emission scenarios and compared the delivery reliability impacts that would occur in each case during average, single dry and several multiple drought year conditions (SWP Reliability Report, Appendix B). The results of this analysis are summarized in Table 10. The “Geophysical Fluid Dynamic Lab Model, Emissions Scenario B1” (GFDL-B1) projection is the most conservative projection identified in Table 10. It projects that SWP deliveries will be the same or lower than each of the other scenarios in an average year, a single dry year, and all multiple-dry year periods that extend for more than four years. The GFDL-B1 model has been incorporated into this WSA to provide for the most conservative assessment of potential climate change impacts that may affect TMV water supplies.

Table 10

SWP Average and Dry Year Table A Delivery from the Delta in Normal, Single Dry, and Various Multiple Dry Year Conditions Based on 82-year Historical Hydrology Record

(Percent of maximum Table A allocations)

		Time Frame and Applicable Years in the 82-Year Hydrology Record					
		Average Year (1922-2003)	Single Dry Year (1977)	2-Year Drought (1976-77)	4-Year Drought (1931-34)	6-Year Drought (1987-92)	6-Year Drought (1929-34)
Climate Change and Emission Scenario	Geophysical Fluid Dynamic Lab Model, Emissions Scenario A2	66%	7%	26%	32%	34%	34%
	Geophysical Fluid Dynamic Lab Model, Emissions Scenario B1	66%	7%	27%	32%	33%	33%
	Parallel Climate Model, Emissions Scenario A2	67%	7%	26%	33%	33%	34%
	Parallel Climate Model, Emissions Scenario B1	69%	7%	27%	37%	35%	36%

SOURCE: *SWP Reliability Report,* Table B-2 (December 2007).

5.1.2. Analysis Assumptions

The CalSim II model adapted by KCWA for use in this WSA allows for the specification of several variables and assumptions. The assumptions utilized in this WSA are intended to reflect a conservative scenario that constrains TCWD's potential supply and water resource management options to a greater extent than would likely occur over the projection period. The most significant assumptions incorporated into the analysis include the following:

(1) *Use of lowest SWP Reliability Report long term reliability projections.* The model incorporates the DWR's GFDL-B1 climate change analysis results. As discussed above, the GFDL-B1 scenario generates the lowest long-term SWP reliability projections identified in the SWP Reliability Report.

(2) *Use of lowest SWP Reliability early-period average and single dry year reliability projections.* In addition to long term projections that identify various potential climate change scenarios, the SWP Reliability Report also projects

system reliability based on "current conditions" (SWP Reliability Report, Table 6-5). The current conditions projections include an average year delivery estimate of 63% of Table A allocations and a single dry year delivery estimate of 6% of Table A allocations. These figures are lower than the corresponding projections in any of the future climate change scenarios, including the GFDL-B1 analysis. To provide the most conservative analysis, this WSA uses the lower current conditions average and single dry year projections as the initial reliability factors assumed in the model and interpolates results for later years until the GFDL-B1 levels are reached. This approach is consistent with the DWR's analysis in the SWP Reliability Report (SWP Reliability Report, Table 7-1) and is more conservative than using the GFDL-B1 results without interpolation from the initial current conditions projections.

(3) *No Article 21, turnback pool, carryover or federal surplus water availability.* The model assumes that, over the twenty-year projection period, TCWD will not obtain Article 21, turnback pool, carryover or other surplus federal water for delivery or banking purposes. These water supplies have historically been used by the district and would likely become available in the future even under the DWR's most conservative SWP reliability analysis.

(4) *No groundwater use.* As discussed in Section 3, TCWD has the right to utilize the Rose Station well to supply groundwater to the TIC project. In 2007, the well produced 458 AFY, or approximately half of the TIC project's full build-out demand. The well is capable of producing about 2,420 AFY, a level of production that would meet all of TIC's estimated future demand. Although the Rose Station well requires certain rehabilitation, TCWD could utilize this facility if necessary to meet at least a portion of the TIC project's demand in emergency or other circumstances. The WSA does not assume that any groundwater supplies are used by TCWD during the analysis period. Potential groundwater use in the TMV project area is discussed in Section 5.5.5.

(5) *Conservative water banking storage limits.* This WSA assumes that TCWD's storage capacity in the KWB and the Pioneer Project is limited to a total of 24,000 acre-feet once the current level of storage (approximately 29,728 acre-feet) drops below that threshold. TCWD has previously been allowed to exceed the 24,000 acre-foot limit in the KWB and Pioneer Project, and the 24,000 acre-foot storage cap represents a conservative storage assumption.

(6) *Conservative water banking extraction limits.* The analysis assumes that TCWD's extraction capacity is limited to 4,000 AFY from the KWB and 750 AFY from the Pioneer Project. As discussed in Section 3, TCWD's ability to extract water from the KWB may be greater than 4,000 AFY and the district has rights to extract 1,000 AFY from the Pioneer Project until such time as KCWA elects to operate 25% of that facility. KCWA has not indicated that it intends to exercise these rights.

(7) *Full demand throughout the analysis period.* The projections assume that TCWD will be required to meet all of the full build-out demand that will be generated by both the TMV and TIC projects from the start of the analysis period. This approach significantly overstates TCWD's service burdens because neither project will generate full demand levels for several years.[1]

[1] The full demand assumption also overstates the extent of recycled water that is available to the project in the early years of the analysis since recycled supplies are a function of water use. TCWD performed additional supply analyses to demonstrate that, until full build-out demand occurs, TCWD can offset reduced levels of recycled water with potable water system supplies without adversely affecting the district's ability to supply the TMV project.

(8) *No use of flood or high-flow Kern River water.* As discussed in Section 3, KCWA is in the process of allocating rights to certain high flow Kern River water. Other flood flows from the river may also become available to the district. This WSA assumes that no Kern River water will be available during the analysis period.

(9) *Maintenance of 7,000 acre-foot water bank reserve.* Water banks are often pumped in dry years and recharged in subsequent periods when supplies are more abundant. Kern County requested, and TCWD has agreed, that TCWD maintain a 7,000 acre-foot reserve in the water banks for the TMV project, an amount equal to a 7-year indoor water use supply. This period of time corresponds with the longest sustained drought previously recorded in Kern County. The 7,000 acre-foot reserve requirement limits the amount of water that TCWD would otherwise be able to cycle into and out of the KWB and represents a conservative assumption regarding potential conjunctive use of the water bank.

(10) *No future or supplemental supply or storage augmentation.* The district has the ability to arrange for certain temporary or permanent water transfers with other districts under the auspices of the KCWA or in accordance with common practice and procedure in the County. None of these potential supply or storage augmentation measures is considered in the analysis. Potential non-SWP water availability is discussed in Section 5.4 below.

Each of these assumptions has been integrated into the WSA analysis and used to generate the average year, dry year and multiple dry year projections required by the Water Code.

5.2. Normal Year Analysis

Water Code Section 10912 requires an analysis of normal or average year supplies that will available for use by the proposed TMV project over a twenty-year period. As discussed in Section 5.1, the most conservative analysis identified in the SWP Reliability Report projects that average year SWP deliveries will range from 63% at the start of the twenty-year period (the “current conditions” projection) to 66% at the end of the period (the GFDL-B1 climate change projection). Values in between these years have been interpolated in the manner described in the SWP Reliability Report.

Table 11 summarizes the average year reliability results for years 1, 5, 10, 15 and 20 of the analysis. In each case, TCWD’s available supplies exceed the total, full build-out demands of the TMV and TIC projects plus other district operational demands. The annual surplus of water available to TCWD under average reliability conditions ranges from approximately 381 acre-feet (assuming a 63% SWP reliability rate) to approximately 539 acre-feet (assuming a 66% SWP reliability rate). If average year deliveries were maintained throughout the twenty-year analysis period, TCWD would not be required to use any of its banked water supplies to meet demand and the combined water banking account would remain unchanged from current storage levels of approximately 29,728 acre-feet. Table 11 demonstrates that TCWD’s normal year supplies are sufficient to meet the TMV project’s demands and to maintain at least 7,000 acre-feet of storage in TCWD’s water banking facilities throughout the analysis period.

Table 11 TCWD Normal Year Water Supply and Demand Analysis					
	2008	**2013**	**2018**	**2023**	**2028**
Recycled Water and SWP Supplies					
Recycled Water	1,158	1,158	1,158	1,158	1,158
SWP Table A (63% 2008, 66% in 2028 and interpolated for other years)	3,325	3,365	3,404	3,444	3,483
Article 21	-	-	-	-	-
Lower Kern River	-	-	-	-	-
Subtotal Supplies	*4,483*	*4,523*	*4,562*	*4,602*	*4,641*
Demands					
TIC Service Area	1,102	1,102	1,102	1,102	1,102
TMV Service Area	2,900	2,900	2,900	2,900	2,900
Other District Operations	100	100	100	100	100
Total TCWD Demands	*4,102*	*4,102*	*4,102*	*4,210*	*4,102*
Surplus/(Extraction)	**381**	**421**	**460**	**500**	**539**

5.3. Single Dry Year Analysis

Water Code Section 10912 requires an analysis of single dry year supplies that will be available for use by the proposed TMV project over a twenty-year period. As discussed in Section 5.1, the most conservative analysis identified in the SWP Reliability Report projects that single dry year SWP deliveries will range from 6% at the start of the twenty-year period (the “current conditions” projection) to 7% at the end of the period (the GFDL-B1 climate change projection). Values in between these years are interpolated in the manner described in the SWP Reliability Report. The analysis also assumes that surface water supplies from high-flow Kern River conditions will not be available for use by TCWD during a single dry year.

Table 12 summarizes the single dry year projections for years 1, 5, 10, 15 and 20 of the analysis. In each case, TCWD will be required to utilize water bank supplies to meet demand. Water bank recoveries range from approximately 2,627 acre-feet (assuming a 6% reliability rate) to approximately 2,575 acre-feet (assuming a 7% reliability rate). As discussed in Section 3, TCWD has the right to extract up to 4,750 acre-feet per year from its water banking facilities. This amount is substantially greater than the maximum recovery volume that would be required to meet demand in any single dry year projected in the analysis.

Table 12

TCWD Single Dry Year Water Supply vs Demands

	2008	2013	2018	2023	2028
Recycled Water and SWP Supplies					
Recycled Water	1,158	1,158	1,158	1,158	1,158
SWP Table A (6% 2008, 7% in 2028 and interpolated for other years)	317	330	343	356	369
Article 21	-	-	-	-	-
Lower Kern River	-	-	-	-	-
Subtotal Supplies	*1,475*	*1,488*	*1,501*	*1,514*	*1,527*
Demands					
TIC Service Area	1,102	1,102	1,102	1,102	1,102
TMV Service Area	2,900	2,900	2,900	2,900	2,900
Other District Operations	100	100	100	100	100
Total TCWD Demands	*4,102*	*4,102*	*4,102*	*4,102*	*4,102*
Surplus/(Extraction)	**(2,627)**	**(2,614)**	**(2,601)**	**(2,588)**	**(2,575)**
Max. Recovery from Water Banks	2,627	2,614	2,601	2,588	2,575
Minimum Reserve in Water Banks	16,722	16,775	16,828	16,880	16,933

At the end of a single dry year, TCWD's water bank reserves would be reduced by the amount of recovery that was needed to meet district demands. The remaining reserve level depends on the water bank's condition at the start of the dry year. At present, for example, TCWD has approximately 29,728 acre-feet in storage. If the 2008 dry year projection were to occur given this level of storage, TCWD's banking reserve would be reduced by 2,627 acre feet to a 27,101 acre-feet at the end of the single dry year.

The 82-year hydrology model developed by KCWA and TCWD was used to estimate the minimum water bank reserve level that could occur under following a single dry year. The analysis shows that the minimum water bank reserve projected in the 82 year model ranges from 16,722 acre-feet (using the 2008 6% single dry year factor) to 16,933 (using the 2028 7% single dry year factor). Each of the minimum reserve levels projected in Table 12 is greater than the 7,000 acre-feet storage requirement requested by the County. Table 12 shows that TCWD's available supplies are sufficient to meet TMV project demands and to satisfy the 7,000 acre-feet storage requirement in a single dry year.

5.4. Multi-Dry Year Analysis

Water Code Section 10912 requires an analysis of multiple dry year supplies that will be available for use by the proposed TMV project over a twenty-year period. As discussed in Section 5.1, the most conservative multiple dry year water supply projections in the SWP Reliability Report are generated by the GFDL-B1 scenario. The analysis also assumes that surface water supplies from high-flow Kern River conditions will not be available for use by TCWD during a multiple dry year period.

To analyze the potential effects of a multiple year drought, TCWD's supply and water storage reserves were assumed to reflect current conditions at the start of the 82-year hydrological model used in the analysis. Historically, the most severe 4-year drought on record in Kern County occurred in 1931-1934, or in years 9-13 of the 1922-2003 hydrologic models. The model indicates that, given the historical sequence of wet and dry years that occurred prior to drought in 1931, TCWD's water bank reserves would have been drawn down to approximately 23,412 acre-feet by the start of the 4-year drought cycle. Table 13 summarizes TCWD's water supply and water bank reserves during the ensuing multiple year dry periods utilizing the GFDL-B1 factors identified in the SWP Reliability Report.

Table 13

Multi-Year Drought Analysis (Based on 1931-34 Conditions)
Annual Water Supply vs Demand Balance

	Year 1	**Year 2**	**Year 3**	**Year 4**
Recycled Water and SWP Supplies				
Recycled Water	1,158	1,158	1,158	1,158
SWP Table A (based on GFDL-B1 reliability factors)	1,320	1,742	2,058	1,742
Article 21	-	-	-	-
Lower Kern River	-	-	-	-
Subtotal Supplies	*2,478*	*2,900*	*3,216*	*2,900*
Demands				
TIC Service Area	1,102	1,102	1,102	1,102
TMV Service Area	2,900	2,900	2,900	2,900
Other District Operations	100	100	100	100
Total TCWD Demands	*4,102*	*4,102*	*4,102*	*4,102*
Surplus/(Extraction)	**(1,624)**	**(1,202)**	**(886)**	**(1,202)**
Maximum Recovery from Water Banks	1,624	1,202	886	1,202
End of Year Water Bank Reserve (based on storage of 23,412 acre-feet at the start of the drought)	21,788	20,586	19,700	18,498

Table 13 shows that TCWD would be required to recover supplies from the water banks in each year of the 4-year drought to meet demand. The annual recovery volumes range from 886 acre-feet to 1,624 acre-feet. TCWD's extraction capacity of 4,750 AFY from the KWB and the Pioneer Project is sufficient to meet these requirements. By the end of the 4-year drought, TCWD's water bank reserves would fall to approximately 18,498 acre-feet. This reserve level exceeds the 7,000 acre-foot storage requirement requested by the County by approximately 11,498 acre-feet.

To further refine the multiple dry year assessment, the 82-year model was utilized to identify the period in which a multi-year drought would have the most significant impact on TWCD's water bank reserves. A series of trials were run with the model to conduct this analysis. The trial runs indicated that the water bank reserves would fall to the lowest levels under the 6-year drought conditions that correspond with the 1987-1992 period in the 82-year model.

To provide a conservative assessment, a multiple year drought projection was prepared based on 1987-1992 conditions. The analysis further assumed that TCWD's water bank reserves at the start of the 6-year dry period would be 16,722 acre-feet, the lowest level projected in the baseline 82-year model run. Table 14 summarizes TCWD's water supply and water bank reserves during the 6-year dry period under these assumptions.

Table 14

Minimum Water Bank Reserve Analysis
Multi-Year Drought (Based on 1987-92 Conditions)
Annual Water Supply vs Demand

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Recycled Water and SWP Supplies						
Recycled Water	1,158	1,158	1,158	1,158	1,158	1,158
SWP Table A	2,956	686	4,170	369	1,056	1,372
Article 21	-	-	-	-	-	-
Lower Kern River	-	-	-	-	-	-
Subtotal Supplies	*4,114*	*1,844*	*5,328*	*1,527*	*2,214*	*2,530*
Demands						
TIC Service Area	1,102	1,102	1,102	1,102	1,102	1,102
TMV Service Area	2,900	2,900	2,900	2,900	2,900	2,900
Other District Operations	100	100	100	100	100	100
Total TCWD Demands	*4,102*	*4,102*	*4,102*	*4,102*	*4,102*	*4,102*
Surplus/(Extraction)	**12**	**(2,258)**	**1,226**	**(2,575)**	**(1,888)**	**(1,572)**
Maximum Recovery from Water Banks	-	2,258	-	2,575	1,888	1,572
End of Year Water Bank Reserve (based on storage of 16,733 acre-feet at the start of the drought)	16,734	14,476	15,702	13,127	11,239	9,667

Table 14 shows that TCWD would be required to recover supplies from the water banks in four of the six years of the drought to meet demand. The maximum recovery volume in any single year would be approximately 2,575 acre-feet. TCWD's rights to extract water from the KWB and the Pioneer Project are sufficient to meet this requirement. By the end of the 6-year drought, TCWD's water bank reserves would fall to approximately 9,667 acre-feet. Despite the use of conservative assumptions in the analysis, the water bank reserves at the end of the 6-year dry period would still exceed the 7,000 acre-foot storage requirement requested by the County by approximately 2,667 acre-feet.

Tables 13 and 14 demonstrate that TCWD will be able to meet TMV project demands and satisfy the County's storage requirement during the multiple dry year conditions identified in the SWP Reliability Report. In addition, the 82-year hydrology model was utilized to evaluate how the district's supplies could vary over time assuming that average year SWP deliveries were lower than projected in the SWP Reliability Report. This supplemental analysis indicates that the district would be able to meet TMV project demands and to maintain at least 7,000 acre-feet in the water banks in the event that long-term average year SWP deliveries were approximately 20% lower than the worst-case scenarios presented in the SWP Reliability Report.

5.5. Other Potential Water Supply Issues

This section discusses certain additional water supply issues that are not specifically required by the Water Code, but that the County requested be evaluated in this WSA.

5.5.1. *Potential availability of diverted stream supplies for TMV use.*

The Tejon Ranch Company (TRC) is one of the members of TMV LLC, the company that owns and operates the TMV project. TRC owns agricultural land in the southern San Joaquin Valley. TRC captures water from approximately eleven streams that flow north from the Tehachapi Mountains to irrigate agricultural land on the valley floor. The County requested that this WSA consider whether these supplies could be available for TMV project use.

TRC's agricultural water diversions do not constitute a feasible supply for the TMV project for several reasons. The diversions are permitted by the by the California State Water Resources Control Board (State Board). The State Board permits and related agreements with certain San Joaquin Valley water districts specifically limit the use of the stream flows to the valley floor. At the time that TRC applied for the permits, the Wheeler Ridge-Maricopa Water Storage District, the Kern Delta Water District, the Arvin Edison Water Storage District, and KCWA expressed concerns that diversion of the stream flows could adversely affect southern San Joaquin Valley aquifers. In 2004, TRC resolved these issues by executing a Memorandum of Understanding (MOU) with the water districts that requires that the State Board permits limit all direct or indirect use of the diverted water to land that is located in the parts of the San Joaquin Valley that historically received flows from the diverted streams. The purpose of this requirement is to assure that irrigation use of the diverted water will continue to provide recharge benefits within the valley and that the diversions would avoid or minimize any potential groundwater or flood-flow impacts in the valley.

The TMV project is not located in any of the permitted use areas identified in the MOU or the permits. To serve the project, the diverted stream flows must be directly or indirectly exported to the TMV site. Any such arrangement would violate the terms of the 2004 MOU and the State Board permits.

The diverted stream flows also do not connect with any existing water conveyance facility that might serve the TMV site. New facilities would need to be proposed, permitted and constructed. This activity, and the exporting of water from its historical drainage basins, could generate significant groundwater, surface water and habitat or species impacts.

Finally, permanently shifting stream flows from agricultural use would reduce TRC's ability to irrigate cropland in the southern San Joaquin Valley. TRC generates approximately $15 million per year from its agricultural activities in the County. Irrigated farmland preservation is one of the County's most significant long-term planning objectives. The loss of high-value farmland resulting from the permanent transfer of the stream flows would adversely affect Kern County's agricultural economy and the work force and businesses that benefit from TRC's farming activities.

TRC's agricultural water diversions are limited for use within the San Joaquin Valley, sustain significant, high-value cropland, and cannot be delivered to the project site without generating potentially significant impacts. As a result, these supplies do not constitute a feasible source of water for the TMV project.

5.5.2 *Potential retirement of agricultural land and transfer of irrigation water.*

TRC owns approximately 5,496 acres of cropland in the southern San Joaquin Valley that receives irrigation water pursuant to long-term contracts with the Wheeler Ridge-Maricopa Water Storage District (WRMWSD). None of this land is located in the TCWD service area. WRMWSD is a member unit of KCWA and primarily utilizes SWP and water banking supplies to meet its members' demands. The County requested that this WSA consider whether TRC could retire land served by WRMWSD and permanently transfer the associated irrigation water rights to TCWD for project use. The permanent transfer and project use of WRMWSD contract water by means of fallowing land within the district would be difficult to achieve for several reasons.

WRMWSD exclusively supplies agricultural water to its members. Most agricultural water districts are only willing to consider permanent transfers in the event that none of their members has need for, or expresses interest in, the potentially affected supplies. As discussed in Section 3 of this WSA and in the SWP Reliability Report, the future reliability of SWP water deliveries is projected to be significantly lower than in the past. Water districts like WRMWSD that rely on SWP water to irrigate established cropland are highly unlikely to approve permanent transfers under these conditions.

A permanent inter-district transfer from WRMWSD to TCWD would also require KCWA approval. KCWA, like other Kern County agencies, has expressed the desire to protect agricultural water supplies within Kern County. Fallowing land to facilitate a permanent transfer of agricultural water for non-agricultural purposes would be inconsistent with this goal, particularly when, as is the case with TCWD, the proposed transfer recipient has sufficient water to meet its future demands.

Finally, the permanent removal of irrigated cropland from production would conflict with several Kern County policies and goals that seek to conserve high value farmland within the County. Many of the potentially affected landholdings are also subject to Williamson Act agricultural conservation easements, and the County specifically encourages farmland preservation by the use of Williamson Act contracts. TRC's farming operations generated over $15 million in 2007. Fallowing a portion of the company's productive cropland land would result in the loss of high quality, irrigated farming capacity and adversely affect agricultural businesses and employment within the County.

As a result, the fallowing of farmland within WRM to effect a permanent water transfer for the benefit of TMV is not a feasible water supply option for the project.

5.5.3 *Potential use of rainwater harvesting.*

Rainwater harvesting systems capture precipitation flowing from buildings or other onsite areas for storage in cisterns, tanks or similar facilities. Rainwater harvesting has been most commonly pursued in parts of New Zealand, Australia, Africa and Asia, particularly in rural areas where developed water supply systems do not exist.

The use of rainwater harvesting within the TMV project could generate several potentially significant effects to the local environment. The project site experiences approximately 13 inches of rainfall per year and precipitation tends to occur in isolated pulses. Most of the onsite watercourses and adjacent riparian areas are dry for lengthy periods and only become saturated for a short time after comparatively rare storm events. Local plants and animals have adapted to these hydrological conditions. As a result, the project has been specifically designed to minimize changes to onsite hydrology.

Rainwater capture systems remove a certain portion of the precipitation that would otherwise drain into the surrounding watershed. In wetter climates, where rainfall is frequent, harvest systems may not significantly affect the local environment. In more arid climates, where animals and plants are adapted to short periods of rainfall and saturated soils, harvesting could disrupt the functions and values of nearby watercourses and riparian areas. To provide for a significant source of water, the project would need to install relatively large capture devices and storage tanks throughout the project's 3,450 residences and commercial areas. The installation and operation of a dispersed water collection network of this magnitude could cause biological and hydrological impacts that would outweigh the corresponding water supply benefits.

Storage systems can also generate significant health problems when captured precipitation must be stored for long periods of time in sealed tanks or cisterns. Runoff from structures is known to contain animal feces, other organic and plant materials, and contaminants from roof and other surfaces. Although techniques have been developed to minimize the potential contamination associated with the initial stages of a storm event, none of the available harvesting systems can completely filter out all of the potential constituents of concerns. Consequently, capture systems require additional water treatment facilities for potable use, and, in some cases, to avoid the degradation of nonpotable supplies. The operation of dispersed water treatment systems throughout the site, including the use of chlorine and other chemicals, could generate health or biological impacts. Any discharge of contaminated water within the project site would also potentially generate health or environmental impacts.

Finally, the large-scale deployment of rainfall capture systems in an upland area could generate legal conflicts concerning downstream water rights. In Colorado, for example, rainfall harvesting is illegal without a permit because capture systems remove water from drainages that have been allocated to other riparian rights holders. California law has not yet explicitly addressed these potential concerns. It is possible that downslope stream flow users could become concerned that the deployment of upslope capture devices would impair their surface or groundwater rights.

Rainfall harvesting could allow for the storage of a limited amount of precipitation for use by the project. The potential hydrological, environmental, health and legal consequences of deploying capture devices within the project area, however, are significant uncertainties which preclude TMV reliance on rainfall harvesting for WSA purposes.

5.5.4 *Potential purchase of non-SWP water for banking and TMV project use.*

As discussed in Section 3, KCWA and its member units are occasionally able to acquire non-SWP water supplies, usually during particularly wet hydrological conditions. However, the following is to address possible permanent purchases of non-SWP water supplies.

For many years, California permanent has encouraged the development of water markets to facilitate permanent permanent transfers and promote water use efficiency. Nevertheless, opportunities to buy non-SWP water supplies remain quite limited in the state for several reasons:

- *Local water supply concerns.* Many communities and counties disfavor water transfers that permanently shift supplies from their jurisdictions. Several have enacted laws that prohibit or constrain such transfers. Localities have also frequently challenged proposed water transactions in court.

- *Multiple approval and review requirements.* Permanent water transfers can require discretionary approvals by state, local or federal agencies. The application, review, environmental assessment and other processing requirements associated with securing these approvals can significantly affect the timing, cost and risk of a proposed transfer.

- *Overlapping supply risks.* In many instances, non-SWP water supplies are subject to the same or similar reliability risks as the SWP system. A significant portion of the federal water system in California, for example, utilizes the SWP pumps or extracts water from the Delta at a location near the SWP pumping facilities. Water supplies that originate from the Delta or similarly sensitive areas can be subject to comparable or possibly even greater reliability risks than the SWP system.

- *Economic factors.* The California water transfer market is not yet mature. Under current circumstances, potential transfers are subject to significant transactional risks and pricing uncertainties. The cost of obtaining potential non-SWP supplies can exceed the typical water district's financial carrying capacity and may be unaffordable for use by the district's customers.

- *Delivery limitations.* Available water held by potentially willing sellers in California is often located in areas that lack a reliable means for delivering water to the intended buyers. Certain water districts and other water rights owners located north of the Delta, for example, have been willing to sell surplus water for several years. Most of the potential buyers, however, are located to the west and south of the Sacramento Delta. The potential transfer supplies must traverse through and be extracted from the Delta on a regular basis for delivery to the end users. As discussed in Section 3 of this WSA, Delta pumping and delivery risks have constrained the existing operations of many of the SWP and other significant water conveyance facilities. As a result, these systems have little or no surplus capacity to transport water from through sensitive regions like the Delta to potential transferees.

At present, no cost-effective sources of non-SWP water are known to be potentially available to TCWD. The district will continue to monitor statewide water markets and may consider supplementing its available supplies with non-SWP water on a case-by-case basis. However, the substantial uncertainties currently associated with transfers in California make it infeasible for TMV to rely on non-SWP water supplies for WSA purposes at this time.

5.5.5 *Potential project use of local groundwater supplies.*

The TMV project overlies a significant portion of groundwater Basin 5-29, an aquifer designated by the DWR in the department's official survey of California groundwater. Pursuant to California law, TMV LLC, and its agents and assigns, have senior overlying rights to extract water from Basin 5-29 for beneficial use within the project area. An overlying groundwater rights holder may beneficially use as much groundwater as needed on the land that overlies an aquifer, provided that such use does not adversely affect the rights of other overlying rights holders.

Overlying groundwater rights run with the land. As such, TMV continues to retain its overlying rights. This WSA does not assume that local groundwater will be used to meet project demand, however, for several reasons:

- The hydrogeology of Basin 5-29 and adjacent areas, which include DWR Basin 5-82 (the "Cuddy Canyon Valley" groundwater basin), DWR Basin 5-83 (the "Cuddy Ranch Area" groundwater basin), and DWR Basin 5-84 (the "Cuddy Valley" groundwater basin) is significantly influenced by major faults and other complex geologic features in the region. Water Code Section 10910(f)(2) requires that a WSA provide a detailed description of the applicable basin or basins from which a proposed project's groundwater will be drawn. TMV believes that additional study of regional hydrogeology, including the potential connectivity between Basin 5-29 and Basins 5-82, 5-83 and 5-84, is required to address these Water Code requirements.

- Water Code Section 10910(f)(5) requires an analysis of "the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project." The hydrogeology of Basin 5-29 and adjacent aquifers is complex. The current and potential groundwater demand analysis required by Water Code Section 10910(f)(5) depends on the characterization of the hydrogeology and connectivity of Basin 5-29 and adjacent groundwater basins.

- Adjacent landowners in the vicinity of the project exclusively rely on local groundwater to meet their water requirements. As discussed in this WSA, TMV project demands can be met by TCWD through the use of other, non-local water supplies. Under these circumstances, it may be inappropriate for WSA purposes to assume or assert that the TMV water demand can be met by local groundwater.

TCWD will continue to monitor and evaluate local groundwater demand, and continue to gather data to help characterize the nature, extent and sustainable yield of project area groundwater in accordance with Water Code requirements. TCWD will report on new data, as it becomes available, in subsequent studies prepared for future planning purposes.

5.6 *Potential project water supply issues associated with the finalization of the Monterey Amendment.*

As discussed in Section 3 of this WSA, the SWP system was significantly amended by the 1995 Monterey Agreement. The amendments resulting from the agreement were subsequently challenged in court. After several years of litigation, the DWR agreed to prepare and circulate a revised EIR to evaluate the potential environmental impacts that could be associated with the implementation of the agreement. A revised EIR was released by the department In October 2007, and public comments were received through January 2008. The DWR has indicated that it intends to finalize the CEQA process and certify the EIR in late 2008.

Under California law, a discretionary action, such as the amendment of SWP system operations, may only be finalized by a state agency after the CEQA process is complete. The SWP has been operated under the terms of the Monterey Agreement for more than a decade, but the amendments authorized by the agreement, including, for example, environmental impact mitigation requirements, could be affected by the finalization of the EIR. The County requested that this WSA consider whether the project's water supply analysis could be affected in the event that the DWR did not or was not able to certify the EIR as currently intended.

The Monterey Agreement included two SWP operational changes that could potentially affect TCWD: (a) the transfer of the KWB to the Kern Water Bank Authority; and (b) the modification of pre-1995 distinctions between contracts for agricultural and municipal and industrial (M&I) water. Each of these issues is discussed below.

(1) *TCWD's Rights to the KWB.* The KWB was transferred to the Kern Water Bank Authority as part of the 1995 Monterey Agreement. Due to the subsequent investment in, and improvements to, the KWB facilities that were made by KCWA and other KWBA participating entities in reliance on the transfer, is highly unlikely that the EIR certification process could significantly affect the current ownership and operation of the KWB.

If the KWB's operations were modified by the failure to certify the Monterey Agreement EIR, TCWD has several options for achieving the same or similar water banking capacity projected in this WSA. The Semitropic Water Storage District (Semitropic), for example, has developed a commercial water banking facility located to the west of the KWB. Like the KWB, this facility has access to the California Aqueduct and allows for the storage and retrieval of SWP water. Semitropic sells banking rights to third parties, including other water districts. Its facilities are being expanded to allow for 1.65 million acre feet of storage and a withdrawal capacity of 290,000 AFY. Semitropic also has SWP allocations that can be used to withdraw banking customer's stored water by exchange of up to an additional 133,000 AFY.[2]

The Semitropic water bank has significant unused capacity. If required to do so, TCWD could purchase rights to the Semitropic facilities, transfer its KWB storage, and conjunctively manage its rights to store and retrieve water in Semitropic in a manner consistent with the projections in this WSA. In the unlikely event that the Monterey Agreement EIR process prevented TCWD from utilizing its rights to the KWB, the same or substantially similar water banking capacity could be feasibly achieved by purchasing capacity in other banking operations located in Kern County.

(2) *Use of agricultural and M&I water.* The Monterey Agreement modified pre-1995 SWP operational distinctions affecting contracts for agricultural and M&I water. In general, pre-1995 SWP agricultural water contracts were limited to agricultural or related irrigation uses and subject to more significant cutbacks than M&I contracts during dry periods. The 1995 Monterey Agreement eliminated contract provisions that restricted agricultural water to agricultural uses and that required more significant agricultural supply reductions compared with M&I contractors during drought conditions. Approximately 2,000 acre-feet of TCWD's Table A allocations derive from a pre-1995 M&I contract with KCWA. Approximately 3,278 acre-feet of the district's supply derives from a pre-1995 agricultural contract with the agency.

Since 1995, water districts and their customers have relied on the post-Monterey Agreement SWP contract amendments to build, construct and maintain water service facilities throughout California. Due to this reliance, it is highly unlikely that the pre-1995 SWP contract provisions would be reimposed as a result of the Monterey Agreement EIR process. If such an event should occur, the portion of TCWD's Table A allocation associated with the pre-1995 agricultural contract could become more restricted in use and subject to greater dry-year reliability reductions than assumed in this WSA while its pre-1995 M & I supplies would be subject to less reductions than assumed in the WSA.

TCWD would have several options for addressing this circumstance. The district could request that KCWA approve an amendment to the agricultural contract that would allow for non-agricultural uses. Since TCWD does not and has not intended to use its supplies for agriculture, such an amendment would not affect Kern County farmland and would be consistent with KCWA and regional water use policies. KCWA has approved contract revisions pertaining to agricultural and M&I use in the past. The amended contract might still be subject to pre-1995 agricultural supply dry period reduction requirements. In such an event, the reliability factors utilized in Section 5.3 (single dry year) and Section 5.4 (multiple dry years) of this WSA to project TCWD's supplies could be lower than assumed. The analyses presented in this WSA, however, show that TCWD has sufficient banked water capacity to address potential reliability issues even if a portion of

[2] Semitropic Water Storage District, "Groundwater Banking" http://www.semitropic.com/GroundwaterBanking.htm (accessed April 2008).

the district's Table A allocations was subject a greater level of reduction during dry periods.[3]

The district could also seek to exchange its agricultural water supplies for M&I-use water. In the event that the pre-1995 SWP agricultural and M&I contract provisions were reimposed in the SWP system, many water users would have contracts that no longer conform with their current water use patterns. Agricultural users would seek to obtain supplies that can be used for farming; M&I users would desire water for municipal purposes. Under such circumstances, SWP system participants would likely exchange contract rights as necessary to reflect their water use requirements. Exchanges of this nature would allow TCWD to maintain rights to SWP water in a manner consistent with the analysis presented in this WSA.

As discussed above, it is highly unlikely that the DWR's finalization of the Monterey Agreement EIR will result in significant changes to the KWB or lead to the reimposition of pre-1995 SWP contract provisions. If any such outcomes were to occur, TCWD could achieve the same operational objectives projected in this WSA by implementing other feasible options that do not depend on the1995 Monterey Agreement.

[3] It is possible that, in a worst case situation and assuming pre-1995 agricultural contract limitations apply, the district's banking reserves could temporarily fall below the 7,000 acre-feet storage level requested by the County. In such a case, reserves would subsequently recover to higher levels over time even assuming that a portion of TCWD's Table A allocation is subject to pre-1995 reliability risks.

6. CONCLUSION

Consistent with the Water Code, this WSA analyzed TMV's potential water supplies during average, single dry and multiple dry years and projected the project's supplies over a 20-year analysis period. Other potential water supply issues were considered in the analysis as requested by the County.

As discussed above, the district's water supplies are likely to be greater and water demands substantially lower than assumed in this assessment. The analysis presented in this WSA therefore represents a conservative assessment of future project water supplies. This WSA demonstrates that TCWD can conjunctively manage its available SWP and water banking resources to meet TMV project water demands, and to maintain a 7,000 acre-foot reserve in the district's water banks, throughout the 20-year analysis period and under each of the hydrologic situations identified in the Water Code.

ATTACHMENTS

Appendix A EKI, *Preliminary Water Use Estimates for the Tejon Mountain Village Project,* (April 2008)

Appendix B California Department of Water Resources**,** *The State Water Project Delivery Reliability Report 2007 (Draft),* (December 2007)

REFERENCES

1. TMV Project Description

2. TCWD Contract for SWP Supplies with Kern County Water Agency

3. Verification of TCWD Groundwater Bank Accounts (KWB and KCWA)

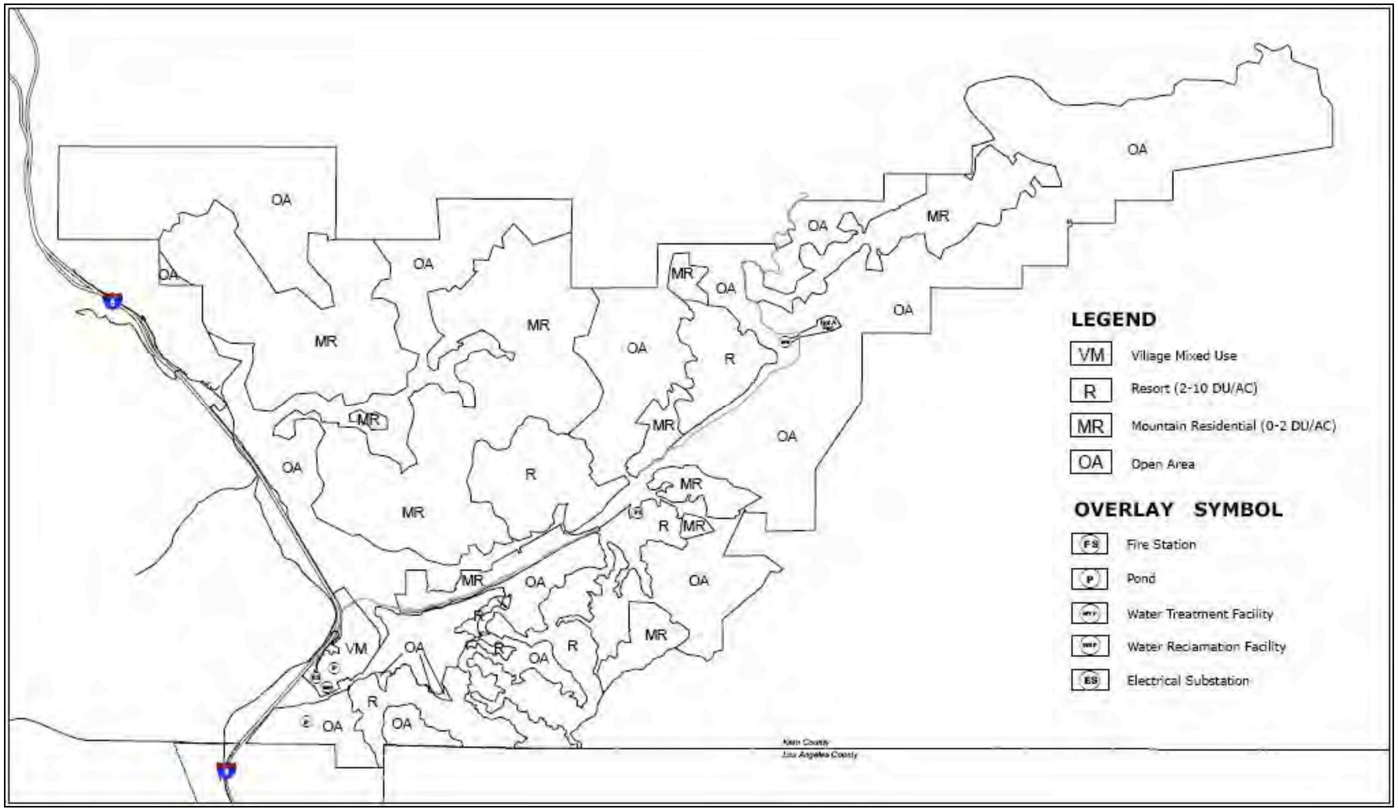
4. TCWD 2005 UWMP

5. California Water Code Sections 10910 *et seq.* (WSA Requirements)

6. Resolution of TCWD Board Approving WSA

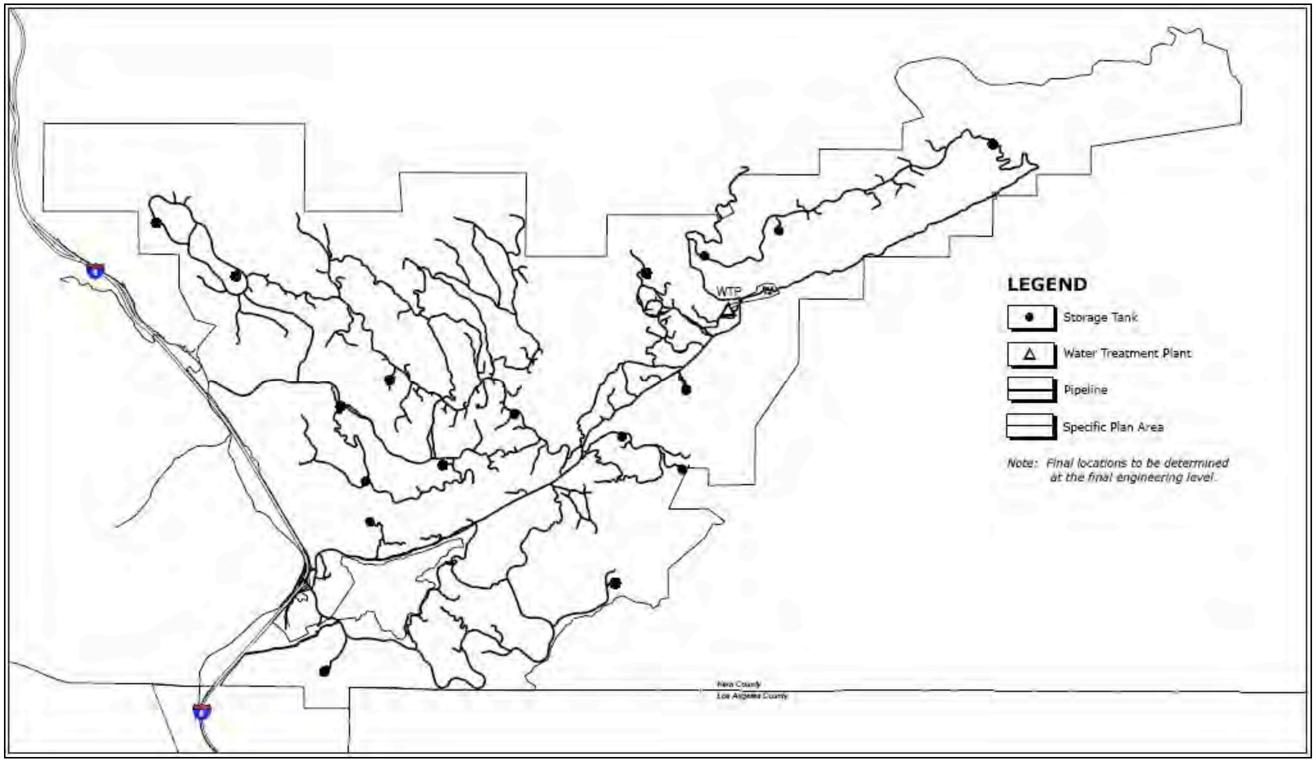
   (a) Notice of WSA Meeting
   (b) Distribution List for Meeting Notice
   (c) Resolution

Figure 1
TMV Project Proposed Land Use and Zoning Classifications



Source: Proposed Tejon Mountain Village Specific Plan (Kern County, pending)

Figure 2
TMV Project Proposed Water Backbone System



Source: Proposed Tejon Mountain Village Specific Plan (Kern County, pending)

Appendix E-2

in the Kern Water Bank (KWB) and Pioneer Project; and (3) SWP deliveries, assuming average, dry and multiple dry year SWP deliveries will occur at the lowest levels identified in the current SWP reliability report published by the DWR (see Draft EIR Tables 4.16-4 through 4.16-7 and WSA Tables 11 though 14). The WSA and Draft EIR analysis shows that TCWD will be able to meet all of the District's needs, including Project demands, utilizing the three water supplies discussed above. The Project's water supplies are not limited to the SWP. It should be noted that, as discussed in the Draft EIR and WSA Section 5, the Project and TCWD have rights to use local and other groundwater supplies. Due to concerns expressed by Mountain Community residents regarding the groundwater aquifers that serve their communities, The WSA and Draft EIR do not rely on groundwater resources and avoid any Project impacts to local or other aquifers. The proposed Project is a low-density, rural, recreational-oriented community and not a "new town" within the meaning of the California Environmental Quality Act (CEQA) or any other applicable legal standard.

Response 58 P.

This comment suggests that Draft EIR "understates" demand and "overstates" supply.

The Project water demand and supply analysis is included in Section 4.16 of the Draft EIR, UTILITIES AND SERVICE SYSTEMS. This is an introductory comment; more specific comments and responses follow. Commentor's opinion is noted.

Response 58 Q.

This comment suggests that the current SWP reliability report may not be used in the analysis of Project water supplies because the report was published before "more recent" biological opinions were issued for "the other" and "migratory" fish species in the Delta.

As discussed in the Draft EIR and the WSA, the current SWP reliability report considers future SWP delivery levels related to potential climate change impacts and the protection of the Delta smelt. On June 4, 2009 the National Marine Fisheries Service (NMFS) issued a biological opinion (Biop) for anadromous, migratory fish species in the Delta. The implementation of certain or the U.S. Fish and Wildlife Service (USFWS) water management measures for the smelt has been enjoined in a lawsuit and there is ongoing litigation concerning the final disposition of these measures. The NMFS Biop has also been criticized by several private and public interests after issuance and may be subject to significant similar legal challenges and uncertainty. WSA Section 5.1.1 acknowledges that operation of the SWP Delta pumps, which supply water from the Delta for the SWP system, could change in response to future conditions. For example, if proposed new conveyance facilities that avoid critical fish habitat in the Delta are built, the WSA notes that SWP system reliability could potentially increase above current levels. Conversely, the WSA observes that "the existing [Delta] pumping system may be maintained and could potentially become subject to increasingly more stringent operational constraints" (WSA at 20). Until legal uncertainties regarding Delta fish protection measures are resolved, and the DWR issues the next updated assessment of the SWP system, the current SWP reliability report remains the most comprehensive analysis of potential SWP system delivery levels available for CEQA purposes. The WSA and Draft EIR show that TCWD has more than adequate supplies to meet all District demands, including Project demands, in normal, dry and multiple-year drought conditions assuming that SWP deliveries occur at the lowest levels identified in the current SWP reliability report (see Draft EIR Tables 4.16-4 through 4.16-6 and WSA Tables 11 through 13). Consequently, TCWD has a sufficient supply reserve to accommodate potential future changes in the SWP system that may be related to the NMFS Biop. The extent of TCWD's supply reserves may be further illustrated by considering potential SWP reliability impacts that may be associated with the NMFS Biop in addition to the climate change and smelt-related impacts indentified in the SWP reliability report. The NMFS Biop states that, "NMFS estimates the water costs associated with the [reasonably prudent alternatives] to be 5-7% of average annual combined exports: 5% for [the federal Central Valley Project], or 130 TAF [thousand acre-feet]/year, and 7% for SWP, or 200 TAF/year. The combined estimated annual average export curtailment is 330 TAF/year." The Biop further states that the 7% SWP delivery reduction would be in addition to measures implemented for the smelt NMFS 2009. As required by the Water Code and CEQA, Draft EIR Tables 4.16-4 through 4.16-6 and WSA Tables 11 through 13 analyze TCWD's ability to meet District demands, including the Project, in normal, dry and multiple dry years over a 20-year period assuming that future SWP deliveries will occur at the most conservative levels identified in the current SWP reliability report. As discussed in Section 5.1.2 of the WSA and in the Draft EIR at 4.16-14, Draft EIR Tables 4.16-4 through 4.16-6 and WSA Tables 11 through 13 incorporate several additional conservative assumptions, such as the assumed need to meet full Project and other District demands from year one of the analysis (although full demand will take several years to materialize), and limiting TCWD's water bank capacity to 24,000 acre-feet although the District current has nearly 30,000 acre-feet in storage. Tables A through C below analyze TCWD's supplies assuming that SWP deliveries will be reduced by an additional 15% below the levels used in the Draft EIR and WSA, or more than double the potential 7% SWP impact identified in the NMFS Biop.

Table A shows that, if SWP deliveries were reduced by an additional 15% below the levels in Draft EIR Table 4.16-4 and WSA Table 11, in normal years the District would be required to utilize a small portion (118 to 17 acre-feet per year) of its banked supplies to meet demand. This level of utilization would not significantly affect TCWD's banked storage levels. Table A shows that, even if SWP deliveries were reduced by more than double the amount identified in the NMFS Biop, in a normal year TCWD would be able to meet all District demands and maintain a storage reserve of at least 7,000 acre-feet for Project use.

Table A
TCWD Normal Year Water Supply and Demand Analysis
SWP Delivery Reduction of 15% Below Levels Assumed in Draft EIR Table 4.16-4, WSA Table 11 and in Most Conservative SWP Reliability Report Levels

	2008	2013	2018	2023	2028
Recycled Water and SWP Supplies					
Recycled Water	1,158	1,158	1,158	1,158	1,158
SWP Table A (reduced by 15% from levels in Draft EIR Table 4.16-4 and WSA Table 11)	2,826	2,860	2,893	2,927	2,960
Article 21	-	-	-	-	-
Lower Kern River	-	-	-	-	-
Subtotal Supplies	*3,984*	*4,018*	*4,051*	*4,085*	*4,118*
Demands					
TIC Service Area	1,102	1,102	1,102	1,102	1,102
Tejon Mountain Village Service	2,900	2,900	2,900	2,900	2,900

Area					
Other District Operations	100	100	100	100	100
Total TCWD Demands	*4,102*	*4,102*	*4,102*	*4,102*	*4,102*
Surplus/(Extraction)	**(118)**	**(84)**	**(51)**	**(17)**	**16**

Table B shows that, if SWP deliveries were reduced by an additional 15% below the levels in Draft EIR Table 4.16-5 and WSA Table 12, in a single dry year TCWD would use stored reserve supplies to meet the majority of the District's demands. This level of utilization would reduce TCWD's banked storage levels over time, but the level of the District's reserve would not fall below approximately 15,077 acre-feet. Table B shows that, even if SWP deliveries were to be reduced by more than double the amount identified in the NMFS Biop, in a single dry year TCWD would be able to meet all District demands and maintain a storage reserve of at least 7,000 acre-feet for Project use.

Table B

TCWD Single Dry Year Water Supply vs Demands
SWP Delivery Reduction of 15% Below Levels Assumed in Draft EIR Table 4.16-5, WSA Table 12 and in Most Conservative SWP Reliability Report Levels

	2008	**2013**	**2018**	**2023**	**2028**
Recycled Water and SWP Supplies					
Recycled Water	1,158	1,158	1,158	1,158	1,158
SWP Table A (reduced by 15% from levels in Draft EIR Table 4.16-5 and WSA Table 12)	269	281	292	303	314
Article 21	-	-	-	-	-
Lower Kern River	-	-	-	-	-
Subtotal Supplies	*1,427*	*1,439*	*1,450*	*1,461*	*1,472*
Demands					
TIC Service Area	1,102	1,102	1,102	1,102	1,102
Tejon Mountain Village Service Area	2,900	2,900	2,900	2,900	2,900
Other District Operations	100	100	100	100	100
Total TCWD Demands	*4,102*	*4,102*	*4,102*	*4,102*	*4,102*
Surplus/(Extraction)	**(2,675)**	**(2,663)**	**(2,652)**	**(2,641)**	**(2,630)**
Max. Recovery from Water Banks	2,675	2,663	2,652	2,641	2,630
Minimum Reserve in Water Banks	15,077	15,146	15,215	15,284	15,353

Table C shows that, if SWP deliveries were reduced by an additional 15% below the levels in Draft EIR Table 4.16-6 and WSA Table 13, in multiple dry years TCWD would use varying levels of stored reserve supplies to meet the District demands. This level of utilization would reduce TCWD's banked storage levels over time, but the level of the District's reserve would not fall below approximately 15,692 acre-feet. Table B shows that, even if SWP deliveries were to be reduced by more than double the amount identified in the NMFS Biop, in multiple dry years TCWD would be able to meet all District demands and maintain a storage reserve of at least 7,000 acre-feet for Project use.

Table C

Multi-Year Drought Analysis (Based on 1931-34 Conditions)
Annual Water Supply vs Demand Balance
SWP Delivery Reduction of 15% Below Levels Assumed in Draft EIR Table 4.16-6, WSA Table 13 and in Most Conservative SWP Reliability Report Levels

	Year 1	**Year 2**	**Year 3**	**Year 4**
Recycled Water and SWP Supplies				
Recycled Water	1,158	1,158	1,158	1,158
SWP Table A (reduced by 15% from levels in Draft EIR Table 4.16-6 and WSA Table 13)	1,122	1,481	1,750	1,481
Article 21	-	-	-	-
Lower Kern River	-	-	-	-
Subtotal Supplies	*2,280*	*2,639*	*2,908*	*2,639*
Demands				
TIC Service Area	1,102	1,102	1,102	1,102
Tejon Mountain Village Service Area	2,900	2,900	2,900	2,900
Other District Operations	100	100	100	100
Total TCWD Demands	*4,102*	*4,102*	*4,102*	*4,102*
Surplus/(Extraction)	**(1,822)**	**(1,463)**	**(1,194)**	**(1,463)**
Maximum Recovery from Water Banks	1,822	1,463	1,194	1,463
End of Year Water Bank Reserve	19,813	18,350	17,155	15,692

Tables A through C show that TCWD will be able to meet all District demands, including the Project, even if the Draft EIR and WSA analyses further assume that SWP deliveries would be reduced by more than twice the levels identified in the NMFS Biop. As a result, the Draft EIR and WSA analyses demonstrate that Project water supplies will be sufficient in the event that the Delta species measures identified in Comment Q impact the SWP system to a greater extent than the most conservative scenarios identified in the SWP reliability report.

Appendix F

CONTRACT TO TRANSFER THE KERN RIVER LOWER RIVER WATER RIGHTS

This Contract is made as of the 23rd day of January 2001, by and between Nickel Family, LLC ("Nickel"), a California limited liability company; the Olcese Water District ("Olcese") and the Kern County Water Agency ("Agency"), both of which are public agencies in the State of California, duly organized, existing and acting pursuant to the laws thereof.

RECITALS

WHEREAS, the Governor's Budget Act for 2000, Chapter 52, Statutes of 2000, appropriated to the Department of Water Resources local assistance grant funds in the amount of $161,544,000 by budget item 3860-01-6027, payable from the interim Reliable Water Supply and Water Quality Infrastructure and Management Subaccount, and the Kern County Water Agency's Kern River Restoration Project has been selected for funding in the amount of $23,000,000 from that subaccount; and

WHEREAS, the Agency intends to use money from that appropriation for development of local water supplies, water quality, conveyance and banking programs within Kern County; and

WHEREAS, the Agency has identified the acquisition of the Lower River Water Rights as a source suitable for such programs; and

WHEREAS, the Lower River Water Rights are Kern River rights that historically have yielded on average 50,000 acre-feet per Year; and

WHEREAS, the Agency has purchased the undivided interest in the Lower River Water Rights, and other water rights and inventories, previously owned by Garces Water Company; and

WHEREAS, Olcese owns the remaining interest in the Lower River Water Rights subject to Nickel's right to use any portion of that water that is excess to Olcese's needs in accordance with the March 18, 1981 contract between Olcese and Nickel; and

WHEREAS, the Agency desires to purchase the remaining interest in the Lower River Water Rights and other interests described herein from Olcese and Nickel on the terms provided for in this Contract; and

WHEREAS, pursuant to the Detachment and Water Sale Contract No. 99-150, dated June 30, 1999, between Olcese, the City of Bakersfield and the California Water Service Company, the City of Bakersfield will provide water to meet the future municipal and industrial needs of lands within Olcese that are within the boundaries of the City of Bakersfield, provided those lands are detached from Olcese; and, WHEREAS, while there is no current demand from the landowners in Olcese for agricultural water supplies, if there should be a demand for water for agricultural use within Olcese over and above the amount that can be supplied to such lands from riparian rights, Olcese will receive sufficient compensation from the sale of its Lower River Water Rights to enable it to meet those demands from sources other than the Lower River Water Rights; and

WHEREAS, the Olcese Board of Directors has determined that the transfer of the Lower River Water Rights to the Agency as provided for in this Contract is in the best interest of its landowners; and

WHEREAS, the Agency, as the lead agency, and Olcese as a responsible agency, have completed all requirements under the California Environmental Quality Act for all actions provided for in this Contract.

NOW, THEREFORE, Nickel, Olcese and the Agency agree as follows:

ARTICLE 1. DEFINITIONS

When used in this contract, the following terms have the meanings hereinafter set forth:

1.1 "Agency's Return on Investment Rate" means the County of Kern's Treasury Pool investment rate.

1.2 "Agency SWP Entitlement Water" and "SWP Entitlement Water" mean the SWP water provided for in Table A of the Agency's Water Supply Contract.

1.3 "Agency's Water Supply Contract" means the November 15, 1963 Water Supply Contract between the State of California Department of Water Resources and Kern County Water Agency, as amended.

1.4 "Carmel Rights" means those rights and interests described in Exhibit C.

1.5 "Castro Ditch Rights" means those water rights and interests described in Exhibit B.

1.6 "CEQA" means the California Environmental Quality Act, California Public Resources Code sections 21000, *et seq.*

1.7 "Close of Escrow" or "Closing Date" means the day on which all applicable conditions precedent to this Contract are completed to Nickel's, Olcese's and the Agency's satisfaction or waived by the party that benefits from the condition precedent as set forth in Articles 8.1, 9.1 and the assignments provision of Article 10.1.

1.8 "DWR" means the Department of Water Resources of the State of California.

1.9 "Escrow Agent" means Chicago National Title Company in its Bakersfield, California office.

1.10 "Agency Transfer Water" means 10,000 acre-feet of water annually, to be provided by the Agency to Nickel for delivery and sale to third parties from the California Aqueduct.

1.11 "Johnson Ditch Rights" means those water rights described in Exhibit B.

1.12 "Lower River Water Rights" means those water rights described in Exhibit A.

1.13 "Rio Bravo Ranch" means that property described as the southern half of the northeast quarter and that portion of the southern half north of the Kern River of Section 33, the southern half of the southern half of Section 34, the southern half of the northern half and the southern half of Section 35, the southern half of the northern half and the southern half of Section 36, Township 28 South Range 29 East Mount Diablo Base and Meridian; Section 1, Section 2, the portion of Section 3 lying east of the Kern River, the northeast quarter of Section 10, Section 11, Section 12, the western half of the northeast quarter and the northwest quarter of the southeast quarter of Section 13, the northeast quarter of Section 24, Township 29 South, Range 29 East Mount Diablo Base and Meridian; the southern half of Section 5, Section 6 and Section 8, Township 29 South, Range 30 East Mount Diablo Base and Meridian, as depicted on Exhibit F.

1.14 "State" means the State of California.

1.15 "State Funds" means the funds made available to the Agency by the State from appropriations of funds authorized by Chapter 52, Statutes of 2000.

1.16 "SWP" means the State Water Project.

1.17 "Tupman" means the point of delivery on the California Aqueduct more particularly described as milepoint 238.04 located within Reach 12E of the California Aqueduct.

1.18 "Year" means the twelve (12) month period from January 1st through December 31st, both dates inclusive.

ARTICLE 2. GENERAL PROVISIONS

2.1 The Agency is purchasing and Nickel and Olcese are selling to the Agency their Lower River Water Rights and other rights as described and provided for herein. The Agency shall pay Nickel and Olcese for these rights the various considerations provided for in this Contract, including, but not limited to, providing Nickel with 10,000 acre-feet of Agency Transfer Water annually at Tupman which Nickel intends to sell both within and outside of Kern County. The Agency shall assume all the rights, duties and obligations associated with the Lower River Water Rights and other rights being transferred to it. Nickel, the Agency, and Olcese shall cooperate with each other in the performance of their respective obligations and in the exercise of their respective rights under this Contract.

ARTICLE 3. TERM OF CONTRACT

3.1 This Contract shall continue in perpetuity. However, if Escrow does not close by the date specified in Article 11.1, this Contract shall terminate on that date.

ARTICLE 4. PURCHASE AND PAYMENT TERMS

4.1 Purchase and Sale: Nickel hereby sells to the Agency and the Agency hereby purchases from Nickel all of Nickel's rights, title and interest to the Lower River Water Rights, including, but not limited to, Nickel's right to store, exchange, substitute and regulate the Lower River water as set forth in Exhibit A. Nickel also quitclaims to the Agency the Castro Ditch Rights and the Johnson Ditch Rights as set forth in Exhibit B. Olcese hereby sells to the Agency and the Agency hereby purchases from Olcese all of Olcese's rights, title and interest to the Lower River Water Rights, including, but not limited to, Olcese's right to store, exchange, substitute and regulate the Lower River Water as set forth in Exhibit A. Nickel and Olcese also hereby substitute the Agency as attorney-in-fact for any powers of attorney they may presently have relating to the Lower River Water Rights sold to the Agency. The purchase and sale of all of these rights shall be consummated through the escrow opened with the Escrow Agent. Any escrow instructions given the Escrow Agent by Nickel, Olcese or the Agency shall be consistent with the terms of this Contract unless otherwise agreed to by all parties in writing.

4.2 Cash Payments: By the Close of Escrow, Agency shall pay to Olcese one million dollars ($1,000,000) for the purchase of Olcese's Lower River Water Rights. By the Close of Escrow, Agency shall pay to Nickel six million four hundred twenty-two thousand dollars ($6,422,000) as partial consideration for the purchase of all rights and assets acquired by the Agency from Nickel under this Contract. The Agency shall pay Nickel and Olcese interest at the Agency's Return on Investment Rate on the above sums from the date on which the Agency receives not less than $10,000,000 of State Funds until the Close of Escrow. This interest shall be payable within five days of the Agency's receipt of the County of Kern's calculation of the first quarter of the Year 2001 quarterly interest rate , provided that the escrow closes, to Nickel and Olcese in proportion to the purchase payments to be paid to them respectively as provided for above.

4.3 Internal Revenue Code Section 1031 Exchange: Agency agrees to cooperate with Nickel in completing an exchange qualifying for nonrecognition of gain under Internal Revenue Code section 1031 and the applicable provisions of the California Revenue and Taxation Code. Nickel reserves the right to convert this transaction to an exchange at any time before the Close of Escrow. Nickel and the Agency agree, however, that consummation of the transaction contemplated by this Contract is not conditioned on completion of such an exchange. Nickel shall have the right to transfer and assign to an intermediary all of Nickel's rights and obligations under this Contract in order to complete the exchange. The Agency shall incur no additional liabilities, expenses or costs as a result of or connected with the exchange.

4.4 Water Exchange: Beginning in 2001 the Agency shall deliver to Nickel, annually during the term of this Contract, ten thousand (10,000) acre-feet of the Agency Transfer Water at Tupman as partial consideration for Nickel's interest in the Lower River Water Rights. The Agency shall provide the Agency Transfer Water at Tupman at no cost to Nickel other than the cost set forth in Article 4.5. The Agency shall use its best efforts to obtain and maintain approvals from the DWR for delivery of any Agency Transfer Water into the California Aqueduct, and if such approvals are not obtained after reasonable efforts the parties shall, in good faith, negotiate alternative mechanisms for delivery of Agency Transfer Water.

4.5 Power Charges: In any Year in which the Agency's allocation of SWP Entitlement Water on May 1st is seventy-five percent (75%) or less than its entitlement for that Year, Nickel shall pay the Agency the following power charge within thirty days after the Agency submits an invoice to Nickel, which invoice shall be submitted on or shortly after May 1. The power charge set forth in the invoice shall be an amount determined by the Agency by multiplying 10,000 acre-feet by the Agency's estimated per acre-foot power costs for pumping water from the Agency's Pioneer Project and delivering it to Tupman. The Agency shall estimate this per acre-foot cost using the method set forth in Exhibit D. There shall be no power charge to Nickel in any Year in which the Agency's allocation of SWP Entitlement Water on May 1 is greater than 75% of its SWP entitlement for that Year.

4.6 Treatment Costs: If the Agency is prevented from delivering non-SWP water into the California Aqueduct to meet the ten thousand (10,000) acre-foot obligation to Nickel required by Article 4.4 due to water quality restrictions unless it is treated, the Agency shall pay the cost of treating that water to the level acceptable for delivery into the California Aqueduct.

4.7 California Aqueduct Capacity: The ten thousand (10,000) acre-feet of Agency Transfer Water provided to Nickel shall be transported within the California Aqueduct to the full extent of the Agency's rights to use Aqueduct.

4.8 Scheduling of Agency Transfer Water: The Agency, in consultation with Nickel, shall schedule all Agency Transfer Water deliveries with the DWR at the same time and in the same manner as the Agency schedules deliveries of SWP Entitlement Water to the Agency's Member Units, as set forth in the Agency's contracts with its Member Units as they presently exist or may be changed from time to time.

4.9 Agency Transfer Water Sales: Any sale of the Agency Transfer Water shall be at the sole discretion and direction of Nickel. Nickel may request Agency's assistance, involvement and expertise in negotiating and consummating any sale. The Agency shall cooperate and assist Nickel, as requested, subject to the Agency's legal powers and duties and the direction of the Agency's Board of Directors. The Agency's involvement may include efforts to market Nickel's Agency Transfer water on behalf of Nickel, entering into contracts for the sale of the Agency Transfer Water and efforts to obtain the approval, cooperation and assistance of DWR and the State Water Contractors in obtaining any necessary approvals from regulatory agencies to effect such sales or transfers.

4.10 Proceeds of Agency Transfer Water Sales: All net proceeds of Agency Transfer Water sales shall be distributed as follows: Ninety percent (90%) to Nickel, ten percent (10%) to the Agency. "Net proceeds of Agency Transfer Water sales" shall mean the amount remaining from the proceeds of a sale after deducting any payments to third parties or other costs incurred by Nickel or the Agency that are necessary in order to complete a sale, such as costs for CEQA compliance, regulatory fees and charges, wheeling charges, power charges for transportation beyond Tupman or pursuant to Article 4.5, etc. Neither Nickel's nor the Agency's administrative costs in affecting an Agency Transfer Water sale shall be deemed to be payments to third parties necessary to complete a sale. All costs shall conform with standard industry practice, and are subject to audit at the requesting parties expense. After incurring such costs, Nickel or the Agency may invoice the other party for its respective share of such costs (Nickel 90%, Agency 10%) and payment thereon shall be made within thirty days of mailing.

4.11 Riparian or Carmel Rights: The Agency shall not challenge or contest directly or indirectly any of the Kern River riparian rights, as defined in the March 18, 1981 "Agency Agreement for Riparian Lands – Olcese Water District", of Nickel or Rio Bravo Ranch. The Agency shall not challenge or contest directly or indirectly any of the Carmel Rights of Olcese, Nickel or Rio Bravo Ranch.

4.12 Discharge of Well Water: The Agency shall not challenge or support any challenge to Olcese's or Rio Bravo Ranch's discharge of well water into the Kern River to meet the demands of the Rio Bravo Ranch or Olcese; provided, that the pumping of such well water does not substantially degrade the Kern River water quality to the injury of the Agency. The Agency acknowledges that Nickel has provided the Agency with an April 2000 study by Kenneth D. Schmidt and Associates regarding the origin of the groundwater pumped by Rio Bravo Ranch and Olcese.

4.13 Additional Consideration: At the Close of Escrow:

(a) The Agency shall convey to Nickel all of the Agency's rights, title and interest in the water inventories, more particularly described in Exhibit E.

(b) Olcese shall convey to the Agency all of Olcese's rights, title and interest in the City of Bakersfield's 2,800 acre recharge facility and to any water banked therein, subject to the City of Bakersfield's agreement to release Olcese from the thirteen (13) year supply requirement to meet the demands within Olcese set forth in Agreement 77-07, as amended by Agreement 78-12, Agreement 81-76, and Agreement 90-05.

(c) The Agency shall quitclaim all its rights, title and interest in the Carmel Rights to Olcese.

(d) Garces Deed: The Agency shall quitclaim to Nickel the rights and property identified in Exhibit G which were included in the rights and property granted to the Agency by the Garces Water Company, Inc. in the September1, 2000 grant deed from Garces Water Company, Inc. to the Agency.

(e) Nickel and Olcese shall deliver to the Agency all documents, files, legal files, historical records, communications and correspondence related to the Lower River Water Rights and the Johnson and Castro Ditch rights. Nickel and Olcese may, at their cost, make copies of such records. The Agency shall provide Nickel and Olcese access to any documents relating to the Lower River Water Rights in its possession upon request.

(f) Miller and Lux Facilities: Nickel and its related entities, and Olcese, agree to transfer, assign and convey any water or water related rights acquired from Miller & Lux, and its successors in interests, related to the Kern River within Kern County north of Highway 46. These rights may include, but are not limited to, transportation, spreading, storage and water rights.

ARTICLE 5. WATER PIPELINE EASEMENT

5.1 Nickel shall grant the Agency, for fifty thousand dollars ($50,000), an easement through Nickel's Rio Bravo Ranch for a water pipeline, beginning at the Rio Bravo Hydroelectric Project power plant forebay and roughly paralleling Highway 178. The size, use, location and terms for this easement shall be mutually agreed upon by Nickel and the Agency. If the use of this easement by the Agency causes any damage of facilities, improvements or orchards in the Rio Bravo Ranch, the Agency shall either, at Nickel's election, replace the damaged facilities or compensate Nickel for the fair market value of the damages. Agency's use of the power canal shall be consistent with the Condemnation Settlement Agreement of May 20, 1985. If any Agency facilities in the easement interfere with Nickel's current or future use of the Nickel's property, the Agency, at Nickel's request, shall relocate its facilities at Nickel's expense. Nickel is not obligated to obtain subordination from existing deeds of trust on its property. For the granting of the easement provided for herein, the Agency shall pay all costs to survey and record the easement. Nickel and the Agency shall use their best efforts to record the easement prior to the Close of Escrow; however, if the easement is not recorded within one year from the date of execution of this Contract the Agency's right to the easement will expire, and the $50,000 payment will be retained by Nickel unless failure to record has been caused by Nickel's failure to cooperate or unreasonable disapproval of proposed alignments. The Agency hereby grants Nickel (a) the right to convey water in the Agency's future water pipeline at the Agency's incremental cost to the extent there is capacity in the water pipeline not being used by the Agency and (b) the right to increase the capacity of the Agency's future water pipeline at the incremental cost.

ARTICLE 6. HYDROPOWER

6.1 Hydropower Interests: Nickel's conveyance of its Lower River Water Rights, and the other described rights to the Agency provided for in this Contract does not include Nickel's rights in the Rio Bravo Hydroelectric Project. The parties agree that Nickel retains its eighty-five percent (85%) interest in the Rio Bravo Hydroelectric Project Agreement dated April 29, 1985 between Catalyst Energy Development Corporation, Catalyst Rio Bravo Corporation and Olcese and the Condemnation Settlement Agreement dated May 20, 1985 between Nickel Enterprises and Olcese.

6.2 Right to Take: Nickel and Olcese shall grant to the Agency the right to take water from the Rio Bravo Hydroelectric Project to serve the Agency's proposed water pipeline referred to in Article 5.1. The Agency's right to take such water shall be subordinate at all times to the extent of Nickel's and Olcese's rights for the Rio Bravo Ranch's current or future irrigation demands.

ARTICLE 7. REPRESENTATIONS AND WARRANTIES

7.1 Nickel and Olcese hereby acknowledge, represent and warrant to the Agency that, as of the date of this Agreement and the Close of Escrow:

(a) Recitals and Exhibits: The Recitals and Exhibits to this Contract are true and correct.

(b) Organization: Nickel and Olcese are duly organized and validly exist in good standing under the laws of the State of California. Nickel and Olcese have full power, authority and legal right to execute, deliver and perform this Contract. To the best of Nickel's and Olcese's knowledge (after due diligent investigation and due inquiry), Nickel and Olcese have the unrestricted right and power to own, use and sell their respective interests in the Lower River Water Rights, as set forth in Exhibit A, as provided in and required by this Contract, have complied with all applicable laws and regulations of governmental agencies, officials or authorities, have obtained all necessary permits, licenses and approvals necessary and appropriate to proceed with the conduct of their business in accordance with the requirements of this Contract and have followed all necessary, proper and appropriate procedures in procuring such permits, licenses and approvals.

(c) Authorization: The execution and delivery by Nickel and Olcese of this Contract, and any other agreements or instruments required by this Contract and the performance by Nickel and Olcese of their obligations in connection with this Contract: (1) have been each duly authorized by all necessary boards of directors; and (2) to the best of Nickel's and Olcese's knowledge, after diligent investigation and due inquiry, require no registrations with or approvals of any person not heretofore obtained.

(d) Litigation: To the best of Nickel's and Olcese's knowledge (after diligent investigation and due inquiry), there is no action, suit, claim, cause of action, or proceeding at law or in equity (or by or before any governmental agency, official or authority of any local, State or Federal government) now pending, contemplated by Nickel or Olcese or threatened in writing against or affecting any Lower River Water Rights other than as expressly stated in a writing delivered to Agency at or prior to the Close of Escrow.

(e) No Oral Understandings: In executing this Contract, neither Nickel nor Olcese is relying upon any representation, communication, understanding or expectation (whether express or implied) that is not clearly and expressly stated in this Contract.

(f) Receipt of Information: Nickel and Olcese have received any and all information from the Agency which they desire or expect in connection with the transaction evidenced by this Contract, or any other document related to or required by this Contract. Nickel and Olcese are not relying upon the Agency directly or indirectly to disclose (or to evaluate any other person's disclosure of) any such matters, and Nickel and Olcese excuse and release the Agency from any duty whatsoever to make such disclosures.

(g) No Continuing Obligations: Nickel and Olcese understand and agree that, after the Close of Escrow, the Agency shall have no direct or indirect obligations whatsoever to them except as expressly stated in or required by this Contract.

(h) Separate Obligations: Nickel and Olcese shall be bound by and perform this Contract and each of the other documents related to or required by this Contract to which they are a party, separately and independently from the obligations of any other person or entity and regardless of whether or not any other person or entity performs this Contract or any other documents related to or required by this Contract.

(i) Violations of Applicable Laws: To the best of their knowledge, neither Nickel nor Olcese is in violation of any law, statute, regulation, ordinance or other governmental provisions with respect to any of the Lower River Water Rights to be conveyed to the Agency pursuant to this Contract.

(j) Violations of Other Agreements: The entry into this Contract does not create or result in a breach of any agreements with respect to any of the Lower River Water Rights to which Nickel or Olcese is a party or to which either of them is otherwise subject or bound.

(k) Ownership of Lower River Water Rights: Nickel and Olcese (a) collectively are the sole owners of the remaining of the Lower River Water Rights, as set forth in Exhibit A, being conveyed herein exclusive of any other owner or claimant and (b) have no knowledge and are not aware of any notice or other information concerning any other claims of any kind which would effect Nickel's or Olcese's title or claim to the Lower River Water Rights. The Lower River Water Rights described in Exhibit A constitute a complete description of all water, water storage, exchange entitlements and drainage contracts and other miscellaneous rights of any kind or description relating thereto owned or claimed by Nickel and Olcese. Nickel and Olcese have heretofore supplied the Agency with all documents known to Nickel and Olcese which constitute evidence of any Lower River Water Rights and title and claim thereto by Nickel and Olcese.

(l) Taxes: To the best of Nickel and Olcese's knowledge (after diligent investigation and due inquiry), Nickel and Olcese have paid (or caused to be paid) all property and other taxes required to be paid (and all assessments of which they have notice or acknowledged) with respect to the Lower River Water Rights to the extent such taxes (or assessments) have become due and payable. If there are any unpaid taxes or assessments as of the Close of Escrow, Nickel and Olcese shall be liable for their payment.

7.2 Agency hereby acknowledges, represents and warrants to Nickel and Olcese that, as of the date of this Contract and the Close of Escrow:

(a) Recitals and Exhibits: The Recitals and Exhibits to this Contract are true and correct.

(b) Organization: The Agency is duly organized and validly exists in good standing under the laws of the State of California. The Agency has full power, authority and legal right to execute, deliver and perform this Contract. To the best of the Agency's knowledge (after due diligent investigation and due inquiry) the Agency has complied with all applicable laws and regulations of governmental agencies, officials or authorities, have obtained all necessary permits, licenses and approvals necessary and appropriate to proceed with the conduct of its business in accordance with the requirements of this Contract and has followed all necessary, proper and appropriate procedures in procuring such permits, licenses and approvals, provided, however, that the approvals which are the subject of Article 4.4 shall be governed by that Article.

(c) Authorization: The execution and delivery by the Agency of this Contract, the consummation of the transactions and contracts required or contemplated by it and the performance by the Agency of its obligations in connection with this Contract: (1) have been each duly authorized by the Agency's board of directors; and (2) to the best of the Agency's knowledge, after diligent investigation and due inquiry, require no registrations with or approvals of any person not heretofore obtained.

(d) No Oral Understandings: In executing this Agreement, the Agency is not relying upon any representation, communication, understanding or expectation (whether express or implied) that is not clearly and expressly stated in this Contract.

(e) Receipt of Information: The Agency has received any and all information from Nickel and Olcese which it desires or expects in connection with the transaction evidenced by this Contract, or any other document related to or required by this Contract. The Agency is not relying upon Nickel or Olcese directly or indirectly to disclose (or to evaluate any other person's disclosure of) any such matters, and the Agency excuses and releases Nickel and Olcese from any duty whatsoever to make such disclosures.

(f) No Continuing Obligations: The Agency understands and agrees that, after the Close of Escrow, neither Nickel nor Olcese shall have any direct or indirect obligations whatsoever to the Agency except as expressly stated in or required by this Contract.

(g) Violations of Applicable Laws: To the best of the Agency's knowledge, the Agency is not in violation of any law, statute, regulation, ordinance or other governmental provisions with respect to any of the funds and the Agency Transfer Water to be conveyed to Nickel pursuant to this Contract.

(h) Violations of Other Agreements: The entry into this Contract does not create or result in the breach of any other agreement to which the Agency is a party or to which the Agency is otherwise subject or bound.

(i) Agency Transfer Water: The Agency has a legal right to the Agency Transfer Water to be provided to Nickel pursuant to this Contract whether from Agency SWP Entitlement Water or other sources, with full authority to exchange such water as provided for herein; and that such water is held free and clear of any liens, encumbrances or rights of any other party, other than the obligation of the Agency to make the payments to the State and other obligations, as required by the Agency's Water Supply Contract, and that the Agency shall maintain such water free and clear of any such claims during the term of this Contract.

(j) Kern River Water: The Agency understands the hydrology of the Kern River and the historical yield of the Lower River Water Rights, which has been on average, approximately fifty thousand (50,000) acre-feet per year. The Agency shall not hold Nickel or Olcese liable for any reduction in the yield of the Lower River Water Rights below this average.

(k) Obligations of the Lower River Water Rights: The Agency understands, agrees and assumes all of the Lower River Water Rights obligations, including, but not limited to, the Tulare Lake Basin Water Storage District annual ten thousand (10,000) acre-foot fee, the Lake Isabella storage costs, the Kern River Watermaster charges and legal fees, and the City of Bakersfield accounting fees and the Kern Property Corporation settlement. The Agency shall assume such obligations at the Close of Escrow, at which time all expenses for such obligations shall be prorated as per Article 9.1.

(l) Litigation: To the best of the Agency's knowledge (after diligent investigation and due inquiry), there is no action, suit, claim, cause of action, or proceeding at law or inequity (or by or before any governmental agency, official or authority of any local, State or Federal government) now pending, contemplated by the Agency or threatened in writing against or affecting any funds the Agency shall receive from the State of California pursuant to the Safe Drinking Water, Clean Water, Watershed Protection and Flood Protection Act or wherein an unfavorable decision, ruling or finding would (i) affect the creation, organization, existence or powers of the Agency or the titles and powers of its Board members and officers to their respective offices; (ii) enjoin or restrain the approval and/or execution of this Contract, or (iii) in any way question or affect any of the rights, powers, duties or obligations of the Agency with respect to implementation of this Contract, other than as expressly stated in a writing delivered to Nickel and Olcese at or prior to the Close of Escrow.

ARTICLE 8. CONDITIONS PRECEDENT

8.1 The obligations of Nickel and Olcese to sell the water rights set forth in Exhibits A and B and the resulting obligation of the Agency to pay and provide additional consideration are conditioned upon the satisfaction or waiver of the following conditions precedent prior to the Close of Escrow:

(a) State Funds: The Agency's receipt of State Funds sufficient to make the payments required of the Agency.

(b) Agency Resolution: The Agency shall provide Nickel a resolution adopted by the Agency's Board of Directors, meeting the requirement of Section 5 of the Kern County Water Agency Act (California Statutes of 1961, Chapter 1003, as amended), containing a finding by the Board that the Agency Transfer Water to be provided to Nickel pursuant to this Contract will not be needed for use within the Agency.

(c) Authorizing Resolutions: Nickel, the Agency and Olcese shall each provide the other parties to this Contract resolutions from their respective Boards of Directors authorizing the execution of this Contract.

(d) Opinion Letter of Counsel: Nickel shall deposit into escrow an opinion letter of counsel, satisfactory to the Agency, providing that the conveyances, transfers and assignments provided in this Contract are sufficient to transfer all right, title and interest of Nickel and Olcese to the rights described herein, except those specifically retained by or quitclaimed to Nickel and/or Olcese.

ARTICLE 9. CLOSE OF ESCROW

9.1 Close of Escrow: Agency shall deposit the sum of $7,472,000 into Escrow, and Close of Escrow shall occur when (1) the Agency delivers to the Escrow Agent $7,472,000 as required by Articles 4.2 and 5.1; (2) the Agency delivers to the Escrow Agent its prorated portion of the annual expenses incurred by the Lower River Water Rights; (3) the Agency, Nickel and Olcese have deposited all requisite documents for the transfer of the Lower River Water Rights, and other described rights to be transferred pursuant to this Contract, duly executed, authorized , acknowledged and approved by the parties' respective counsel as sufficient to transfer all purchased rights; and (4) all conditions precedent have occurred. If assignments are not approved, Nickel and Olcese shall in good faith negotiate with the Agency to provide for an operation agreement which will provide the Agency with equivalent rights (in the Agency's judgment) to the failed assignment. All expenses associated with the Lower River Water Rights shall be prorated as of January 1, 2001. The Agency, Nickel and Olcese shall notify by written notice to all parties and the Escrow Agent of the intended date for the Close of Escrow. All closing costs and fees, including without limitation, any transfer taxes, escrow fees, drafting and notary charges and recording fees shall be apportioned equally between the Agency, Olcese and Nickel. Each party shall be responsible for fees and costs of its own counsel.

ARTICLE 10. CONDITIONS SUBSEQUENT

10.1 Completion of All Required Assignments of Rights and/or Obligations: Prior to the Close of Escrow, the parties shall cooperate to achieve all necessary approvals of assignments and transfers of the rights and obligations to the Agency described herein and such approvals shall be deposited into Escrow prior to the Close of Escrow. If such assignments are not approved prior to the Close of Escrow, the parties shall negotiate a mutually satisfactory amendment, pursuant to Article 12.9, making such approvals a condition subsequent.

ARTICLE 11. ESCROW AGENT'S EXCULPATORY PROVISIONS

11.1 Close of Escrow: Escrow shall be closed as soon as possible, but no later than February 22, 2001 provided that the Escrow may extend beyond February 22, 2001 for six months by written agreement of the parties.

11.2 Neglect, Misconduct: The Escrow Agent will not be liable for any of its acts or omissions unless the same constitutes negligence or willful misconduct.

11.3 Information: The Escrow Agent will have no obligation to inform any party of any other transaction or of facts within the Escrow Agent's knowledge, even though the same concerns water entitlements, provided such matters do not prevent the Escrow Agent's compliance with this Contract.

11.4 Form, Validity, and Authority: The Escrow Agent will not be responsible for (1) the sufficiency or correctness as to form or the validity of any document deposited with the Escrow Agent, (2) the manner of execution of any such deposited document, unless such execution occurs in the Escrow Agent's premises and under its supervision, or (3) the identity, authority, or rights of any person executing any document deposited with the Escrow Agent.

11.5 Conflicting Instructions: Upon receipt of any conflicting instructions, the Escrow Agent shall immediately notify all parties that there is an apparent conflict in the instructions. The Escrow Agent will have the right to take no further action until otherwise directed, either by the parties' mutual written instructions or a final order or judgment of a court of competent jurisdiction.

11.6 Interpleader: The Escrow Agent will have the absolute right, at its election, to file an action in interpleader requiring the parties to answer and litigate their several claims and rights among themselves, and the Escrow Agent is authorized to deposit with the clerk of the court all documents and funds held in Escrow. If such action is filed, the parties will jointly and severally pay the Escrow Agent's termination charges and costs and reasonable attorney's fees that the Escrow Agent is required to expend or incur in the interpleader action, the amount thereof to be fixed and judgment therefor to be rendered by the court. Upon the filing of such action, the Escrow Agent will be and become fully released and discharged from all obligations to further perform any obligations imposed by this Contract.

ARTICLE 12. MISCELLANEOUS

12.1 Reference: The parties to this Contract agree to waive and give up the right to a jury trial and to submit all disputes, controversies, differences, claims or demands, whether of fact or of law or both, relating to or arising out of this Contract, to be resolved at the request of any party, by a trial on Order of Reference conducted pursuant to the provisions of Code of Civil Procedure section 638 *et seq.* or any amendment, addition or successor section thereto to hear the case and report a statement of decision thereon. The parties intend this general reference agreement to be specifically enforceable in accordance with said provisions. If the parties are unable to agree upon a referee, one shall be appointed by the Presiding Judge of the Kern County Superior Court. The parties shall share equally, by paying their proportionate amount of the estimated fees and costs of the initial reference.

12.2 Indemnity: Each party shall jointly and severally indemnify the other parties hereto against, and hold each other harmless from, any loss, cost, damage (whether general, compensatory, or otherwise), liability, indebtedness, claim, cause of action, judgment, court costs, and legal or other out-of-pocket expense (including attorneys' fees) which any party may suffer or incur as a direct or indirect consequence of (a) any breach by another party of any representation or warranty made in connection with this Contract; (b) any failure of any party to perform any obligation under this Contract which may affect another party.

12.3 Notices: All Notices given hereunder shall be transmitted in writing to the addresses below or to such other address in the State of California as a party may designate by written notice to the other parties:

If to Nickel:	Mr. James Nickel, President Nickel Family, LLC P.O. Box 60679 Bakersfield, California 93386-0679 Facsimile: (661) 872-7141
If to Olcese:	Board of Directors Olcese Water District P.O. Box 651 Bakersfield, California 93302 Facsimile: (661) 872-9956
If to Agency:	Mr. Thomas N. Clark, General Manager Kern County Water Agency P.O. Box 58 Bakersfield, California 93302 Facsimile: (661) 634-1428

All such notices shall be deemed to have been given at the first to occur of time of actual delivery, or, if mailed, forty-eight (48) hours after deposited in certified or registered United States mail, postage prepaid. In case of notice transmitted by an overnight delivery service (which obtains a written receipt upon delivery), notice shall be deemed to be given when delivered by any such service, charges prepaid and the receipt is signed. If any party transmits information to any other party orally or by a means not authorized herein, the party receiving such information shall be entitled to assume that the party giving such information will nevertheless comply with its written notice obligations, and no notice shall be deemed to have been given until the party receiving the information receives written notice as required herein.

12.4 Cumulative Remedies: Except as otherwise expressly provided herein, all rights and remedies provided for in this Contract are cumulative and shall be in addition to any and all other rights, powers, privileges and remedies provided by law.

12.5 No Third Parties Benefited: This Contract is made and entered into for the sole protection and benefit of the parties hereto, their successors and assigns, and no other person shall be a direct or indirect beneficiary of, or have any direct or indirect cause of action or claim in connection with, this Contract.

12.6 Time: Time is of the essence in this Contract.

12.7 Governing Law: This Contract shall be governed by and be construed according to the law of the State of California.

12.8 Counterparts: This Contract may be executed in any number of counterparts, each of which shall be deemed an original, but all such counterparts together shall constitute but one and the same instrument.

12.9 Amendments: This Contract contains the entire and exclusive agreement of the parties hereto. This Contract may only be modified or amended by a written contract executed by Nickel and the Agency. This Contract supersedes all prior drafts and communications with respect thereto. Neither such principles of interpretation nor the express language herein shall be impaired or adversely affected by the language of any prior discussion form or draft of this Contract or any other documents. Furthermore, this Contract has been the subject of negotiations by the parties, and this Contract shall not be construed against any party merely because of that party's involvement in their preparation.

12.10 Force Majeure: If the performance by any party to this Contract of any of its obligations or undertakings under this Contract is interrupted or delayed by any occurrence not occasioned by the conduct of any party to this Contract, whether that occurrence is an act of God or public enemy, or whether that occurrence is caused by war, riot, storm, earthquake, or other natural forces, or by the acts of anyone not party to this Contract, then that party shall be excused from any further performance for whatever period of time after the occurrence is reasonably necessary to remedy the effects of that occurrence.

12.11 Post-Escrow Cooperation: Following Close of Escrow, Nickel, Olcese, and Agency shall in good faith cooperate to ensure the complete transfer of all assets as specified in this Contract including, but not limited to, the execution and delivery of documents, deeds, assignments, and other instruments required to achieve the asset transfers specified in this Contract. The parties currently believe George W. Nickel Jr., Adele R. Nickel, and La Hacienda, Inc. do not possess an independent interest in the assets specified in the Contract, but if such interest is discovered they will cooperate to achieve the asset transfers specified in this Contract.

12.12 List of Exhibits: The following shall constitute all of the Exhibits to this Contract and by this reference are fully incorporated herein:

Exhibit A	Lower River Water Rights
Exhibit B	Johnson Ditch Rights and Castro Ditch Rights
Exhibit C	Carmel Water Rights
Exhibit D	Power Charges for Agency Transfer Water
Exhibit E	Water Inventories
Exhibit F	Map of Rio Bravo Ranch
Exhibit G	Garces Property Description

Dated: January 23, 2001

Kern County Water Agency

By ______________________
General Manager

Attested:

By ______________________
Secretary, Kern County Water Agency

Dated: January 23, 2001

Olcese Water District

By ______________________
President, Board of Directors

Attested:

By ______________________
Secretary, Olcese Water District

Dated: January 23, 2001

Nickel Family, LLC

By ______________________

President, Board of Directors

Dated: January 23, 2001

George W. Nickel, Jr.

____

Dated: January 23, 2001

Adele R. Nickel

____

Dated: January 23, 2001

La Hacienda, Inc.

By ______________________

President

Recording Requested By:
CHICAGO TITLE COMPANY
ESCROW NO. 673298-MM

When Recorded Mail to:
KERN COUNTY WATER AGENCY
Attention: JOHN STOVALL
P.O. BOX 58
BAKERSFIELD, CA 93302-0058

GRANT DEED

DOCUMENTARY TRANSFER TAX $ -0-
( ) COMPUTED ON FULL VALUE OF PROPERTY CONVEYED, OR ( ) COMPUTED ON FULL VALUE LESS LIENS AND ENCUMBRANCES REMAINING THEREON AT TIME OF SALE.

____
Signature of declarant or agent determining tax – Firm Name

( ) Unincorporated Area ( ) City of ______________

Assessor's Parcel No.: ______________

NICKEL FAMILY, LLC, a California limited liability company and OLCESE WATER DISTRICT, a California public agency, for valuable consideration, receipt of which is hereby acknowledged, DO HEREBY GRANT TO KERN COUNTY WATER AGENCY, a California public agency, the real property in the county of Kern, State of California, described on Exhibit A attached hereto and incorporated herein by this reference, together with all improvements thereon and all easements, rights of way, and other rights appurtenant thereto, subject, however, to the lien of non-delinquent real property taxes and assessments and covenants, conditions, restrictions, easements, rights-of-way and servitudes of record.

DATE: ______________, 2001

SELLERS:

Nickel Family, LLC

By: ______________________________
Title: ______________________________

Olcese Water District

By: ______________________________
Title: ______________________________

(ALL SIGNATURES MUST BE ACKNOWLEDGED)
MAIL TAX STATEMENTS TO GRANTEE AT ADDRESS ABOVE

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA)
) ss.
COUNTY OF KERN)

On ____________________ (Date), before me, ______________________________ (Name and Title of Officer (e.g. "Jane Doe, Notary Public")),

personally appeared ______________________________ (Name of Signers),

☐ personally known to me – **OR** – ☐ proved to me on the basis of satisfactory evidence to be the persons whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Signature of Notary Public

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY(IES) CLAIMED BY SIGNER(S)

☐ Individual
☐ Corporate Officer

____
Titles

☐ Partners ☐ Limited
☐ General
☐ Attorney-In-Fact
☐ Trustees
☐ Guardian/Conservator
☐ Other: ____________________

Signer is Representing:
Name of Persons or Entity(ies)

____

____

DESCRIPTION OF ATTACHED DOCUMENT

____
Title or Type of Document

____
Number of Pages

____
Date of Document

____
Signers Other Than Named Above

EXHIBIT A

TO GRANT DEED FROM NICKEL FAMILY, LLC AND OLCESE WATER DISTRICT TO THE KERN COUNTY WATER AGENCY

The real property transferred pursuant to this Grant Deed consists of the undivided interests held by Grantors, Nickel Family, LLC and Olcese Water District in and to the real property described in EXHIBIT A-1 attached hereto.

EXHIBIT A-1

The property referred to in this Contract is set forth below. For the purposes of this Water Asset Description, the term "Sellers" shall refer collectively to the following:

> Nickel Family, LLC, a California limited liability company (sometimes herein called "Nickel") and the Olcese Water District, a California public agency (sometimes herein called "Olcese"), George W. Nickel, Jr., Adele R. Nickel, and La Hacienda, Inc..

A. LOWER RIVER WATER RIGHTS. Any and all of Sellers' right, title and interest now owned in any right or title to divert that certain present and future allocation of the natural flow of the Kern River, including, but not limited to, those rights arising pursuant to the following series of agreements and commonly known as the Lower River Water Rights, and any powers of attorney relating thereto which Sellers may now have:

1. Kern River Water Right and Storage Allocation Agreement. That certain Kern River Water Right and Storage Allocation Agreement (the "Allocation Agreement") dated March 10, 1961, by and among Hacienda Water District and Kern River Delta Farms, as first parties, and Robert Burhans, Jr., Gertrude B. Burhans and Burhans & Trew, Inc., as second parties, recorded January 25, 1967, Book 4019, Page 311, Kern County which grants certain water and storage rights to the second parties ("Burhans") which rights were transferred, or modified, as follows:

(a) That certain Assignment dated March 10, 1961, recorded January 25, 1967, Book 4019, Page 309, Kern County, by which Burhans transferred their rights under the Allocation Agreement to Miller & Lux Incorporated; and

(b) That certain Agreement dated September 30, 1966, recorded January 25, 1967, Kern County, Book 4019, Pages 305-322 and recorded in Book 899, Pages 824-842 of the Official Records of Kings County ("Kings County"), by and among Hacienda Water District, George W. Nickel, Jr. dba Kern River Delta Farms and Miller & Lux Incorporated confirmed and ratified by the Kern River Water Right and Storage Allocation Agreement; and

(c) That certain Assignment dated January 11, 1974, recorded January 22, 1974, Book 4822, Page 952, Kern County, by which Miller & Lux, Incorporated assigned all of its rights under the Allocation Agreement to J.G. Boswell Company ("Boswell"); and

(d) That certain unrecorded Assignment dated October 4, 1974, by which J.G. Boswell transferred all of its rights under the Allocation Agreement to George W. Nickel, Jr.;

2. 1962 Kern River Water Rights and Storage Agreement. That certain Kern River Water Rights and Storage Agreement (the "1962 Agreement"), dated

December 31, 1962, by and between Buena Vista Water Storage District ("Buena Vista"), North Kern Water Storage District ("North Kern"), collectively the "Upstream Group," and Tulare Lake Basin Water Storage District ("Tulare Lake") and Hacienda Water District ("Hacienda"), collectively the "Downstream Group," and recorded April 5, 1963, in Book 3594 at Page 3, Kern County, which agreement further allocates diversion rights to Kern River water subject to the Miller-Haggin Agreement, and, in addition, certain storage and exchange rights for water so diverted in Isabella Reservoir, between the Upstream Group and the Downstream Group as successors in interest to the parties to the Miller-Haggin Agreement; and

3. Water Settlement Agreements. That certain Kern River Water Settlement Agreement dated January 1, 1963, which divides and apportions the Downstream Group's water and storage and provides for the exchange of water, and that certain Supplement to Kern River Water Settlement Agreement dated August 8, 1974, in which Hacienda has the option of delivering water from the California Aqueduct to Tulare Lake or making dollar payments to Tulare Lake, or both, and both agreements are by and between Tulare Lake and Hacienda (collectively, the "Tulare Lake-Hacienda Agreement") and neither agreement has been recorded; and

4. Agreement of Sale of Hacienda Ranch. That certain Agreement of Sale, and that certain Kern River Water and Storage Reservation Agreement (the "Reservation Agreement") both agreements dated October 16, 1978, and entered into by and between La Hacienda-TLR Agreement"), a California joint venture (the "La Hacienda-TLR Agreement"), and that certain Memorandum of Agreement dated October 12, 1978, recorded October 24, 1978, Book 1130, Page 957, Kings County, which agreements reserve to George Nickel, Adele Nickel and La Hacienda the Kern River water and storage rights allocated to the Downstream Group pursuant to the 1962 Agreement and, in addition, certain other water rights formerly held by Hacienda; and

5. Special Power of Attorney. That certain Special Power of Attorney from Hacienda to La Hacienda dated February 14, 1979, recorded Book 1184, Page 120, Kings County and recorded September 18, 1980, Book 5315, Page 1253, Kern County, as authorized by Hacienda Resolution No. 79-1; and that certain Special Power of Attorney from the Tulare Lake Representatives to La Hacienda dated February 8, 1979, both of which grant all rights to utilize the water and storage rights reserved under the Agreement of Sale of Hacienda Ranch referred to in subparagraph A.4 above for the limited purpose of contracting for, selling, exchanging, transferring, conveying or otherwise dealing with Kern River rights reserved by George Nickel, Adele Nickel, and La Hacienda; and

6. 1980 Contract. That certain Contract by and between Hacienda, Olcese, La Hacienda, George Nickel and Adele Nickel dated on or about August 20, 1980; and

7. Olcese-La Hacienda Agreement. That certain contract for the Purchase and Sale of Kern River Water and Storage Rights (the "Olcese-La Hacienda

Agreement"), dated March 18, 1981, by and between Olcese Water District ("Olcese"), La Hacienda, George Nickel and Adele Nickel, recorded May 26, 1981, Book 5377, Page 349, Kern County, which purports to transfer into Olcese the Kern River water and storage rights set forth in subparagraphs A.4 and A.1.a-d above, but reserves to La Hacienda, George Nickel and Adele Nickel "Excess Water" rights, "Option Water" rights, and other "Residential Rights," including the use of the special powers of attorney referred to in subparagraph A.5 above to the extent necessary to exercise Nickel's reserved rights.

8. Water Transfer Agreement. That certain contract entered into on March 29, 1988, by and between George W. Nickel, Jr., Adele R. Nickel, Nickel Enterprises, Rio Bravo Resort, Inc., La Hacienda, Inc., Kern River Development Company, and Lekcin Management Company, Inc., as Transferors and Garces Water Company, Inc. and the McNear-Driver Trust, which transferred eighty-five percent (85%) of the Transferors' combined interest in the Kern River water and storage rights reserved to the Transferors in the Olcese-La Hacienda Agreement referred to in subparagraph A.7 above to the McNear-Driver Trust and the remaining fifteen percent (15%) of those reserved interests to Garces Water Company, Inc. The March 29, 1988 contract granted Garces the right of first refusal to purchase the Trust's interest in those assets upon a sale or disposition of any of them by the Trust.

9. Water Transfer Agreement; Amendment and Consent to Ownership Transfer. That certain contract between the McNear-Driver Trust and Nickel Family, LLC, George W. Nickel, Jr., Adele R. Nickel, Nickel Enterprises, La Hacienda, Inc. and Garces Water Company, Inc. in which the Ttrust stated its desire to transfer the interests it obtained from the Transferors in the Water Transfer Agreement referred to in subparagraph A.8 above to Nickel, LLC, and in which Garces consented to such a transfer.

10. January 1, 1997 Transfer Agreement. That certain transfer agreement dated January 1, 1997, by and between Dudley L. Drake, Trustee of the McNear-Driver Trust and Nickel, LLC, wherein the Trustee granted and conveyed to Nickel LLC the undivided eighty-five percent (85%) interest in the assets obtained by the Trust in the Water Transfer Agreement referred to in subparagraph A8 above.

B. STORAGE RIGHTS. Any and all Sellers' right, title and interest in any right to store water, in Isabella Reservoir including, but not limited to the following:

1. Storage Rights In Isabella Reservoir. The perpetual right of Sellers to rent from North Kern (which has a right to storage space in Isabella Reservoir pursuant to the 1962 Agreement referred to in subparagraph A.2 above and that certain Contract among the United State of America, North Kern, Buena Vista, Tulare Lake and Hacienda, dated October 23, 1964) storage space in Isabella Reservoir for storage of their Kern River water, including Excess Water, as such right is set forth on behalf of the Downstream Group in Paragraph 9 of the 1962 Storage Agreement (such right to rent storage space reserved by Sellers in the Reservation Agreement referred to in subparagraph A.4 currently entitles Sellers

to twenty percent (20%) of the storage capacity of Isabella Reservoir); and

2. 1964 Contract with the United States of America. Any and all of Sellers' right to store water pursuant to the Contract with the United States of America, Number 14-06-200-1360A; and

3. Settlement Agreements. Any and all of Sellers' right to store water pursuant to the Reservation Agreement referred to in subparagraph A.4and the Kern River Water Settlement Agreement and the Supplement to Kern River Water Settlement Agreement referred to in subparagraph A.3 above; and

4. Minimum Pool Agreement. Any and all of Sellers' right to store water pursuant to the Agreement for Establishment and Maintenance of Minimum Recreation Pool of 30,000 acre feet in Isabella Reservoir by and between Buena Vista, North Kern, Tulare Lake, Hacienda, and the County of Kern dated November 8, 1963; and

5. Allocation Agreement. Any and all of Sellers' right to store water pursuant to the Allocation Agreement referred to in subparagraph A.1 above assigned to Miller & Lux, Inc. pursuant to the Assignment referred to in subparagraph A.1.a above and confirmed and ratified by the Agreement dated September 30, 1966, referred to in subparagraph A.1.b above; and

6. Spreading Agreements. Any and all of Sellers' rights under the Olcese-La Hacienda Agreement, referred to in subparagraph A.6 above, to store water in the Bakersfield Spreading Area pursuant to the Agreement No. 77-07 W.B. and Agreements No. 78-12 W.B. and 81-76 W.B.; and

C. WATER EXCHANGE AGREEMENTS. Any and all of Sellers' right, title and interest to, exchange water and entitlements arising as a result of contracts executed by Sellers for deliveries of water pursuant to various water exchange agreements for water originating in Kern County regardless of where delivered or regardless of whether the water for which it is exchanged originated in Kern County, including, but not limited to, the following:

1. 1962 Agreement; Water Exchange Rights. Such rights and entitlements of Sellers as from time to time arise pursuant to the priority position of Sellers to substitute its Kern River water for Kern River water to be delivered by Buena Vista or North Kern to third parties, and to receive water being returned to such parties in payment of prior exchanges, to the extent Sellers have a credit balance of water to be delivered, as such priority is set forth in Paragraph 14 of the 1962 Agreement; and

2. Right To Purchase Option Water. The annual right of Nickel to purchase all Olcese water in the Bakersfield Spreading Area which is in excess of that needed by Olcese as determined by Sections 8 and 9 of the Olcese-La Hacienda Agreement referred to in subparagraph A.6 above ("Option Water"), on the terms and conditions set forth in Section 10 of the Olcese-La Hacienda Agreement; and

3. Hacienda Water Substitution Agreement. The right of Sellers to substitute Hacienda water for all or a portion of Buena Vista water in exchange for Buena Vista entitlement of State Aqueduct water pursuant to the Water Substitution Agreement dated November 14, 1972, by and between Buena Vista and Hacienda; and

4. Buena Vista-La Hacienda Water Exchange Agreement. The right of Nickel to exchange Option Water for the Kern River water of Buena Vista pursuant to Paragraph 3(f) of the Buena Vista-La Hacienda Agreement; and

5. California Aqueduct Water Exchange Agreement. The right of Sellers to receive California Aqueduct Water from the Kern County Water Agency Improvement District No. 4 (the "Agency") in return for amounts of Kern River water delivered by Sellers or their predecessors to the Agency, pursuant to the terms and conditions set forth in that certain Water Exchange Agreement dated April 17, 1982, by and between the Agency and Nickel; and

D. CONTRACT RIGHTS. Any and all Sellers' right, title and interest in any contract rights relating to the sale or exchange of water originating in Kern County, whether general intangibles or otherwise, including, but not limited to the following:

1. TLR-La Hacienda Agreement. The right of Sellers to the first opportunity to sell Kern River water to TLR for use on that real property commonly referred to as the "Hacienda Ranch" or within the Tulare Lake Basin area, as set forth in Section 2(h) of the Kern River Water and Storage Reservation Agreement referred to in subparagraph A.4 above, and the right of Sellers to payment from TLR as set forth in Section 2 thereof; and

E. TRANSPORTATION RIGHTS. Those certain miscellaneous rights of Sellers to utilize canals, ditches, or other water transportation methods or conveyances or delivery facilities, and pumping equipment such as is necessary to exercise the water conveyance, transportation, and delivery rights, storage rights, water rights, water exchange entitlements, contract rights or any other rights or entitlements Sellers may have now, including, but not limited to, the rights specified in the following agreements:

1. That certain Common Use Agreement Between Buena Vista Water Storage District and Hacienda Water District dated June 18, 1973; and

2. That certain Agreement of Sale referred to in subparagraph A.4 above, as more particularly set forth in Section 2(h) thereof, including the canal parallel to and one mile north of state Highway 46 as said canal is described therein; and

3. That certain 1964 Amendment to Miller-Haggin Agreement referred to in subparagraph A.1.a. above which provides for use of first-point conduit to transport second-point group water pursuant to Section 5 thereof; and

4. That certain Kern River Canal Extension Agreement dated October 14, 1964, by and between Buena Vista, Buena Vista Associates Incorporated, and Miller & Lux Incorporated as more particularly set forth in Section VI thereof; and

5. Any and all agreements that now exist with respect to or regarding the Johnson Ditch.

6. Certain Agreements. Any rights, to the extent owned by Sellers, under the following agreements:

a. That certain Goose Lake Canal Agreement dated May 13, 1979 by and between Buena Vista as first party, and La Hacienda and Twin Farms, Inc., as second parties, recorded June 5, 1979, Kern County, Book 5203, Page 487; and

b. That certain goose Lake Canal Allocation of Water and Operating Agreement dated May 13, 1979 by and between La Hacienda, and Nickel Enterprises and Twin Farms: and

c. That certain Agreement for Joint Use of Burhans Canal System and Introduction of Nondistrict Water Into Burhans Ranch Area dated May 14, 1979, by and between Nickel Enterprises and Lost Hills Water District.

F. EXCLUSIONS. The following rights held by Sellers shall not be included within the definition of Lower River Water Rights:

1. Riparian Rights. Any rights not discussed above that are legally defined as riparian rights under California law; and

2. Groundwater. The right to pump groundwater that naturally occurs beneath land owned by Sellers; and

3. Public Agency Water. The right to obtain water from any Public Agency exclusively for use on land owned or leased by Sellers within that agency's service area.

RECORDING REQUESTED BY:
CHICAGO TITLE COMPANY

WHEN RECORDED MAIL TO
AND MAIL TAX STATEMENTS TO:

NAME	KERN COUNTY WATER AGENCY Attention: JOHN STOVALL
ADDRESS	P.O. BOX 58
CITY	BAKERSFIELD
STATE & ZIP	CALIFORNIA 93302-0058

QUITCLAIM DEED

TITLE NO. **ESCROW. NO. 673298-MM** **APN:**

THE UNDERSIGNED GRANTOR(s) DECLARE(s)
DOCUMENTARY TRANSFER TAX is $ -0- (No Consideration) CITY TAX $__________________
☐ Computed on full value of property conveyed, or ☐ Computed on full value less value of liens or encumbrances remaining at time of sale,
☐ Unincorporated area: ☐ City of Bakersfield, and

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, NICKEL FAMILY, LLC, a California limited liability company hereby remise, release and forever quitclaim to KERN COUNTY WATER AGENCY, a California public agency, receipt of which is its interest in the real property described in Exhibit B attached hereto and incorporated herein by this reference, together with all improvements thereon and all easements, rights of way, and other rights appurtenant thereto, subject, however, to the lien of non-delinquent real property taxes and assessments and covenants, conditions, restrictions easements, rights-of-way and servitudes of record in the County of Kern, State of California.

See Attached Exhibit B

Dated____________, 2001 ______________________________

____

(ALL SIGNATURES MUST BE ACKNOWLEDGED)

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA)
) ss.
COUNTY OF KERN)

On ______________________ (Date), before me, ______________________ (Name and Title of Officer (e.g. "Jane Doe, Notary Public")),

personally appeared ______________________ (Name of Signers),

☐ personally known to me – OR – ☐ proved to me on the basis of satisfactory evidence to be the persons whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Signature of Notary Public

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY(IES) CLAIMED BY SIGNER(S)

☐ Individual
☐ Corporate Officer

____
Titles

☐ Partner(s) ☐ Limited
☐ General
☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other: ______________________

Signer is Representing:
Name of Persons or Entity(ies)

____

____

DESCRIPTION OF ATTACHED DOCUMENT

____
Title or Type of Document

____
Number of Pages

____
Date of Document

____
Signers Other Than Named Above

EXHIBIT B

TO QUITCLAIM DEED FROM NICKEL FAMILY, LLC TO KERN COUNTY WATER AGENCY

The real property transferred pursuant to this Quitclaim Deed consists of the undivided interests held by Grantor, NICKEL FAMILY, LLC in and to the real property described in EXHIBIT B-1 attached hereto.

EXHIBIT B-1

A. CASTRO DITCH WATER RIGHTS. Any and all of Nickel's right, title and interest now owned in the so-called Castro Right to divert water from the Kern River evidenced by various instruments, conveyances, contracts and agreements, including, but not limited to, the following:

1. That certain Indenture dated April 5, 1894, recorded April 6, 1894 Kern County, Book 54, Deeds, Pages 30 and 31, by which H.H. Fish, George Daggett, and H.A. Blodget conveyed an undivided 1/18th interest in the Castro Ditch and water right to James M. Keith; and

2. That certain Indenture dated April 5, 1894, recorded April 6, 1894, Kern County, Book 54, Deeds, Pages 32 and 33, by which H.H. Fish, George Daggett, and H.A. Blodget conveyed an undivided 1/9th interest in the Castro Ditch and water right to S.W. Wible; and

3. That certain Indenture dated May 20, 1896, recorded May 20, 1896, Kern County, Book 60, Deeds, Pages 640 and 641, by which Tomas Castro and Manual Castro conveyed an undivided 2/18ths part of the Castro Ditch and all the branches thereof and of the water and water rights appurtenant thereto to William S. Tevis; and

4. That certain Indenture dated May 20, 1896, recorded May 22, 1896 Kern County, Book 60, Deeds, Pages 644 and 645, by which W.L. Dixon and Florence G. Dixon, his wife, conveyed an undivided 2/18ths part of the Castro Ditch and all the branches thereof and of the water and water rights appurtenant thereto to William S. Tevis; and

5. That certain Agreement dated March 31, 1905, which provides for the right to appropriate and divert water from the Kern River at the head of Stine Canal Extension up to 20 cfs; and

6. That certain Corporation Quitclaim Deed dated February 4, 1982, recorded February 25, 1982, Kern County, Book 5440, Pages 2241-2242, by which Miller & Lux, Inc., remised, released and quitclaimed to La Hacienda, Inc., Assessors Parcel Number 700-980-24-00-8; and

7. That certain Corporation Quitclaim Deed recorded February 25, 1982, Kern County, Book 5440, Pages 2243-2244, by which Miller & Lux, Inc., remised, released and quitclaimed to La Hacienda, Inc., Assessors Parcel Number 700-980-25-00-1; and

8. That certain Quitclaim Deed dated November 25, 1986, by which La Hacienda, Inc., remised, released and quitclaimed to the City of Bakersfield the physical facilities of the Castro Ditch excepting all Kern River Rights appurtenant to eight shares of stock in the Castro Ditch; and

9. Any other or additional right, title or interest in or to the Castro Ditch and water right now owned by Nickel.

B. JOHNSON DITCH WATER RIGHTS. The so-called Johnson Right to divert water from the Kern River of which Nickel owns a part as a result of various instruments, conveyances, contracts, and agreements, including, but not limited to, the following:

1. That certain Corporation Quitclaim Deed dated February 4, 1982, recorded February 25, 1982, Kern County, Book 5440, Pages 2245-2246, by which Miller & Lux, Inc., remised, released and quitclaimed to La Hacienda, Inc., Assessors Parcel Number 700-980-26-00-4; and

2. Any other or additional right, title or interest in or to the Johnson Ditch and water right now owned by Nickel.

RECORDING REQUESTED BY:
CHICAGO TITLE COMPANY

WHEN RECORDED MAIL TO
AND MAIL TAX STATEMENTS TO:

NAME **OLCESE WATER DISTRICT**
Attention: Board of Directors
ADDRESS P.O. BOX 651

CITY BAKERSFIELD

STATE & ZIP CALIFORNIA 93302

QUITCLAIM DEED

TITLE NO. **ESCROW. NO. 673298-MM** **APN:**

THE UNDERSIGNED GRANTOR(s) DECLARE(s)
DOCUMENTARY TRANSFER TAX is $ -0- (No Consideration) CITY TAX $____________________

☐ Computed on full value of property conveyed, or ☐ Computed on full value less value of liens or encumbrances remaining at time of sale,
☐ Unincorporated area: ☐ City of Bakersfield, and

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, KERN COUNTY WATER AGENCY, a California public agency, hereby remise, release and forever quitclaim to OLCESE WATER DISTRICT, a California public agency, receipt of which is its interest in the real property described in Exhibit C attached hereto and incorporated herein by this reference, together with all improvements thereon and all easements, rights of way, and other rights appurtenant thereto, subject, however, to the lien of non-delinquent real property taxes and assessments and covenants, conditions, restrictions easements, rights-of-way and servitudes of record in the County of Kern, State of California.

See Attached Exhibit C

Dated____________________, 2001 ______________________________________

____

(ALL SIGNATURES MUST BE ACKNOWLEDGED)

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA)
) ss.
COUNTY OF KERN)

On ______________________ (Date), before me, ______________________ (Name and Title of Officer (e.g. "Jane Doe, Notary Public")),

personally appeared ______________________ (Name of Signers),

☐ personally known to me – **OR** – ☐ proved to me on the basis of satisfactory evidence to be the persons whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Signature of Notary Public

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY(IES) CLAIMED BY SIGNER(S)

☐ Individual
☐ Corporate Officer

____
Titles

☐ Partner(s) ☐ Limited ☐ General
☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other: ______________________

Signer is Representing:
Name of Persons or Entity(ies)

____

____

DESCRIPTION OF ATTACHED DOCUMENT

____
Title or Type of Document

____
Number of Pages

____
Date of Document

____
Signers Other Than Named Above

EXHIBIT C

TO QUITCLAIM DEED FROM KERN COUNTY WATER AGENCY TO OLCESE WATER DISTRICT

The real property transferred pursuant to this Quitclaim Deed consists of the undivided interests held by Grantor, KERN COUNTY WATER AGENCY in and to the real property described in EXHIBIT C-1 attached hereto.

EXHIBIT C-1

A. CARMEL WATER RIGHT. The so-called Carmel Water right to 3.956% of Kern River water allocated to the Miller-Haggin First Parties of which Nickel's predecessors in interest owned a part as a result of various instruments, conveyances, contracts, and agreements as follows:

1. That certain Agreement dated October 24, 1945, between Buena Vista Water Storage District as first party, and C.E. Houchin and George L. Bradford, co-partners doing business as Carmel Cattle Company, as second party, recorded December 1, 1945, Kern County, Book 1290, Page 176, by which the second party reserved said Carmel Water Right; and

2. That certain Deed dated February 23, 1956, in which Kathryn Houchin, Francis L. Houchin, and Anna Lumis, as executors of the estate of C.E. Houchin, deceased, conveyed to Miller & Lux, Inc. said Carmel Water Right; and

3. That certain Deed dated February 24, 1956, recorded February 1956, Kern County, Book 2567, Page 0527, document no. 11922, in which Miller & Lux, Inc. conveyed to C. Ray Robinson and Pauline Robinson, husband and wife, an undivided 15% of said Carmel Water Right; and

4. That certain Quitclaim Deed Agreement dated August 31, 1973, recorded September 24, 1973, Kern County, Book 4805(?), Page 812(?) by which C. Ray Robinson, as grantor and as successor in interest to Pauline Robinson in said Deed to Mr. & Mrs. Robinson, thereafter transferred all his then remaining 12.75% undivided interest in and right to either water or income in said Carmel Water Right to George Nickel; and

5. That certain Agreement by and between Nickel doing business as Kern River Delta Farms, and Olcese Water District, dated February 27, 1976, to which said 12.75% undivided interest of George Nickel in said Carmel Water Right is subject, pursuant to Sections 1 and 5 thereof.

RECORDING REQUESTED BY:
CHICAGO TITLE COMPANY

WHEN RECORDED MAIL TO
AND MAIL TAX STATEMENTS TO:

NAME NICKEL FAMILY, LLC
Attention: James Nickel, President
ADDRESS P.O. BOX 60679

CITY BAKERSFIELD

STATE & ZIP CALIFORNIA 93386-0679

QUITCLAIM DEED

TITLE NO. ESCROW. NO. 673298-MM APN:

THE UNDERSIGNED GRANTOR(s) DECLARE(s)
DOCUMENTARY TRANSFER TAX is $ -0- (No Consideration) CITY TAX $__________
☐ Computed on full value of property conveyed, or ☐ Computed on full value less value of liens or encumbrances remaining at time of sale,
☐ Unincorporated area: ☐ City of Bakersfield, and

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, KERN COUNTY WATER AGENCY, a California public agency, hereby remise, release and forever quitclaim to NICKEL FAMILY, LLC, a California limited liability company, receipt of which is its interest in the real property described in Exhibit E attached hereto and incorporated herein by this reference, together with all improvements thereon and all easements, rights of way, and other rights appurtenant thereto, subject, however, to the lien of non-delinquent real property taxes and assessments and covenants, conditions, restrictions easements, rights-of-way and servitudes of record in the County of Kern, State of California.

See Attached Exhibit E

Dated________________, 2001 ____________________

____

(ALL SIGNATURES MUST BE ACKNOWLEDGED)

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA)
) ss.
COUNTY OF)

On ____________________, before me, ____________________________________,
Date — Name and Title of Officer (e.g. "Jane Doe, Notary Public")

personally appeared ____,
Name of Signers

☐ personally known to me – **OR** – ☐ proved to me on the basis of satisfactory evidence to be the persons whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Signature of Notary Public

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY(IES) CLAIMED BY SIGNER(S)

☐ Individual
☐ Corporate Officer

____
Titles

☐ Partner(s) ☐ Limited
☐ General
☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other: ____________________

Signer is Representing:
Name of Persons or Entity(ies)

____

____

DESCRIPTION OF ATTACHED DOCUMENT

____
Title or Type of Document

____
Number of Pages

____
Date of Document

____
Signers Other Than Named Above

Exhibit D

Power Charge = $/KWH X Avg. KWH/AF X 10,000 AF

1. $/KWH is calculated by using the PG&E, AG 5b rate or future equivalent determined prior to May 1 of each year. Currently AG 5b includes demand charges and electric energy charges for on peak, off peak, and partial peak and California Energy Commision taxes. The 10,000 af is assumed to be pumped at a rate of 1,000 AF per month from March 1 to December 31. The average daily rate is 33 AF. Pumping is assumed to occur throughout the entire 24 hour period for each day of the month.

2. The following table will be used to determine the KWH/AF. Average Depth to Groundwater is a value calculated from the measurements of wells in the Pioneer Project during the spring of each year. This data is compiled for the Kern Fan Monitoring Committee.

Spring Average Depth to Groundwater on the Pioneer Project[1]	Average KWH/AF
10	194
20	211
30	229
40	246
50	264
60	281
70	299
80	317
90	334
100	352
110	369
120	387
130	405
140	422
150	440
160	457
170	475
180	493
190	510
200	528
210	545
220	563
230	581
240	598
250	616
260	633
270	651
280	668
290	686
300	704

Example: If groundwater levels are 102 feet.

$224,005 = $0.0631/KWH X 355 KWH/AF X 10,000 AF

[1]If average depth to groundwater drops below 300 feet the KWH/AF will be recalculated.

Summary of Power Costs
Nickel 10,000 AF
2001

Month	AF	KWH	Amount	$/KWH
March	1,000	355,000	$16,972.54	0.05
April	1,000	355,000	16,913.30	0.05
May	1,000	355,000	26,145.30	0.07
June	1,000	355,000	25,853.10	0.07
July	1,000	355,000	26,145.30	0.07
August	1,000	355,000	26,145.30	0.07
September	1,000	355,000	25,853.10	0.07
October	1,000	355,000	26,145.30	0.07
November	1,000	355,000	16,913.30	0.05
December	1,000	355,000	16,972.54	0.05
Total	10,000	3,550,000	$224,059.08	

Average $/KWH........................... $0.06

KERN COUNTY WATER AGENCY

POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	PG&E SCHEDULE No.	AG-5B	PERIOD	B
FACILITY:	Pioneer Project	MONTH of	Mar 2001	CODE	3

			Usage	Rate		TOTAL $
;USTOMER CHARGE:						0.00
/IETER CHARGE:						0.00
)EMAND CHARGES PER (KW) :			KW	$/KW		
	per KW of maximum-peak-period demand		564	0.00		0.00
(From PG&E)	per KW of maximum-part-peak-period demand		0	0.00		0.00
	per KW of off-peak-period seasonal billing demand					
	(3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K		555	4.40		2,442.00
:LECTRIC ENERGY CHARGES:						
		Multiplier	KWH	$/KWH	Amount $	
Total KWH			355,000			
Base Energy Charges:						
	On Peak	0.0%	0	0.00000	0.00	
(From PG&E)	Partial Peak	38.4%	136,465	0.04661	6,360.63	
	Off Peak	61.6%	218,535	0.03706	8,098.91	
TOTAL ELECTRIC ENERGY CHARGES:						14,459.54
					Sub Total	$16,901.54
TAXES			KWH	$/KWH		
California Energy Commission			355,000	0.00020		71.00
			TOTAL BILLING			$16,972.54
			TOTAL NET BILLING			**$16,972.54**

KERN COUNTY WATER AGENCY

POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	PG&E SCHEDULE No.	AG-5B	PERIOD		B
FACILITY:	Pioneer Project	MONTH of	Apr 2001	CODE		4

			Usage	Rate		TOTAL $
USTOMER CHARGE:						0.00
ETER CHARGE:						0.00
EMAND CHARGES PER (KW) :			KW	$/KW		
	per KW of maximum-peak-period demand		564	0.00		0.00
From PG&E)	per KW of maximum-part-peak-period demand		0	0.00		0.00
	per KW of off-peak-period seasonal billing demand					
	(3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K		555	4.40		2,442.00
LECTRIC ENERGY CHARGES:						
		Multiplier	KWH	$/KWH	Amount $	
otal KWH			355,000			
Base Energy Charges:						
	On Peak	0.0%	0	0.00000	0.00	
From PG&E)	Partial Peak	36.7%	130,262	0.04661	6,071.51	
	Off Peak	63.3%	224,738	0.03706	8,328.79	
OTAL ELECTRIC ENERGY CHARGES:						14,400.30
					Sub Total	$16,842.30
AXES			KWH	$/KWH		
California Energy Commission			355,000	0.00020		71.00
			TOTAL BILLING			$16,913.30
		TOTAL NET BILLING				$16,913.30

KERN COUNTY WATER AGENCY
POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	*PG&E SCHEDULE No.*	AG-5B	*PERIOD*	A
FACILITY:	Pioneer Project	*MONTH of* May 2001		*CODE*	5

			Usage	*Rate*		*TOTAL $*
JSTOMER CHARGE:						0.00
ETER CHARGE:						0.00
EMAND CHARGES PER (KW) :			*KW*	*$/KW*		
	per KW of maximum-peak-period demand		564	0.00		0.00
From PG&E)	per KW of maximum-part-peak-period demand		555	2.70		1,498.50
	per KW of off-peak-period seasonal billing demand					
	(3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K		555	6.55		3,635.25
LECTRIC ENERGY CHARGES:						
		Multiplier	*KWH*	*$/KWH*	*Amount $*	
otal KWH			355,000			
Base Energy Charges:						
	On Peak	17.7%	62,984	0.14294	9,002.93	
From PG&E)	Partial Peak	0.0%	0	0.00000	0.00	
	Off Peak	82.3%	292,016	0.04088	11,937.61	
'OTAL ELECTRIC ENERGY CHARGES:						20,940.55
					Sub Total	$26,074.30
'AXES			*KWH*	*$/KWH*		
California Energy Commission			355,000	0.00020		71.00
			TOTAL BILLING			$26,145.30
			TOTAL NET BILLING			**$26,145.30**

KERN COUNTY WATER AGENCY

POWER BILLING CALCULATION

LOCATION:	**Nickel 10,000 AF**	*PG&E SCHEDULE No.*	AG-5B	*PERIOD*		**A**
FACILITY:	**Pioneer Project**	*MONTH of*	**Jun 2001**	*CODE*		**6**

			Usage	*Rate*		*TOTAL $*
CUSTOMER CHARGE:						0.00
METER CHARGE:						0.00
DEMAND CHARGES PER (KW):			*KW*	*$/KW*		
	per KW of maximum-peak-period demand		564	0.00		0.00
(From PG&E)	per KW of maximum-part-peak-period demand		555	2.70		1,498.50
	per KW of off-peak-period seasonal billing demand					
	(3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K		555	6.55		3,635.25
ELECTRIC ENERGY CHARGES:						
		Multiplier	*KWH*	*$/KWH*	*Amount $*	
Total KWH			355,000			
Base Energy Charges:						
	On Peak	16.9%	60,121	0.14294	8,593.70	
(From PG&E)	Partial Peak	0.0%	0	0.00000	0.00	
	Off Peak	83.1%	294,879	0.04088	12,054.65	
TOTAL ELECTRIC ENERGY CHARGES:						20,648.35
					Sub Total	$25,782.10
TAXES			*KWH*	*$/KWH*		
California Energy Commission			355,000	0.00020		71.00
			TOTAL BILLING			$25,853.10
			TOTAL NET BILLING			**$25,853.10**

KERN COUNTY WATER AGENCY

POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	*PG&E SCHEDULE No.*	AG-5B	*PERIOD*		A
FACILITY:	Pioneer Project	*MONTH of*	Jul 2001	*CODE*		7

			Usage	*Rate*		*TOTAL $*
USTOMER CHARGE:						0.00
IETER CHARGE:						0.00
IEMAND CHARGES PER (KW) :			*KW*	*$/KW*		
	per KW of maximum-peak-period demand		564	0.00		0.00
(From PG&E)	per KW of maximum-part-peak-period demand		555	2.70		1,498.50
	per KW of off-peak-period seasonal billing demand					
	(3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K		555	6.55		3,635.25
:LECTRIC ENERGY CHARGES:						
		Multiplier	*KWH*	*$/KWH*	*Amount $*	
'otal KWH			355,000			
Base Energy Charges:						
	On Peak	17.7%	62,984	0.14294	9,002.93	
(From PG&E)	Partial Peak	0.0%	0	0.00000	0.00	
	Off Peak	82.3%	292,016	0.04088	11,937.61	
TOTAL ELECTRIC ENERGY CHARGES:						20,940.55
					Sub Total	$26,074.30
TAXES			*KWH*	*$/KWH*		
California Energy Commission			355,000	0.00020		71.00
			TOTAL BILLING			$26,145.30
			TOTAL NET BILLING			**$26,145.30**

KERN COUNTY WATER AGENCY
POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	*PG&E SCHEDULE No.*	AG-5B	*PERIOD*	A
FACILITY:	Pioneer Project	*MONTH of* Aug 2001		*CODE*	8

			Usage	*Rate*		*TOTAL $*
USTOMER CHARGE:						0.00
IETER CHARGE:						0.00
DEMAND CHARGES PER (KW):			*KW*	*$/KW*		
	per KW of maximum-peak-period demand		564	0.00		0.00
(From PG&E)	per KW of maximum-part-peak-period demand		555	2.70		1,498.50
	per KW of off-peak-period seasonal billing demand					
	(3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K		555	6.55		3,635.25
ELECTRIC ENERGY CHARGES:						
		Multiplier	*KWH*	*$/KWH*	*Amount $*	
Total KWH			355,000			
Base Energy Charges:						
	On Peak	17.7%	62,984	0.14294	9,002.93	
(From PG&E)	Partial Peak	0.0%	0	0.00000	0.00	
	Off Peak	82.3%	292,016	0.04088	11,937.61	
TOTAL ELECTRIC ENERGY CHARGES:						20,940.55
					Sub Total	$26,074.30
TAXES			*KWH*	*$/KWH*		
California Energy Commission			355,000	0.00020		71.00
			TOTAL BILLING			$26,145.30
			TOTAL NET BILLING			**$26,145.30**

KERN COUNTY WATER AGENCY
POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	*PG&E SCHEDULE No.*	AG-5B	*PERIOD*	A
FACILITY:	Pioneer Project	*MONTH of*	Sep 2001	*CODE*	9

		Usage	*Rate*		*TOTAL $*
JSTOMER CHARGE:					0.00
ETER CHARGE:					0.00
EMAND CHARGES PER (KW) :		*KW*	*$/KW*		
	per KW of maximum-peak-period demand	564	0.00		0.00
rom PG&E)	per KW of maximum-part-peak-period demand	555	2.70		1,498.50
	per KW of off-peak-period seasonal billing demand				
	(3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K	555	6.55		3,635.25

LECTRIC ENERGY CHARGES:

		Multiplier	*KWH*	*$/KWH*	*Amount $*	
otal KWH			355,000			
Base Energy Charges:						
	On Peak	16.9%	60,121	0.14294	8,593.70	
From PG&E)	Partial Peak	0.0%	0	0.00000	0.00	
	Off Peak	83.1%	294,879	0.04088	12,054.65	
OTAL ELECTRIC ENERGY CHARGES:						20,648.35
					Sub Total	$25,782.10

AXES	*KWH*	*$/KWH*	
California Energy Commission	355,000	0.00020	71.00
	TOTAL BILLING		$25,853.10

TOTAL NET BILLING **$25,853.10**

KERN COUNTY WATER AGENCY

POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	*PG&E SCHEDULE No.*	AG-5B	*PERIOD*		A
FACILITY:	Pioneer Project	*MONTH of*	Oct 2001	*CODE*		10

			Usage	*Rate*		*TOTAL $*
USTOMER CHARGE:						0.00
IETER CHARGE:						0.00
EMAND CHARGES PER (KW) :			*KW*	*$/KW*		
	per KW of maximum-peak-period demand		564	0.00		0.00
From PG&E)	per KW of maximum-part-peak-period demand		555	2.70		1,498.50
	per KW of off-peak-period seasonal billing demand					
	(3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K		555	6.55		3,635.25
ELECTRIC ENERGY CHARGES:						
		Multiplier	*KWH*	*$/KWH*	*Amount $*	
'otal KWH			355,000			
Base Energy Charges:						
	On Peak	17.7%	62,984	0.14294	9,002.93	
(From PG&E)	Partial Peak	0.0%	0	0.00000	0.00	
	Off Peak	82.3%	292,016	0.04088	11,937.61	
TOTAL ELECTRIC ENERGY CHARGES:						20,940.55
					Sub Total	$26,074.30
TAXES			*KWH*	*$/KWH*		
California Energy Commission			355,000	0.00020		71.00
			TOTAL BILLING			$26,145.30
			TOTAL NET BILLING			**$26,145.30**

KERN COUNTY WATER AGENCY

POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	*PG&E SCHEDULE No.*	AG-5B	*PERIOD*	B
FACILITY:	Pioneer Project	*MONTH of* Nov 2001		*CODE*	11

		Usage	Rate		TOTAL $
:USTOMER CHARGE:					0.00
/IETER CHARGE:					0.00
)EMAND CHARGES PER (KW) :		KW	$/KW		
	per KW of maximum-peak-period demand	564	0.00		0.00
(From PG&E)	per KW of maximum-part-peak-period demand	0	0.00		0.00
	per KW of off-peak-period seasonal billing demand (3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K'	555	4.40		2,442.00

:LECTRIC ENERGY CHARGES:

		Multiplier	KWH	$/KWH	Amount $	
'otal KWH			355,000			
Base Energy Charges:						
	On Peak	0.0%	0	0.00000	0.00	
(From PG&E)	Partial Peak	36.7%	130,262	0.04661	6,071.51	
	Off Peak	63.3%	224,738	0.03706	8,328.79	
'OTAL ELECTRIC ENERGY CHARGES:						14,400.30
					Sub Total	$16,842.30

'AXES	KWH	$/KWH	
California Energy Commission	355,000	0.00020	71.00
	TOTAL BILLING		$16,913.30

TOTAL NET BILLING **$16,913.30**

KERN COUN[illegible]

POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	*PG&E SCHEDULE No.*	AG-5B	*PERIOD*	B
FACILITY:	Pioneer Project	*MONTH of*	Dec 2001	*CODE*	12

		Multiplier	Usage / KW / KWH	Rate / $/KW / $/KWH	Amount $	TOTAL $
JSTOMER CHARGE:						0.00
ETER CHARGE:						0.00
EMAND CHARGES PER (KW) :			KW	$/KW		
	per KW of maximum-peak-period demand		564	0.00		0.00
From PG&E)	per KW of maximum-part-peak-period demand		0	0.00		0.00
	per KW of off-peak-period seasonal billing demand (3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K		555	4.40		2,442.00
LECTRIC ENERGY CHARGES:						
		Multiplier	*KWH*	*$/KWH*	*Amount $*	
otal KWH			355,000			
Base Energy Charges:						
	On Peak	0.0%	0	0.00000	0.00	
(From PG&E)	Partial Peak	38.4%	136,465	0.04661	6,360.63	
	Off Peak	61.6%	218,535	0.03706	8,098.91	
TOTAL ELECTRIC ENERGY CHARGES:						14,459.54
					Sub Total	$16,901.54
TAXES			*KWH*	*$/KWH*		
California Energy Commission			355,000	0.00020		71.00
			TOTAL BILLING			$16,972.54

TOTAL NET BILLING **$16,972.54**

EXHIBIT E

TO QUITCLAIM DEED FROM KERN COUNTY WATER AGENCY TO NICKEL FAMILY, LLC

The real property transferred pursuant to this Quitclaim Deed consists of the undivided interests held by Grantor, KERN COUNTY WATER AGENCY in and to the real property described in EXHIBIT E-1 attached hereto.

EXHIBIT E-1

A. WATER INVENTORIES:

1. The Buena Vista Water Storage District forty thousand (40,000) acre-foot inventory;

2. The North Kern Water Storage District five thousand eight hundred eighty-two (5,882) acre-foot inventory;

3. The Preconsolidation fourteen thousand one hundred seventy (14,170) acre-foot inventory;

4. The five thousand (5,000) acre-foot payback water from Kern County Water Agency Improvement District No. 4.

RECORDING REQUESTED BY:
CHICAGO TITLE COMPANY

WHEN RECORDED MAIL TO
AND MAIL TAX STATEMENTS TO:

NAME NICKEL FAMILY, LLC
Attention: James Nickel, President
ADDRESS P.O. BOX 60679

CITY BAKERSFIELD

STATE & ZIP CALIFORNIA 93386-0679

QUITCLAIM DEED

TITLE NO. **ESCROW. NO. 673298-MM** **APN:**

THE UNDERSIGNED GRANTOR(s) DECLARE(s)
DOCUMENTARY TRANSFER TAX is $ -0- (No Consideration) CITY TAX $______________

- ☐ Computed on full value of property conveyed, or ☐ Computed on full value less value of liens or encumbrances remaining at time of sale,
- ☐ Unincorporated area: ☐ City of Bakersfield, and

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, KERN COUNTY WATER AGENCY, a California public agency, hereby remise, release and forever quitclaim to NICKEL FAMILY, LLC, a California limited liability company, receipt of which is its interest in the real property described in Exhibit G attached hereto and incorporated herein by this reference, together with all improvements thereon and all easements, rights of way, and other rights appurtenant thereto, subject, however, to the lien of non-delinquent real property taxes and assessments and covenants, conditions, restrictions easements, rights-of-way and servitudes of record in the County of Kern, State of California.

See Attached Exhibit G

Dated________________, 2001 ______________________________

____

(ALL SIGNATURES MUST BE ACKNOWLEDGED)

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA)
) ss.
COUNTY OF KERN)

On ________________________ , before me, ____ ,
Date — Name and Title of Officer (e.g. "Jane Doe, Notary Public")

personally appeared ____ ,
Name of Signers

☐ personally known to me – **OR** – ☐ proved to me on the basis of satisfactory evidence to be the persons whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Signature of Notary Public

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY(IES) CLAIMED BY SIGNER(S)

☐ Individual
☐ Corporate Officer

____
Titles

☐ Partner(s) ☐ Limited
☐ General
☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other: ________________________

Signer is Representing:
Name of Persons or Entity(ies)

____

____

DESCRIPTION OF ATTACHED DOCUMENT

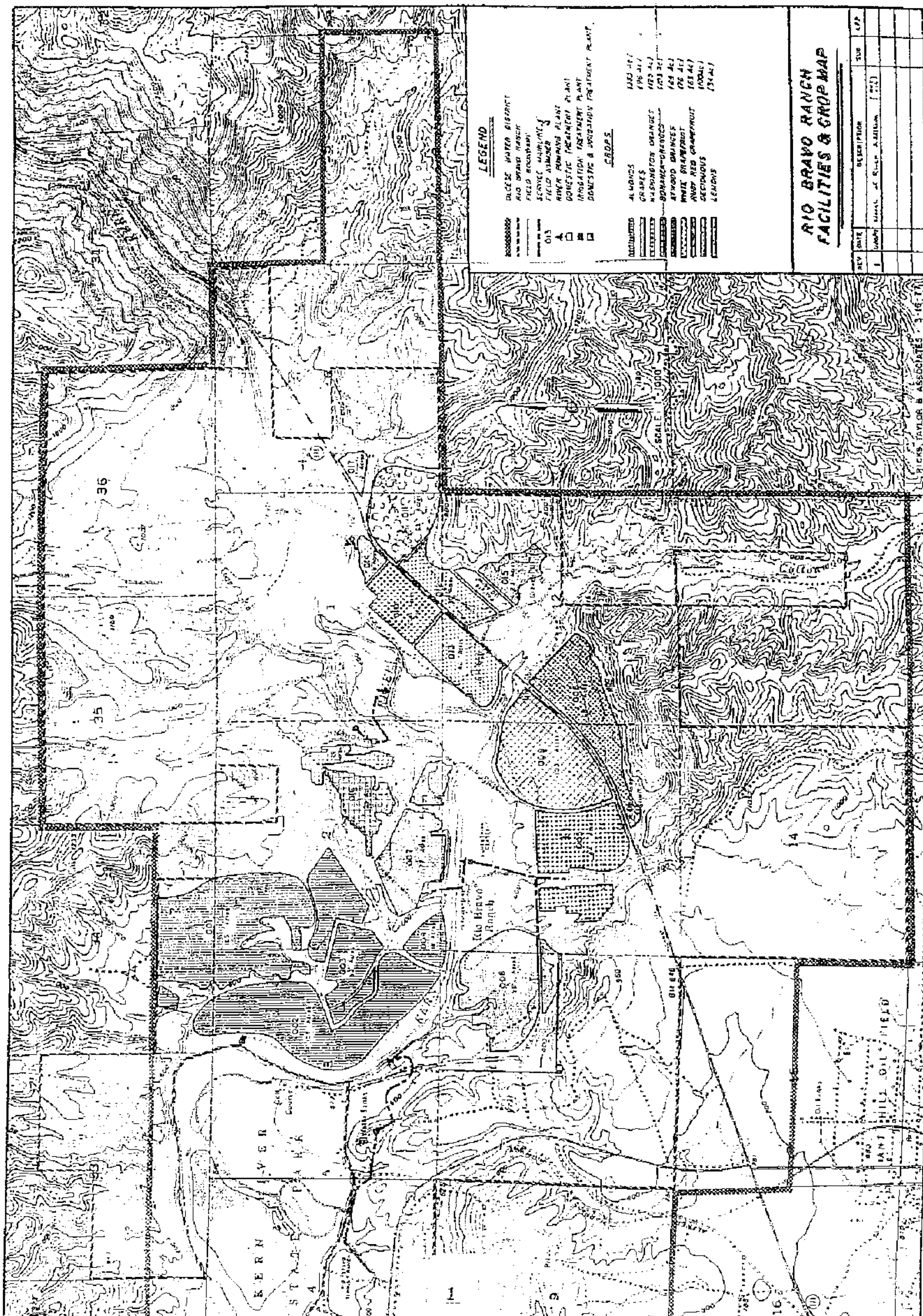
____
Title or Type of Document

____
Number of Pages

____
Date of Document

____
Signers Other Than Named Above

Exhibit F - Map of Rio Bravo Ranch



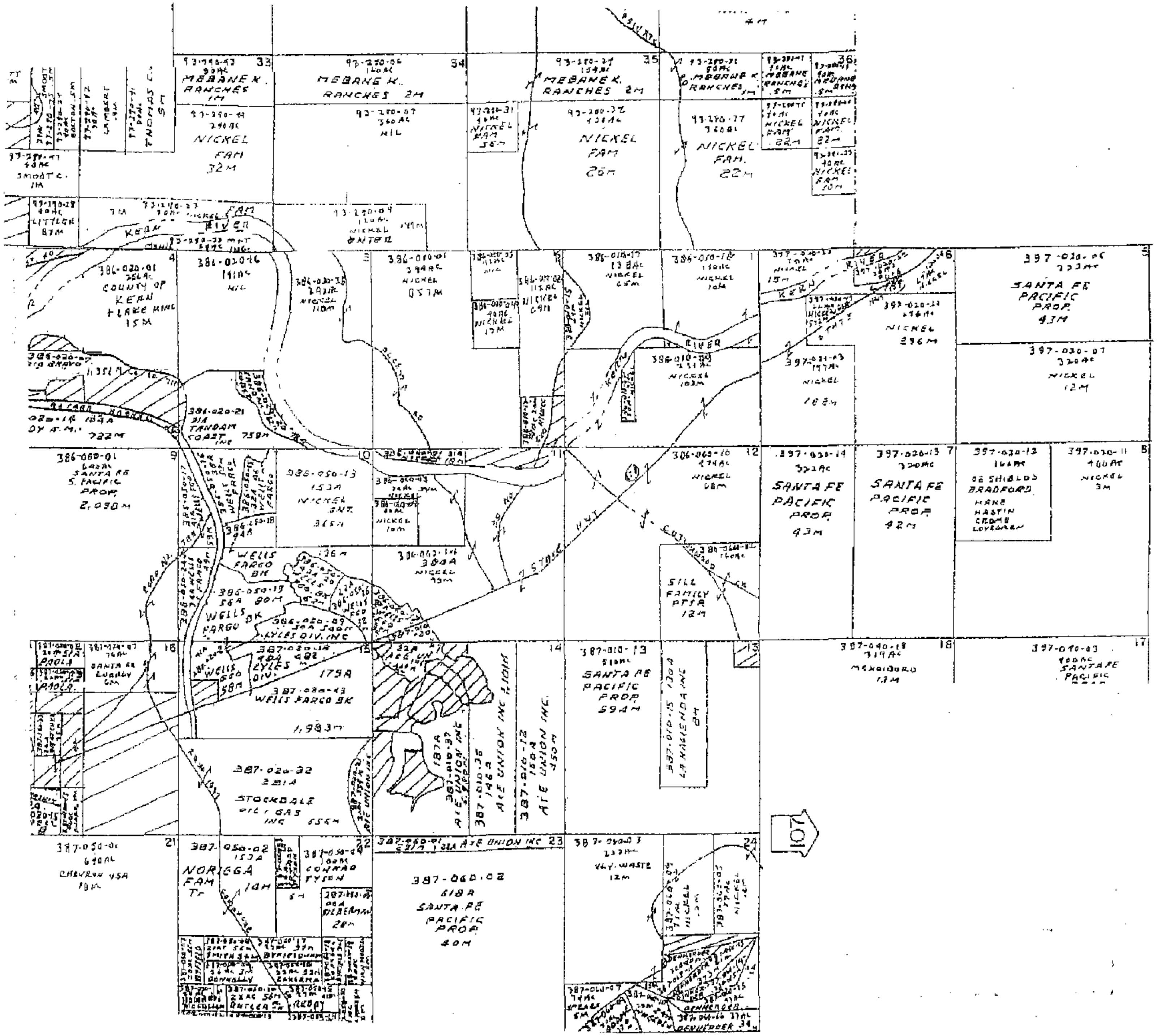

MEBANE K. RANCHES 1M
MEBANE K. RANCHES 2M
NICKEL FAM 32M
NICKEL FAM 26M
NICKEL FAM. 22M
THOMAS C. 5M
KERN RIVER
386-020-01 256AC COUNTY OF KERN
386-060-01 SANTA FE S. PACIFIC PROP 2,030M
WELLS FARGO BK
387-020-43 WELLS FARGO BK 1,983M
387-020-32 281A STOCKDALE OIL & GAS INC 655M
387-010-36 146A A&E UNION INC 1,101M
387-010-12 150A A&E UNION INC. 450M
387-060-02 618A SANTA FE PACIFIC PROP 40M
387-010-13 SANTA FE PACIFIC PROP 594M
387-010-15 130A LA HACIENDA INC 8M
SILL FAMILY PTSR 12M
397-020-14 SANTA FE PACIFIC PROP 43M
397-020-13 320AC SANTA FE PACIFIC PROP 42M
397-020-06 SANTA FE PACIFIC PROP 43M
397-020-07 320AC NICKEL 12M
397-020-11 460AC NICKEL 3M
397-040-18 MAXOIDURO 13M
397-040-03 SANTA FE PACIFIC
387-050-06 640AC CHEVRON USA 18M
387-050-02 NORIEGA FAM TR 14M
CONRAD TYSON
107

EXHIBIT G

TO QUITCLAIM DEED FROM KERN COUNTY WATER AGENCY TO NICKEL FAMILY, LLC

The real property transferred pursuant to this Quitclaim Deed consists of the undivided interests held by Grantor, KERN COUNTY WATER AGENCY in and to the real property described in EXHIBIT G-1 attached hereto.

EXHIBIT G-1

On or about September 1, 2000, Garces Water Company, Inc., a California corporation, hereinafter referred to as "Garces" granted to the Kern County Water Agency, a California public agency, hereinafter referred to as the "Agency", various property rights described in the Grant Deed from Garces to the Agency, which is attached hereto and incorporated herein by reference. This Grant Deed was recorded in the Official Records of Kern County on September 8, 2000, as document No. 0200112678 consisting of 24 pages , and is hereinafter referred to as the "Garces Grant Deed". For valuable consideration, receipt of which is hereby acknowledged, the Agency hereby quitclaims to Nickel Family LLC, a California limited liability company, hereinafter referred to as "Nickel LLC", the following described portions of the property and rights the Agency received from Garces in the Garces Grant Deed; it being the intent of the Agency in this Quit Claim Deed to transfer to Nickel LLC only such property and rights described herein as it received from Garces in the Garces Grant Deed and not to transfer to Nickel LLC any other property or rights that the Agency may now or hereafter own . All references hereinafter to Exhibit WTA-1 refer to that exhibit in the attached Garces Grant Deed.

The following Particular Water Rights referred to in Part I of Exhibit WTA-1:

1. Pre-consolidation Return Water. The Agency's right, title and interest in the Pre-Consolidation Return Water described in Item B of Part I of Exhibit WTA-1, which the Agency received from Garces in the Garces Grant Deed.

2. Right to Use Olcese Water. The Agency's right, title and interest in those portions of the right to use Olcese water described in Item C-3 of Part I of Exhibit WTA-1, which the Agency received from Garces in the Garces Grant Deed.

3. Water Rights Arising From Previously Riparian Rights. The Agency's right, title and interest in any riparian water rights appurtenant to the Rio Bravo Ranch in Kern County, described in Item D of Part I of Exhibit WTA-1, which the Agency received from Garces in the Garces Grant Deed.

4. Storage Rights. The Agency's right, title and interest to any storage rights which the Agency received from Garces in the Garces Grant Deed, which may be hereinafter acquired by Nickel LLC.

5. Storage Rights in Buena Vista Water Storage District. The Agency's right, title and interest in the storage rights in Buena Vista Water Storage District described in Item E-7 of Part I of Exhibit WTA-1, which the Agency received from Garces in the Garces Grant Deed.

6. Buena Vista-La Hacienda Water Exchange Agreement. The Agency's right, title and interest in the Buena Vista-La Hacienda Water Exchange Agreement described in Item F-4 of Part I of Exhibit WTA-1, which the Agency received from Garces in the Garces Grant Deed.

7. General Water Exchange Rights. All the Agency's right, title and interest in all water exchange rights and entitlements which may accrue to Nickel LLC in any future contracts and agreements entered into by Nickel LLC, which the Agency received from Garces in the Garces Grant Deed.

15. Hydro Assets. All of the Agency's right, title and interest in any licenses, guarantees, bills of sale, securities, confidential information and other proceeds and products described in Exhibit HTA-1 of the Garces Grant Deed, that may be hereinafter acquired by Nickel LLC in any hydroelectric projects other than the Rio Bravo Hydroelectric Project described in Exhibit HTA-1 of the Garces Grant Deed, which were conveyed to the Agency by Garces in the Garces Grant Deed.

KERN COUNTY WATER AGENCY
A California Public Agency

By: ______________________________
Chairman, Board of Directors

Appendix G

- REDACTED -

OPTION AND WATER PURCHASE AGREEMENT

THIS AGREEMENT is made and effective as of May 1, 2007 (the "Effective Date") by and between Nickel Family, LLC, a California limited liability company ("Nickel"), and DMB Communities II, LLC, an Arizona limited liability company ("DMB"), with reference to the following facts:

RECITALS

A. Nickel previously held rights to water from the Kern River. Nickel conveyed those rights to the Kern County Water Agency ("KCWA" or "Agency") in exchange for a perpetual right to 10,000 acre-feet per year of certain other water (the "Agency Transfer Water") to be made available by the Agency for the benefit of Nickel pursuant to the terms of that certain Contract to Transfer the Kern River Lower River Water Rights between Nickel, the Olcese Water District and the Agency dated January 23, 2001 (the "Agency Agreement"). A copy of the Agency Agreement is attached hereto as Exhibit A and incorporated herein by this reference.

B. Pursuant to the terms of the Agency Agreement, Nickel received the right to the Agency Transfer Water for the purpose of selling, or transferring, Agency Transfer Water to third parties within or outside of Kern County. Also pursuant to the terms of the Agency Agreement, Nickel has the right to the assistance and cooperation of the Agency in consummating sales or transfers of Agency Transfer Water, including entering into contracts for the sale of the Agency Transfer Water and efforts to obtain the approval, cooperation and assistance of the California Department of Water Resources and the State Water Contractors in obtaining any necessary approvals from regulatory agencies to effect such sales or transfers.

C. DMB wishes to acquire an option to purchase the use of 8,393 acre-feet at the California Aqueduct at Tupman (Reach 13B) (the "Acquired Water") of the Agency Transfer Water for the exclusive use by DMB as described herein, each year, for an initial period of thirty-five (35) years (the "Transfer Term") and for a potential extension period of another thirty-five 35 years (the "Extended Transfer Term"), which extension is exercisable solely at the discretion of DMB, as provided in this Agreement. DMB also wishes to acquire Nickel's right to the assistance and cooperation of the Agency in entering into contracts for the sale or transfer of the Acquired Water to third parties for the period of the Transfer Term and any Extended Transfer Term and efforts to obtain the approval, cooperation and assistance of the California Department of Water Resources and the State Water Contractors in obtaining any necessary approvals from regulatory agencies to effect such sales or transfers. Nickel is willing to grant such an option under the terms and conditions set forth in this Agreement.

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D. DMB paid to Nickel on or about March 7, 2007, (the "Due Diligence Payment") to initiate a due diligence period expiring at the end of May 7, 2007, (the "Due Diligence Period"), which period DMB and Nickel may agree to extend by thirty (30) days (the "Extended Due Diligence Period") to and including June 6, 2007.

THEREFORE, the Parties hereby agree as follows:

1. Grant of Option. Subject to the terms and conditions set forth in this Agreement, Nickel hereby grants to DMB an option (the "Option") to purchase and acquire the exclusive right to the use of the Acquired Water each year during the Transfer Term. The term of the Option shall start on the Effective Date of this Agreement upon payment of the Initial Option Consideration Payment as set forth in Section 2 below, and expire at the end of December 31, 2007 (the "Initial Option Term"); provided, that DMB may elect to extend the term of the Option by twelve (12) additional calendar months to the end of December 31, 2008, (the "Extended Option Term") by giving written notice of extension to Nickel in the manner set forth in Section 19 and paying the Extended Option Consideration Payment (as defined below) prior to the expiration of the Initial Option Term at the end of December 31, 2007.

2. Option Consideration. As consideration for the grant of the Initial Option Term, DMB shall pay to Nickel on or by the end of May 7, 2007, the Initial Option Consideration Payment; provided that if DMB and Nickel agree to the Extended Due Diligence Period, DMB shall pay the to Nickel on or by the end of June 6, 2007, as the Initial Option Consideration Payment. If DMB elects to take the Extended Option Term and desires the Extended Option Term, in addition to the Initial Option Consideration Payment, DMB shall pay to Nickel on or by the end of December 31, 2007, as the Extended Option Consideration Payment. The Initial Option Consideration Payment and the Extended Option Consideration Payment shall be applied as a credit against the Purchase Price, as defined below. Other than as set forth in this Agreement, the Initial Option Consideration Payment and the Extended Option Consideration Payment shall be non-refundable to DMB.

3. Exercise of Option.

(a) DMB may exercise the Option by giving written notice (the "Option Notice") by sending the Option Notice, in the form of Exhibit B to this Agreement, to Nickel at any time prior to the expiration of the Initial Option Term. Once the Initial Option has been exercised, DMB shall be obligated to purchase, and Nickel shall be obligated to sell, the exclusive use of the Acquired Water each year of the entire Transfer Term in accordance with the terms of this Agreement and upon payment of the Purchase Price. If the Option Notice is delivered on or before the end of September 1, 2007, the Transfer Term shall commence on January 1, 2008.

(b) If DMB has elected to take the Extended Option Term, and has paid the Extended Option Consideration Payment, then DMB may exercise the Option by sending the Option Notice in the form of Exhibit B to this Agreement to Nickel at any time prior to the expiration of the Extended Option Term. Once the Extended Option has been exercised, DMB shall be obligated to purchase, and Nickel shall be obligated to sell, the exclusive use of the Acquired Water each year of the entire Transfer Term in accordance with the terms of this Agreement and upon payment of the Purchase Price.

(c) If the Option Notice is delivered after September 1, 2007, but before September 1, 2008, either through the Initial Option Term or the Extended Option Term, then the Transfer Term shall commence on January 1, 2009.

(d) If the Option Notice is delivered after September 1, 2008, and before the end of December 31, 2008, then the Transfer Term also shall commence on January 1, 2009. In anticipation of such an event, to help ensure that Acquired Water may be delivered to DMB starting January 1, 2009, DMB may submit to Nickel prior to August 15, 2008, a written request and schedule for delivery of Acquired Water at Tupman or elsewhere to start on or after January 1, 2009. Upon receipt, Nickel shall immediately submit DMB's delivery request to the Agency consistent with the requirements of Article 4.8 of the Agency Agreement. DMB may subsequently revise its delivery request to change the amount of Acquired Water to be delivered, the schedule for delivery and the point or points of delivery, and Nickel shall immediately submit such revised delivery request to the Agency. Nickel makes no representation that the aforementioned request will be accepted by the Agency.

(e) The first year of the Transfer Term shall be referred to herein as the "First Water Year."

4. Purchase Price; Payment of Purchase Price.

(a) As of the Effective Date, the annual purchase price (the "Purchase Price") for the use of the Acquired Water shall be acre-feet of Agency Transfer Water at per acre-foot) at Tupman; provided that the annual Purchase Price shall be increased on each January 1, commencing on January 1, 2008, by multiplying the Purchase Price on the Effective Date and thereafter in effect on the previous January 1 by the change in the Consumer Price Index (All Urban Consumers—All Items—Los Angeles-Riverside-Orange County) (the "Index") for the unadjusted twelve (12)-month period ending in September of the prior calendar year or by 1.03 (for a 3 percent increase), whichever is greater (the "Escalator").

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As an example of the foregoing, on January 1, 2008, the Purchase Price would be adjusted by comparing the Index on September 1, 2006, e.g., 100, to the Index on September 1, 2007, e.g., 104, and multiplying the Purchase Price by the change in the Index, or by 1.03 (three (3) percent),whichever is greater, for an adjusted Purchase Price of per-acre foot on January 1, 2008, or 104/100( )= versus 1.03( )= . Thereafter, commencing January 1, 2009, the 2008 Purchase Price of would be adjusted by comparing the Index on September 1, 2007, e.g., 104, with the Index on September 1, 2008, and multiplying by the change, or 1.03, whichever is greater, and so on each January 1 of this Agreement.

The annual Purchase Price shall be paid on or before January 15 of each year during the Transfer Term. So long as Nickel can deliver the Acquired Water at Tupman, DMB shall pay the Purchase Price regardless of whether delivery of all Acquired Water is requested.

(b) Provided the Parties mutually agree, if DMB exercises the Option, either DMB or Nickel may request to negotiate for DMB to pay an up-front cash payment and thereby reduce or eliminate the annual Purchase Price. An escalator and a discount rate may be negotiated and used to establish the present value of the Purchase Price payments to be made during either the Transfer Term or Extended Transfer Term or both. The percentage of the present value to be paid up front also may be negotiated and used. Alternatively, DMB and Nickel may mutually agree to have DMB pay to Nickel an up-front cash payment to reduce or eliminate the Escalator component of the annual Purchase Price. The Parties acknowledge and agree that this Section 4(b) does not create any vested right in or guarantee any agreement respecting an up-front cash payment.

(c) The)ue Diligence Payment that DMB made to Nickel, the Initial Option Consideration Payment and any Extended Option Consideration Payment (the "Payment Credit") shall all be credited toward DMB's payment of the Purchase Price. The total Payment Credit shall be divided into five (5) equal payments applied over the first five years in which Purchase Price Payments are made. In the event that DMB and Nickel agree upon an up-front cash payment to reduce or eliminate the annual Purchase Price, the up-front cash payment shall be reduced by the amount of the Payment Credit.

5. Right to Extended Transfer Term.

(a) Subject to Section 21(b), provided this Agreement is in full force and effect and DMB is not in default, DMB shall have the right to extend the initial Transfer Term by an additional thirty-five (35) years by providing Nickel with written notice of DMB's election of an Extended Transfer Term pursuant to this Section 5. Such notice shall be provided to Nickel at least one year prior to the expiration of the initial Transfer Term. The terms and conditions of this Agreement including, without limitation, the amount of the adjusted Purchase Price as adjusted pursuant to Section 4(a), shall apply to the Extended Transfer Term, and all references in this Agreement to the Transfer Term shall include the Extended Transfer Term, including future adjustments of the Purchase Price pursuant to Section 4(a).

As an example of the foregoing, the Purchase Price on the first January 1 of the Extended Transfer Term shall equal the Purchase Price in effect the last year of the initial Transfer Term, further adjusted as provided in Section 4(a) for a new or adjusted Purchase Price on the first January 1 of the Extended Transfer Term, thereafter adjusted in the same manner each succeeding January 1 of the Extended Transfer Term.

(b) If DMB extends this Agreement under Section 5(a) above, not later than two (2) years prior to the expiration of the Extended Transfer Term, the Parties may enter into diligent good faith negotiations for a new agreement to extend this Agreement for an additional period to be negotiated by the Parties, with such amendments as they may negotiate and mutually agree to. The Parties acknowledge and agree that this Section 5(b) does not create any vested right in or guarantee any further term or agreement.

6. Reversion or Partial Reversion of Acquired Water to Nickel. The use of the Acquired Water and all other rights pursuant to the Agency Agreement shall revert to Nickel at the end of the Transfer Term or, if applicable, the Extended Transfer Term, or upon termination of this Agreement. In the event any of the Acquired Water is Assigned under Section 10 of this Agreement, any use of the Acquired Water and all other rights pursuant to the Agency Agreement that have been assigned shall revert to Nickel at the end of the Transfer Term or, if applicable, the Extended Transfer Term, or upon termination of the Assignment for any reason.

7. Delivery Schedule; Point of Delivery.

(a) Except as provided in Article 4.5 of the Agency Agreement and, subject to Section 21(b), provided this Agreement is in full force and effect and DMB is not in default, at the commencement of the Transfer Term and each year during the Transfer Term Nickel shall, at no cost to DMB, make or cause the Acquired Water to be available to DMB at the Tupman turnout, as defined in Article 1.17 of the Agency Agreement ("Tupman"), as provided in Article 4.4 of the Agency Agreement.

(b) DMB shall annually supply a written delivery schedule to Nickel and Agency consistent with the requirements of Article 4.8 of the Agency Agreement.

(c) The Acquired Water shall be made available to DMB at Tupman, free and clear of all liens, encumbrances, or rights of any other party, at the same time and in the same manner as Agency schedules deliveries of State Water Project ("SWP") Water ("SWP Water") to the Agency's Member Units, as set forth in the Agency's contracts with its Member Units as they presently exist or may be changed from time to time. The shortage provision in Article 18 of the Agency's SWP Water Supply Contract with DWR (the "SWP Contract Shortage Provision") does not apply to the delivery of Acquired Water under this Agreement. Pursuant to the Agency Agreement, the Acquired Water is not subject to the shortages that can affect DWR's delivery of SWP Water to the Agency and other SWP Contractors during average, single dry and multiple dry water years.

(d) Subject to Section 21(b), provided this Agreement is in full force and effect and DMB is not in default, DMB shall succeed to Nickel's right, pursuant to Article 4.7 of the Agency Agreement, to the Agency's commitment to transport Acquired Water within the California Aqueduct to the full extent of the Agency's rights to use the Aqueduct.

8. Additional Charges.

(a) DMB shall be responsible for all costs or expenses, if any, associated with the conveyance and delivery of the Acquired Water delivered to a location other than Tupman, including but not limited to costs imposed by the Agency and DWR for conveyance of the Acquired Water to a location other than Tupman.

(b) Commencing with the Transfer Term and during any Extended Transfer Term, DMB shall pay to Nickel that portion of those power charges attributable to the Acquired Water in any year in which Nickel is obligated to pay to Agency the power charges described in Article 4.5 of the Agency Agreement (the "Power Charges"), which the Parties acknowledge is up to 83.93 percent of the total power charges payable by Nickel to the Agency in any year in which such charges are payable for the full 10,000 acre-feet of Agency Transfer Water under Article 4.5 of the Agency Agreement. DMB shall pay Nickel the Power Charges within thirty (30) days of DMB's receipt of an invoice for the Power Charges from Nickel. Alternatively, DMB may pay such Power Charges directly to the Agency, so long as the Agency and Nickel consent in writing to DMB's direct payment of Power Charges.

9. Agency Actions. Nickel and DMB shall jointly request that Agency enter into one or more long-term "point of delivery" agreements with DWR approving delivery of a portion of Agency's SWP Water, used as exchange water, to up to five (5) long-term transferees, so that the Acquired Water can be delivered by exchange to up to five (5) long-term transferees for the entire Transfer Term and any Extended Transfer Term (the "Point of Delivery

Agreements"). DMB shall succeed to all of Nickel's rights with respect to the Acquired Water, pursuant to Articles 4.4 and 4.9 of the Agency Agreement, including but not limited to the assistance and cooperation of the Agency in entering into contracts for the sale or transfer of the Acquired Water to third parties and efforts to obtain the approval, cooperation and assistance of DWR and the State Water Contractors in obtaining any necessary approvals from regulatory agencies to effect such sales or transfers. DMB shall reimburse Nickel and Agency for all reasonable out-of-pocket expenses incurred in assisting DMB in obtaining any approvals.

10. <u>Assignment</u>. Nickel acknowledges that DMB intends to transfer, or assign, the right to use Acquired Water to up to five (5) public water supply agencies or reliable, solvent private companies for purposes of establishing an adequate long-term water supply for one or more real estate development projects and for other beneficial uses for the Transfer Term or any extended Transfer Term.

(a) DMB may assign this Agreement, in whole or in part, subject to advance written consent by Nickel. The foregoing decision whether to allow an assignment under this Section 10 rests solely with Nickel, subject to the following:

(i) Nickel shall consent to a proposed assignee of a Purchase Price and Power Charge payment obligation, so long as that proposed assignee is a government agency that holds a contract with DWR for SWP water service or a contract with the U.S. Bureau of Reclamation for Central Valley Project water service and so long as the assignee proposed to assume such payment obligations for such Acquired Water has the ability to perform such payment obligations for the Acquired Water proposed for assignment for the Transfer Term or any Extended Transfer Term; or

(ii) Nickel shall consent to other proposed assignees of Purchase Price and Power Charge payment obligations so long as any assignee proposed to assume such obligations for such Acquired Water has the ability to perform such payment obligations for the Acquired Water proposed for assignment for the Transfer Term or any Extended Transfer Term.

(iii) Nickel shall consent to a proposed assignee of a Purchase Price and Power Charge payment obligation proposed for assignment for the Transfer Term or any Extended Transfer Term, so long as DMB agrees to remain responsible for any Purchase Price and Power Charge payments that are due from such assignee but have not been timely paid. DMB agrees to provide a new Representation and Warranty to Nickel that DMB's net worth remains at least)efore Nickel's consent to the proposed assignment shall be given.

(iv) Assignments of all, or a part, of this Agreement among DMB and its Affiliated Entities that do not involve a long-term point of delivery agreement from DWR do not count against the five (5) long-term transfers, or assignments, governed by this Section 10. The term "Affiliated Entity" shall mean DMB, any entity that is a subsidiary of DMB or any entity which is controlled by or under common control of DMB. The term "control" with respect to any entity shall mean: (i) the possession, directly or indirectly, of the power to vote 51 percent or more of the stock, voting trust certificates or other securities having voting power for the election of directors of an entity; or (ii) the status of managing member of a limited liability company. For the Assignment to be effective under this Section 10(a)(iv), an Affiliated Entity must have a net worth of at least , or DMB must agree to remain responsible for any Purchase Price and Power Charge payments that are due from such "Affiliated Entity."

(b) Subject to the consent requirement in Section 10(a), should DMB assign this Agreement, or any part, as provided in this Section 10:

(i) Each assignee shall be required to agree, in writing, to be bound by and timely comply with all those terms and provisions of this Agreement that are specifically designated for assignment to the assignee;

(ii) it is recognized that an assignee of the right to use Acquired Water may be an entity different from that which is obligated to pay the Purchase Price and Power Charge for such Acquired Water, in which case this Agreement's terms and provisions governing payment of the Purchase Price and Power Charge would not be applicable to such assignee of the right to use Acquired Water, and this Agreement's terms and provisions governing delivery schedules for the Acquired Water would not be applicable to such assignee of the obligation to pay the Purchase Price and Power Charge for such Acquired Water. Notwithstanding the foregoing, and subject to Section 21(b), for any assignment to be effective, the assignment agreement must contain a provision that Nickel has no obligation to deliver the assigned portion of the Acquired Water, unless the Purchase Price, as adjusted, is paid to Nickel and any Power Charges are paid for the Acquired Water being assigned, and all other obligations of this Agreement applicable to the assignment are met;

(iii) any assignment of part of this Agreement, including the right to use Acquired Water or the obligation to pay the Purchase Price and Power Charge for such Acquired Water, shall specifically designate the rights and obligations being assigned;

(iv) each assignee shall succeed to the specifically designated rights and obligations of DMB under this Agreement with respect to the amount of Acquired Water assigned or the amount of the Purchase Price and Power Charge the assignee is obligated to pay and shall be recognized by Nickel as possessing all designated rights and obligations, and all applicable references to "DMB" herein shall be deemed to refer to such assignee, except as otherwise expressly provided in this Agreement.

11. Short-term Transfers.

(a) Until such time as DMB exercises its Option and the Transfer Term commences, Nickel may annually market the Acquired Water for temporary transfer to third parties, so long as delivery under the temporary transfer ends prior to commencement of the Transfer Term pursuant Section 3 of this Agreement; provided that DMB shall have the right of first refusal with respect to any temporary transfer to any third party to occur after December 31, 2007.

(b) Subject to Section 21(b), provided this Agreement is in full force and effect and DMB is not in default, if DMB exercises the Option and the Transfer Term commences, DMB may sell, on a yearly basis and on terms and conditions acceptable to DMB, the use of any or all of the Acquired Water DMB purchases in a year to one or more third parties without the consent of Nickel; provided, that DMB expressly acknowledges that Nickel and the Agency are only obligated to make Acquired Water available at Tupman in accordance with this Agreement and the Agency Agreement. Such transfers shall not count against the five (5) long-term transfers or assignments, governed by Section 10 of this Agreement.

12. Maintenance of Acquired Water. While this Agreement is in effect, Nickel shall not take or omit to take any action that would render Nickel unable to fully perform its obligations under this Agreement. Without limiting the foregoing, while this Agreement is in effect, Nickel shall not (i) amend or revise the Agency Agreement, or (ii) encumber, commit, transfer or otherwise dispose of the Acquired Water, if any of those actions would render Nickel unable to fully perform its obligations under this Agreement. Further, Nickel shall take all actions necessary to ensure that it can fully perform its obligations under this Agreement. Notwithstanding the above, and subject to this Agreement, Nickel shall have the right prior to the commencement of the Transfer Term to annually market the water that will be the Acquired Water, so long as the Acquired Water is available to DMB during the Transfer Term.

13. Representations and Warranties of Nickel. Nickel hereby makes the following covenants, representations and warranties as of the Effective Date:

(a) Nickel has the authority to enter into this Agreement, to sell and transfer the use of the Acquired Water to DMB, and to otherwise perform as set forth herein. Nickel is the sole owner of the Acquired Water and has the unrestricted right and power to transfer the use of it to DMB under the terms of this Agreement and to make the Acquired Water available at Tupman for the benefit of DMB pursuant to the Agency Agreement. The execution and delivery of this Agreement have been validly authorized by all requisite action on the part of Nickel.

(b) Nickel's execution of this Agreement and performance of its obligations hereunder will not violate any agreement, option, covenant, condition, obligation or undertaking of Nickel, nor to the best of Nickel's actual knowledge will it violate any law, ordinance, statute, order or regulation.

(c) To the best of Nickel's actual knowledge, there are no actions, suits or proceedings of any kind or nature, legal or equitable, pending, or threatened, relating to the Agency Agreement or the Acquired Water, or potentially affecting or arising out of Nickel's ownership, management, or ability to sell the Acquired Water, in any court or before or by any federal, state, county or municipal department, commission, board, bureau, agency, or other governmental instrumentality.

(d) To the best of Nickel's actual knowledge, neither the Acquired Water nor any portion thereof, is subject to or affected by (i) any assessments, whether or not presently constituting a lien thereon, or (ii) any threatened or pending condemnation, eminent domain, or similar proceedings that render Nickel unable to fully perform its obligations under this Agreement.

(e) The Acquired Water is free and clear of any liens, encumbrances, or rights of any other party, that would render Nickel unable to fully perform its obligations under this Agreement, and Nickel shall maintain the Acquired Water free and clear of any such liens, encumbrances, or rights imposed against Nickel that render Nickel unable to fully perform its obligations under this Agreement while this Agreement is in effect.

(f) Delivery of Acquired Water under this Agreement is not subject to the Agency's SWP Contract Shortage Provision.

(g) To the best of Nickel's actual knowledge, except for the Agency Agreement and Nickel's obligations to Agency under the Agency Agreement, there are no contracts, licenses, commitments, agreements or undertakings respecting the 8,393 acre-feet of Acquired Water by which Nickel would be obligated or liable to any person.

(h) Except as expressly contemplated by this Agreement, no approval is required from Agency in order for the transactions contemplated by this Agreement to occur, and no approval is required from any other party in order for the Acquired Water to be made available to DMB by Nickel at Tupman.

(i) No proceedings are pending or threatened in which Nickel may be adjudicated as bankrupt or discharged from any and all of its debts or obligations or granted an extension of time to pay its debts or a reorganization or readjustment of its debts.

(j) Subject to Section 10 of this Agreement, while this Agreement is in effect, Nickel shall use its best efforts to assist DMB to obtain all necessary approvals, including the cooperation and approval of the Agency and DWR, for delivery of the Acquired Water, including by exchange, to up to five public water supply agencies or water companies at points other than Tupman. However, no assignment, or transfer, of Acquired Water shall extend beyond the Transfer Term and Extended Transfer Term. DMB shall reimburse Nickel for Nickel's reasonable out-of-pocket costs or other expenses incurred in assisting DMB with obtaining cooperation and approval for delivery of the Acquired Water at points other than Tupman.

(k) To the best of Nickel's actual knowledge, there is no action, suit, claim, cause of action, or proceeding at law or in equity (or by or before any governmental agency, official or authority of any local, state or federal government) now pending, wherein an unfavorable decision, ruling or finding would: (i) affect the creation, organization, existence or powers of Nickel or the titles and powers of its officers and the members of its board of directors and their rights to their respective offices; (ii) enjoin or restrain the approval and/or execution of this Agreement, or (iii) in any way question or affect any of Nickel's rights and powers.

(l) Nickel is unaware of any fact or circumstance that would prevent Nickel or the Agency from being able to fully perform its obligations under this Agreement, or that would prevent DMB from acquiring or using the Acquired Water as contemplated by DMB.

14. Representations and Warranties of DMB. DMB hereby makes the following covenants, representations and warranties as of the Effective Date of this Agreement:

(a) DMB has the authority to enter into this Agreement, purchase the Acquired Water, and to otherwise perform as set forth herein. The execution and delivery of the Agreement has been validly authorized by all requisite action on the part of DMB.

(b) DMB's execution of this Agreement and performance of its obligations hereunder will not violate any agreement, option, covenant, condition, obligation or undertaking of DMB, nor to the best of DMB's knowledge will it violate any law, ordinance, statute, order, or regulation.

(c) To the best of DMB's actual knowledge, there is no action, suit, claim, cause of action, or proceeding at law or in equity (or by or before any governmental agency, official or authority of any local, state or federal government) now pending, wherein an unfavorable decision, ruling or finding would: (i) affect the creation, organization, existence or powers of DMB or the titles and powers of its Board members and officers to their respective offices; (ii) enjoin or restrain the approval and/or execution of this Agreement, or (iii) in any way question or affect any of the rights, powers, duties or obligations of DMB with respect to implementation of this Agreement.

(d) No proceedings are pending or threatened in which DMB may be adjudicated as bankrupt or discharged from any and all of its debts or obligations or granted an extension of time to pay its debts or a reorganization or readjustment of its debts.

(e) DMB has the ability to perform all financial obligations to Nickel under this Agreement. DMB further represents and warrants that as of the Execution Date of this Agreement, it has a present net worth of at least and to the best of DMB's knowledge, it is not aware of any facts or circumstances that would lower its net worth below the amount in the foreseeable future.

15. <u>Condition Precedent to Nickel's Obligations to Perform</u>. Subject to Section 21(b), if DMB exercises the Option, Nickel's obligation to transfer the Acquired Water in any year of the Transfer Term is hereby expressly conditioned on satisfaction or waiver by Nickel of the following condition precedent: DMB shall have timely performed each of the acts to be performed by it hereunder including, without limitation, payment of the annual Purchase Price or of an up-front amount negotiated by DMB and Nickel.

16. <u>Conditions Precedent to DMB's Obligation to Perform</u>. If DMB exercises the Option, DMB's obligation to purchase the Acquired Water in any year of the Transfer Term is hereby expressly conditioned on satisfaction or waiver by DMB of each and every one of the following conditions precedent:

(a) Nickel shall have timely performed each of the acts to be performed by it hereunder; and

(b) The Acquired Water is available and can be made available in accordance with the terms of this Agreement.

17. <u>Costs and Expenses</u>. In addition to all other cost and expense provisions provided herein, DMB shall pay all costs and fees associated with any transfer or assignment of the Acquired Water under this Agreement, including without limitation any transfer taxes associated with the Acquired Water. Each Party to this Agreement shall be responsible for its own attorneys' and other professional fees and internal administrative costs associated with the preparation of this Agreement and the transfer of the Acquired Water from Nickel to DMB.

18. Brokerage Commissions. DMB and Nickel each represents and warrants to the other that it has not engaged the services of any broker, agent or finder, nor done any other act nor made any statement, promise or undertaking which would result in the imposition of liability for the payment of any brokerage commission, finder's fee or otherwise in connection with the transaction described in this Agreement.

(a) In the event that any person or entity perfects a claim for a brokerage commission, finder's fee or otherwise, based upon any agreement, statement or act, the Party through whom such person or entity makes such claim shall be responsible therefor and shall indemnify, defend and hold the other Party and the Acquired Water harmless from and against such claim and all loss, cost and expense associated therewith, including attorneys' fees.

(b) Nickel's obligation to pay the Agency pursuant to Article 4.10 of the Agency Agreement is not a brokerage commission. Nickel shall comply with Article 4.10 and shall be solely responsible for making any and all payments to the Agency that may be due under Article 4.10 of the Agency Agreement, and DMB shall have no obligation to make any such payment to the Agency.

19. Notices. All notices under this Agreement shall be effective upon personal delivery or electronically confirmed facsimile transmission to Nickel or DMB, as the case may be, or three business days after deposit in the United States mail, registered or certified, postage fully prepaid and addressed to the respective Parties as follows:

To Nickel:
James L. Nickel
President
Nickel Family, LLC
P.O. Box 60679
Bakersfield, California 93386-0679
Facsimile: (661) 872-7141

To DMB:
Mark C. Kehke
Senior Vice President
DMB Associates, Inc.
7600 E. Doubletree Ranch Rd., #300
Scottsdale, Arizona 85258-2137
Facsimile: (480) 367-9788

General Counsel
DMB Associates, Inc.
7600 E. Doubletree Ranch Rd., #300
Scottsdale, Arizona 85258-2137
Facsimile: (480) 367-9788

or such other address as the Parties may from time to time designate in writing.

20. No Third Party Beneficiaries. Except for assignees receiving valid approved written assignments made pursuant to Section 10 of this Agreement, Nickel and DMB hereby agree that it is not their intent to create any rights or benefits in any third parties and that no third party beneficiaries shall be created or shall be deemed created by this Agreement.

21. Remedies. The Parties understand and agree that use of the Acquired Water is unique, may not be replaceable in the event it is not transferred and delivered to DMB in accordance with this Agreement, and will be relied upon by DMB through the Transfer Term, including any Extended Transfer Term, in connection with its development activities in California. Likewise, the Parties agree that payment to Nickel of the Purchase Price will be relied upon by Nickel for its daily operations. Therefore, in addition to a claim for damages for a breach or default, and in addition and without prejudice to any other right or remedy available at law or in equity that each Party may have against the other in the event of a threatened or actual breach of this Agreement, the aggrieved Party shall be entitled to injunctive relief, specific performance and other equitable remedies. The Parties acknowledge that in the event of a threatened or actual breach of this Agreement by the other, the aggrieved Party will be irreparably damaged in the event that this Agreement is not specifically enforced and that equitable relief would be appropriate. If either Party breaches, or defaults in the performance of its obligations under this Agreement, the other Party may pursue any remedies available to it at law or in equity for such default or breach.

(a) Notwithstanding the foregoing, if one Party threatens to breach, breaches or defaults in the performance of its obligations under this Agreement (the "defaulting party"), no remedy at law or equity will be sought until written notice is provided to the defaulting Party in accordance with Section 19 and the threat of breach, breach or default exists fifteen (15) days after the defaulting Party's receipt of written notice of such default.

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(b) In the event of a threat to breach or to default or of a breach or default in the performance of an obligation by an assignee of all or part of this Agreement approved under Section 10 (the "defaulting assignee"), such threat or default or breach shall in no way impair the rights and obligations of Nickel, DMB or any non-defaulting assignees under this Agreement. For example, one defaulting assignee's failure to perform payment obligations with respect to an assignment of a portion of the Acquired Water does not excuse Nickel's obligation to deliver the remainder of the Acquired Water to DMB or to other assignees.

(c) Subject to Section 21(a) of this Agreement, and consistent with Section 18(b) of this Agreement, in the event that DMB were voluntarily to elect to cure a default or breach by Nickel in Nickel's payments to KCWA under Articles 4.5 or 4.10 of the Agency Agreement, Nickel shall indemnify DMB for such cure.

22. Entire Agreement. The Recitals of this Agreement are incorporated into this Agreement by reference. This Agreement and items incorporated herein contain all of the agreements of the Parties hereto with respect to the matters contained herein, and no prior agreement or understanding pertaining to any such matter shall be effective for any purpose. No provisions hereof may be amended or modified in any manner whatsoever except by an agreement in writing signed by duly authorized representatives of each of the Parties.

23. Successors. The terms, covenants and conditions hereof shall be binding upon and shall inure to the benefit of the heirs, executors, administrators and assignees of the respective Parties hereto.

24. Further Action. The Parties agree to perform all further acts, and to execute, acknowledge, and deliver any documents that may be reasonably necessary, appropriate or desirable to carry out the purposes of this Agreement. Without limiting the foregoing, at the request of DMB, Nickel shall assist DMB in obtaining any and all consents or assistance from the Agency necessary or desirable in connection with the transfer of the use of the Acquired Water and with DMB's assignment, or transfer, of the use of Acquired Water to up to five public water supply agencies or water companies including, without limitation, any requests for assistance pursuant to Articles 4.4 and 4.9 of the Agency Agreement.

25. Waiver. A waiver of any breach of this Agreement by any Party shall not constitute a continuing waiver or a waiver of any subsequent breach of the same or any other provision of this Agreement.

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26. Choice of Laws. This Agreement shall be governed by the laws of the State of California and any question arising hereunder shall be construed or determined according to such law.

27. Headings. Headings at the beginning of each numbered Section of this Agreement are solely for the convenience of the Parties and are not a part of this Agreement.

28. Time. Time is of the essence, it being understood that each date set forth herein and the obligations of the Parties to be satisfied by such dates have been the subject of specific negotiations by the Parties.

29. Counterparts. This Agreement may be signed by the Parties in different counterparts and the signature pages combined to create a document binding on all Parties.

30. Force Majeure. If the performance by any Party to this Agreement of any of its obligations or undertakings under this Agreement is interrupted or delayed by any occurrence not occasioned by the conduct of a Party to this Agreement, whether that occurrence is an act of God or public enemy, or whether that occurrence is caused by war, riot, storm, earthquake, or other natural forces, or by the acts of anyone not a Party to this Agreement, then the Parties shall be excused from any further performance for whatever period of time after the occurrence is reasonably necessary to remedy the effects of that occurrence. The Transfer Term shall be extended by the period of time such performance is so excused.

31. Quitclaim. Upon the expiration of this Agreement for any reason, including the failure to timely exercise the Option in the manner provided herein, DMB shall properly execute, acknowledge and deliver to Nickel a quitclaim in a form suitable to establish the termination of this Agreement.

32. Confidentiality. Nickel and DMB agree not to disclose to any third party the identity of DMB or DMB's potential uses of the Acquired Water, or the potential or final terms of this Agreement (the "Confidential Information"); provided that DMB may authorize or direct disclosure of specific Confidential Information to specific third parties. DMB shall not unreasonably withhold approval of a request by Nickel to disclose Confidential Information. DMB and Nickel acknowledge the need to provide certain Confidential Information to the Agency in connection with execution of this Agreement and the transfer, or assignment, of Acquired Water to third parties. DMB and Nickel acknowledge that the Agency is a public agency subject to disclosure of certain information

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under the California Public Records Act (California Government Code section 6250 et seq.). Any disclosure of Confidential Information by Nickel to Agency requires advance approval by DMB, which DMB will not unreasonably withhold.

IN WITNESS WHEREOF, the Parties have executed this Agreement on the date first hereinabove written.

NICKEL FAMILY, LLC

By: ______________________
James L. Nickel, President

DMB COMMUNITIES II, LLC, an Arizona limited liability company

By: DMB Associates, Inc., an Arizona corporation, its Manager

By: ______________________
Mark Kehke

Its: Senior Vice President

EXHIBIT A

"The Agency Agreement"

EXHIBIT B

OPTION NOTICE

NOTICE OF EXERCISE OF OPTION TO PURCHASE WATER

To: James L. Nickel
Nickel Family LLC
P. O. Box 606779
Bakersfield, CA 93386-0679

Notice is hereby given that DMB Communities II, LLC, an Arizona limited liability company ("DMB") exercises its right to purchase 8,393 acre-feet annually ("afa") of the Nickel Family LLC ("Nickel") water described in that certain Option and Water Purchase Agreement, dated , between DMB and Nickel in accordance with the provisions of the Option and Water Purchase Agreement.

(Check applicable Box)

☐ This Notice is on or before September 1, 2007.

☐ This Notice is after September 1, 2007 and on or before September 1, 2008.

☐ This Notice is after September 1, 2008 and on or before December 31, 2008.

Dated: ______________________, 200 __

DMB Communities, II

By: ______________________

Name: ______________________

Title: ______________________

Appendix H

PURCHASE AND SALE AGREEMENT

By and Between

DMB Pacific LLC, as Seller

and

Tejon Ranchcorp, as Buyer

October 3, 2013

PURCHASE AND SALE AGREEMENT

(Partial Assignment of Nickel Water Agreement)

THIS PURCHASE AND SALE AGREEMENT ("Agreement"), dated for reference purposes only as of October 3, 2013, is made by and between DMB PACIFIC LLC, a Delaware limited liability company ("Seller"), and TEJON RANCHCORP, a California corporation ("Buyer"). Unless otherwise specifically provided herein, all provisions of this Agreement shall be effective as of the last date set forth on the signature page ("Effective Date").

RECITALS:

A. DMB Communities II LLC, an Arizona limited liability company ("DMBCII"), and Nickel Family, LLC, a California limited liability company ("Nickel"), entered into that certain Option and Water Purchase Agreement dated as of May 1, 2007 ("Nickel Agreement"). A copy of the Nickel Agreement is attached to and incorporated into this Agreement as Exhibit A. All capitalized terms not defined in this Agreement shall have their respective meanings set forth in the Nickel Agreement.

B. Pursuant to the Nickel Agreement, DMBCII acquired and exercised an option to purchase the right to eight thousand three hundred ninety-three (8,393) acre-feet per year of water ("Nickel Water").

C. In 2009, Nickel approved DMBCII's assignment of the Nickel Agreement to Seller.

D. Section 10 of the Nickel Agreement permits Seller to assign the Nickel Agreement, in whole or in part, subject to advance, written consent by Nickel as more particularly described therein.

E. Buyer seeks to purchase an assignment of six thousand six hundred ninety-three (6,693) acre-feet per year of Nickel Water for 2014 through the remainder of the term of the Nickel Agreement and all of Seller's contractual rights and obligations associated therewith (collectively, "Assignment Water"), and Seller is willing to make such assignment to Buyer, under the terms and conditions set forth in this Agreement.

AGREEMENT

NOW THEREFORE, in consideration of the mutual covenants contained herein and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Seller and Buyer hereby agree as follows:

1. PURCHASE AND SALE.

Subject to the terms and conditions contained in this Agreement, Seller shall sell and convey the Assignment Water to Buyer, and Buyer shall purchase the Assignment Water from Seller, for a purchase price of redacted ("Purchase Price"), at Close of Escrow (as defined in Section 3.3).

2. PAYMENT OF PURCHASE PRICE.

Buyer shall pay redacted as follows:

2.1 Deposit. On September 20, 2013, Buyer paid to Seller redacted ("Deposit"). Subject to the provisions of this Agreement, the Deposit shall become non-refundable after the expiration of the Inspection Period (except as set forth in Section 6.4(a) and Section 7.2(b)), and shall be applied to the Purchase Price at Close of Escrow. Notwithstanding any provision to the contrary contained in this Agreement, Seller and Buyer agree that redacted shall be paid to Seller in all events as consideration for Buyer's right to conduct due diligence hereunder and for Seller's execution, delivery and performance of this Agreement, the sufficiency of which is acknowledged by Seller ("Independent Consideration"). The Independent Consideration is in addition to and independent of any other consideration or payment provided in this Agreement, is nonrefundable, applicable to the Purchase Price, and, notwithstanding any other provision of this Agreement, shall be retained by Seller if this Agreement terminates for any reason.

2.2 Balance of Purchase Price.

redacted

3. CLOSING.

3.1 Close of Escrow. The Close of Escrow shall take place at the offices of Coblentz Patch Duffy & Bass LLP, 1 Ferry Building, Suite 200, San Francisco, California 94111, commencing at 10:00 a.m. local time on the earlier of (a) a date selected by Seller and Buyer, or (b) the date that is ten (10) days after the expiration of the Inspection Period ("Closing Date"); provided that all conditions precedent set forth in Section 6 have been satisfied or waived, as more specifically set forth in Section 6. If Seller has not received the Nickel Consent on or before the Closing Date, Seller shall have the right (but not the obligation) to extend the Closing Date for up to thirty (30) days to obtain the Nickel Consent.

3.2 Closing Deliveries.

(a) At or prior to Close of Escrow, Buyer shall deliver to Seller the following:

(i) The balance of the Purchase Price to be delivered by Buyer pursuant to Section 2.2;

(ii) Buyer's share of the fees and charges described in Section 3.4 or evidence reasonably satisfactory to Seller that such fees and changes will be paid as of the Close of Escrow;

(iii) Four (4) originals of Buyer's counterpart of the Partial Assignment Agreement (Nickel Water Agreement) in the form attached hereto as Exhibit B ("Partial Assignment"); and

(iv) Such other instruments and documents as are reasonably required by the terms of this Agreement.

(b) At or prior to Close of Escrow, Seller shall deliver to Buyer the following:

(i) Four (4) originals of Seller's counterparts of the Partial Assignment;

(ii) Evidence reasonably satisfactory to Buyer that Seller's share of the fees and charges described in Section 3.4 will be paid as of the Close of Escrow or instructions to deduct Seller's share of such fees and charges from the Purchase Price; and

(iii) Such other instruments and documents as are reasonably required by the terms of this Agreement.

3.3 Closing. The "Close of Escrow" shall be defined herein as the time that Buyer has delivered to Seller all deliveries required pursuant to Section 3.2(a), Seller has delivered to Buyer all deliveries required pursuant to Section 3.2(b), all conditions precedent set forth in Section 6 have been satisfied or waived and the Nickel Consent has been obtained.

3.4 Costs. Buyer and Seller shall each pay one-half (1/2) of all costs, expenses and fees associated with (i) any transfer or assignment of Assignment Water under this Agreement or the Nickel Agreement, including any transfer taxes associated with the Assignment Water (which shall not be construed as taxes on Seller for receipt of any payments under this Agreement), or (ii) Nickel's due diligence investigation of the proposed assignment to Buyer. Seller and Buyer shall each be responsible for its own attorneys' and other professional fees and internal administrative costs associated with the preparation of this Agreement and the assignment of rights and obligations under the Nickel Agreement from Seller to Buyer. Nothing in this Section 3.4 shall limit Buyer's responsibility for all payments due under the Nickel Agreement with respect to the Assignment Water after the Close of Escrow.

4. DUE DILIGENCE.

4.1 AS IS CONDITION. BUYER HAS BEEN STRONGLY ADVISED TO INVESTIGATE THE CONDITION AND SUITABILITY OF ALL ASPECTS OF THE ASSIGNMENT WATER AND THE NICKEL AGREEMENT AND ALL MATTERS AFFECTING THE VALUE OR DESIRABILITY OF THE ASSIGNMENT WATER AND THE NICKEL AGREEMENT. EXCEPT AS EXPRESSLY PROVIDED IN SECTION 5.1, NEITHER SELLER, NOR ITS AFFILIATES, NOR THEIR RESPECTIVE OFFICERS, DIRECTORS, EMPLOYEES OR AGENTS, MAKES OR HAS MADE ANY REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, WRITTEN OR ORAL, AS TO THE NICKEL AGREEMENT OR THE VALUE, DESIRABILITY OR CONDITION OF THE ASSIGNMENT WATER, THE USES OF THE ASSIGNMENT WATER OR ANY LIMITATIONS THEREON.

4.2 Due Diligence. For a period of thirty (30) days after September 23, 2013 ("Inspection Period"), Buyer, at its sole cost and expense, has had and shall have the right to conduct due diligence with respect to the Nickel Agreement and the Assignment Water. Within five (5) days after the Effective Date, Seller shall deliver to Buyer copies of all documents creating the right to the Assignment Water that will be transferred to Buyer at the Close of Escrow or related to Seller's acquisition thereof; provided, however, that Seller shall not be obligated to deliver any documents or other information (i) not presently in Seller's possession or control, (ii) relating to opinions of value and appraisals and/or future projections of opinions of value and appraisals, (iii) relating to any effort to market any portion of the Nickel Water or to the potential or actual sale thereof, (iv) documentation of prior sales and approvals, (v) subject to confidentiality agreements or to work product or attorney-client privilege, or (vi) internal analyses and correspondence prepared for Seller's members. Any documents or information delivered to Buyer under this Section 4.2(a) shall be in its "as-is" condition, without representation or warranty of any kind or any agreement by Seller or any other party to permit Buyer's reliance thereon.

4.3 Right to Terminate. If, for any reason, Buyer is not satisfied with the results of its due diligence investigation of the Assignment Water or the Nickel Agreement, Buyer shall have the right to terminate this Agreement by written notice to Seller given prior to the expiration of the Inspection Period. Buyer's failure to terminate this Agreement prior to the expiration of the Inspection Period shall be deemed Buyer's approval of all matters relating to the Assignment Water and the Nickel Agreement. If Buyer elects not to terminate this Agreement as permitted above, (a) the Deposit shall become fully-earned by Seller and non-refundable, to Buyer, except as set forth in Section 6.4(a) and 7.2(b); and (b) in addition to all other claims waived by Buyer hereunder, Buyer shall be deemed to have waived any and all rights or claims against Seller with respect to matters discovered prior to the expiration of the Inspection Period. If Buyer elects to terminate this Agreement as permitted above, Buyer shall be entitled to return of the Deposit (less the Independent Consideration), and this Agreement, the Escrow and the rights and obligations of the parties hereunder shall terminate as of the date of such notice, except for the obligations that expressly survive the termination of this Agreement.

4.4 Confidentiality. Until Close of Escrow, unless disclosure is otherwise required under this Agreement or under applicable law, Buyer shall keep and shall cause Buyer's agents, consultants and employees to keep confidential all reports, documents, analyses, and opinions obtained by Buyer with respect to the Assignment Water, including any information provided by Seller or received or prepared by Buyer in Buyer's independent factual, physical and legal examinations and inquiries respecting the Assignment Water or the Nickel Agreement (collectively, "Confidential Information"), except that Buyer may disclose the same to its legal counsel and consultants, provided that Buyer obtains the agreement in writing of such legal counsel and consultants to keep the Confidential Information confidential. Until Close of Escrow, neither the contents nor the results of any Confidential Information shall be disclosed by Buyer, its agents, consultants and employees without Seller's prior written approval, which Seller may grant or withhold at Seller's sole and absolute discretion, unless and until Buyer is legally compelled to make such disclosure.

4.5 Mutual Release. Effective as of the Close of Escrow, Buyer hereby waives, releases and forever discharges Seller, its affiliates, and their respective officers, directors, members, employees, agents and contractors from any and all losses, costs, claims, demands, actions, suits, orders, damages, obligations, liabilities, or causes of action (including attorneys' fees and costs) that Buyer may have at the Close of Escrow or that may arise in the future on account of or in any way arising out of or connected with the Assignment Water or the Nickel Agreement, including the condition, nature or quality of the Assignment Water:

> A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM OR HER MUST HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR.
>
> Buyer's Initials: ______

Effective as of the Close of Escrow, Seller hereby waives, releases and forever discharges Buyer, its affiliates, and their respective officers, directors, members, employees, agents and contractors from any and all losses, costs, claims, demands, actions, suits, orders, damages, obligations, liabilities, or causes of action (including attorneys' fees and costs) to the extent arising as a result of or attributable to Seller's obligations under the Nickel Agreement prior to the Close of Escrow.

A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM OR HER MUST HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR.

Seller's Initials: ____________________

4.6 Survival. The covenants, agreements and obligations of Buyer contained in this Section 4 and the agreement of Seller in Section 4.5 shall survive the expiration or earlier termination of this Agreement or the Close of Escrow.

5. REPRESENTATIONS AND WARRANTIES.

5.1 Seller's Representations. Seller hereby represents and warrants to Buyer as follows:

(a) Subject to Seller obtaining the Nickel Consent, Seller has full right, power and authority to enter into this Agreement and to sell, convey and transfer the Assignment Water to Buyer. All corporate action on the part of Seller necessary for the valid authorization, execution, and delivery of this Agreement, and the consummation of the transactions contemplated hereby has been taken, or at or prior to Close of Escrow will have been taken.

(b) Subject to Seller obtaining the Nickel Consent, the execution and delivery of this Agreement and the consummation of the transactions contemplated hereby will not conflict with or constitute a default under any of the terms, conditions or provisions of any other agreement to which Seller is a party or by which Seller is bound, and will not violate any provision of, or require any consent, authorization or approval under, any applicable law, regulation, or order.

(c) Seller hereby represents, warrants and covenants that Seller holds all rights and interests in the Assignment Water, that all necessary acts to use such water have been taken by Seller, that to Seller's knowledge all rights to such water are free and clear of any liens, claims or other encumbrances, that no other options, commitments or similar rights have been granted by Seller to any person for such water, that Seller is as of the date of this Agreement in full compliance with the Nickel Agreement and that Seller is free to assign such water to Buyer subject only to the terms of the Nickel Agreement.

(d) The representations and warranties of Seller set forth in this Agreement shall be true on and as of the Close of Escrow as if those representations and warranties were made on and as of such time.

5.2 Buyer's Representations. In consideration of Seller entering into this Agreement and as an inducement to Seller to sell the Assignment Water to Buyer, Buyer makes the following representations and warranties, each of which is material, is being relied upon by Seller (the continued truth and accuracy of which shall constitute a condition precedent to Seller's obligations hereunder) and shall fully survive the Close of Escrow:

(a) Buyer is duly organized, validly existing and in good standing under the laws of the state of its organization and is qualified to do business in the State of California, and the persons executing this Agreement on behalf of Buyer have the full right and authority to execute this Agreement on behalf of Buyer and to bind Buyer without the consent or approval of any other person or entity. This Agreement and all documents executed by Buyer which are to be delivered to Seller upon Close of Escrow are, or at the time of Close of Escrow will be, (i) duly authorized, properly executed and delivered by Buyer, (ii) legal, valid and binding obligations of Buyer enforceable in accordance with their terms at the time of Close of Escrow, and (iii) not in violation of any agreement or judicial order to which Buyer is a party or to which it is subject.

(b) Buyer is represented or has had an opportunity to be represented by counsel in connection with this transaction. Except for the express representations and warranties of Seller contained in Section 5.1 above, Buyer specifically acknowledges that it is acquiring the Assignment Water without any representations or warranties of Seller, express or implied, written or oral, as to the any aspect or condition of the Assignment Water or the Nickel Agreement. Buyer is relying solely upon, and, as of the expiration of the Inspection Period will have conducted, its own due diligence investigation as it deems necessary or appropriate in connection with this transaction. Buyer is not relying in any way upon any representations, statements, agreements, warranties, studies, plans, reports, descriptions, guidelines or other information or material furnished by Seller or its representatives, whether oral or written, express or implied, of any nature whatsoever regarding any of the foregoing matters.

(c) The representations and warranties of Buyer set forth in this Agreement shall be true on and as of the Close of Escrow as if those representations and warranties were made on and as of such time.

6. CONDITIONS PRECEDENT.

6.1 Conditions to Buyer's Obligations. Buyer's obligation to purchase the Assignment Water is subject to the fulfillment or waiver of each of the following conditions precedent:

(a) The representations and warranties of Seller set forth in this Agreement shall be true on and as of the Close of Escrow as if those representations and warranties were made on and as of such time; and

(b) Seller shall have performed each and every covenant contained in this Agreement to be performed by Seller at or prior to Close of Escrow.

6.2 Conditions to Seller's Obligations. Seller's obligation under this Agreement to sell the Assignment Water to Buyer is subject to the fulfillment or waiver of each of the following conditions precedent:

(a) The representations and warranties of Buyer set forth in this Agreement shall be true on and as of the Close of Escrow as if those representations and warranties were made on and as of such time; and

(b) Buyer's timely performance of each and every covenant contained in this Agreement to be performed by Buyer.

6.3 Nickel Consent. Seller has determined that the consent of Nickel to the transaction contemplated by this Agreement is required pursuant to Section 10(a) of the Nickel Agreement ("Nickel Consent"). A condition precedent to Seller's sale of the Assignment Water to Buyer, and therefore, the obligation of each party to close the sale of the Assignment Water shall be conditioned upon obtaining such Nickel Consent in the form attached to the Partial Assignment (or such other form as Seller approves, in its reasonable discretion) at or prior to the Inspection Period. Seller shall use commercially reasonable efforts to obtain the Nickel Consent at or prior to the Inspection Period. Buyer acknowledges and agrees that Seller makes no representation or warranty with respect to the likelihood of, or timing of, the Nickel Consent, and Buyer hereby waives all claims against Seller for losses, expenses or damages suffered or incurred by Buyer as a result of the need for the Nickel Consent, any delay in receipt of the Nickel Consent or the failure of Nickel to consent to the sale of the Assignment Water or the partial transfer of the Nickel Agreement to Buyer.

Notwithstanding the foregoing, should Nickel fail to consent to the transaction contemplated by this Agreement, Buyer shall have a right of first refusal to purchase from Seller the Assignment Water for the 2014 calendar year at Seller's full cost under terms of the Nickel Agreement and any other actual costs incurred by Seller relative to delivery of the 2014 Assignment Water. Buyer's right of first refusal to purchase the 2014 Assignment Water pursuant to this provision shall expire if not exercised on or before January 31, 2014.

6.4 Termination of Agreement for Failure of Conditions.

(a) Failure of Buyer's Conditions. If any one or more of the conditions to Buyer's obligations, as set forth in Section 6.1 or elsewhere in this Agreement, is not either fully performed, satisfied or waived in writing on or before the Closing Date, then Buyer may elect, by written notice to Seller, to terminate this Agreement and the Escrow, in which event Buyer shall be entitled to a return of the Deposit (less the Independent Consideration), this Agreement, the Escrow and the rights and obligations of the parties hereunder shall terminate.

(b) Failure of Seller's Conditions. If any one or more of the conditions to Seller's obligations, as set forth in Section 6.2 or elsewhere in this Agreement, is not either fully performed, satisfied or waived in writing on or before the Closing Date, then Seller may elect, by written notice to Buyer, to terminate this Agreement and the Escrow, in which event this Agreement, the Escrow and the rights and obligations of the parties hereunder shall terminate. Nothing in this paragraph shall be construed to limit Seller's rights under Section 7.1 in the event of a default by Buyer.

(c) Nickel Approval. The condition set forth in Section 6.3 may not be waived by either party.

7. DEFAULT.

7.1 Buyer's Default.

(a) IF THE SALE OF THE ASSIGNMENT WATER TO BUYER UNDER THIS AGREEMENT DOES NOT CLOSE BECAUSE OF A DEFAULT BY BUYER, SELLER MAY UNILATERALLY TERMINATE THIS AGREEMENT AND THE ESCROW BY GIVING WRITTEN NOTICE TO BUYER. THEREUPON, SELLER SHALL BE RELEASED FROM ALL OBLIGATIONS UNDER THIS AGREEMENT, AND SELLER MAY RETAIN THE DEPOSIT AS LIQUIDATED DAMAGES. SELLER'S RETENTION OF THE DEPOSIT IS NOT INTENDED AS A FORFEITURE OR A PENALTY, BUT IS INTENDED TO COMPENSATE SELLER FOR DAMAGES IT WILL SUSTAIN BY REASON OF SUCH DEFAULT BY BUYER, INCLUDING DAMAGES RESULTING FROM THE REMOVAL OF THE ASSIGNMENT WATER FROM THE MARKET, THE LOSS OF BUSINESS OPPORTUNITIES AND THE LOSS OF PROSPECTIVE INVESTMENT. THE PARTIES AGREE AND ACKNOWLEDGE THAT THE AMOUNT OF SELLER'S ACTUAL DAMAGES AS A RESULT OF BUYER'S DEFAULT WOULD BE EXTREMELY DIFFICULT OR IMPRACTICABLE TO ASCERTAIN, AND THE AMOUNT PROVIDED FOR HEREIN IS A REASONABLE ESTIMATE OF SUCH DAMAGES. BY THEIR SIGNATURES BELOW, SELLER AND BUYER SPECIFICALLY ACKNOWLEDGE THEIR ACCEPTANCE AND APPROVAL OF THE FOREGOING LIQUIDATED DAMAGES PROVISION.

(b) NOTHING CONTAINED IN THIS SECTION SHALL SERVE TO WAIVE OR OTHERWISE LIMIT (i) SELLER'S REMEDIES OR DAMAGES FOR CLAIMS WITH RESPECT TO ANY OBLIGATIONS OF BUYER THAT, BY THE TERMS OF THIS AGREEMENT, SURVIVE THE CLOSE OF ESCROW OR ANY TERMINATION OF THIS AGREEMENT BEFORE THE CLOSE OF ESCROW, INCLUDING BUYER'S CONFIDENTIALITY OBLIGATIONS, INDEMNIFICATION

OBLIGATIONS redacted
ESCROW, OR FOR CLAIMS IN CONNECTION WITH THE NICKEL AGREEMENT OR THE PARTIAL ASSIGNMENT, OR (ii) SELLER'S RIGHTS TO OBTAIN FROM BUYER ALL COSTS AND EXPENSES OF ENFORCING THE LIQUIDATED DAMAGE PROVISION ABOVE, INCLUDING ATTORNEYS' FEES AND COSTS PURSUANT TO SECTION 9 BELOW.

redacted

(c) THE PARTIES AGREE THAT SELLER WOULD SUFFER MATERIAL INJURY OR DAMAGE NOT COMPENSABLE BY THE PAYMENT OF MONEY IF BUYER WERE TO BREACH OR VIOLATE ITS redacted
OBLIGATIONS UNDER THIS AGREEMENT. ACCORDINGLY, NOTWITHSTANDING THE PROVISIONS OF SECTION 7.1(a) ABOVE, IN ADDITION TO ALL OTHER REMEDIES THAT SELLER MAY HAVE, SELLER MAY BRING AN ACTION IN EQUITY OR OTHERWISE FOR SPECIFIC PERFORMANCE TO ENFORCE COMPLIANCE WITH SUCH OBLIGATIONS, OR AN INJUNCTION TO ENJOIN THE CONTINUANCE OF ANY SUCH BREACH OR VIOLATION THEREOF. BUYER AGREES TO WAIVE ANY REQUIREMENT FOR A BOND IN CONNECTION WITH ANY SUCH INJUNCTIVE OR OTHER EQUITABLE RELIEF.

ACKNOWLEDGMENT AS TO ACCEPTANCE OF THE IMMEDIATELY PRECEDING LIQUIDATED DAMAGES PROVISION:

Buyer: TEJON RANCHCORP	Seller: DMB PACIFIC LLC
By: [signature]	By: [signature]
Greg Tobias Vice President, General Counsel	Print Name: Mark Kehke, Pres. Lt COO

7.2 Seller's Default. If the sale of the Assignment Water under this Agreement does not close because of a default by Seller, Buyer shall have, at its option and as its sole remedies, the following:

(a) The right to pursue specific performance of this Agreement, provided that Buyer waives in writing any right it may have to bring an action for, or assert, any damages against Seller for such default of Seller. In no event shall Buyer be entitled to any damages as a result of a default by Seller under this Agreement.

(b) As an alternative to the remedy provided in Section 7.2(a), the right to terminate this Agreement, in which event Buyer shall be entitled to return of the Deposit (less the Independent Consideration), and this Agreement, the Escrow and the rights and obligations of the parties hereunder shall terminate as of the date of such notice, except for obligations that expressly survive the termination of this Agreement.

7.3 Failure of Conditions. If, prior to the Close of Escrow, Seller discloses to Buyer or Buyer otherwise discovers that (a) Seller failed to make any material disclosures to Buyer regarding the Assignment Water or the Nickel Agreement, or (b) any representation or warranty of Seller contained in this Agreement is, or as of the Closing Date will be, untrue (collectively, "Disclosure Defects"), then Seller shall bear no liability for such Disclosure Defects, and Buyer shall, within five (5) days following Buyer's awareness of the existence of a Disclosure Defect, give Seller written notice of its objection thereto, which objection shall be in writing and shall specifically delineate the reasons therefor. If Buyer fails to furnish Seller with such an objection notice within said five (5) day period, Buyer shall be deemed to have irrevocably waived any right to object to the Disclosure Defect, and this Agreement shall continue in full force and effect. However, if Buyer furnishes Seller with such an objection notice within said five (5) day period, Seller may elect by notice to Buyer either (a) to attempt to cure or otherwise remedy Buyer's objection (in which event, Seller may postpone the Close of Escrow for up to thirty (30) days to effect said cure) or (b) not to cure or otherwise remedy Buyer's objection. Buyer acknowledges and agrees that Seller shall have no obligation to cure any objection. If Seller is unable or unwilling to cure Buyer's objection within ten (10) days after notice thereof from Seller ("Seller's Cure Period"), then Buyer, as Buyer's sole remedy, shall elect to either (a) waive the Disclosure Defect and complete the purchase of the Assignment Water in accordance with the terms of this Agreement or (b) terminate this Agreement by giving written notice to Seller within ten (10) days after Seller's Cure Period, and, provided that Buyer shall not be in default hereunder, Buyer shall be entitled to return of the Deposit (less the Independent Consideration), and this Agreement, the Escrow and the rights and obligations of the parties hereunder shall terminate as of the date of such notice, except for obligations that expressly survive the termination of this Agreement. If Buyer fails to give Seller Buyer's written notice to terminate within ten (10) days after Seller's Cure Period, then Buyer shall be deemed to have elected to waive such Disclosure Defect and Buyer's right to terminate this Agreement pursuant to this Section 7.3. Notwithstanding anything to the contrary in this Agreement, Buyer's consent to the Close of Escrow in this transaction shall conclusively demonstrate Buyer's waiver of any Disclosure Defects known to Buyer prior to the Close of Escrow, and Buyer shall not be entitled to make any claim or bring any action for damages against Seller arising out of any Disclosure Defects.

8. BROKERS.

8.1 Seller.

Seller hereby represents and warrants to Buyer that Seller has incurred no obligation to any finder or real estate broker or salesperson with respect to this transaction, other than to Stratecon ("Seller's Broker"), and in the event that any contrary claim is made, Seller shall indemnify, defend and hold Buyer harmless from and against any and all losses, costs, claims, damages, liabilities or causes of action (including attorneys' fees and costs) with respect to any such additional finder, broker or salesperson. Seller shall pay any commissions owed to Seller's Broker pursuant to a separate agreement. Buyer acknowledges and agrees that Seller's Broker represents the interests of Seller and not Buyer in the transaction contemplated hereunder. In the event that this transaction does not close for any reason, including a default by Seller or Buyer, no fee or commission shall be payable to Seller's Broker. The representations, warranties and covenants of Seller contained in this Section 8.1 shall survive the expiration or earlier termination of this Agreement or the Close of Escrow.

8.2 Buyer. Buyer hereby represents and warrants to Seller that Buyer has not incurred any obligation to any finder or real estate broker or salesperson with respect to this transaction, and in the event that any contrary claim is made, Buyer shall indemnify, defend and hold Seller harmless from and against any and all losses, costs, claims, damages, liabilities or causes of action (including attorneys' fees and costs) with respect to any such finder, broker or salesperson. The representations, warranties and covenants of Buyer contained in this Section 8.2 shall the expiration or earlier termination of this Agreement or the Close of Escrow.

9. MISCELLANEOUS.

9.1 Survival. The representations and warranties of Seller and Buyer contained in this Agreement shall survive the Close of Escrow and continue for a period of one (1) year thereafter and shall thereupon expire and be of no further force and effect. Any claim for breach of any such representations and warranties must be made in writing within such six (6) month period or shall be waived. Notwithstanding the foregoing two sentences, discovery by Buyer of any Disclosure Defects prior to the Close of Escrow shall be exclusively governed by Section 7.3 above. The waivers of claims or rights, the releases and the obligations of Buyer under this Agreement to indemnify, protect, defend and hold harmless Seller and other persons shall survive the expiration or earlier termination of this Agreement or the Close of Escrow, and so shall all other obligations or agreements of Seller and Buyer which by their nature or by their terms survive.

9.2 Time of Essence. Time is of the essence of this Agreement and each and every provision hereof.

9.3 Submission of Agreement. Submission of this document for examination or signature by Buyer does not constitute an option or offer to sell the Assignment Water to Buyer. This document is not effective as a purchase and sale agreement or otherwise until executed and delivered by both Seller and Buyer.

9.4 Binding Effect; Assignment. This Agreement shall be binding upon, and shall inure to the benefit of, the heirs, successors and assigns of the parties hereto. Notwithstanding the foregoing, Buyer shall have no right to assign its rights and obligations under this Agreement prior to the Close of Escrow unless (a) Buyer shall obtain the prior written consent of Seller to such assignment, which consent may be granted or withheld in Seller's sole discretion, (b) Buyer shall not then be in default of any of its obligations under this Agreement, (c) Seller shall have approved the form of assignment, (d) the assignee shall have expressly assumed all of the obligations of Buyer under this Agreement, (e) Buyer shall furnish Seller with evidence acceptable to Seller that the proposed assignee possesses the financial ability to perform Buyer's obligations contemplated by this Agreement, and (f) Buyer shall continue to be primarily liable under this Agreement. Buyer agrees to reimburse Seller, within thirty (30) days after demand, for all costs and expenses (including attorneys' fees and costs) incurred by Seller in connection with any assignment of Buyer's interest in this Agreement, whether or not Seller's consent to such assignment is obtained. Buyer acknowledges that fees attributable to the work of Seller's in-house attorneys are reimbursable under the preceding sentence, and that such fees shall be calculated as provided in Section 9.10 below. Buyer acknowledges and agrees that Seller shall have the right to assign or otherwise convey its rights and/or obligations under this Agreement and/or with respect to the Assignment Water without the consent of Buyer, provided that Seller provides written notice of such assignment or conveyance, and the assignee assumes the remaining obligations of Seller under this Agreement. Said assignee shall be substituted as Seller hereunder and shall be entitled to the benefit of and may enforce Buyer's covenants, representations and warranties hereunder as if such assignee were the original Seller hereunder.

9.5 Severability. If any provision of this Agreement shall be unenforceable or invalid, the same shall not affect the remaining provisions of this Agreement and to this end the provisions of this Agreement are intended to be and shall be severable; provided, however, if such unenforceability or invalidity alters the substance of this Agreement (taken as a whole) so as to deny either party, in a material way, the realization of the intended benefit of its bargain, such party may terminate this Agreement by notice to the other party within thirty (30) days after the final determination. If such party so elects to terminate this Agreement, Buyer shall be entitled to return of the Deposit (less the Independent Consideration), and this Agreement, the Escrow and the rights and obligations of the parties hereunder shall terminate as of the date of such notice, except for obligations that expressly survive the termination of this Agreement.

9.6 Governing Laws. This Agreement shall be governed by, and construed and enforced in accordance with, the laws of the State of California.

9.7 Counterparts. This Agreement may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.

9.8 Notices. Any notice or other communication required or permitted under this Agreement shall be in writing and shall be either personally delivered or transmitted by registered or certified mail, return receipt requested, postage prepaid, or by a nationally recognized overnight courier, such as FedEx or Airborne Express, addressed to the parties as follows:

If to Seller:	DMB Pacific LLC c/o DMB Pacific Ventures LLC 801 Montgomery, Suite 200 San Francisco, CA 94133 Attn: Mark C. Kehke Tel: (415) 576-9200
with a copy to:	Coblentz, Patch, Duffy & Bass LLP One Ferry Building, Suite 200 San Francisco, CA 94111 Attn: Harry O'Brien, Esq. Tel: (415) 772-5723
If to Buyer:	Tejon Ranchcorp P.O. Box 1000 (if by mail) 4436 Lebec Rd., (if by courier) Lebec, CA 93243 Attn: Allen E. Lyda, Executive Vice President Tel: (661) 248-3000
With a copy to:	Tejon Ranchcorp P.O. Box 1000 (if by mail) 4436 Lebec Rd., (if by courier) Lebec, CA 93243 Attn: Greg Tobias, Vice President, General Counsel Tel: (661) 248-3000

The date of any notice or communication shall be deemed to be the date of receipt if delivered personally, or the date of the receipt or refusal of delivery if transmitted by mail or overnight courier. Any party may change the address for notice by giving notice to the other party in accordance with this Section.

9.9 Attorneys' Fees. In the event that any party shall bring an action to enforce its rights under this Agreement, or relating to the interpretation hereof, whether for declaratory or other relief, the prevailing party in any such proceeding shall be entitled to recover from the other party reasonable attorneys' fees and all costs, expenses and disbursements that the prevailing party incurred in connection with such proceeding and any appeal thereof (including the reasonable costs of discovery, investigation, preparation for trial, professional or expert consultation and testimony). Buyer shall also pay all attorneys' fees and costs Seller incurs in defending this Agreement or otherwise protecting Seller's rights in any voluntary or involuntary bankruptcy case, assignment for the benefit of creditors, or other insolvency, liquidation or reorganization proceeding involving Buyer or this Agreement, including all motions and proceedings related to relief from an automatic stay, use of cash collateral, claim objections, disclosure statements and plans of reorganization. A party shall be deemed to have prevailed in any such action (without limiting the generality of the foregoing) if such action is dismissed upon the payment by the other party of the sums allegedly due or the performance of obligations allegedly not complied with, or if such party obtains substantially the relief sought by it in the action, irrespective of whether such action is prosecuted to judgment. The non-prevailing party shall also pay the attorneys' fees and costs incurred by the prevailing party in any post-judgment proceedings to collect and enforce the judgment. For purposes hereof, the reasonable fees of Seller's and Buyer's in-house attorneys who perform services in connection with any such action are recoverable, and shall be based on the fees regularly charged by private attorneys with the equivalent number of years of experience in the relevant subject matter area of the law, in law firms in the City of San Francisco. Any such fees and costs incurred prior to judgment, award, or decree may be included in any judgment, award or decree entered in such proceeding in favor of the prevailing party. Any such fees, costs and expenses incurred by the prevailing party in enforcing a judgment, award or decree in its favor shall be recoverable separately from and in addition to any other amount included in such judgment, award or decree. This provision is separete and several and shall survive the merger of this Agreement into any judgment on this Agreement.

9.10 Limitation on Liability. Buyer expressly agrees that the obligations and liabilities of Seller under this Agreement and any document referenced herein shall not constitute personal obligations of the officers, directors, employees, agents, affiliates, members, representatives, stockholders or other principals and representatives of Seller. Seller's liability, if any, arising in connection with this Agreement or with the Assignment Water shall be limited to Seller's interest in the Assignment Water, or to the sales proceeds from the Assignment Water subsequent to the Close of Escrow, for the recovery of any judgment against Seller, and Seller's liability shall not extend to any other assets of Seller. The limitations of liability contained in this Section shall apply equally and inure to the benefit of Seller's present and future officers, directors, employees, agents, affiliates, members, representatives, stockholders or other principals and representatives, and their respective heirs, successors and assigns.

9.11 Required Actions of Buyer and Seller. Buyer and Seller agree to take such reasonable actions, including acknowledging, delivering or executing instruments and documents, as may be required to effectuate the purposes of this Agreement or to close the purchase and sale of the Assignment Water as contemplated herein.

9.12 Back-Up Offers. Seller shall have the right to solicit, receive, consider and accept so-called "back-up" offers to purchase the Assignment Water.

9.13 Joint and Several Liability. If two or more individuals, corporations, partnerships or other business associations (or any combination of two or more thereof) shall sign this Agreement as Buyer, the liability of each such individual, corporation, partnership or other business association to perform Buyer's obligations hereunder shall be deemed to be joint and several, and all notices, payments and agreements given or made by, with or to any one of such individuals, corporations, partnerships or other business associations shall be deemed to have been given or made by, with or to all of them. In like manner, if Buyer shall be a partnership or other business association, the members of which are, by virtue of statute or federal law, subject to personal liability, then the liability of each such member shall be joint and several.

9.14 Captions. Captions to the paragraphs and sections in this Agreement are included for convenience only and do not modify any of the terms of this Agreement.

9.15 Interpretation. This Agreement shall be construed according to the fair meaning of its language. The rule of construction to the effect that ambiguities are to be resolved against the drafting party shall not be employed in interpreting this Agreement. Unless the context clearly requires otherwise: (a) the plural and singular shall each be deemed to include the other; (b) the masculine, feminine, and neuter genders shall each be deemed to include the others; (c) "shall," "will," or "agrees" are mandatory, and "may" is permissive; (d) "or" is not exclusive; (e) "include," "includes," and "including" are not intended to be restrictive, and lists following such words shall not be interpreted to be exhaustive or limited to items of the same type as those enumerated; and (f) "days" means calendar days, except if the last day for performance occurs on a Saturday, Sunday, or any legal holiday, then the next succeeding business day shall be the last day for performance.

9.16 Entire Agreement; Amendment. This Agreement and the exhibits hereto contain the entire understanding of the parties relating to the subject matter hereof and shall supersede any prior written or oral agreements or communications between the parties pertaining to such subject matter. Seller's or Buyer's obligations under this Agreement may not be altered or amended in any respect except by a writing executed by both Buyer and Seller.

9.17 Exhibits. The following Exhibits are attached hereto and incorporated by reference into this Agreement:

Exhibit A – Nickel Water Agreement
Exhibit B – Partial Assignment Agreement (Nickel Water Agreement)

IN WITNESS WHEREOF, the parties have duly executed this Agreement.

SELLER:

DMB PACIFIC LLC,
a Delaware corporation

By: DMB Pacific Ventures, LLC, a Delaware limited liability company, its Manager

By: ______________________
Mark Kehke
President and Chief Operating Officer

Date: 10/3/13

BUYER:

TEJON RANCHCORP,
a California corporation

By: ______________________
Greg Tobias
Vice President, General Counsel

Date: October 3, 2013

EXHIBIT A

NICKEL AGREEMENT

[See Attached]

- REDACTED -

OPTION AND WATER PURCHASE AGREEMENT

THIS AGREEMENT is made and effective as of May 1, 2007 (the "Effective Date") by and between Nickel Family, LLC, a California limited liability company ("Nickel"), and DMB Communities II, LLC, an Arizona limited liability company ("DMB"), with reference to the following facts:

RECITALS

A. Nickel previously held rights to water from the Kern River. Nickel conveyed those rights to the Kern County Water Agency ("KCWA" or "Agency") in exchange for a perpetual right to 10,000 acre-feet per year of certain other water (the "Agency Transfer Water") to be made available by the Agency for the benefit of Nickel pursuant to the terms of that certain Contract to Transfer the Kern River Lower River Water Rights between Nickel, the Olcese Water District and the Agency dated January 23, 2001 (the "Agency Agreement"). A copy of the Agency Agreement is attached hereto as Exhibit A and incorporated herein by this reference.

B. Pursuant to the terms of the Agency Agreement, Nickel received the right to the Agency Transfer Water for the purpose of selling, or transferring, Agency Transfer Water to third parties within or outside of Kern County. Also pursuant to the terms of the Agency Agreement, Nickel has the right to the assistance and cooperation of the Agency in consummating sales or transfers of Agency Transfer Water, including entering into contracts for the sale of the Agency Transfer Water and efforts to obtain the approval, cooperation and assistance of the California Department of Water Resources and the State Water Contractors in obtaining any necessary approvals from regulatory agencies to effect such sales or transfers.

C. DMB wishes to acquire an option to purchase the use of 8,393 acre-feet at the California Aqueduct at Tupman (Reach 13B) (the "Acquired Water") of the Agency Transfer Water for the exclusive use by DMB as described herein, each year, for an initial period of thirty-five (35) years (the "Transfer Term") and for a potential extension period of another thirty-five 35 years (the "Extended Transfer Term"), which extension is exercisable solely at the discretion of DMB, as provided in this Agreement. DMB also wishes to acquire Nickel's right to the assistance and cooperation of the Agency in entering into contracts for the sale or transfer of the Acquired Water to third parties for the period of the Transfer Term and any Extended Transfer Term and efforts to obtain the approval, cooperation and assistance of the California Department of Water Resources and the State Water Contractors in obtaining any necessary approvals from regulatory agencies to effect such sales or transfers. Nickel is willing to grant such an option under the terms and conditions set forth in this Agreement.

D. DMB paid to Nickel on or about March 7, 2007, (the "Due Diligence Payment") to initiate a due diligence period expiring at the end of May 7, 2007, (the "Due Diligence Period"), which period DMB and Nickel may agree to extend by thirty (30) days (the "Extended Due Diligence Period") to and including June 6, 2007.

THEREFORE, the Parties hereby agree as follows:

1. Grant of Option. Subject to the terms and conditions set forth in this Agreement, Nickel hereby grants to DMB an option (the "Option") to purchase and acquire the exclusive right to the use of the Acquired Water each year during the Transfer Term. The term of the Option shall start on the Effective Date of this Agreement upon payment of the Initial Option Consideration Payment as set forth in Section 2 below, and expire at the end of December 31, 2007 (the "Initial Option Term"); provided, that DMB may elect to extend the term of the Option by twelve (12) additional calendar months to the end of December 31, 2008, (the "Extended Option Term") by giving written notice of extension to Nickel in the manner set forth in Section 19 and paying the Extended Option Consideration Payment (as defined below) prior to the expiration of the Initial Option Term at the end of December 31, 2007.

2. Option Consideration. As consideration for the grant of the Initial Option Term, DMB shall pay to Nickel on or by the end of May 7, 2007, the Initial Option Consideration Payment; provided that if DMB and Nickel agree to the Extended Due Diligence Period, DMB shall pay the to Nickel on or by the end of June 6, 2007, as the Initial Option Consideration Payment. If DMB elects to take the Extended Option Term and desires the Extended Option Term, in addition to the Initial Option Consideration Payment, DMB shall pay to Nickel on or by the end of December 31, 2007, as the Extended Option Consideration Payment. The Initial Option Consideration Payment and the Extended Option Consideration Payment shall be applied as a credit against the Purchase Price, as defined below. Other than as set forth in this Agreement, the Initial Option Consideration Payment and the Extended Option Consideration Payment shall be non-refundable to DMB.

3. Exercise of Option.

(a) DMB may exercise the Option by giving written notice (the "Option Notice") by sending the Option Notice, in the form of Exhibit B to this Agreement, to Nickel at any time prior to the expiration of the Initial Option Term. Once the Initial Option has been exercised, DMB shall be obligated to purchase, and Nickel shall be obligated to sell, the exclusive use of the Acquired Water each year of the entire Transfer Term in accordance with the terms of this Agreement and upon payment of the Purchase Price. If the Option Notice is delivered on or before the end of September 1, 2007, the Transfer Term shall commence on January 1, 2008.

(b) If DMB has elected to take the Extended Option Term, and has paid the Extended Option Consideration Payment, then DMB may exercise the Option by sending the Option Notice in the form of Exhibit B to this Agreement to Nickel at any time prior to the expiration of the Extended Option Term. Once the Extended Option has been exercised, DMB shall be obligated to purchase, and Nickel shall be obligated to sell, the exclusive use of the Acquired Water each year of the entire Transfer Term in accordance with the terms of this Agreement and upon payment of the Purchase Price.

(c) If the Option Notice is delivered after September 1, 2007, but before September 1, 2008, either through the Initial Option Term or the Extended Option Term, then the Transfer Term shall commence on January 1, 2009.

(d) If the Option Notice is delivered after September 1, 2008, and before the end of December 31, 2008, then the Transfer Term also shall commence on January 1, 2009. In anticipation of such an event, to help ensure that Acquired Water may be delivered to DMB starting January 1, 2009, DMB may submit to Nickel prior to August 15, 2008, a written request and schedule for delivery of Acquired Water at Tupman or elsewhere to start on or after January 1, 2009. Upon receipt, Nickel shall immediately submit DMB's delivery request to the Agency consistent with the requirements of Article 4.8 of the Agency Agreement. DMB may subsequently revise its delivery request to change the amount of Acquired Water to be delivered, the schedule for delivery and the point or points of delivery, and Nickel shall immediately submit such revised delivery request to the Agency. Nickel makes no representation that the aforementioned request will be accepted by the Agency.

(e) The first year of the Transfer Term shall be referred to herein as the "First Water Year."

4. <u>Purchase Price; Payment of Purchase Price</u>.

(a) As of the Effective Date, the annual purchase price (the "Purchase Price") for the use of the Acquired Water shall be
acre-feet of Agency Transfer Water at per acre-foot) at Tupman; provided that the annual Purchase Price shall be increased on each January 1, commencing on January 1, 2008, by multiplying the Purchase Price on the Effective Date and thereafter in effect on the previous January 1 by the change in the Consumer Price Index (All Urban Consumers—All Items—Los Angeles-Riverside-Orange County) (the "Index") for the unadjusted twelve (12)-month period ending in September of the prior calendar year or by 1.03 (for a 3 percent increase), whichever is greater (the "Escalator").

As an example of the foregoing, on January 1, 2008, the Purchase Price would be adjusted by comparing the Index on September 1, 2006, e.g., 100, to the Index on September 1, 2007, e.g., 104, and multiplying the Purchase Price by the change in the Index, or by 1.03 (three (3) percent),whichever is greater, for an adjusted Purchase Price of per-acre foot on January 1, 2008, or 104/100( )= versus 1.03( )= . Thereafter, commencing January 1, 2009, the 2008 Purchase Price of would be adjusted by comparing the Index on September 1, 2007, e.g., 104, with the Index on September 1, 2008, and multiplying by the change, or 1.03, whichever is greater, and so on each January 1 of this Agreement.

The annual Purchase Price shall be paid on or before January 15 of each year during the Transfer Term. So long as Nickel can deliver the Acquired Water at Tupman, DMB shall pay the Purchase Price regardless of whether delivery of all Acquired Water is requested.

(b) Provided the Parties mutually agree, if DMB exercises the Option, either DMB or Nickel may request to negotiate for DMB to pay an up-front cash payment and thereby reduce or eliminate the annual Purchase Price. An escalator and a discount rate may be negotiated and used to establish the present value of the Purchase Price payments to be made during either the Transfer Term or Extended Transfer Term or both. The percentage of the present value to be paid up front also may be negotiated and used. Alternatively, DMB and Nickel may mutually agree to have DMB pay to Nickel an up-front cash payment to reduce or eliminate the Escalator component of the annual Purchase Price. The Parties acknowledge and agree that this Section 4(b) does not create any vested right in or guarantee any agreement respecting an up-front cash payment.

(c) The)ue Diligence Payment that DMB made to Nickel, the Initial Option Consideration Payment and any Extended Option Consideration Payment (the "Payment Credit") shall all be credited toward DMB's payment of the Purchase Price. The total Payment Credit shall be divided into five (5) equal payments applied over the first five years in which Purchase Price Payments are made. In the event that DMB and Nickel agree upon an up-front cash payment to reduce or eliminate the annual Purchase Price, the up-front cash payment shall be reduced by the amount of the Payment Credit.

5. <u>Right to Extended Transfer Term</u>.

(a) Subject to Section 21(b), provided this Agreement is in full force and effect and DMB is not in default, DMB shall have the right to extend the initial Transfer Term by an additional thirty-five (35) years by providing Nickel with written notice of DMB's election of an Extended Transfer Term pursuant to this Section 5. Such notice shall be provided to Nickel at least one year prior to the expiration of the initial Transfer Term. The terms and conditions of this Agreement including, without limitation, the amount of the adjusted Purchase Price as adjusted pursuant to Section 4(a), shall apply to the Extended Transfer Term, and all references in this Agreement to the Transfer Term shall include the Extended Transfer Term, including future adjustments of the Purchase Price pursuant to Section 4(a).

As an example of the foregoing, the Purchase Price on the first January 1 of the Extended Transfer Term shall equal the Purchase Price in effect the last year of the initial Transfer Term, further adjusted as provided in Section 4(a) for a new or adjusted Purchase Price on the first January 1 of the Extended Transfer Term, thereafter adjusted in the same manner each succeeding January 1 of the Extended Transfer Term.

(b) If DMB extends this Agreement under Section 5(a) above, not later than two (2) years prior to the expiration of the Extended Transfer Term, the Parties may enter into diligent good faith negotiations for a new agreement to extend this Agreement for an additional period to be negotiated by the Parties, with such amendments as they may negotiate and mutually agree to. The Parties acknowledge and agree that this Section 5(b) does not create any vested right in or guarantee any further term or agreement.

6. Reversion or Partial Reversion of Acquired Water to Nickel. The use of the Acquired Water and all other rights pursuant to the Agency Agreement shall revert to Nickel at the end of the Transfer Term or, if applicable, the Extended Transfer Term, or upon termination of this Agreement. In the event any of the Acquired Water is Assigned under Section 10 of this Agreement, any use of the Acquired Water and all other rights pursuant to the Agency Agreement that have been assigned shall revert to Nickel at the end of the Transfer Term or, if applicable, the Extended Transfer Term, or upon termination of the Assignment for any reason.

7. Delivery Schedule; Point of Delivery.

(a) Except as provided in Article 4.5 of the Agency Agreement and, subject to Section 21(b), provided this Agreement is in full force and effect and DMB is not in default, at the commencement of the Transfer Term and each year during the Transfer Term Nickel shall, at no cost to DMB, make or cause the Acquired Water to be available to DMB at the Tupman turnout, as defined in Article 1.17 of the Agency Agreement ("Tupman"), as provided in Article 4.4 of the Agency Agreement.

(b) DMB shall annually supply a written delivery schedule to Nickel and Agency consistent with the requirements of Article 4.8 of the Agency Agreement.

(c) The Acquired Water shall be made available to DMB at Tupman, free and clear of all liens, encumbrances, or rights of any other party, at the same time and in the same manner as Agency schedules deliveries of State Water Project ("SWP") Water ("SWP Water") to the Agency's Member Units, as set forth in the Agency's contracts with its Member Units as they presently exist or may be changed from time to time. The shortage provision in Article 18 of the Agency's SWP Water Supply Contract with DWR (the "SWP Contract Shortage Provision") does not apply to the delivery of Acquired Water under this Agreement. Pursuant to the Agency Agreement, the Acquired Water is not subject to the shortages that can affect DWR's delivery of SWP Water to the Agency and other SWP Contractors during average, single dry and multiple dry water years.

(d) Subject to Section 21(b), provided this Agreement is in full force and effect and DMB is not in default, DMB shall succeed to Nickel's right, pursuant to Article 4.7 of the Agency Agreement, to the Agency's commitment to transport Acquired Water within the California Aqueduct to the full extent of the Agency's rights to use the Aqueduct.

8. Additional Charges.

(a) DMB shall be responsible for all costs or expenses, if any, associated with the conveyance and delivery of the Acquired Water delivered to a location other than Tupman, including but not limited to costs imposed by the Agency and DWR for conveyance of the Acquired Water to a location other than Tupman.

(b) Commencing with the Transfer Term and during any Extended Transfer Term, DMB shall pay to Nickel that portion of those power charges attributable to the Acquired Water in any year in which Nickel is obligated to pay to Agency the power charges described in Article 4.5 of the Agency Agreement (the "Power Charges"), which the Parties acknowledge is up to 83.93 percent of the total power charges payable by Nickel to the Agency in any year in which such charges are payable for the full 10,000 acre-feet of Agency Transfer Water under Article 4.5 of the Agency Agreement. DMB shall pay Nickel the Power Charges within thirty (30) days of DMB's receipt of an invoice for the Power Charges from Nickel. Alternatively, DMB may pay such Power Charges directly to the Agency, so long as the Agency and Nickel consent in writing to DMB's direct payment of Power Charges.

9. Agency Actions. Nickel and DMB shall jointly request that Agency enter into one or more long-term "point of delivery" agreements with DWR approving delivery of a portion of Agency's SWP Water, used as exchange water, to up to five (5) long-term transferees, so that the Acquired Water can be delivered by exchange to up to five (5) long-term transferees for the entire Transfer Term and any Extended Transfer Term (the "Point of Delivery

Agreements"). DMB shall succeed to all of Nickel's rights with respect to the Acquired Water, pursuant to Articles 4.4 and 4.9 of the Agency Agreement, including but not limited to the assistance and cooperation of the Agency in entering into contracts for the sale or transfer of the Acquired Water to third parties and efforts to obtain the approval, cooperation and assistance of DWR and the State Water Contractors in obtaining any necessary approvals from regulatory agencies to effect such sales or transfers. DMB shall reimburse Nickel and Agency for all reasonable out-of-pocket expenses incurred in assisting DMB in obtaining any approvals.

10. <u>Assignment</u>. Nickel acknowledges that DMB intends to transfer, or assign, the right to use Acquired Water to up to five (5) public water supply agencies or reliable, solvent private companies for purposes of establishing an adequate long-term water supply for one or more real estate development projects and for other beneficial uses for the Transfer Term or any extended Transfer Term.

(a) DMB may assign this Agreement, in whole or in part, subject to advance written consent by Nickel. The foregoing decision whether to allow an assignment under this Section 10 rests solely with Nickel, subject to the following:

(i) Nickel shall consent to a proposed assignee of a Purchase Price and Power Charge payment obligation, so long as that proposed assignee is a government agency that holds a contract with DWR for SWP water service or a contract with the U.S. Bureau of Reclamation for Central Valley Project water service and so long as the assignee proposed to assume such payment obligations for such Acquired Water has the ability to perform such payment obligations for the Acquired Water proposed for assignment for the Transfer Term or any Extended Transfer Term; or

(ii) Nickel shall consent to other proposed assignees of Purchase Price and Power Charge payment obligations so long as any assignee proposed to assume such obligations for such Acquired Water has the ability to perform such payment obligations for the Acquired Water proposed for assignment for the Transfer Term or any Extended Transfer Term.

(iii) Nickel shall consent to a proposed assignee of a Purchase Price and Power Charge payment obligation proposed for assignment for the Transfer Term or any Extended Transfer Term, so long as DMB agrees to remain responsible for any Purchase Price and Power Charge payments that are due from such assignee but have not been timely paid. DMB agrees to provide a new Representation and Warranty to Nickel that DMB's net worth remains at least)efore Nickel's consent to the proposed assignment shall be given.

(iv) Assignments of all, or a part, of this Agreement among DMB and its Affiliated Entities that do not involve a long-term point of delivery agreement from DWR do not count against the five (5) long-term transfers, or assignments, governed by this Section 10. The term "Affiliated Entity" shall mean DMB, any entity that is a subsidiary of DMB or any entity which is controlled by or under common control of DMB. The term "control" with respect to any entity shall mean: (i) the possession, directly or indirectly, of the power to vote 51 percent or more of the stock, voting trust certificates or other securities having voting power for the election of directors of an entity; or (ii) the status of managing member of a limited liability company. For the Assignment to be effective under this Section 10(a)(iv), an Affiliated Entity must have a net worth of at least , or DMB must agree to remain responsible for any Purchase Price and Power Charge payments that are due from such "Affiliated Entity."

(b) Subject to the consent requirement in Section 10(a), should DMB assign this Agreement, or any part, as provided in this Section 10:

(i) Each assignee shall be required to agree, in writing, to be bound by and timely comply with all those terms and provisions of this Agreement that are specifically designated for assignment to the assignee;

(ii) it is recognized that an assignee of the right to use Acquired Water may be an entity different from that which is obligated to pay the Purchase Price and Power Charge for such Acquired Water, in which case this Agreement's terms and provisions governing payment of the Purchase Price and Power Charge would not be applicable to such assignee of the right to use Acquired Water, and this Agreement's terms and provisions governing delivery schedules for the Acquired Water would not be applicable to such assignee of the obligation to pay the Purchase Price and Power Charge for such Acquired Water. Notwithstanding the foregoing, and subject to Section 21(b), for any assignment to be effective, the assignment agreement must contain a provision that Nickel has no obligation to deliver the assigned portion of the Acquired Water, unless the Purchase Price, as adjusted, is paid to Nickel and any Power Charges are paid for the Acquired Water being assigned, and all other obligations of this Agreement applicable to the assignment are met;

(iii) any assignment of part of this Agreement, including the right to use Acquired Water or the obligation to pay the Purchase Price and Power Charge for such Acquired Water, shall specifically designate the rights and obligations being assigned;

(iv) each assignee shall succeed to the specifically designated rights and obligations of DMB under this Agreement with respect to the amount of Acquired Water assigned or the amount of the Purchase Price and Power Charge the assignee is obligated to pay and shall be recognized by Nickel as possessing all designated rights and obligations, and all applicable references to "DMB" herein shall be deemed to refer to such assignee, except as otherwise expressly provided in this Agreement.

11. Short-term Transfers.

(a) Until such time as DMB exercises its Option and the Transfer Term commences, Nickel may annually market the Acquired Water for temporary transfer to third parties, so long as delivery under the temporary transfer ends prior to commencement of the Transfer Term pursuant Section 3 of this Agreement; provided that DMB shall have the right of first refusal with respect to any temporary transfer to any third party to occur after December 31, 2007.

(b) Subject to Section 21(b), provided this Agreement is in full force and effect and DMB is not in default, if DMB exercises the Option and the Transfer Term commences, DMB may sell, on a yearly basis and on terms and conditions acceptable to DMB, the use of any or all of the Acquired Water DMB purchases in a year to one or more third parties without the consent of Nickel; provided, that DMB expressly acknowledges that Nickel and the Agency are only obligated to make Acquired Water available at Tupman in accordance with this Agreement and the Agency Agreement. Such transfers shall not count against the five (5) long-term transfers or assignments, governed by Section 10 of this Agreement.

12. Maintenance of Acquired Water. While this Agreement is in effect, Nickel shall not take or omit to take any action that would render Nickel unable to fully perform its obligations under this Agreement. Without limiting the foregoing, while this Agreement is in effect, Nickel shall not (i) amend or revise the Agency Agreement, or (ii) encumber, commit, transfer or otherwise dispose of the Acquired Water, if any of those actions would render Nickel unable to fully perform its obligations under this Agreement. Further, Nickel shall take all actions necessary to ensure that it can fully perform its obligations under this Agreement. Notwithstanding the above, and subject to this Agreement, Nickel shall have the right prior to the commencement of the Transfer Term to annually market the water that will be the Acquired Water, so long as the Acquired Water is available to DMB during the Transfer Term.

13. Representations and Warranties of Nickel. Nickel hereby makes the following covenants, representations and warranties as of the Effective Date:

(a) Nickel has the authority to enter into this Agreement, to sell and transfer the use of the Acquired Water to DMB, and to otherwise perform as set forth herein. Nickel is the sole owner of the Acquired Water and has the unrestricted right and power to transfer the use of it to DMB under the terms of this Agreement and to make the Acquired Water available at Tupman for the benefit of DMB pursuant to the Agency Agreement. The execution and delivery of this Agreement have been validly authorized by all requisite action on the part of Nickel.

(b) Nickel's execution of this Agreement and performance of its obligations hereunder will not violate any agreement, option, covenant, condition, obligation or undertaking of Nickel, nor to the best of Nickel's actual knowledge will it violate any law, ordinance, statute, order or regulation.

(c) To the best of Nickel's actual knowledge, there are no actions, suits or proceedings of any kind or nature, legal or equitable, pending, or threatened, relating to the Agency Agreement or the Acquired Water, or potentially affecting or arising out of Nickel's ownership, management, or ability to sell the Acquired Water, in any court or before or by any federal, state, county or municipal department, commission, board, bureau, agency, or other governmental instrumentality.

(d) To the best of Nickel's actual knowledge, neither the Acquired Water nor any portion thereof, is subject to or affected by (i) any assessments, whether or not presently constituting a lien thereon, or (ii) any threatened or pending condemnation, eminent domain, or similar proceedings that render Nickel unable to fully perform its obligations under this Agreement.

(e) The Acquired Water is free and clear of any liens, encumbrances, or rights of any other party, that would render Nickel unable to fully perform its obligations under this Agreement, and Nickel shall maintain the Acquired Water free and clear of any such liens, encumbrances, or rights imposed against Nickel that render Nickel unable to fully perform its obligations under this Agreement while this Agreement is in effect.

(f) Delivery of Acquired Water under this Agreement is not subject to the Agency's SWP Contract Shortage Provision.

(g) To the best of Nickel's actual knowledge, except for the Agency Agreement and Nickel's obligations to Agency under the Agency Agreement, there are no contracts, licenses, commitments, agreements or undertakings respecting the 8,393 acre-feet of Acquired Water by which Nickel would be obligated or liable to any person.

(h) Except as expressly contemplated by this Agreement, no approval is required from Agency in order for the transactions contemplated by this Agreement to occur, and no approval is required from any other party in order for the Acquired Water to be made available to DMB by Nickel at Tupman.

(i) No proceedings are pending or threatened in which Nickel may be adjudicated as bankrupt or discharged from any and all of its debts or obligations or granted an extension of time to pay its debts or a reorganization or readjustment of its debts.

(j) Subject to Section 10 of this Agreement, while this Agreement is in effect, Nickel shall use its best efforts to assist DMB to obtain all necessary approvals, including the cooperation and approval of the Agency and DWR, for delivery of the Acquired Water, including by exchange, to up to five public water supply agencies or water companies at points other than Tupman. However, no assignment, or transfer, of Acquired Water shall extend beyond the Transfer Term and Extended Transfer Term. DMB shall reimburse Nickel for Nickel's reasonable out-of-pocket costs or other expenses incurred in assisting DMB with obtaining cooperation and approval for delivery of the Acquired Water at points other than Tupman.

(k) To the best of Nickel's actual knowledge, there is no action, suit, claim, cause of action, or proceeding at law or in equity (or by or before any governmental agency, official or authority of any local, state or federal government) now pending, wherein an unfavorable decision, ruling or finding would: (i) affect the creation, organization, existence or powers of Nickel or the titles and powers of its officers and the members of its board of directors and their rights to their respective offices; (ii) enjoin or restrain the approval and/or execution of this Agreement, or (iii) in any way question or affect any of Nickel's rights and powers.

(l) Nickel is unaware of any fact or circumstance that would prevent Nickel or the Agency from being able to fully perform its obligations under this Agreement, or that would prevent DMB from acquiring or using the Acquired Water as contemplated by DMB.

14. Representations and Warranties of DMB. DMB hereby makes the following covenants, representations and warranties as of the Effective Date of this Agreement:

(a) DMB has the authority to enter into this Agreement, purchase the Acquired Water, and to otherwise perform as set forth herein. The execution and delivery of the Agreement has been validly authorized by all requisite action on the part of DMB.

(b) DMB's execution of this Agreement and performance of its obligations hereunder will not violate any agreement, option, covenant, condition, obligation or undertaking of DMB, nor to the best of DMB's knowledge will it violate any law, ordinance, statute, order, or regulation.

(c) To the best of DMB's actual knowledge, there is no action, suit, claim, cause of action, or proceeding at law or in equity (or by or before any governmental agency, official or authority of any local, state or federal government) now pending, wherein an unfavorable decision, ruling or finding would: (i) affect the creation, organization, existence or powers of DMB or the titles and powers of its Board members and officers to their respective offices; (ii) enjoin or restrain the approval and/or execution of this Agreement, or (iii) in any way question or affect any of the rights, powers, duties or obligations of DMB with respect to implementation of this Agreement.

(d) No proceedings are pending or threatened in which DMB may be adjudicated as bankrupt or discharged from any and all of its debts or obligations or granted an extension of time to pay its debts or a reorganization or readjustment of its debts.

(e) DMB has the ability to perform all financial obligations to Nickel under this Agreement. DMB further represents and warrants that as of the Execution Date of this Agreement, it has a present net worth of at least and to the best of DMB's knowledge, it is not aware of any facts or circumstances that would lower its net worth below the amount in the foreseeable future.

15. Condition Precedent to Nickel's Obligations to Perform. Subject to Section 21(b), if DMB exercises the Option, Nickel's obligation to transfer the Acquired Water in any year of the Transfer Term is hereby expressly conditioned on satisfaction or waiver by Nickel of the following condition precedent: DMB shall have timely performed each of the acts to be performed by it hereunder including, without limitation, payment of the annual Purchase Price or of an up-front amount negotiated by DMB and Nickel.

16. Conditions Precedent to DMB's Obligation to Perform. If DMB exercises the Option, DMB's obligation to purchase the Acquired Water in any year of the Transfer Term is hereby expressly conditioned on satisfaction or waiver by DMB of each and every one of the following conditions precedent:

(a) Nickel shall have timely performed each of the acts to be performed by it hereunder; and

(b) The Acquired Water is available and can be made available in accordance with the terms of this Agreement.

17. Costs and Expenses. In addition to all other cost and expense provisions provided herein, DMB shall pay all costs and fees associated with any transfer or assignment of the Acquired Water under this Agreement, including without limitation any transfer taxes associated with the Acquired Water. Each Party to this Agreement shall be responsible for its own attorneys' and other professional fees and internal administrative costs associated with the preparation of this Agreement and the transfer of the Acquired Water from Nickel to DMB.

18. Brokerage Commissions. DMB and Nickel each represents and warrants to the other that it has not engaged the services of any broker, agent or finder, nor done any other act nor made any statement, promise or undertaking which would result in the imposition of liability for the payment of any brokerage commission, finder's fee or otherwise in connection with the transaction described in this Agreement.

(a) In the event that any person or entity perfects a claim for a brokerage commission, finder's fee or otherwise, based upon any agreement, statement or act, the Party through whom such person or entity makes such claim shall be responsible therefor and shall indemnify, defend and hold the other Party and the Acquired Water harmless from and against such claim and all loss, cost and expense associated therewith, including attorneys' fees.

(b) Nickel's obligation to pay the Agency pursuant to Article 4.10 of the Agency Agreement is not a brokerage commission. Nickel shall comply with Article 4.10 and shall be solely responsible for making any and all payments to the Agency that may be due under Article 4.10 of the Agency Agreement, and DMB shall have no obligation to make any such payment to the Agency.

19. Notices. All notices under this Agreement shall be effective upon personal delivery or electronically confirmed facsimile transmission to Nickel or DMB, as the case may be, or three business days after deposit in the United States mail, registered or certified, postage fully prepaid and addressed to the respective Parties as follows:

To Nickel: James L. Nickel
President
Nickel Family, LLC
P.O. Box 60679
Bakersfield, California 93386-0679
Facsimile: (661) 872-7141

To DMB: Mark C. Kehke
Senior Vice President
DMB Associates, Inc.
7600 E. Doubletree Ranch Rd., #300
Scottsdale, Arizona 85258-2137
Facsimile: (480) 367-9788

General Counsel
DMB Associates, Inc.
7600 E. Doubletree Ranch Rd., #300
Scottsdale, Arizona 85258-2137
Facsimile: (480) 367-9788

or such other address as the Parties may from time to time designate in writing.

20. No Third Party Beneficiaries. Except for assignees receiving valid approved written assignments made pursuant to Section 10 of this Agreement, Nickel and DMB hereby agree that it is not their intent to create any rights or benefits in any third parties and that no third party beneficiaries shall be created or shall be deemed created by this Agreement.

21. Remedies. The Parties understand and agree that use of the Acquired Water is unique, may not be replaceable in the event it is not transferred and delivered to DMB in accordance with this Agreement, and will be relied upon by DMB through the Transfer Term, including any Extended Transfer Term, in connection with its development activities in California. Likewise, the Parties agree that payment to Nickel of the Purchase Price will be relied upon by Nickel for its daily operations. Therefore, in addition to a claim for damages for a breach or default, and in addition and without prejudice to any other right or remedy available at law or in equity that each Party may have against the other in the event of a threatened or actual breach of this Agreement, the aggrieved Party shall be entitled to injunctive relief, specific performance and other equitable remedies. The Parties acknowledge that in the event of a threatened or actual breach of this Agreement by the other, the aggrieved Party will be irreparably damaged in the event that this Agreement is not specifically enforced and that equitable relief would be appropriate. If either Party breaches, or defaults in the performance of its obligations under this Agreement, the other Party may pursue any remedies available to it at law or in equity for such default or breach.

(a) Notwithstanding the foregoing, if one Party threatens to breach, breaches or defaults in the performance of its obligations under this Agreement (the "defaulting party"), no remedy at law or equity will be sought until written notice is provided to the defaulting Party in accordance with Section 19 and the threat of breach, breach or default exists fifteen (15) days after the defaulting Party's receipt of written notice of such default.

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(b) In the event of a threat to breach or to default or of a breach or default in the performance of an obligation by an assignee of all or part of this Agreement approved under Section 10 (the "defaulting assignee"), such threat or default or breach shall in no way impair the rights and obligations of Nickel, DMB or any non-defaulting assignees under this Agreement. For example, one defaulting assignee's failure to perform payment obligations with respect to an assignment of a portion of the Acquired Water does not excuse Nickel's obligation to deliver the remainder of the Acquired Water to DMB or to other assignees.

(c) Subject to Section 21(a) of this Agreement, and consistent with Section 18(b) of this Agreement, in the event that DMB were voluntarily to elect to cure a default or breach by Nickel in Nickel's payments to KCWA under Articles 4.5 or 4.10 of the Agency Agreement, Nickel shall indemnify DMB for such cure.

22. Entire Agreement. The Recitals of this Agreement are incorporated into this Agreement by reference. This Agreement and items incorporated herein contain all of the agreements of the Parties hereto with respect to the matters contained herein, and no prior agreement or understanding pertaining to any such matter shall be effective for any purpose. No provisions hereof may be amended or modified in any manner whatsoever except by an agreement in writing signed by duly authorized representatives of each of the Parties.

23. Successors. The terms, covenants and conditions hereof shall be binding upon and shall inure to the benefit of the heirs, executors, administrators and assignees of the respective Parties hereto.

24. Further Action. The Parties agree to perform all further acts, and to execute, acknowledge, and deliver any documents that may be reasonably necessary, appropriate or desirable to carry out the purposes of this Agreement. Without limiting the foregoing, at the request of DMB, Nickel shall assist DMB in obtaining any and all consents or assistance from the Agency necessary or desirable in connection with the transfer of the use of the Acquired Water and with DMB's assignment, or transfer, of the use of Acquired Water to up to five public water supply agencies or water companies including, without limitation, any requests for assistance pursuant to Articles 4.4 and 4.9 of the Agency Agreement.

25. Waiver. A waiver of any breach of this Agreement by any Party shall not constitute a continuing waiver or a waiver of any subsequent breach of the same or any other provision of this Agreement.

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26. Choice of Laws. This Agreement shall be governed by the laws of the State of California and any question arising hereunder shall be construed or determined according to such law.

27. Headings. Headings at the beginning of each numbered Section of this Agreement are solely for the convenience of the Parties and are not a part of this Agreement.

28. Time. Time is of the essence, it being understood that each date set forth herein and the obligations of the Parties to be satisfied by such dates have been the subject of specific negotiations by the Parties.

29. Counterparts. This Agreement may be signed by the Parties in different counterparts and the signature pages combined to create a document binding on all Parties.

30. Force Majeure. If the performance by any Party to this Agreement of any of its obligations or undertakings under this Agreement is interrupted or delayed by any occurrence not occasioned by the conduct of a Party to this Agreement, whether that occurrence is an act of God or public enemy, or whether that occurrence is caused by war, riot, storm, earthquake, or other natural forces, or by the acts of anyone not a Party to this Agreement, then the Parties shall be excused from any further performance for whatever period of time after the occurrence is reasonably necessary to remedy the effects of that occurrence. The Transfer Term shall be extended by the period of time such performance is so excused.

31. Quitclaim. Upon the expiration of this Agreement for any reason, including the failure to timely exercise the Option in the manner provided herein, DMB shall properly execute, acknowledge and deliver to Nickel a quitclaim in a form suitable to establish the termination of this Agreement.

32. Confidentiality. Nickel and DMB agree not to disclose to any third party the identity of DMB or DMB's potential uses of the Acquired Water, or the potential or final terms of this Agreement (the "Confidential Information"); provided that DMB may authorize or direct disclosure of specific Confidential Information to specific third parties. DMB shall not unreasonably withhold approval of a request by Nickel to disclose Confidential Information. DMB and Nickel acknowledge the need to provide certain Confidential Information to the Agency in connection with execution of this Agreement and the transfer, or assignment, of Acquired Water to third parties. DMB and Nickel acknowledge that the Agency is a public agency subject to disclosure of certain Information
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under the California Public Records Act (California Government Code section 6250 et seq.). Any disclosure of Confidential Information by Nickel to Agency requires advance approval by DMB, which DMB will not unreasonably withhold.

IN WITNESS WHEREOF, the Parties have executed this Agreement on the date first hereinabove written.

NICKEL FAMILY, LLC

By: ____________________
James L. Nickel, President

DMB COMMUNITIES II, LLC, an Arizona limited liability company

By: DMB Associates, Inc., an Arizona corporation, its Manager

By: ____________________
Mark Kehke

Its: Senior Vice President

860153.1

EXHIBIT A

"The Agency Agreement"

CONTRACT TO TRANSFER
THE KERN RIVER LOWER RIVER WATER RIGHTS

This Contract is made as of the 23rd day of January 2001, by and between Nickel Family, LLC ("Nickel"), a California limited liability company; the Olcese Water District ("Olcese") and the Kern County Water Agency ("Agency"), both of which are public agencies in the State of California, duly organized, existing and acting pursuant to the laws thereof.

RECITALS

WHEREAS, the Governor's Budget Act for 2000, Chapter 52, Statutes of 2000, appropriated to the Department of Water Resources local assistance grant funds in the amount of $161,544,000 by budget item 3860-01-6027, payable from the interim Reliable Water Supply and Water Quality Infrastructure and Management Subaccount, and the Kern County Water Agency's Kern River Restoration Project has been selected for funding in the amount of $23,000,000 from that subaccount; and

WHEREAS, the Agency intends to use money from that appropriation for development of local water supplies, water quality, conveyance and banking programs within Kern County; and

WHEREAS, the Agency has identified the acquisition of the Lower River Water Rights as a source suitable for such programs; and

WHEREAS, the Lower River Water Rights are Kern River rights that historically have yielded on average 50,000 acre-feet per Year; and

WHEREAS, the Agency has purchased the undivided interest in the Lower River Water Rights, and other water rights and inventories, previously owned by Garces Water Company; and

WHEREAS, Olcese owns the remaining interest in the Lower River Water Rights subject to Nickel's right to use any portion of that water that is excess to Olcese's needs in accordance with the March 18, 1981 contract between Olcese and Nickel; and

WHEREAS, the Agency desires to purchase the remaining interest in the Lower River Water Rights and other interests described herein from Olcese and Nickel on the terms provided for in this Contract; and

WHEREAS, pursuant to the Detachment and Water Sale Contract No. 99-150, dated June 30, 1999, between Olcese, the City of Bakersfield and the California Water Service Company, the City of Bakersfield will provide water to meet the future municipal and industrial needs of lands within Olcese that are within the boundaries of the City of Bakersfield, provided those lands are detached from Olcese, and, WHEREAS, while there is no current demand from the landowners in Olcese for agricultural water supplies, if there should be a demand for water for agricultural use within Olcese over and above the amount that can be supplied to such lands from riparian rights, Olcese will receive sufficient compensation from the sale of its Lower River Water Rights to enable it to meet those demands from sources other than the Lower River Water Rights; and

WHEREAS, the Olcese Board of Directors has determined that the transfer of the Lower River Water Rights to the Agency as provided for in this Contract is in the best interest of its landowners; and

WHEREAS, the Agency, as the lead agency, and Olcese as a responsible agency, have completed all requirements under the California Environmental Quality Act for all actions provided for in this Contract.

NOW, THEREFORE, Nickel, Olcese and the Agency agree as follows:

ARTICLE 1. DEFINITIONS

When used in this contract, the following terms have the meanings hereinafter set forth:

1.1 "Agency's Return on Investment Rate" means the County of Kern's Treasury Pool investment rate.

1.2 "Agency SWP Entitlement Water" and "SWP Entitlement Water" mean the SWP water provided for in Table A of the Agency's Water Supply Contract.

1.3 "Agency's Water Supply Contract" means the November 15, 1963 Water Supply Contract between the State of California Department of Water Resources and Kern County Water Agency, as amended.

1.4 "Carmel Rights" means those rights and interests described in Exhibit C.

1.5 "Castro Ditch Rights" means those water rights and interests described in Exhibit B.

1.6 "CEQA" means the California Environmental Quality Act, California Public Resources Code sections 21000, *et seq.*

1.7 "Close of Escrow" or "Closing Date" means the day on which all applicable conditions precedent to this Contract are completed to Nickel's, Olcese's and the Agency's satisfaction or waived by the party that benefits from the condition precedent as set forth in Articles 8.1, 9.1 and the assignments provision of Article 10.1.

1.8 "DWR" means the Department of Water Resources of the State of California.

1.9 "Escrow Agent" means Chicago National Title Company in its Bakersfield, California office.

1.10 "Agency Transfer Water" means 10,000 acre-feet of water annually, to be provided by the Agency to Nickel for delivery and sale to third parties from the California Aqueduct.

1.11 "Johnson Ditch Rights" means those water rights described in Exhibit B.

1.12 "Lower River Water Rights" means those water rights described in Exhibit A.

1.13 "Rio Bravo Ranch" means that property described as the southern half of the northeast quarter and that portion of the southern half north of the Kern River of Section 33, the southern half of the southern half of Section 34, the southern half of the northern half and the southern half of Section 35, the southern half of the northern half and the southern half of Section 36, Township 28 South Range 29 East Mount Diablo Base and Meridian; Section 1, Section 2, the portion of Section 3 lying east of the Kern River, the northeast quarter of Section 10, Section 11, Section 12, the western half of the northeast quarter and the northwest quarter of the southeast quarter of Section 13, the northeast quarter of Section 24, Township 29 South, Range 29 East Mount Diablo Base and Meridian; the southern half of Section 5, Section 6 and Section 8, Township 29 South, Range 30 East Mount Diablo Base and Meridian, as depicted on Exhibit F.

1.14 "State" means the State of California.

1.15 "State Funds" means the funds made available to the Agency by the State from appropriations of funds authorized by Chapter 52, Statutes of 2000.

1.16 "SWP" means the State Water Project.

1.17 "Tupman" means the point of delivery on the California Aqueduct more particularly described as milepoint 238.04 located within Reach 12E of the California Aqueduct.

1.18 "Year" means the twelve (12) month period from January 1st through December 31st, both dates inclusive.

ARTICLE 2. GENERAL PROVISIONS

2.1 The Agency is purchasing and Nickel and Olcese are selling to the Agency their Lower River Water Rights and other rights as described and provided for herein. The Agency shall pay Nickel and Olcese for these rights the various considerations provided for in this Contract, including, but not limited to, providing Nickel with 10,000 acre-feet of Agency Transfer Water annually at Tupman which Nickel intends to sell both within and outside of Kern County. The Agency shall assume all the rights, duties and obligations associated with the Lower River Water Rights and other rights being transferred to it. Nickel, the Agency, and Olcese shall cooperate with each other in the performance of their respective obligations and in the exercise of their respective rights under this Contract.

ARTICLE 3. TERM OF CONTRACT

3.1 This Contract shall continue in perpetuity. However, if Escrow does not close by the date specified in Article 11.1, this Contract shall terminate on that date.

ARTICLE 4. PURCHASE AND PAYMENT TERMS

4.1 Purchase and Sale: Nickel hereby sells to the Agency and the Agency hereby purchases from Nickel all of Nickel's rights, title and interest to the Lower River Water Rights, including, but not limited to, Nickel's right to store, exchange, substitute and regulate the Lower River water as set forth in Exhibit A. Nickel also quitclaims to the Agency the Castro Ditch Rights and the Johnson Ditch Rights as set forth in Exhibit B. Olcese hereby sells to the Agency and the Agency hereby purchases from Olcese all of Olcese's rights, title and interest to the Lower River Water Rights, including, but not limited to, Olcese's right to store, exchange, substitute and regulate the Lower River Water as set forth in Exhibit A. Nickel and Olcese also hereby substitute the Agency as attorney-in-fact for any powers of attorney they may presently have relating to the Lower River Water Rights sold to the Agency. The purchase and sale of all of these rights shall be consummated through the escrow opened with the Escrow Agent. Any escrow instructions given the Escrow Agent by Nickel, Olcese or the Agency shall be consistent with the terms of this Contract unless otherwise agreed to by all parties in writing.

4.2 Cash Payments: By the Close of Escrow, Agency shall pay to Olcese one million dollars ($1,000,000) for the purchase of Olcese's Lower River Water Rights. By the Close of Escrow, Agency shall pay to Nickel six million four hundred twenty-two thousand dollars ($6,422,000) as partial consideration for the purchase of all rights and assets acquired by the Agency from Nickel under this Contract. The Agency shall pay Nickel and Olcese interest at the Agency's Return on Investment Rate on the above sums from the date on which the Agency receives not less than $10,000,000 of State Funds until the Close of Escrow. This interest shall be payable within five days of the Agency's receipt of the County of Kern's calculation of the first quarter of the Year 2001 quarterly interest rate , provided that the escrow closes, to Nickel and Olcese in proportion to the purchase payments to be paid to them respectively as provided for above.

4.3 Internal Revenue Code Section 1031 Exchange: Agency agrees to cooperate with Nickel in completing an exchange qualifying for nonrecognition of gain under Internal Revenue Code section 1031 and the applicable provisions of the California Revenue and Taxation Code. Nickel reserves the right to convert this transaction to an exchange at any time before the Close of Escrow. Nickel and the Agency agree, however, that consummation of the transaction contemplated by this Contract is not conditioned on completion of such an exchange. Nickel shall have the right to transfer and assign to an intermediary all of Nickel's rights and obligations under this Contract in order to complete the exchange. The Agency shall incur no additional liabilities, expenses or costs as a result of or connected with the exchange.

4.4 Water Exchange: Beginning in 2001 the Agency shall deliver to Nickel, annually during the term of this Contract, ten thousand (10,000) acre-feet of the Agency Transfer Water at Tupman as partial consideration for Nickel's interest in the Lower River Water Rights. The Agency shall provide the Agency Transfer Water at Tupman at no cost to Nickel other than the cost set forth in Article 4.5. The Agency shall use its best efforts to obtain and maintain approvals from the DWR for delivery of any Agency Transfer Water into the California Aqueduct, and if such approvals are not obtained after reasonable efforts the parties shall, in good faith, negotiate alternative mechanisms for delivery of Agency Transfer Water.

4.5 Power Charges: In any Year in which the Agency's allocation of SWP Entitlement Water on May 1st is seventy-five percent (75%) or less than its entitlement for that Year, Nickel shall pay the Agency the following power charge within thirty days after the Agency submits an invoice to Nickel, which invoice shall be submitted on or shortly after May 1. The power charge set forth in the invoice shall be an amount determined by the Agency by multiplying 10,000 acre-feet by the Agency's estimated per acre-foot power costs for pumping water from the Agency's Pioneer Project and delivering it to Tupman. The Agency shall estimate this per acre-foot cost using the method set forth in Exhibit D. There shall be no power charge to Nickel in any Year in which the Agency's allocation of SWP Entitlement Water on May 1 is greater than 75% of its SWP entitlement for that Year.

4.6 Treatment Costs: If the Agency is prevented from delivering non-SWP water into the California Aqueduct to meet the ten thousand (10,000) acre-foot obligation to Nickel required by Article 4.4 due to water quality restrictions unless it is treated, the Agency shall pay the cost of treating that water to the level acceptable for delivery into the California Aqueduct.

4.7 California Aqueduct Capacity: The ten thousand (10,000) acre-feet of Agency Transfer Water provided to Nickel shall be transported within the California Aqueduct to the full extent of the Agency's rights to use Aqueduct.

4.8 Scheduling of Agency Transfer Water: The Agency, in consultation with Nickel, shall schedule all Agency Transfer Water deliveries with the DWR at the same time and in the same manner as the Agency schedules deliveries of SWP Entitlement Water to the Agency's Member Units, as set forth in the Agency's contracts with its Member Units as they presently exist or may be changed from time to time.

4.9 Agency Transfer Water Sales: Any sale of the Agency Transfer Water shall be at the sole discretion and direction of Nickel. Nickel may request Agency's assistance, involvement and expertise in negotiating and consummating any sale. The Agency shall cooperate and assist Nickel, as requested, subject to the Agency's legal powers and duties and the direction of the Agency's Board of Directors. The Agency's involvement may include efforts to market Nickel's Agency Transfer water on behalf of Nickel, entering into contracts for the sale of the Agency Transfer Water and efforts to obtain the approval, cooperation and assistance of DWR and the State Water Contractors in obtaining any necessary approvals from regulatory agencies to effect such sales or transfers.

4.10 Proceeds of Agency Transfer Water Sales: All net proceeds of Agency Transfer Water sales shall be distributed as follows: Ninety percent (90%) to Nickel, ten percent (10%) to the Agency. "Net proceeds of Agency Transfer Water sales" shall mean the amount remaining from the proceeds of a sale after deducting any payments to third parties or other costs incurred by Nickel or the Agency that are necessary in order to complete a sale, such as costs for CEQA compliance, regulatory fees and charges, wheeling charges, power charges for transportation beyond Tupman or pursuant to Article 4.5, etc. Neither Nickel's nor the Agency's administrative costs in affecting an Agency Transfer Water sale shall be deemed to be payments to third parties necessary to complete a sale. All costs shall conform with standard industry practice, and are subject to audit at the requesting parties expense. After incurring such costs, Nickel or the Agency may invoice the other party for its respective share of such costs (Nickel 90%, Agency 10%) and payment thereon shall be made within thirty days of mailing.

4.11 Riparian or Carmel Rights: The Agency shall not challenge or contest directly or indirectly any of the Kern River riparian rights, as defined in the March 18, 1981 "Agency Agreement for Riparian Lands – Olcese Water District", of Nickel or Rio Bravo Ranch. The Agency shall not challenge or contest directly or indirectly any of the Carmel Rights of Olcese, Nickel or Rio Bravo Ranch.

4.12 Discharge of Well Water: The Agency shall not challenge or support any challenge to Olcese's or Rio Bravo Ranch's discharge of well water into the Kern River to meet the demands of the Rio Bravo Ranch or Olcese; provided, that the pumping of such well water does not substantially degrade the Kern River water quality to the injury of the Agency. The Agency acknowledges that Nickel has provided the Agency with an April 2000 study by Kenneth D. Schmidt and Associates regarding the origin of the groundwater pumped by Rio Bravo Ranch and Olcese.

4.13 Additional Consideration: At the Close of Escrow:

(a) The Agency shall convey to Nickel all of the Agency's rights, title and interest in the water inventories, more particularly described in Exhibit E.

(b) Olcese shall convey to the Agency all of Olcese's rights, title and interest in the City of Bakersfield's 2,800 acre recharge facility and to any water banked therein, subject to the City of Bakersfield's agreement to release Olcese from the thirteen (13) year supply requirement to meet the demands within Olcese set forth in Agreement 77-07, as amended by Agreement 78-12, Agreement 81-76, and Agreement 90-05.

(c) The Agency shall quitclaim all its rights, title and interest in the Carmel Rights to Olcese.

(d) Garces Deed: The Agency shall quitclaim to Nickel the rights and property identified in Exhibit G which were included in the rights and property granted to the Agency by the Garces Water Company, Inc. in the September1, 2000 grant deed from Garces Water Company, Inc. to the Agency.

(e) Nickel and Olcese shall deliver to the Agency all documents, files, legal files, historical records, communications and correspondence related to the Lower River Water Rights and the Johnson and Castro Ditch rights. Nickel and Olcese may, at their cost, make copies of such records. The Agency shall provide Nickel and Olcese access to any documents relating to the Lower River Water Rights in its possession upon request.

(f) Miller and Lux Facilities: Nickel and its related entities, and Olcese, agree to transfer, assign and convey any water or water related rights acquired from Miller & Lux, and its successors in interests, related to the Kern River within Kern County north of Highway 46. These rights may include, but are not limited to, transportation, spreading, storage and water rights.

ARTICLE 5. WATER PIPELINE EASEMENT

5.1 Nickel shall grant the Agency, for fifty thousand dollars ($50,000), an easement through Nickel's Rio Bravo Ranch for a water pipeline, beginning at the Rio Bravo Hydroelectric Project power plant forebay and roughly paralleling Highway 178. The size, use, location and terms for this easement shall be mutually agreed upon by Nickel and the Agency. If the use of this easement by the Agency causes any damage of facilities, improvements or orchards in the Rio Bravo Ranch, the Agency shall either, at Nickel's election, replace the damaged facilities or compensate Nickel for the fair market value of the damages. Agency's use of the power canal shall be consistent with the Condemnation Settlement Agreement of May 20, 1985. If any Agency facilities in the easement interfere with Nickel's current or future use of the Nickel's property, the Agency, at Nickel's request, shall relocate its facilities at Nickel's expense. Nickel is not obligated to obtain subordination from existing deeds of trust on its property. For the granting of the easement provided for herein, the Agency shall pay all costs to survey and record the easement. Nickel and the Agency shall use their best efforts to record the easement prior to the Close of Escrow; however, if the easement is not recorded within one year from the date of execution of this Contract the Agency's right to the easement will expire, and the $50,000 payment will be retained by Nickel unless failure to record has been caused by Nickel's failure to cooperate or unreasonable disapproval of proposed alignments. The Agency hereby grants Nickel (a) the right to convey water in the Agency's future water pipeline at the Agency's incremental cost to the extent there is capacity in the water pipeline not being used by the Agency and (b) the right to increase the capacity of the Agency's future water pipeline at the incremental cost.

ARTICLE 6. HYDROPOWER

6.1 Hydropower Interests: Nickel's conveyance of its Lower River Water Rights, and the other described rights to the Agency provided for in this Contract does not include Nickel's rights in the Rio Bravo Hydroelectric Project. The parties agree that Nickel retains its eighty-five percent (85%) interest in the Rio Bravo Hydroelectric Project Agreement dated April 29, 1985 between Catalyst Energy Development Corporation, Catalyst Rio Bravo Corporation and Olcese and the Condemnation Settlement Agreement dated May 20, 1985 between Nickel Enterprises and Olcese.

6.2 Right to Take: Nickel and Olcese shall grant to the Agency the right to take water from the Rio Bravo Hydroelectric Project to serve the Agency's proposed water pipeline referred to in Article 5.1. The Agency's right to take such water shall be subordinate at all times to the extent of Nickel's and Olcese's rights for the Rio Bravo Ranch's current or future irrigation demands.

ARTICLE 7. REPRESENTATIONS AND WARRANTIES

7.1 Nickel and Olcese hereby acknowledge, represent and warrant to the Agency that, as of the date of this Agreement and the Close of Escrow:

(a) Recitals and Exhibits: The Recitals and Exhibits to this Contract are true and correct.

(b) Organization: Nickel and Olcese are duly organized and validly exist in good standing under the laws of the State of California. Nickel and Olcese have full power, authority and legal right to execute, deliver and perform this Contract. To the best of Nickel's and Olcese's knowledge (after due diligent investigation and due inquiry), Nickel and Olcese have the unrestricted right and power to own, use and sell their respective interests in the Lower River Water Rights, as set forth in Exhibit A, as provided in and required by this Contract, have complied with all applicable laws and regulations of governmental agencies, officials or authorities, have obtained all necessary permits, licenses and approvals necessary and appropriate to proceed with the conduct of their business in accordance with the requirements of this Contract and have followed all necessary, proper and appropriate procedures in procuring such permits, licenses and approvals.

(c) Authorization: The execution and delivery by Nickel and Olcese of this Contract, and any other agreements or instruments required by this Contract and the performance by Nickel and Olcese of their obligations in connection with this Contract: (1) have been each duly authorized by all necessary boards of directors; and (2) to the best of Nickel's and Olcese's knowledge, after diligent investigation and due inquiry, require no registrations with or approvals of any person not heretofore obtained.

(d) Litigation: To the best of Nickel's and Olcese's knowledge (after diligent investigation and due inquiry), there is no action, suit, claim, cause of action, or proceeding at law or in equity (or by or before any governmental agency, official or authority of any local, State or Federal government) now pending, contemplated by Nickel or Olcese or threatened in writing against or affecting any Lower River Water Rights other than as expressly stated in a writing delivered to Agency at or prior to the Close of Escrow.

(e) No Oral Understandings: In executing this Contract, neither Nickel nor Olcese is relying upon any representation, communication, understanding or expectation (whether express or implied) that is not clearly and expressly stated in this Contract.

(f) Receipt of Information: Nickel and Olcese have received any and all information from the Agency which they desire or expect in connection with the transaction evidenced by this Contract, or any other document related to or required by this Contract. Nickel and Olcese are not relying upon the Agency directly or indirectly to disclose (or to evaluate any other person's disclosure of) any such matters, and Nickel and Olcese excuse and release the Agency from any duty whatsoever to make such disclosures.

(g) No Continuing Obligations: Nickel and Olcese understand and agree that, after the Close of Escrow, the Agency shall have no direct or indirect obligations whatsoever to them except as expressly stated in or required by this Contract.

(h) Separate Obligations: Nickel and Olcese shall be bound by and perform this Contract and each of the other documents related to or required by this Contract to which they are a party, separately and independently from the obligations of any other person or entity and regardless of whether or not any other person or entity performs this Contract or any other documents related to or required by this Contract.

(i) Violations of Applicable Laws: To the best of their knowledge, neither Nickel nor Olcese is in violation of any law, statute, regulation, ordinance or other governmental provisions with respect to any of the Lower River Water Rights to be conveyed to the Agency pursuant to this Contract.

(j) Violations of Other Agreements: The entry into this Contract does not create or result in a breach of any agreements with respect to any of the Lower River Water Rights to which Nickel or Olcese is a party or to which either of them is otherwise subject or bound.

(k) Ownership of Lower River Water Rights: Nickel and Olcese (a) collectively are the sole owners of the remaining of the Lower River Water Rights, as set forth in Exhibit A, being conveyed herein exclusive of any other owner or claimant and (b) have no knowledge and are not aware of any notice or other information concerning any other claims of any kind which would effect Nickel's or Olcese's title or claim to the Lower River Water Rights. The Lower River Water Rights described in Exhibit A constitute a complete description of all water, water storage, exchange entitlements and drainage contracts and other miscellaneous rights of any kind or description relating thereto owned or claimed by Nickel and Olcese. Nickel and Olcese have heretofore supplied the Agency with all documents known to Nickel and Olcese which constitute evidence of any Lower River Water Rights and title and claim thereto by Nickel and Olcese.

(l) Taxes: To the best of Nickel and Olcese's knowledge (after diligent investigation and due inquiry), Nickel and Olcese have paid (or caused to be paid) all property and other taxes required to be paid (and all assessments of which they have notice or acknowledged) with respect to the Lower River Water Rights to the extent such taxes (or assessments) have become due and payable. If there are any unpaid taxes or assessments as of the Close of Escrow, Nickel and Olcese shall be liable for their payment.

7.2 Agency hereby acknowledges, represents and warrants to Nickel and Olcese that, as of the date of this Contract and the Close of Escrow:

(a) Recitals and Exhibits: The Recitals and Exhibits to this Contract are true and correct.

(b) Organization: The Agency is duly organized and validly exists in good standing under the laws of the State of California. The Agency has full power, authority and legal right to execute, deliver and perform this Contract. To the best of the Agency's knowledge (after due diligent investigation and due inquiry) the Agency has complied with all applicable laws and regulations of governmental agencies, officials or authorities, have obtained all necessary permits, licenses and approvals necessary and appropriate to proceed with the conduct of its business in accordance with the requirements of this Contract and has followed all necessary, proper and appropriate procedures in procuring such permits, licenses and approvals, provided, however, that the approvals which are the subject of Article 4.4 shall be governed by that Article.

(c) Authorization: The execution and delivery by the Agency of this Contract, the consummation of the transactions and contracts required or contemplated by it and the performance by the Agency of its obligations in connection with this Contract: (1) have been each duly authorized by the Agency's board of directors; and (2) to the best of the Agency's knowledge, after diligent investigation and due inquiry, require no registrations with or approvals of any person not heretofore obtained.

(d) No Oral Understandings: In executing this Agreement, the Agency is not relying upon any representation, communication, understanding or expectation (whether express or implied) that is not clearly and expressly stated in this Contract.

(e) Receipt of Information: The Agency has received any and all information from Nickel and Olcese which it desires or expects in connection with the transaction evidenced by this Contract, or any other document related to or required by this Contract. The Agency is not relying upon Nickel or Olcese directly or indirectly to disclose (or to evaluate any other person's disclosure of) any such matters, and the Agency excuses and releases Nickel and Olcese from any duty whatsoever to make such disclosures.

(f) No Continuing Obligations: The Agency understands and agrees that, after the Close of Escrow, neither Nickel nor Olcese shall have any direct or indirect obligations whatsoever to the Agency except as expressly stated in or required by this Contract.

(g) Violations of Applicable Laws: To the best of the Agency's knowledge, the Agency is not in violation of any law, statute, regulation, ordinance or other governmental provisions with respect to any of the funds and the Agency Transfer Water to be conveyed to Nickel pursuant to this Contract.

(h) Violations of Other Agreements: The entry into this Contract does not create or result in the breach of any other agreement to which the Agency is a party or to which the Agency is otherwise subject or bound.

(i) Agency Transfer Water: The Agency has a legal right to the Agency Transfer Water to be provided to Nickel pursuant to this Contract whether from Agency SWP Entitlement Water or other sources, with full authority to exchange such water as provided for herein; and that such water is held free and clear of any liens, encumbrances or rights of any other party, other than the obligation of the Agency to make the payments to the State and other obligations, as required by the Agency's Water Supply Contract, and that the Agency shall maintain such water free and clear of any such claims during the term of this Contract.

(j) Kern River Water: The Agency understands the hydrology of the Kern River and the historical yield of the Lower River Water Rights, which has been on average, approximately fifty thousand (50,000) acre-feet per year. The Agency shall not hold Nickel or Olcese liable for any reduction in the yield of the Lower River Water Rights below this average.

(k) Obligations of the Lower River Water Rights: The Agency understands, agrees and assumes all of the Lower River Water Rights obligations, including, but not limited to, the Tulare Lake Basin Water Storage District annual ten thousand (10,000) acre-foot fee, the Lake Isabella storage costs, the Kern River Watermaster charges and legal fees, and the City of Bakersfield accounting fees and the Kern Property Corporation settlement The Agency shall assume such obligations at the Close of Escrow, at which time all expenses for such obligations shall be prorated as per Article 9.1.

(l) Litigation: To the best of the Agency's knowledge (after diligent investigation and due inquiry), there is no action, suit, claim, cause of action, or proceeding at law or inequity (or by or before any governmental agency, official or authority of any local, State or Federal government) now pending, contemplated by the Agency or threatened in writing against or affecting any funds the Agency shall receive from the State of California pursuant to the Safe Drinking Water, Clean Water, Watershed Protection and Flood Protection Act or wherein an unfavorable decision, ruling or finding would (i) affect the creation, organization, existence or powers of the Agency or the titles and powers of its Board members and officers to their respective offices; (ii) enjoin or restrain the approval and/or execution of this Contract, or (iii) in any way question or affect any of the rights, powers, duties or obligations of the Agency with respect to implementation of this Contract, other than as expressly stated in a writing delivered to Nickel and Olcese at or prior to the Close of Escrow.

ARTICLE 8. CONDITIONS PRECEDENT

8.1 The obligations of Nickel and Olcese to sell the water rights set forth in Exhibits A and B and the resulting obligation of the Agency to pay and provide additional consideration are conditioned upon the satisfaction or waiver of the following conditions precedent prior to the Close of Escrow:

(a) State Funds: The Agency's receipt of State Funds sufficient to make the payments required of the Agency.

(b) Agency Resolution: The Agency shall provide Nickel a resolution adopted by the Agency's Board of Directors, meeting the requirement of Section 5 of the Kern County Water Agency Act (California Statutes of 1961, Chapter 1003, as amended), containing a finding by the Board that the Agency Transfer Water to be provided to Nickel pursuant to this Contract will not be needed for use within the Agency.

(c) Authorizing Resolutions: Nickel, the Agency and Olcese shall each provide the other parties to this Contract resolutions from their respective Boards of Directors authorizing the execution of this Contract.

(d) Opinion Letter of Counsel: Nickel shall deposit into escrow an opinion letter of counsel, satisfactory to the Agency, providing that the conveyances, transfers and assignments provided in this Contract are sufficient to transfer all right, title and interest of Nickel and Olcese to the rights described herein, except those specifically retained by or quitclaimed to Nickel and/or Olcese.

ARTICLE 9. CLOSE OF ESCROW

9.1 Close of Escrow: Agency shall deposit the sum of $7,472,000 into Escrow, and Close of Escrow shall occur when (1) the Agency delivers to the Escrow Agent $7,472,000 as required by Articles 4.2 and 5.1; (2) the Agency delivers to the Escrow Agent its prorated portion of the annual expenses incurred by the Lower River Water Rights; (3) the Agency, Nickel and Olcese have deposited all requisite documents for the transfer of the Lower River Water Rights, and other described rights to be transferred pursuant to this Contract, duly executed, authorized , acknowledged and approved by the parties' respective counsel as sufficient to transfer all purchased rights; and (4) all conditions precedent have occurred. If assignments are not approved, Nickel and Olcese shall in good faith negotiate with the Agency to provide for an operation agreement which will provide the Agency with equivalent rights (in the Agency's judgment) to the failed assignment. All expenses associated with the Lower River Water Rights shall be prorated as of January 1, 2001. The Agency, Nickel and Olcese shall notify by written notice to all parties and the Escrow Agent of the intended date for the Close of Escrow. All closing costs and fees, including without limitation, any transfer taxes, escrow fees, drafting and notary charges and recording fees shall be apportioned equally between the Agency, Olcese and Nickel. Each party shall be responsible for fees and costs of its own counsel.

ARTICLE 10. CONDITIONS SUBSEQUENT

10.1 Completion of All Required Assignments of Rights and/or Obligations: Prior to the Close of Escrow, the parties shall cooperate to achieve all necessary approvals of assignments and transfers of the rights and obligations to the Agency described herein and such approvals shall be deposited into Escrow prior to the Close of Escrow. If such assignments are not approved prior to the Close of Escrow, the parties shall negotiate a mutually satisfactory amendment, pursuant to Article 12.9, making such approvals a condition subsequent.

ARTICLE 11. ESCROW AGENT'S EXCULPATORY PROVISIONS

11.1 Close of Escrow: Escrow shall be closed as soon as possible, but no later than February 22, 2001 provided that the Escrow may extend beyond February 22, 2001 for six months by written agreement of the parties.

11.2 Neglect, Misconduct: The Escrow Agent will not be liable for any of its acts or omissions unless the same constitutes negligence or willful misconduct.

11.3 Information: The Escrow Agent will have no obligation to inform any party of any other transaction or of facts within the Escrow Agent's knowledge, even though the same concerns water entitlements, provided such matters do not prevent the Escrow Agent's compliance with this Contract.

11.4 Form, Validity, and Authority: The Escrow Agent will not be responsible for (1) the sufficiency or correctness as to form or the validity of any document deposited with the Escrow Agent, (2) the manner of execution of any such deposited document, unless such execution occurs in the Escrow Agent's premises and under its supervision, or (3) the identity, authority, or rights of any person executing any document deposited with the Escrow Agent.

11.5 Conflicting Instructions: Upon receipt of any conflicting instructions, the Escrow Agent shall immediately notify all parties that there is an apparent conflict in the instructions. The Escrow Agent will have the right to take no further action until otherwise directed, either by the parties' mutual written instructions or a final order or judgment of a court of competent jurisdiction.

11.6 Interpleader: The Escrow Agent will have the absolute right, at its election, to file an action in interpleader requiring the parties to answer and litigate their several claims and rights among themselves, and the Escrow Agent is authorized to deposit with the clerk of the court all documents and funds held in Escrow. If such action is filed, the parties will jointly and severally pay the Escrow Agent's termination charges and costs and reasonable attorney's fees that the Escrow Agent is required to expend or incur in the interpleader action, the amount thereof to be fixed and judgment therefor to be rendered by the court. Upon the filing of such action, the Escrow Agent will be and become fully released and discharged from all obligations to further perform any obligations imposed by this Contract.

ARTICLE 12. MISCELLANEOUS

12.1 Reference: The parties to this Contract agree to waive and give up the right to a jury trial and to submit all disputes, controversies, differences, claims or demands, whether of fact or of law or both, relating to or arising out of this Contract, to be resolved at the request of any party, by a trial on Order of Reference conducted pursuant to the provisions of Code of Civil Procedure section 638 *et seq.* or any amendment, addition or successor section thereto to hear the case and report a statement of decision thereon. The parties intend this general reference agreement to be specifically enforceable in accordance with said provisions. If the parties are unable to agree upon a referee, one shall be appointed by the Presiding Judge of the Kern County Superior Court. The parties shall share equally, by paying their proportionate amount of the estimated fees and costs of the initial reference.

12.2 Indemnity: Each party shall jointly and severally indemnify the other parties hereto against, and hold each other harmless from, any loss, cost, damage (whether general, compensatory, or otherwise), liability, indebtedness, claim, cause of action, judgment, court costs, and legal or other out-of-pocket expense (including attorneys' fees) which any party may suffer or incur as a direct or indirect consequence of (a) any breach by another party of any representation or warranty made in connection with this Contract; (b) any failure of any party to perform any obligation under this Contract which may affect another party.

12.3 Notices: All Notices given hereunder shall be transmitted in writing to the addresses below or to such other address in the State of California as a party may designate by written notice to the other parties:

If to Nickel:

Mr. James Nickel, President
Nickel Family, LLC
P.O. Box 60679
Bakersfield, California 93386-0679
Facsimile: (661) 872-7141

If to Olcese:

Board of Directors
Olcese Water District
P.O. Box 651
Bakersfield, California 93302
Facsimile: (661) 872-9956

If to Agency:

Mr. Thomas N. Clark, General Manager
Kern County Water Agency
P.O. Box 58
Bakersfield, California 93302
Facsimile: (661) 634-1428

All such notices shall be deemed to have been given at the first to occur of time of actual delivery, or, if mailed, forty-eight (48) hours after deposited in certified or registered United States mail, postage prepaid. In case of notice transmitted by an overnight delivery service (which obtains a written receipt upon delivery), notice shall be deemed to be given when delivered by any such service, charges prepaid and the receipt is signed. If any party transmits information to any other party orally or by a means not authorized herein, the party receiving such information shall be entitled to assume that the party giving such information will nevertheless comply with its written notice obligations, and no notice shall be deemed to have been given until the party receiving the information receives written notice as required herein.

12.4 Cumulative Remedies: Except as otherwise expressly provided herein, all rights and remedies provided for in this Contract are cumulative and shall be in addition to any and all other rights, powers, privileges and remedies provided by law.

12.5 No Third Parties Benefited: This Contract is made and entered into for the sole protection and benefit of the parties hereto, their successors and assigns, and no other person shall be a direct or indirect beneficiary of, or have any direct or indirect cause of action or claim in connection with, this Contract.

12.6 Time: Time is of the essence in this Contract.

12.7 Governing Law: This Contract shall be governed by and be construed according to the law of the State of California.

12.8 Counterparts: This Contract may be executed in any number of counterparts, each of which shall be deemed an original, but all such counterparts together shall constitute but one and the same instrument.

12.9 Amendments: This Contract contains the entire and exclusive agreement of the parties hereto. This Contract may only be modified or amended by a written contract executed by Nickel and the Agency. This Contract supersedes all prior drafts and communications with respect thereto. Neither such principles of interpretation nor the express language herein shall be impaired or adversely affected by the language of any prior discussion form or draft of this Contract or any other documents. Furthermore, this Contract has been the subject of negotiations by the parties, and this Contract shall not be construed against any party merely because of that party's involvement in their preparation.

12.10 Force Majeure: If the performance by any party to this Contract of any of its obligations or undertakings under this Contract is interrupted or delayed by any occurrence not occasioned by the conduct of any party to this Contract, whether that occurrence is an act of God or public enemy, or whether that occurrence is caused by war, riot, storm, earthquake, or other natural forces, or by the acts of anyone not party to this Contract, then that party shall be excused from any further performance for whatever period of time after the occurrence is reasonably necessary to remedy the effects of that occurrence.

12.11 Post-Escrow Cooperation: Following Close of Escrow, Nickel, Olcese, and Agency shall in good faith cooperate to ensure the complete transfer of all assets as specified in this Contract including, but not limited to, the execution and delivery of documents, deeds, assignments, and other instruments required to achieve the asset transfers specified in this Contract. The parties currently believe George W. Nickel Jr., Adele R. Nickel, and La Hacienda, Inc. do not possess an independent interest in the assets specified in the Contract, but if such interest is discovered they will cooperate to achieve the asset transfers specified in this Contract.

12.12 List of Exhibits: The following shall constitute all of the Exhibits to this Contract and by this reference are fully incorporated herein:

Exhibit A	Lower River Water Rights
Exhibit B	Johnson Ditch Rights and Castro Ditch Rights
Exhibit C	Carmel Water Rights
Exhibit D	Power Charges for Agency Transfer Water
Exhibit E	Water Inventories
Exhibit F	Map of Rio Bravo Ranch
Exhibit G	Garces Property Description

Dated: January 23, 2001

Kern County Water Agency

By ____________________
General Manager

Attested:

By ____________________
Secretary, Kern County Water Agency

Dated: January 23, 2001

Olcese Water District

By ____________________
President, Board of Directors

Attested:

By ____________________
Secretary, Olcese Water District

Dated: January 23, 2001

Nickel Family, LLC

By ______________________
President, Board of Directors

Dated: January 23, 2001

George W. Nickel, Jr.

____

Dated: January 23, 2001

Adele R. Nickel

____

Dated: January 23, 2001

La Hacienda, Inc.

By ______________________
President

Recording Requested By:
CHICAGO TITLE COMPANY
ESCROW NO. 673298-MM

When Recorded Mail to:
KERN COUNTY WATER AGENCY
Attention: JOHN STOVALL
P.O. BOX 58
BAKERSFIELD, CA 93302-0058

GRANT DEED

DOCUMENTARY TRANSFER TAX $ -0-
( ) COMPUTED ON FULL VALUE OF PROPERTY CONVEYED, OR ( ) COMPUTED ON FULL VALUE LESS LIENS AND ENCUMBRANCES REMAINING THEREON AT TIME OF SALE.

____
Signature of declarant or agent determining tax – Firm Name

( ) Unincorporated Area ( ) City of ______________

Assessor's Parcel No.: ______________

NICKEL FAMILY, LLC, a California limited liability company and OLCESE WATER DISTRICT, a California public agency, for valuable consideration, receipt of which is hereby acknowledged, DO HEREBY GRANT TO KERN COUNTY WATER AGENCY, a California public agency, the real property in the county of Kern, State of California, described on Exhibit A attached hereto and incorporated herein by this reference, together with all improvements thereon and all easements, rights of way, and other rights appurtenant thereto, subject, however, to the lien of non-delinquent real property taxes and assessments and covenants, conditions, restrictions, easements, rights-of-way and servitudes of record.

DATE: ______________, 2001

SELLERS:

Nickel Family, LLC

By: ______________________
Title: ______________________

Olcese Water District

By: ______________________
Title: ______________________

(ALL SIGNATURES MUST BE ACKNOWLEDGED)
MAIL TAX STATEMENTS TO GRANTEE AT ADDRESS ABOVE

641309.1

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA)
) ss.
COUNTY OF KERN)

On ____________________ (Date), before me, ______________________________ (Name and Title of Officer (e.g. "Jane Doe, Notary Public")),

personally appeared ______________________________ (Name of Signers),

☐ personally known to me – **OR** – ☐ proved to me on the basis of satisfactory evidence to be the persons whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Signature of Notary Public

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY(IES) CLAIMED BY SIGNER(S)

☐ Individual
☐ Corporate Officer

____
Titles

☐ Partners ☐ Limited ☐ General
☐ Attorney-In-Fact
☐ Trustees
☐ Guardian/Conservator
☐ Other: ____________________

Signer is Representing:
Name of Persons or Entity(ies)

____

____

DESCRIPTION OF ATTACHED DOCUMENT

____
Title or Type of Document

____
Number of Pages

____
Date of Document

____
Signers Other Than Named Above

041309 1

EXHIBIT A

TO GRANT DEED FROM NICKEL FAMILY, LLC AND OLCESE WATER DISTRICT TO THE KERN COUNTY WATER AGENCY

The real property transferred pursuant to this Grant Deed consists of the undivided interests held by Grantors, Nickel Family, LLC and Olcese Water District in and to the real property described in EXHIBIT A-1 attached hereto.

EXHIBIT A-1

The property referred to in this Contract is set forth below. For the purposes of this Water Asset Description, the term "Sellers" shall refer collectively to the following:

> Nickel Family, LLC, a California limited liability company (sometimes herein called "Nickel") and the Olcese Water District, a California public agency (sometimes herein called "Olcese"), George W. Nickel, Jr., Adele R. Nickel, and La Hacienda, Inc..

A. LOWER RIVER WATER RIGHTS. Any and all of Sellers' right, title and interest now owned in any right or title to divert that certain present and future allocation of the natural flow of the Kern River, including, but not limited to, those rights arising pursuant to the following series of agreements and commonly known as the Lower River Water Rights, and any powers of attorney relating thereto which Sellers may now have:

1. Kern River Water Right and Storage Allocation Agreement. That certain Kern River Water Right and Storage Allocation Agreement (the "Allocation Agreement") dated March 10, 1961, by and among Hacienda Water District and Kern River Delta Farms, as first parties, and Robert Burhans, Jr., Gertrude B. Burhans and Burhans & Trew, Inc., as second parties, recorded January 25, 1967, Book 4019, Page 311, Kern County which grants certain water and storage rights to the second parties ("Burhans") which rights were transferred, or modified, as follows:

(a) That certain Assignment dated March 10, 1961, recorded January 25. 1967, Book 4019, Page 309, Kern County, by which Burhans transferred their rights under the Allocation Agreement to Miller & Lux Incorporated; and

(b) That certain Agreement dated September 30, 1966, recorded January 25, 1967, Kern County, Book 4019, Pages 305-322 and recorded in Book 899, Pages 824-842 of the Official Records of Kings County ("Kings County"), by and among Hacienda Water District, George W. Nickel, Jr. dba Kern River Delta Farms and Miller & Lux Incorporated confirmed and ratified by the Kern River Water Right and Storage Allocation Agreement; and

(c) That certain Assignment dated January 11, 1974, recorded January 22, 1974, Book 4822, Page 952, Kern County, by which Miller & Lux, Incorporated assigned all of its rights under the Allocation Agreement to J.G. Boswell Company ("Boswell"); and

(d) That certain unrecorded Assignment dated October 4, 1974, by which J.G Boswell transferred all of its rights under the Allocation Agreement to George W. Nickel, Jr;

2. 1962 Kern River Water Rights and Storage Agreement. That certain Kern River Water Rights and Storage Agreement (the "1962 Agreement"), dated

December 31, 1962, by and between Buena Vista Water Storage District ("Buena Vista"), North Kern Water Storage District ("North Kern"), collectively the "Upstream Group," and Tulare Lake Basin Water Storage District ("Tulare Lake") and Hacienda Water District ("Hacienda"), collectively the "Downstream Group," and recorded April 5, 1963, in Book 3594 at Page 3, Kern County, which agreement further allocates diversion rights to Kern River water subject to the Miller-Haggin Agreement, and, in addition, certain storage and exchange rights for water so diverted in Isabella Reservoir, between the Upstream Group and the Downstream Group as successors in interest to the parties to the Miller-Haggin Agreement; and

3. Water Settlement Agreements. That certain Kern River Water Settlement Agreement dated January 1, 1963, which divides and apportions the Downstream Group's water and storage and provides for the exchange of water, and that certain Supplement to Kern River Water Settlement Agreement dated August 8, 1974, in which Hacienda has the option of delivering water from the California Aqueduct to Tulare Lake or making dollar payments to Tulare Lake, or both, and both agreements are by and between Tulare Lake and Hacienda (collectively, the "Tulare Lake-Hacienda Agreement") and neither agreement has been recorded; and

4. Agreement of Sale of Hacienda Ranch. That certain Agreement of Sale, and that certain Kern River Water and Storage Reservation Agreement (the "Reservation Agreement") both agreements dated October 16, 1978, and entered into by and between La Hacienda-TLR Agreement"), a California joint venture (the "La Hacienda-TLR Agreement"), and that certain Memorandum of Agreement dated October 12, 1978, recorded October 24, 1978, Book 1130, Page 957, Kings County, which agreements reserve to George Nickel, Adele Nickel and La Hacienda the Kern River water and storage rights allocated to the Downstream Group pursuant to the 1962 Agreement and, in addition, certain other water rights formerly held by Hacienda; and

5. Special Power of Attorney. That certain Special Power of Attorney from Hacienda to La Hacienda dated February 14, 1979, recorded Book 1184, Page 120, Kings County and recorded September 18, 1980, Book 5315, Page 1253, Kern County, as authorized by Hacienda Resolution No. 79-1; and that certain Special Power of Attorney from the Tulare Lake Representatives to La Hacienda dated February 8, 1979, both of which grant all rights to utilize the water and storage rights reserved under the Agreement of Sale of Hacienda Ranch referred to in subparagraph A.4 above for the limited purpose of contracting for, selling, exchanging, transferring, conveying or otherwise dealing with Kern River rights reserved by George Nickel, Adele Nickel, and La Hacienda; and

6. 1980 Contract. That certain Contract by and between Hacienda, Olcese, La Hacienda, George Nickel and Adele Nickel dated on or about August 20, 1980; and

7. Olcese-La Hacienda Agreement. That certain contract for the Purchase and Sale of Kern River Water and Storage Rights (the "Olcese-La Hacienda

Agreement"), dated March 18, 1981, by and between Olcese Water District ("Olcese"), La Hacienda, George Nickel and Adele Nickel, recorded May 26, 1981, Book 5377, Page 349, Kern County, which purports to transfer into Olcese the Kern River water and storage rights set forth in subparagraphs A.4 and A.1.a-d above, but reserves to La Hacienda, George Nickel and Adele Nickel "Excess Water" rights, "Option Water" rights, and other "Residential Rights," including the use of the special powers of attorney referred to in subparagraph A.5 above to the extent necessary to exercise Nickel's reserved rights.

8. Water Transfer Agreement. That certain contract entered into on March 29, 1988, by and between George W. Nickel, Jr., Adele R. Nickel, Nickel Enterprises, Rio Bravo Resort, Inc., La Hacienda, Inc., Kern River Development Company, and Lekein Management Company, Inc., as Transferors and Garces Water Company, Inc. and the McNear-Driver Trust, which transferred eighty-five percent (85%) of the Transferors' combined interest in the Kern River water and storage rights reserved to the Transferors in the Olcese-La Hacienda Agreement referred to in subparagraph A.7 above to the McNear-Driver Trust and the remaining fifteen percent (15%) of those reserved interests to Garces Water Company, Inc. The March 29, 1988 contract granted Garces the right of first refusal to purchase the Trust's interest in those assets upon a sale or disposition of any of them by the Trust.

9. Water Transfer Agreement: Amendment and Consent to Ownership Transfer. That certain contract between the McNear-Driver Trust and Nickel Family, LLC, George W. Nickel, Jr., Adele R. Nickel, Nickel Enterprises, La Hacienda, Inc. and Garces Water Company, Inc. in which the Ttrust stated its desire to transfer the interests it obtained from the Transferors in the Water Transfer Agreement referred to in subparagraph A.8 above to Nickel, LLC, and in which Garces consented to such a transfer.

10. January 1, 1997 Transfer Agreement. That certain transfer agreement dated January 1, 1997, by and between Dudley L. Drake, Trustee of the McNear-Driver Trust and Nickel, LLC, wherein the Trustee granted and conveyed to Nickel LLC the undivided eighty-five percent (85%) interest in the assets obtained by the Trust in the Water Transfer Agreement referred to in subparagraph A8 above.

B. STORAGE RIGHTS. Any and all Sellers' right, title and interest in any right to store water, in Isabella Reservoir including, but not limited to the following:

1. Storage Rights In Isabella Reservoir. The perpetual right of Sellers to rent from North Kern (which has a right to storage space in Isabella Reservoir pursuant to the 1962 Agreement referred to in subparagraph A.2 above and that certain Contract among the United State of America, North Kern, Buena Vista, Tulare Lake and Hacienda, dated October 23, 1964) storage space in Isabella Reservoir for storage of their Kern River water, including Excess Water, as such right is set forth on behalf of the Downstream Group in Paragraph 9 of the 1962 Storage Agreement (such right to rent storage space reserved by Sellers in the Reservation Agreement referred to in subparagraph A.4 currently entitles Sellers

to twenty percent (20%) of the storage capacity of Isabella Reservoir); and

2. 1964 Contract with the United States of America. Any and all of Sellers' right to store water pursuant to the Contract with the United States of America, Number 14-06-200-1360A; and

3. Settlement Agreements. Any and all of Sellers' right to store water pursuant to the Reservation Agreement referred to in subparagraph A.4and the Kern River Water Settlement Agreement and the Supplement to Kern River Water Settlement Agreement referred to in subparagraph A.3 above; and

4. Minimum Pool Agreement. Any and all of Sellers' right to store water pursuant to the Agreement for Establishment and Maintenance of Minimum Recreation Pool of 30,000 acre feet in Isabella Reservoir by and between Buena Vista, North Kern, Tulare Lake, Hacienda, and the County of Kern dated November 8, 1963; and

5. Allocation Agreement. Any and all of Sellers' right to store water pursuant to the Allocation Agreement referred to in subparagraph A.1 above assigned to Miller & Lux, Inc. pursuant to the Assignment referred to in subparagraph A.1.a above and confirmed and ratified by the Agreement dated September 30, 1966, referred to in subparagraph A.1.b above; and

6. Spreading Agreements. Any and all of Sellers' rights under the Olcese-La Hacienda Agreement, referred to in subparagraph A.6 above, to store water in the Bakersfield Spreading Area pursuant to the Agreement No. 77-07 W.B. and Agreements No. 78-12 W.B. and 81-76 W.B.; and

C. WATER EXCHANGE AGREEMENTS. Any and all of Sellers' right, title and interest to, exchange water and entitlements arising as a result of contracts executed by Sellers for deliveries of water pursuant to various water exchange agreements for water originating in Kern County regardless of where delivered or regardless of whether the water for which it is exchanged originated in Kern County, including, but not limited to, the following:

1. 1962 Agreement; Water Exchange Rights. Such rights and entitlements of Sellers as from time to time arise pursuant to the priority position of Sellers to substitute its Kern River water for Kern River water to be delivered by Buena Vista or North Kern to third parties, and to receive water being returned to such parties in payment of prior exchanges, to the extent Sellers have a credit balance of water to be delivered, as such priority is set forth in Paragraph 14 of the 1962 Agreement; and

2. Right To Purchase Option Water. The annual right of Nickel to purchase all Olcese water in the Bakersfield Spreading Area which is in excess of that needed by Olcese as determined by Sections 8 and 9 of the Olcese-La Hacienda Agreement referred to in subparagraph A.6 above ("Option Water"), on the terms and conditions set forth in Section 10 of the Olcese-La Hacienda Agreement; and

3. Hacienda Water Substitution Agreement. The right of Sellers to substitute Hacienda water for all or a portion of Buena Vista water in exchange for Buena Vista entitlement of State Aqueduct water pursuant to the Water Substitution Agreement dated November 14, 1972, by and between Buena Vista and Hacienda; and

4. Buena Vista-La Hacienda Water Exchange Agreement. The right of Nickel to exchange Option Water for the Kern River water of Buena Vista pursuant to Paragraph 3(f) of the Buena Vista-La Hacienda Agreement; and

5. California Aqueduct Water Exchange Agreement. The right of Sellers to receive California Aqueduct Water from the Kern County Water Agency Improvement District No. 4 (the "Agency") in return for amounts of Kern River water delivered by Sellers or their predecessors to the Agency, pursuant to the terms and conditions set forth in that certain Water Exchange Agreement dated April 17, 1982, by and between the Agency and Nickel; and

D. CONTRACT RIGHTS. Any and all Sellers' right, title and interest in any contract rights relating to the sale or exchange of water originating in Kern County, whether general intangibles or otherwise, including, but not limited to the following:

1. TLR-La Hacienda Agreement. The right of Sellers to the first opportunity to sell Kern River water to TLR for use on that real property commonly referred to as the "Hacienda Ranch" or within the Tulare Lake Basin area, as set forth in Section 2(h) of the Kern River Water and Storage Reservation Agreement referred to in subparagraph A.4 above, and the right of Sellers to payment from TLR as set forth in Section 2 thereof; and

E. TRANSPORTATION RIGHTS. Those certain miscellaneous rights of Sellers to utilize canals, ditches, or other water transportation methods or conveyances or delivery facilities, and pumping equipment such as is necessary to exercise the water conveyance, transportation, and delivery rights, storage rights, water rights, water exchange entitlements, contract rights or any other rights or entitlements Sellers may have now, including, but not limited to, the rights specified in the following agreements:

1. That certain Common Use Agreement Between Buena Vista Water Storage District and Hacienda Water District dated June 18, 1973; and

2. That certain Agreement of Sale referred to in subparagraph A.4 above, as more particularly set forth in Section 2(h) thereof, including the canal parallel to and one mile north of state Highway 46 as said canal is described therein; and

3. That certain 1964 Amendment to Miller-Haggin Agreement referred to in subparagraph A.1.a. above which provides for use of first-point conduit to transport second-point group water pursuant to Section 5 thereof; and

4. That certain Kern River Canal Extension Agreement dated October 14, 1964, by and between Buena Vista, Buena Vista Associates Incorporated, and Miller & Lux Incorporated as more particularly set forth in Section VI thereof; and

5. Any and all agreements that now exist with respect to or regarding the Johnson Ditch.

6. Certain Agreements. Any rights, to the extent owned by Sellers, under the following agreements:

a. That certain Goose Lake Canal Agreement dated May 13, 1979 by and between Buena Vista as first party, and La Hacienda and Twin Farms, Inc., as second parties, recorded June 5, 1979, Kern County, Book 5203, Page 487; and

b. That certain goose Lake Canal Allocation of Water and Operating Agreement dated May 13, 1979 by and between La Hacienda, and Nickel Enterprises and Twin Farms: and

c. That certain Agreement for Joint Use of Burhans Canal System and Introduction of Nondistrict Water Into Burhans Ranch Area dated May 14, 1979, by and between Nickel Enterprises and Lost Hills Water District.

F. EXCLUSIONS. The following rights held by Sellers shall not be included within the definition of Lower River Water Rights:

1. Riparian Rights. Any rights not discussed above that are legally defined as riparian rights under California law; and

2. Groundwater. The right to pump groundwater that naturally occurs beneath land owned by Sellers; and

3. Public Agency Water. The right to obtain water from any Public Agency exclusively for use on land owned or leased by Sellers within that agency's service area.

RECORDING REQUESTED BY:
CHICAGO TITLE COMPANY

WHEN RECORDED MAIL TO
AND MAIL TAX STATEMENTS TO:

NAME	**KERN COUNTY WATER AGENCY** Attention: JOHN STOVALL
ADDRESS	P.O. BOX 58
CITY	BAKERSFIELD
STATE & ZIP	CALIFORNIA 93302-0058

QUITCLAIM DEED

TITLE NO. **ESCROW. NO. 673298-MM** **APN:**

THE UNDERSIGNED GRANTOR(s) DECLARE(s)
DOCUMENTARY TRANSFER TAX is $ -0- (No Consideration) CITY TAX $__________
☐ Computed on full value of property conveyed, or ☐ Computed on full value less value of liens or encumbrances remaining at time of sale,
☐ Unincorporated area: ☐ City of Bakersfield, and

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, NICKEL FAMILY, LLC, a California limited liability company hereby remise, release and forever quitclaim to KERN COUNTY WATER AGENCY, a California public agency, receipt of which is its interest in the real property described in Exhibit B attached hereto and incorporated herein by this reference, together with all improvements thereon and all easements, rights of way, and other rights appurtenant thereto, subject, however, to the lien of non-delinquent real property taxes and assessments and covenants, conditions, restrictions easements, rights-of-way and servitudes of record in the County of Kern, State of California.

See Attached Exhibit B

Dated__________, 2001 ____________________

____

(ALL SIGNATURES MUST BE ACKNOWLEDGED)

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA)
) ss.
COUNTY OF KERN)

On ____________________, before me, ______________________________________,
Date — Name and Title of Officer (e.g. "Jane Doe, Notary Public")

personally appeared ____,
Name of Signers

☐ personally known to me – OR – ☐ proved to me on the basis of satisfactory evidence to be the persons whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Signature of Notary Public

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY(IES) CLAIMED BY SIGNER(S)

☐ Individual
☐ Corporate Officer

____
Titles

☐ Partner(s) ☐ Limited ☐ General
☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other: ______________________

Signer is Representing:
Name of Persons or Entity(ies)

____

____

DESCRIPTION OF ATTACHED DOCUMENT

____
Title or Type of Document

____
Number of Pages

____
Date of Document

____
Signers Other Than Named Above

EXHIBIT B

TO QUITCLAIM DEED FROM NICKEL FAMILY, LLC TO KERN COUNTY WATER AGENCY

The real property transferred pursuant to this Quitclaim Deed consists of the undivided interests held by Grantor, NICKEL FAMILY, LLC in and to the real property described in EXHIBIT B-1 attached hereto.

EXHIBIT B-1

A. CASTRO DITCH WATER RIGHTS. Any and all of Nickel's right, title and interest now owned in the so-called Castro Right to divert water from the Kern River evidenced by various instruments, conveyances, contracts and agreements, including, but not limited to, the following:

1. That certain Indenture dated April 5, 1894, recorded April 6, 1894 Kern County, Book 54, Deeds, Pages 30 and 31, by which H.H. Fish, George Daggett, and H.A. Blodget conveyed an undivided 1/18th interest in the Castro Ditch and water right to James M. Keith; and

2. That certain Indenture dated April 5, 1894, recorded April 6, 1894, Kern County, Book 54, Deeds, Pages 32 and 33, by which H.H. Fish, George Daggett, and H.A. Blodget conveyed an undivided 1/9th interest in the Castro Ditch and water right to S.W. Wible; and

3. That certain Indenture dated May 20, 1896, recorded May 20, 1896, Kern County, Book 60, Deeds, Pages 640 and 641, by which Tomas Castro and Manual Castro conveyed an undivided 2/18ths part of the Castro Ditch and all the branches thereof and of the water and water rights appurtenant thereto to William S. Tevis; and

4. That certain Indenture dated May 20, 1896, recorded May 22, 1896 Kern County, Book 60, Deeds, Pages 644 and 645, by which W.L. Dixon and Florence G. Dixon, his wife, conveyed an undivided 2/18ths part of the Castro Ditch and all the branches thereof and of the water and water rights appurtenant thereto to William S. Tevis; and

5. That certain Agreement dated March 31, 1905, which provides for the right to appropriate and divert water from the Kern River at the head of Stine Canal Extension up to 20 cfs; and

6. That certain Corporation Quitclaim Deed dated February 4, 1982, recorded February 25, 1982, Kern County, Book 5440, Pages 2241-2242, by which Miller & Lux, Inc., remised, released and quitclaimed to La Hacienda, Inc., Assessors Parcel Number 700-980-24-00-8; and

7. That certain Corporation Quitclaim Deed recorded February 25, 1982, Kern County, Book 5440, Pages 2243-2244, by which Miller & Lux, Inc., remised, released and quitclaimed to La Hacienda, Inc., Assessors Parcel Number 700-980-25-00-1; and

8. That certain Quitclaim Deed dated November 25, 1986, by which La Hacienda, Inc., remised, released and quitclaimed to the City of Bakersfield the physical facilities of the Castro Ditch excepting all Kern River Rights appurtenant to eight shares of stock in the Castro Ditch; and

9. Any other or additional right, title or interest in or to the Castro Ditch and water right now owned by Nickel.

B. JOHNSON DITCH WATER RIGHTS. The so-called Johnson Right to divert water from the Kern River of which Nickel owns a part as a result of various instruments, conveyances, contracts, and agreements, including, but not limited to, the following:

1. That certain Corporation Quitclaim Deed dated February 4, 1982, recorded February 25, 1982, Kern County, Book 5440, Pages 2245-2246, by which Miller & Lux, Inc., remised, released and quitclaimed to La Hacienda, Inc., Assessors Parcel Number 700-980-26-00-4; and

2. Any other or additional right, title or interest in or to the Johnson Ditch and water right now owned by Nickel.

RECORDING REQUESTED BY:
CHICAGO TITLE COMPANY

WHEN RECORDED MAIL TO
AND MAIL TAX STATEMENTS TO:

NAME OLCESE WATER DISTRICT
Attention: Board of Directors
ADDRESS P.O. BOX 651

CITY BAKERSFIELD

STATE & ZIP CALIFORNIA 93302

QUITCLAIM DEED

TITLE NO. ESCROW. NO. 673298-MM APN:

THE UNDERSIGNED GRANTOR(s) DECLARE(s)
DOCUMENTARY TRANSFER TAX is $ -0- (No Consideration) CITY TAX $__________

☐ Computed on full value of property conveyed, or ☐ Computed on full value less value of liens or encumbrances remaining at time of sale,
☐ Unincorporated area: ☐ City of Bakersfield, and

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, KERN COUNTY WATER AGENCY, a California public agency, hereby remise, release and forever quitclaim to OLCESE WATER DISTRICT, a California public agency, receipt of which is its interest in the real property described in Exhibit C attached hereto and incorporated herein by this reference, together with all improvements thereon and all easements, rights of way, and other rights appurtenant thereto, subject, however, to the lien of non-delinquent real property taxes and assessments and covenants, conditions, restrictions easements, rights-of-way and servitudes of record in the County of Kern, State of California.

See Attached Exhibit C

Dated__________________, 2001 ________________________

____

(ALL SIGNATURES MUST BE ACKNOWLEDGED)

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA)
) ss.
COUNTY OF KERN)

On ______________________ , before me, ____ ,
Date — Name and Title of Officer (e.g "Jane Doe, Notary Public")

personally appeared ____ ,
Name of Signers

☐ personally known to me – OR – ☐ proved to me on the basis of satisfactory evidence to be the persons whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Signature of Notary Public

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY(IES) CLAIMED BY SIGNER(S)

☐ Individual
☐ Corporate Officer

____
Titles

☐ Partner(s) ☐ Limited
☐ General
☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other: ______________________

Signer is Representing:
Name of Persons or Entity(ies)

____

____

DESCRIPTION OF ATTACHED DOCUMENT

____
Title or Type of Document

____
Number of Pages

____
Date of Document

____
Signers Other Than Named Above

641209.1

EXHIBIT C

TO QUITCLAIM DEED FROM KERN COUNTY WATER AGENCY TO OLCESE WATER DISTRICT

The real property transferred pursuant to this Quitclaim Deed consists of the undivided interests held by Grantor, KERN COUNTY WATER AGENCY in and to the real property described in EXHIBIT C-1 attached hereto.

EXHIBIT C-1

A. CARMEL WATER RIGHT. The so-called Carmel Water right to 3.956% of Kern River water allocated to the Miller-Haggin First Parties of which Nickel's predecessors in interest owned a part as a result of various instruments, conveyances, contracts, and agreements as follows:

1. That certain Agreement dated October 24, 1945, between Buena Vista Water Storage District as first party, and C.E. Houchin and George L. Bradford, co-partners doing business as Carmel Cattle Company, as second party, recorded December 1, 1945, Kern County, Book 1290, Page 176, by which the second party reserved said Carmel Water Right; and

2. That certain Deed dated February 23, 1956, in which Kathryn Houchin, Francis L. Houchin, and Anna Lumis, as executors of the estate of C.E. Houchin, deceased, conveyed to Miller & Lux, Inc. said Carmel Water Right; and

3. That certain Deed dated February 24, 1956, recorded February 1956, Kern County, Book 2567, Page 0527, document no. 11922, in which Miller & Lux, Inc. conveyed to C. Ray Robinson and Pauline Robinson, husband and wife, an undivided 15% of said Carmel Water Right; and

4. That certain Quitclaim Deed Agreement dated August 31, 1973, recorded September 24, 1973, Kern County, Book 4805(?), Page 812(?) by which C. Ray Robinson, as grantor and as successor in interest to Pauline Robinson in said Deed to Mr. & Mrs. Robinson, thereafter transferred all his then remaining 12.75% undivided interest in and right to either water or income in said Carmel Water Right to George Nickel, and

5. That certain Agreement by and between Nickel doing business as Kern River Delta Farms, and Olcese Water District, dated February 27, 1976, to which said 12.75% undivided interest of George Nickel in said Carmel Water Right is subject, pursuant to Sections 1 and 5 thereof.

RECORDING REQUESTED BY:
CHICAGO TITLE COMPANY

WHEN RECORDED MAIL TO
AND MAIL TAX STATEMENTS TO:

NAME NICKEL FAMILY, LLC
Attention: James Nickel, President
ADDRESS P.O. BOX 60679

CITY BAKERSFIELD

STATE & ZIP CALIFORNIA 93386-0679

QUITCLAIM DEED

TITLE NO. ESCROW. NO. 673298-MM APN:

THE UNDERSIGNED GRANTOR(s) DECLARE(s)
DOCUMENTARY TRANSFER TAX is $ -0- (No Consideration) CITY TAX $________________
☐ Computed on full value of property conveyed, or ☐ Computed on full value less value of liens or encumbrances remaining at time of sale,
☐ Unincorporated area: ☐ City of Bakersfield, and

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, KERN COUNTY WATER AGENCY, a California public agency, hereby remise, release and forever quitclaim to NICKEL FAMILY, LLC, a California limited liability company, receipt of which is its interest in the real property described in Exhibit E attached hereto and incorporated herein by this reference, together with all improvements thereon and all easements, rights of way, and other rights appurtenant thereto, subject, however, to the lien of non-delinquent real property taxes and assessments and covenants, conditions, restrictions easements, rights-of-way and servitudes of record in the County of Kern, State of California.

See Attached Exhibit E

Dated____________________, 2001 ______________________________

____

(ALL SIGNATURES MUST BE ACKNOWLEDGED)

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA)
) ss.
COUNTY OF)

On ______________________, before me, ____,
Date — Name and Title of Officer (e.g. "Jane Doe, Notary Public")

personally appeared ____,
Name of Signers

☐ personally known to me – OR – ☐ proved to me on the basis of satisfactory evidence to be the persons whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their authorized capacities, and that by their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

____
Signature of Notary Public

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY(IES) CLAIMED BY SIGNER(S)

☐ Individual
☐ Corporate Officer

____
Titles

☐ Partner(s) ☐ Limited
☐ General
☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other: ____________________

Signer is Representing:
Name of Persons or Entity(ies)

____

____

DESCRIPTION OF ATTACHED DOCUMENT

____
Title or Type of Document

____
Number of Pages

____
Date of Document

____
Signers Other Than Named Above

Exhibit D

Power Charge = $/KWH X Avg. KWH/AF X 10,000 AF

1. $/KWH is calculated by using the PG&E, AG 5b rate or future equivalent determined prior to May 1 of each year. Currently AG 5b includes demand charges and electric energy charges for on peak, off peak, and partial peak and California Energy Commision taxes. The 10,000 af is assumed to be pumped at a rate of 1,000 AF per month from March 1 to December 31. The average daily rate is 33 AF. Pumping is assumed to occur throughout the entire 24 hour period for each day of the month.

2. The following table will be used to determine the KWH/AF. Average Depth to Groundwater is a value calculated from the measurements of wells in the Pioneer Project during the spring of each year. This data is compiled for the Kern Fan Monitoring Committee.

Spring Average Depth to Groundwater on the Pioneer Project[1]	Average KWH/AF
10	194
20	211
30	229
40	246
50	264
60	281
70	299
80	317
90	334
100	352
110	369
120	387
130	405
140	422
150	440
160	457
170	475
180	493
190	510
200	528
210	545
220	563
230	581
240	598
250	616
260	633
270	651
280	668
290	686
300	704

Example: If groundwater levels are 102 feet.

$224,005 = $0.0631/KWH X 355 KWH/AF X 10,000 AF

[1]If average depth to groundwater drops below 300 feet the KWH/AF will be recalculated.

Summary of Power Costs
Nickel 10,000 AF
2001

Month	AF	KWH	Amount	$/KWH
March	1,000	355,000	$16,972.54	0.05
April	1,000	355,000	16,913.30	0.05
May	1,000	355,000	26,145.30	0.07
June	1,000	355,000	25,853.10	0.07
July	1,000	355,000	26,145.30	0.07
August	1,000	355,000	26,145.30	0.07
September	1,000	355,000	25,853.10	0.07
October	1,000	355,000	26,145.30	0.07
November	1,000	355,000	16,913.30	0.05
December	1,000	355,000	16,972.54	0.05
Total	10,000	3,550,000	$224,059.06	

Average $/KWH........................... $0.06

KERN COUNTY WATER AGENCY

POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	PG&E SCHEDULE No.	AG-5B	PERIOD	B
FACILITY:	Pioneer Project	MONTH of	Mar 2001	CODE	3

		Usage	Rate		TOTAL $
:USTOMER CHARGE:					0.00
/IETER CHARGE:					0.00
)EMAND CHARGES PER (KW) :		KW	$/KW		
	per KW of maximum-peak-period demand	564	0.00		0.00
(From PG&E)	per KW of maximum-part-peak-period demand	0	0.00		0.00
	per KW of off-peak-period seasonal billing demand (3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K	555	4.40		2,442.00

:LECTRIC ENERGY CHARGES:

		Multiplier	KWH	$/KWH	Amount $	
Total KWH			355,000			
Base Energy Charges:						
	On Peak	0.0%	0	0.00000	0.00	
(From PG&E)	Partial Peak	38.4%	136,465	0.04661	6,360.63	
	Off Peak	61.6%	218,535	0.03706	8,098.91	
TOTAL ELECTRIC ENERGY CHARGES:						14,459.54
					Sub Total	$16,901.54

TAXES	KWH	$/KWH	
California Energy Commission	355,000	0.00020	71.00
	TOTAL BILLING		$16,972.54

TOTAL NET BILLING **$16,972.54**

KERN COUNTY WATER AGENCY

POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	PG&E SCHEDULE No.	AG-5B	PERIOD	B
FACILITY:	Pioneer Project	MONTH of	Apr 2001	CODE	4

			Usage	Rate		TOTAL $
USTOMER CHARGE:						0.00
ETER CHARGE:						0.00
EMAND CHARGES PER (KW) :			KW	$/KW		
	per KW of maximum-peak-period demand		564	0.00		0.00
rom PG&E)	per KW of maximum-part-peak-period demand		0	0.00		0.00
	per KW of off-peak-period seasonal billing demand					
	(3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K		555	4.40		2,442.00
LECTRIC ENERGY CHARGES:						
		Multiplier	KWH	$/KWH	Amount $	
tal KWH			355,000			
Base Energy Charges:						
	On Peak	0.0%	0	0.00000	0.00	
From PG&E)	Partial Peak	36.7%	130,262	0.04661	6,071.51	
	Off Peak	63.3%	224,738	0.03706	8,328.79	
OTAL ELECTRIC ENERGY CHARGES:						14,400.30
					Sub Total	$16,842.30
AXES			KWH	$/KWH		
California Energy Commission			355,000	0.00020		71.00
			TOTAL BILLING			$16,913.30

TOTAL NET BILLING **$16,913.30**

KERN COUNTY WATER AGENCY

POWER BILLING CALCULATION

LOCATION:	Nickel 10,000 AF	*PG&E SCHEDULE No.*	AG-5B	*PERIOD*		A
FACILITY:	Pioneer Project	*MONTH of* May 2001		*CODE*		5

			Usage	*Rate*		*TOTAL $*
JSTOMER CHARGE:						0.00
ETER CHARGE:						0.00
EMAND CHARGES PER (KW) :			*KW*	*$/KW*		
	per KW of maximum-peak-period demand		564	0.00		0.00
From PG&E)	per KW of maximum-part-peak-period demand		555	2.70		1,498.50
	per KW of off-peak-period seasonal billing demand					
	(3 wells - 250 HP @ .74 KW/hp = maximum demand of 555 K		555	6.55		3,635.25
LECTRIC ENERGY CHARGES:						
		Multiplier	*KWH*	*$/KWH*	*Amount $*	
otal KWH			355,000			
Base Energy Charges:						
	On Peak	17.7%	62,984	0.14294	9,002.93	
From PG&E)	Partial Peak	0.0%	0	0.00000	0.00	
	Off Peak	82.3%	292,016	0.04088	11,937.61	
OTAL ELECTRIC ENERGY CHARGES:						20,940.55
					Sub Total	$26,074.30
AXES			*KWH*	*$/KWH*		
California Energy Commission			355,000	0.00020		71.00
			TOTAL BILLING			$26,145.30

TOTAL NET BILLING **$26,145.30**

EXHIBIT B

OPTION NOTICE

NOTICE OF EXERCISE OF OPTION TO PURCHASE WATER

To: James L. Nickel
Nickel Family LLC
P. O. Box 606779
Bakersfield, CA 93386-0679

Notice is hereby given that DMB Communities II, LLC, an Arizona limited liability company ("DMB") exercises its right to purchase 8,393 acre-feet annually ("afa") of the Nickel Family LLC ("Nickel") water described in that certain Option and Water Purchase Agreement, dated , between DMB and Nickel in accordance with the provisions of the Option and Water Purchase Agreement.

(Check applicable Box)

☐ This Notice is on or before September 1, 2007.

☐ This Notice is after September 1, 2007 and on or before September 1, 2008.

☐ This Notice is after September 1, 2008 and on or before December 31, 2008.

Dated: ______________________, 200 __

DMB Communities, II

By: ____________________________

Name: ____________________________

Title: ____________________________

EXHIBIT B

PARTIAL ASSIGNMENT AGREEMENT
(NICKEL WATER AGREEMENT)

[See Attached]

PARTIAL ASSIGNMENT AGREEMENT
(Nickel Water Agreement)

THIS PARTIAL ASSIGNMENT AGREEMENT ("Agreement") is made as of this ___ day of __________, 2013, by and between TEJON RANCHCORP, a California corporation ("Tejon"), and DMB Pacific LLC, a Delaware limited liability company ("Pacific"). Tejon and Pacific are sometimes collectively referred to in this Agreement as the "Parties".

RECITALS

A. DMB Communities II LLC, an Arizona limited liability company ("DMBCII"), and Nickel Family, LLC, a California limited liability company ("Nickel"), entered into that certain Option and Water Purchase Agreement dated as of May 1, 2007 ("Nickel Agreement"). A copy of the Nickel Agreement is attached to and incorporated into this Agreement as Exhibit A. All capitalized terms not defined in this Agreement shall have their respective meanings set forth in the Nickel Agreement.

B. Pursuant to the Nickel Agreement, DMBCII acquired and exercised an option to purchase the right to eight thousand three hundred ninety-three (8,393) acre-feet per year of water ("Nickel Water").

C. In 2009, Nickel approved DMBCII's assignment of the Nickel Agreement to Pacific.

D. Section 10 of the Nickel Agreement permits Pacific to assign the Nickel Agreement, in whole or in part, subject to advance, written consent by Nickel.

E. Pursuant to that certain Purchase Agreement dated as of October ____, 2013 (the "Purchase Agreement"), by and between Pacific, as seller, and Tejon, as buyer, Tejon has elected to purchase an assignment of six thousand six hundred ninety-three (6,693) acre-feet per year of Nickel Water for 2014 through the remainder of the term of the Nickel Agreement, and all of Pacific's contractual rights and obligations associated therewith (as the same may be extended) (collectively, "Assignment Water"), and Pacific is willing to make such assignment to Tejon under the terms and conditions set forth in this Agreement.

ASSIGNMENT

NOW, THEREFORE, for valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Effective Date; Nickel Consent. The recitals are hereby incorporated into this Agreement. This Agreement shall be effective on the later of the date first set forth above or the date that Nickel executes and delivers the Consent to Partial Assignment attached to this Agreement, as shown by the date set forth below Nickel's signature block.

2. Assignment of Assignment Water. Pacific hereby assigns and transfers to Tejon all of its rights and obligations under the Nickel Agreement with respect to the Assignment Water (the "Assignment"). In accordance with Section 10(b)(iv) of the Nickel Agreement, all applicable references to "DMB" in the Nickel Agreement shall be deemed to refer to Tejon with respect to the Assignment Water. Without limiting the generality of the foregoing assignment, the rights and obligations that Pacific hereby assigns to Tejon under the Nickel Agreement with respect to the Assignment Water include, but are not limited to:

(a) The obligation to timely pay the annual Purchase Price for the Assignment Water to Nickel under Section 4 of the Nickel Agreement. Tejon shall pay the Purchase Price for all of the Assignment Water, regardless of whether delivery of all Assignment Water is requested.

(b) The obligation to timely pay the Power Charge for the Assignment Water to Nickel or the Agency under Section 8(b) of the Nickel Agreement.

(c) The obligation to timely pay the Wheeling Fee for the Assignment Water to the Agency.

(d) The obligation to timely pay any and all costs, fees and charges to convey and deliver Assignment Water to a location other than Tupman.

(e) The obligation to annually submit a delivery schedule for the Assignment Water under Section 7(b) of the Nickel Agreement.

(f) Subject to the terms of the Nickel Agreement, the right to the Assignment Water for the remainder of the initial Transfer Term of the Nickel Agreement.

(g) The right to extend the initial Transfer Term for the Extended Transfer Term and potential further extension on the terms set forth in the Nickel Agreement, as applied to the Assignment Water only; provided that Tejon's exercise of, or failure to exercise, any right to extend the term of the Nickel Agreement with respect to the Assignment Water shall have no effect on any right or opportunity to extend, or not to extend, the term of the Nickel Agreement with respect to the remaining Nickel Water.

(h) The right to reassign the Assignment Water, subject to the terms of Section 10 of the Nickel Agreement.

(i) The right to do short-term water transfers of the Assignment Water, to the extent allowed under Section 11(b) of the Nickel Agreement.

3. Assumption. Tejon hereby accepts the foregoing Assignment, and assumes and agrees that it is bound by and will timely perform all obligations of Pacific under the Nickel Agreement with respect to the Assignment Water. In accordance with Section 10(b)(ii) of the Nickel Agreement, Tejon acknowledges that Nickel has no obligation to deliver the Assignment Water under the Nickel Agreement, unless Tejon has paid all costs, fees and charges due, and

otherwise complied with all other obligations, under the Nickel Agreement with respect to the Assignment Water.

4. Interpretation. This Agreement shall be interpreted in accordance with the common meaning of its terms and shall not be interpreted strictly for or against either party.

5. Counterparts. This Agreement may be executed in any number of counterparts, each of which shall be deemed an original, and when taken together they shall constitute one and the same Agreement.

6. Successors and Assigns. This Agreement shall be binding upon, and inure to the benefit of, the parties hereto and their respective successors, heirs, administrators and assigns.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the day and year first above written.

Tejon:

TEJON RANCHCORP,
a California corporation

By: ______________________________
Name: ______________________________
Its: ______________________________

Pacific:

DMB Pacific LLC,
a Delaware limited liability company

By: DMB Pacific Ventures, LLC,
a Delaware limited liability company,
its Manager

By: ________________________
Name: ________________________
Its: ________________________

CONSENT TO PARTIAL ASSIGNMENT
BY DMB PACIFIC LLC TO TEJON RANCHCORP

Pursuant to Section 10(a) of that certain Option and Water Purchase Agreement dated as of May 1, 2007 ("Nickel Agreement"), by and between DMB Pacific LLC, a Delaware limited liability company ("Pacific"), as successor in interest to DMB Communities II, LLC, an Arizona limited liability company ("DMBCII"), and Nickel Family, LLC, a California limited liability company ("Nickel"), Nickel hereby consents to the Partial Assignment Agreement, dated as of September ___, 2013 ("Partial Assignment"), by and between Pacific and Tejon Ranchcorp, a California corporation ("Tejon"), and all terms therein. Nickel agrees that, pursuant to Section 10(b)(iv) of the Nickel Agreement, Tejon hereby succeeds to all rights and obligations of Pacific under the Nickel Agreement with respect to the Assignment Water (as defined in the Partial Assignment) and will be recognized by Nickel as possessing all such rights and obligations. Nickel also agrees that: (a) this consent is granted pursuant to Section 10(a)(ii) of the Nickel Agreement, and Pacific, DMBCII and each of their respective affiliates are released of any and all obligations under the Nickel Agreement with respect to the Assignment Water; (b) in no event shall any action or failure to act under the Nickel Agreement by Tejon, its affiliates, successors or assigns, with respect to the Assignment Water affect any rights of any person to the remaining portions of Nickel Water and the Nickel Agreement; and (c) in no event shall any action or failure to act under the Nickel Agreement by Pacific, its affiliates, successors or assigns (other than Tejon), with respect to the remaining portions of Nickel Water affect Tejon or its rights to the Assignment Water and the assigned portion of the Nickel Agreement.

NICKEL FAMILY, LLC,
a California limited liability company

By:____________________________
James L. Nickel, President

Date: ____________________________

EXHIBIT A

NICKEL AGREEMENT

[See Attached]

FIRST AMENDMENT TO PURCHASE AND SALE AGREEMENT

THIS FIRST AMENDMENT TO PURCHASE AND SALE AGREEMENT (this "Amendment") is made and entered into as of the 22nd day of October, 2013, by and between DMB PACIFIC LLC, a Delaware limited liability company ("Seller"), and TEJON RANCHCORP, a California corporation ("Buyer").

RECITALS

A. Seller and Buyer are parties to that certain Purchase and Sale Agreement dated as of October 3, 2013 (collectively, the "Purchase Agreement").

B. The Inspection Period under the Purchase Agreement is scheduled to expire on October 23, 2013.

C. Seller and Buyer desire to amend the Purchase Agreement to extend the Inspection Period, as more particularly described in this Amendment.

AGREEMENT

NOW, THEREFORE, for good and valuable consideration, the adequacy and receipt of which is hereby acknowledged, the parties hereby agree as follows:

1. Defined Terms. Capitalized terms that are not otherwise defined in this Amendment shall have the same meanings as set forth in the Purchase Agreement.

2. Inspection Period Extension. Notwithstanding anything to the contrary contained in the Purchase Agreement, including Section 4.2 thereof, the Inspection Period is hereby extended until 5:00 p.m. (Pacific Time) on Friday, November 1, 2013.

3. Closing Date. Section 3.1 of the Purchase Agreement is hereby deleted and the following inserted in lieu thereof:

> 3.1 Close of Escrow. The Close of Escrow shall take place at the offices of Coblentz Patch Duffy & Bass LLP, 1 Ferry Building, Suite 200, San Francisco, California 94111, commencing at 10:00 a.m. local time on the earlier of (a) a date selected by Seller and Buyer, or (b) November 6, 2013 ("Closing Date"); provided that all conditions precedent set forth in Section 6 have been satisfied or waived, as more specifically set forth in Section 6. If Seller has not received the Nickel Consent on or before the Closing Date, Seller shall have the right (but not the obligation) to extend the Closing Date for up to thirty (30) days to obtain the Nickel Consent.

4. Reaffirmation. The terms of this Amendment shall govern and control over any conflicting provisions in the Purchase Agreement. Except in the case of such conflicts and as expressly amended by this Amendment, the terms and provisions of the Purchase Agreement shall remain unchanged and in full force and effect.

5. Counterparts. This Amendment may be executed in one or more counterparts, each of which shall be deemed to constitute an original, but all of which, when taken together, shall constitute one and the same instrument, with the same effect as if all of the parties to this Amendment had executed the same counterpart. A fully executed facsimile or .pdf copy of this Amendment shall be effective as an original.

IN WITNESS WHEREOF, the parties hereto have caused this Amendment to be executed by the signatures of their duly authorized representatives as of the day and year first above written.

SELLER:

DMB PACIFIC LLC,
a Delaware corporation

By: DMB Pacific Ventures, LLC, a Delaware limited liability company, its Manager,

By: ______________________
Mark Kehke
President and Chief Operating Officer

BUYER:

TEJON RANCHCORP,
a California corporation

By: ______________________

Name: Greg Tobias

Its: Vice President, General Counsel

14879 015 2633700v1

SECOND AMENDMENT TO PURCHASE AND SALE AGREEMENT

THIS SECOND AMENDMENT TO PURCHASE AND SALE AGREEMENT (this "Amendment") is made and entered into as of the 6th day of November, 2013, by and between DMB PACIFIC LLC, a Delaware limited liability company ("Seller"), and TEJON RANCHCORP, a California corporation ("Buyer").

RECITALS

A. Seller and Buyer are parties to that certain Purchase and Sale Agreement dated as of October 3, 2013 (the "Original Agreement"), as amended by that certain First Amendment to Purchase and Sale Agreement dated as of October 22, 2013 ("First Amendment" and, together with the Original Agreement, the "Purchase Agreement").

B. The Inspection Period under the Purchase Agreement expired on November 1, 2013, and the Close of Escrow is scheduled to occur on November 6, 2013.

C. Prior to the expiration of the Inspection Period, Seller and Buyer agreed to certain modifications to the form of Partial Assignment that was attached to the Original Agreement.

D. In addition, Seller, Buyer and Nickel agreed to certain modifications to the form of Nickel Consent attached to the Partial Assignment, and Nickel and Buyer have executed and delivered the modified Nickel Consent.

E. Seller and Buyer desire to amend the Purchase Agreement to replace the forms of the Partial Assignment and the Nickel Consent attached thereto.

AGREEMENT

NOW, THEREFORE, for good and valuable consideration, the adequacy and receipt of which is hereby acknowledged, the parties hereby agree as follows:

1. Defined Terms. Capitalized terms that are not otherwise defined in this Amendment shall have the same meanings as set forth in the Original Agreement.

2. Form of Partial Assignment. The form of the Partial Assignment, including the Nickel Consent, attached to the Original Agreement as Exhibit B is hereby deleted and replaced with the form of Partial Assignment and Nickel Consent attached to this Amendment as Exhibit B.

3. Nickel Consent Obtained. The parties acknowledge that the Nickel Consent has been obtained and that the condition set forth in Section 6.3 has been satisfied in full.

4. Reaffirmation. The terms of this Amendment shall govern and control over any conflicting provisions in the Purchase Agreement. Except in the case of such conflicts and as expressly amended by this Amendment, the terms and provisions of the Purchase Agreement shall remain unchanged and in full force and effect.

5. Counterparts. This Amendment may be executed in one or more counterparts, each of which shall be deemed to constitute an original, but all of which, when taken together, shall constitute one and the same instrument, with the same effect as if all of the parties to this Amendment had executed the same counterpart. A fully executed facsimile or .pdf copy of this Amendment shall be effective as an original.

IN WITNESS WHEREOF, the parties hereto have caused this Amendment to be executed by the signatures of their duly authorized representatives as of the day and year first above written.

SELLER:

DMB PACIFIC LLC,
a Delaware limited liability company

By: DMB Pacific Ventures LLC, a Delaware limited liability company, its Manager

By: ______________________
Mark Kenke
President and Chief Operating Officer

BUYER:

TEJON RANCHCORP,
a California corporation

By: ______________________

Name: Gregory J. Tobias

Its: Vice President, General Counsel

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EXHIBIT A

FORM OF PARTIAL ASSIGNMENT

PARTIAL ASSIGNMENT AGREEMENT
(Nickel Water Agreement)

THIS PARTIAL ASSIGNMENT AGREEMENT ("Agreement") is made as of this 6th day of November, 2013, by and between TEJON RANCHCORP, a California corporation ("Tejon"), and DMB Pacific LLC, a Delaware limited liability company ("Pacific"). Tejon and Pacific are sometimes collectively referred to in this Agreement as the "Parties".

RECITALS

A. DMB Communities II LLC, an Arizona limited liability company ("DMBCII"), and Nickel Family, LLC, a California limited liability company ("Nickel"), entered into that certain Option and Water Purchase Agreement dated as of May 1, 2007 ("Nickel Agreement"). A copy of the Nickel Agreement is attached to and incorporated into this Agreement as Exhibit A. All capitalized terms not defined in this Agreement shall have their respective meanings set forth in the Nickel Agreement.

B. Pursuant to the Nickel Agreement, DMBCII acquired and exercised an option to purchase the right to eight thousand three hundred ninety-three (8,393) acre-feet per year of water ("Nickel Water").

C. In 2009, Nickel approved DMBCII's assignment of the Nickel Agreement to Pacific.

D. Section 10 of the Nickel Agreement permits Pacific to assign the Nickel Agreement, in whole or in part, subject to advance, written consent by Nickel.

E. Pursuant to that certain Purchase Agreement dated October 3, 2013 (the "Purchase Agreement"), by and between Pacific, as seller, and Tejon, as buyer, Tejon has elected to purchase an assignment of six thousand six hundred ninety-three (6,693) acre-feet per year of Nickel Water for 2014 through the remainder of the term of the Nickel Agreement, and all of Pacific's contractual rights and obligations associated therewith (as the same may be extended) (collectively, "Assignment Water"), and Pacific is willing to make such assignment to Tejon under the terms and conditions set forth in this Agreement.

ASSIGNMENT

NOW, THEREFORE, for valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Effective Date; Nickel Consent. The recitals are hereby incorporated into this Agreement. This Agreement shall be effective on the later of the date first set forth above or the date that Nickel executes and delivers the Consent to Partial Assignment attached to this Agreement, as shown by the date set forth below Nickel's signature block.

2. Assignment of Assignment Water. Pacific hereby assigns and transfers to Tejon all of its rights and obligations under the Nickel Agreement with respect to the Assignment Water (the "Assignment"). In accordance with Section 10(b)(iv) of the Nickel Agreement, all applicable references to "DMB" in the Nickel Agreement shall be deemed to refer to Tejon with respect to the Assignment Water. Without limiting the generality of the foregoing assignment, the rights and obligations that Pacific hereby assigns to Tejon under the Nickel Agreement with respect to the Assignment Water include, but are not limited to:

(a) The obligation to timely pay the annual Purchase Price for the Assignment Water to Nickel under Section 4 of the Nickel Agreement. Tejon shall pay the Purchase Price for all of the Assignment Water, regardless of whether delivery of all Assignment Water is requested.

(b) The obligation to timely pay the Power Charge for the Assignment Water to Nickel or the Agency under Section 8(b) of the Nickel Agreement.

The obligation to timely pay the Wheeling Fee for the Assignment Water to the Agency.

(c) The obligation to timely pay any and all costs, fees and charges to convey and deliver Assignment Water to a location other than Tupman.

(d) The obligation to annually submit a delivery schedule for the Assignment Water under Section 7(b) of the Nickel Agreement.

(e) Subject to the terms of the Nickel Agreement, the right to the Assignment Water for the remainder of the initial Transfer Term of the Nickel Agreement.

(f) The right to extend the initial Transfer Term for the Extended Transfer Term and potential further extension on the terms set forth in the Nickel Agreement, as applied to the Assignment Water only; provided that Tejon's exercise of, or failure to exercise, any right to extend the term of the Nickel Agreement with respect to the Assignment Water shall have no effect on any right or opportunity to extend, or not to extend, the term of the Nickel Agreement with respect to the remaining Nickel Water.

(g) The right to reassign the Assignment Water, subject to the terms of Section 10 of the Nickel Agreement.

(h) The right to do short-term water transfers of the Assignment Water, to the extent allowed under Section 11(b) of the Nickel Agreement.

(i) The rights under Section 7(d) of the Nickel Agreement to capacity in the Aqueduct.

(j) The rights under Section 13(j) of the Nickel Agreement to Nickel's assistance and cooperation.

(k) The rights of Nickel under Section 4.9 of the Agency Agreement to request Agency assistance, involvement and expertise in negotiating and consummating any sale of the Assignment Water.

3. Assumption. Tejon hereby accepts the foregoing Assignment, and assumes and agrees that it is bound by and will timely perform all obligations of Pacific under the Nickel Agreement with respect to the Assignment Water. In accordance with Section 10(b)(ii) of the Nickel Agreement, Tejon acknowledges that Nickel has no obligation to deliver the Assignment Water under the Nickel Agreement, unless Tejon has paid all costs, fees and charges due, and otherwise complied with all other obligations, under the Nickel Agreement with respect to the Assignment Water.

4. Interpretation. This Agreement shall be interpreted in accordance with the common meaning of its terms and shall not be interpreted strictly for or against either party.

5. Counterparts. This Agreement may be executed in any number of counterparts, each of which shall be deemed an original, and when taken together they shall constitute one and the same Agreement.

6. Successors and Assigns. This Agreement shall be binding upon, and inure to the benefit of, the parties hereto and their respective successors, heirs, administrators and assigns.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the day and year first above written.

Tejon:

TEJON RANCHCORP,
a California corporation

By: ______________________________
Name: ______________________________
Its: ______________________________

Pacific:

DMB Pacific LLC,
a Delaware limited liability company

By: DMB Pacific Ventures, LLC,
a Delaware limited liability company,
its Manager

By: ______________________________
Name: ______________________________
Its: ______________________________

CONSENT TO PARTIAL ASSIGNMENT
BY DMB PACIFIC LLC TO TEJON RANCHCORP

Pursuant to Section 10(a) of that certain Option and Water Purchase Agreement dated as of May 1, 2007 ("Nickel Agreement"), by and between DMB Pacific LLC, a Delaware limited liability company ("Pacific"), as successor in interest to DMB Communities II, LLC, an Arizona limited liability company ("DMBCII"), and Nickel Family, LLC, a California limited liability company ("Nickel"), Nickel hereby consents, subject to the terms and conditions set forth herein, to the Partial Assignment Agreement, dated as of November ___, 2013 ("Partial Assignment"), by and between Pacific and Tejon Ranchcorp, a California corporation ("Tejon"), and all terms therein. Nickel agrees, subject to the terms and conditions set forth herein, that, pursuant to Section 10(b)(iv) of the Nickel Agreement, Tejon hereby succeeds to all rights and obligations of Pacific under the Nickel Agreement with respect to the Assignment Water (as defined in the Partial Assignment) and will be recognized by Nickel as possessing all such rights and obligations. Nickel also agrees, subject to the terms and conditions set forth herein, that: (a) this consent is granted pursuant to Section 10(a)(ii) of the Nickel Agreement, and Pacific, DMBCII and each of their respective affiliates are released of any and all obligations under the Nickel Agreement with respect to the Assignment Water; (b) in no event shall any action or failure to act under the Nickel Agreement by Tejon, its affiliates, successors or assigns, with respect to the Assignment Water affect any rights of any person to the remaining portions of Nickel Water and the Nickel Agreement; and (c) in no event shall any action or failure to act under the Nickel Agreement by Pacific, its affiliates, successors or assigns (other than Tejon), with respect to the remaining portions of Nickel Water affect Tejon or its rights to the Assignment Water and the assigned portion of the Nickel Agreement.

The foregoing consent and approval by Nickel is also expressly conditioned upon, and subject to the following terms and conditions:

1. Tejon hereby makes the following covenants, representations and warranties as of the Effective Date of the Partial Assignment and underlying Nickel Agreement:

(a) Tejon has the authority to enter into the Partial Assignment and underlying Nickel Agreement, purchase the Assignment Water (as defined in the Partial Assignment), and to otherwise perform as set forth within those Agreements. The execution and delivery of the Partial Assignment has been validly authorized by all requisite action on the part of Tejon.

(b) Tejon's execution of the Partial Assignment and performance of its obligations hereunder will not violate any agreement, option, covenant, condition, obligation or undertaking of Tejon, nor to the best of Tejon's knowledge will it violate any law, ordinance, statute, order, or regulation.

(c) To the best of Tejon's actual knowledge, there is no action, suit, claim, cause of act ion, or proceeding at law or in equity (or by or before any governmental agency, official or authority of any local state or federal government) now pending, wherein an unfavorable decision, ruling or finding would: (i) affect the creation, organization, existence or powers of Tejon or the titles and powers of its Board members and officers to their respective offices; (ii) enjoin or restrain the approval and/or execution of the Partial Assignment and underlying Nickel Agreement, or (iii) in any way question or affect any of the rights, powers, duties or obligations of Tejon with respect to implementation of the Partial Assignment and underlying Nickel Agreement.

(d) No proceedings are pending or threatened in which Tejon may be adjudicated as bankrupt or discharged from any and all of its debts or obligations or granted an extension of time to pay its debts or a reorganization or readjustment of its debts.

(e) Tejon has the ability to perform all financial obligations to Nickel under this the Partial Assignment and underlying Nickel Agreement. Tejon further represents and warrants that as of the Execution Date of the Partial Assignment, it has a present net worth of at least $100 million, and to the best of Tejon's knowledge, it is not aware of any facts or circumstances that would lower its net worth below the $100 million amount in the foreseeable future.

2. Nickel agrees, subject to the terms and conditions set forth herein, that, pursuant to Section 10(b)(iv) of the Nickel Agreement, Tejon hereby succeeds to all rights and obligations of Pacific under the Nickel Agreement with respect to the Assignment Water and will be recognized by Nickel as possessing all such rights and obligations including, without limitation, the right under section 5 to extend the Transfer Term for an additional 35 years as to the Assignment Water.

3. Nickel hereby covenants, represents and warrants as follows:

(a) The current Transfer Term under the Nickel Agreement commenced on January 1, 2009 and expires on December 31, 2044, unless extended.

(b) To the best of Nickel's actual knowledge, neither Pacific nor DMBCII are in default of any provision of the Nickel Agreement, nor has an event occurred which, with notice and the passage of time, could be deemed a default by Pacific or DMBCII thereunder.

4. Each party consents to the exclusive jurisdiction of any state court located within the County of Kern, State of California or Federal Court located within the Eastern District of California in any dispute arising under or in connection with the Partial Assignment and underlying Nickel Agreement. Each party accepts for itself and in connection with its properties, generally and unconditionally, the exclusive jurisdiction of these courts and waives any defense of forum non conveniens.

5. This Consent document is not effective until DMB reimburses Nickel for the costs incurred to conduct due diligence associated with this Partial Assignment to Tejon.

TEJON RANCHCORP,
a California corporation

By: [signature]

Name: Gregory Tobias

Its: Vice President, General Counsel

Date: October 29, 2013

NICKEL FAMILY, LLC,
a California limited liability company

By: [signature]
James L. Nickel, President

Date: October 28, 2013

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Exhibit A

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PARTIAL ASSIGNMENT AGREEMENT
(Nickel Water Agreement)

THIS PARTIAL ASSIGNMENT AGREEMENT ("Agreement") is made as of this 6th day of November, 2013, by and between TEJON RANCHCORP, a California corporation ("Tejon"), and DMB Pacific LLC, a Delaware limited liability company ("Pacific"). Tejon and Pacific are sometimes collectively referred to in this Agreement as the "Parties".

RECITALS

A. DMB Communities II LLC, an Arizona limited liability company ("DMBCII"), and Nickel Family, LLC, a California limited liability company ("Nickel"), entered into that certain Option and Water Purchase Agreement dated as of May 1, 2007 ("Nickel Agreement"). A copy of the Nickel Agreement is attached to and incorporated into this Agreement as Exhibit A. All capitalized terms not defined in this Agreement shall have their respective meanings set forth in the Nickel Agreement.

B. Pursuant to the Nickel Agreement, DMBCII acquired and exercised an option to purchase the right to eight thousand three hundred ninety-three (8,393) acre-feet per year of water ("Nickel Water").

C. In 2009, Nickel approved DMBCII's assignment of the Nickel Agreement to Pacific.

D. Section 10 of the Nickel Agreement permits Pacific to assign the Nickel Agreement, in whole or in part, subject to advance, written consent by Nickel.

E. Pursuant to that certain Purchase Agreement dated October 3, 2013 (the "Purchase Agreement"), by and between Pacific, as seller, and Tejon, as buyer, Tejon has elected to purchase an assignment of six thousand six hundred ninety-three (6,693) acre-feet per year of Nickel Water for 2014 through the remainder of the term of the Nickel Agreement, and all of Pacific's contractual rights and obligations associated therewith (as the same may be extended) (collectively, "Assignment Water"), and Pacific is willing to make such assignment to Tejon under the terms and conditions set forth in this Agreement.

ASSIGNMENT

NOW, THEREFORE, for valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Effective Date; Nickel Consent. The recitals are hereby incorporated into this Agreement. This Agreement shall be effective on the later of the date first set forth above or the date that Nickel executes and delivers the Consent to Partial Assignment attached to this Agreement, as shown by the date set forth below Nickel's signature block.

2. Assignment of Assignment Water. Pacific hereby assigns and transfers to Tejon all of its rights and obligations under the Nickel Agreement with respect to the Assignment Water (the "Assignment"). In accordance with Section 10(b)(iv) of the Nickel Agreement, all applicable references to "DMB" in the Nickel Agreement shall be deemed to refer to Tejon with respect to the Assignment Water. Without limiting the generality of the foregoing assignment, the rights and obligations that Pacific hereby assigns to Tejon under the Nickel Agreement with respect to the Assignment Water include, but are not limited to:

(a) The obligation to timely pay the annual Purchase Price for the Assignment Water to Nickel under Section 4 of the Nickel Agreement. Tejon shall pay the Purchase Price for all of the Assignment Water, regardless of whether delivery of all Assignment Water is requested.

(b) The obligation to timely pay the Power Charge for the Assignment Water to Nickel or the Agency under Section 8(b) of the Nickel Agreement.

(c) The obligation to timely pay the Wheeling Fee for the Assignment Water to the Agency.

(d) The obligation to timely pay any and all costs, fees and charges to convey and deliver Assignment Water to a location other than Tupman.

(e) The obligation to annually submit a delivery schedule for the Assignment Water under Section 7(b) of the Nickel Agreement.

(f) Subject to the terms of the Nickel Agreement, the right to the Assignment Water for the remainder of the initial Transfer Term of the Nickel Agreement.

(g) The right to extend the initial Transfer Term for the Extended Transfer Term and potential further extension on the terms set forth in the Nickel Agreement, as applied to the Assignment Water only; provided that Tejon's exercise of, or failure to exercise, any right to extend the term of the Nickel Agreement with respect to the Assignment Water shall have no effect on any right or opportunity to extend, or not to extend, the term of the Nickel Agreement with respect to the remaining Nickel Water.

(h) The right to reassign the Assignment Water, subject to the terms of Section 10 of the Nickel Agreement.

(i) The right to do short-term water transfers of the Assignment Water, to the extent allowed under Section 11(b) of the Nickel Agreement.

(j) The rights under Section 7(d) of the Nickel Agreement to capacity in the Aqueduct.

(k) The rights under Section 13(j) of the Nickel Agreement to Nickel's assistance and cooperation.

(l) The rights of Nickel under Section 4.9 of the Agency Agreement to request Agency assistance, involvement and expertise in negotiating and consummating any sale of the Assignment Water.

3. Assumption. Tejon hereby accepts the foregoing Assignment, and assumes and agrees that it is bound by and will timely perform all obligations of Pacific under the Nickel Agreement with respect to the Assignment Water. In accordance with Section 10(b)(ii) of the Nickel Agreement, Tejon acknowledges that Nickel has no obligation to deliver the Assignment Water under the Nickel Agreement, unless Tejon has paid all costs, fees and charges due, and otherwise complied with all other obligations, under the Nickel Agreement with respect to the Assignment Water.

4. Interpretation. This Agreement shall be interpreted in accordance with the common meaning of its terms and shall not be interpreted strictly for or against either party.

5. Counterparts. This Agreement may be executed in any number of counterparts, each of which shall be deemed an original, and when taken together they shall constitute one and the same Agreement.

6. Successors and Assigns. This Agreement shall be binding upon, and inure to the benefit of, the parties hereto and their respective successors, heirs, administrators and assigns.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the day and year first above written.

Tejon:

TEJON RANCHCORP,
a California corporation

By: ______________________
Name: Gregory J. Tobias
Its: Vice President, General Counsel

Pacific:

DMB Pacific LLC,
a Delaware limited liability company

By: DMB Pacific Ventures LLC,
a Delaware limited liability company,
its Manager

By: ______________________
Mark Kehke
President and Chief Operating Officer

CONSENT TO PARTIAL ASSIGNMENT
BY DMB PACIFIC LLC TO TEJON RANCHCORP

Pursuant to Section 10(a) of that certain Option and Water Purchase Agreement dated as of May 1, 2007 ("Nickel Agreement"), by and between DMB Pacific LLC, a Delaware limited liability company ("Pacific"), as successor in interest to DMB Communities II, LLC, an Arizona limited liability company ("DMBCII"), and Nickel Family, LLC, a California limited liability company ("Nickel"), Nickel hereby consents, subject to the terms and conditions set forth herein, to the Partial Assignment Agreement, dated as of November ___, 2013 ("Partial Assignment"), by and between Pacific and Tejon Ranchcorp, a California corporation ("Tejon"), and all terms therein. Nickel agrees, subject to the terms and conditions set forth herein, that, pursuant to Section 10(b)(iv) of the Nickel Agreement, Tejon hereby succeeds to all rights and obligations of Pacific under the Nickel Agreement with respect to the Assignment Water (as defined in the Partial Assignment) and will be recognized by Nickel as possessing all such rights and obligations. Nickel also agrees, subject to the terms and conditions set forth herein, that: (a) this consent is granted pursuant to Section 10(a)(ii) of the Nickel Agreement, and Pacific, DMBCII and each of their respective affiliates are released of any and all obligations under the Nickel Agreement with respect to the Assignment Water; (b) in no event shall any action or failure to act under the Nickel Agreement by Tejon, its affiliates, successors or assigns, with respect to the Assignment Water affect any rights of any person to the remaining portions of Nickel Water and the Nickel Agreement; and (c) in no event shall any action or failure to act under the Nickel Agreement by Pacific, its affiliates, successors or assigns (other than Tejon), with respect to the remaining portions of Nickel Water affect Tejon or its rights to the Assignment Water and the assigned portion of the Nickel Agreement.

The foregoing consent and approval by Nickel is also expressly conditioned upon, and subject to the following terms and conditions:

1. Tejon hereby makes the following covenants, representations and warranties as of the Effective Date of the Partial Assignment and underlying Nickel Agreement:

(a) Tejon has the authority to enter into the Partial Assignment and underlying Nickel Agreement, purchase the Assignment Water (as defined in the Partial Assignment), and to otherwise perform as set forth within those Agreements. The execution and delivery of the Partial Assignment has been validly authorized by all requisite action on the part of Tejon.

(b) Tejon's execution of the Partial Assignment and performance of its obligations hereunder will not violate any agreement, option, covenant, condition, obligation or undertaking of Tejon, nor to the best of Tejon's knowledge will it violate any law, ordinance, statute, order, or regulation.

(c) To the best of Tejon's actual knowledge, there is no action, suit, claim, cause of act ion, or proceeding at law or in equity (or by or before any governmental agency, official or authority of any local state or federal government) now pending, wherein an unfavorable decision, ruling or finding would: (i) affect the creation, organization, existence or powers of Tejon or the titles and powers of its Board members and officers to their respective offices; (ii) enjoin or restrain the approval and/or execution of the Partial Assignment and underlying Nickel Agreement, or (iii) in any way question or affect any of the rights, powers, duties or obligations of Tejon with respect to implementation of the Partial Assignment and underlying Nickel Agreement.

(d) No proceedings are pending or threatened in which Tejon may be adjudicated as bankrupt or discharged from any and all of its debts or obligations or granted an extension of time to pay its debts or a reorganization or readjustment of its debts.

(e) Tejon has the ability to perform all financial obligations to Nickel under this the Partial Assignment and underlying Nickel Agreement. Tejon further represents and warrants that as of the Execution Date of the Partial Assignment, it has a present net worth of at least $100 million, and to the best of Tejon's knowledge, it is not aware of any facts or circumstances that would lower its net worth below the $100 million amount in the foreseeable future.

2. Nickel agrees, subject to the terms and conditions set forth herein, that, pursuant to Section 10(b)(iv) of the Nickel Agreement, Tejon hereby succeeds to all rights and obligations of Pacific under the Nickel Agreement with respect to the Assignment Water and will be recognized by Nickel as possessing all such rights and obligations including, without limitation, the right under section 5 to extend the Transfer Term for an additional 35 years as to the Assignment Water.

3. Nickel hereby covenants, represents and warrants as follows:

(a) The current Transfer Term under the Nickel Agreement commenced on January 1, 2009 and expires on December 31, 2044, unless extended.

(b) To the best of Nickel's actual knowledge, neither Pacific nor DMBCII are in default of any provision of the Nickel Agreement, nor has an event occurred which, with notice and the passage of time, could be deemed a default by Pacific or DMBCII thereunder.

4. Each party consents to the exclusive jurisdiction of any state court located within the County of Kern, State of California or Federal Court located within the Eastern District of California in any dispute arising under or in connection with the Partial Assignment and underlying Nickel Agreement. Each party accepts for itself and in connection with its properties, generally and unconditionally, the exclusive jurisdiction of these courts and waives any defense of forum non conveniens.

5. This Consent document is not effective until DMB reimburses Nickel for the costs incurred to conduct due diligence associated with this Partial Assignment to Tejon.

TEJON RANCHCORP,
a California corporation

By: [signature]

Name: Gregory Tobias

Its: Vice President, General Counsel

Date: October 29, 2013

NICKEL FAMILY, LLC,
a California limited liability company

By: [signature]
James L. Nickel, President

Date: October 28, 2013

EXHIBIT A

NICKEL AGREEMENT

[See Attached]