Madera Water District

Madera Lake Pump & Pipeline Project

Draft Initial Study / Mitigated Negative Declaration

September 2022

Prepared for:
Madera Water District

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Table of Contents

List of Figures

List of Tables

Acronyms and Abbreviations

AB .... Assembly Bill
APE .... Area of Potential Effect
APN .... Assessor's Parcel Numbers
AQP .... Air Quality Plan
BAU .... business as usual
BPS .... Best Performance Standards
CALFIRE .... California Department of Forestry and Fire Protection
Cal/OSHA .... California Occupational Safety and Health Administration
CalEEMod .... California Emissions Estimator Modeling (software)
CalEPA .... California Environemntal Protection Agency
CARB .... California Air Resources Board
CAP .... Climate Action Plan
CCAA .... California Clean Air Act
CDFW .... California Department of Fish and Wildlife
CESA .... California Endangered Species Act
CGS .... California Geological Survey
COGs .... Councils of Government
County .... Madera County
CRHR .... California Reigster of Historical Resources
CTS .... California Tiger Salamander
CVP .... Central Valley Project
CWA .... Clean Water Act
DDW .... Division of Drinking Water
DOC .... California Department of Conservations
DOD .... Department of Defense
DOGGR .... Division of Oil, Gas and Geothermal Resources
District .... Madera Water District
DSOD .... Division of Safety of Dams
DMG .... Division of Mines and Geology
DTSC .... (California) Department of Toxic Substances Control
DWQ .... Department of Water Quality
DWR .... Department of Water Resources

EIR .... Environmental Impact Report
EPA .... Environmental Protection Agency
FEMA .... Federal Emergency Management Agency
FESA .... Federal Endangered Species Act
FHSZ .... Fire Hazard Severity Zone
FMBTA .... Federal Migratory Bird Treaty Act
FMMP .... Farmland Mapping and Monitoring Program
GAMAQI .... Guidelines for Assessing and Mitigating Air Quality Impacts
GHG .... Greenhouse Gas
GIS .... Geographic Information System
gpm .... gallons per minute
hp .... Horsepower
HUC .... Hydrologic Unit Code
IPaC .... U.S. Fish and Wildlife Service's Information for Planning and Consultation system
IS .... Initial Study
IS/MND .... Initial Study/Mitigated Negative Declaration
ITP .... Incidental Take Permit
km .... kilometers
LOA .... Live Oak Associates, Inc.
MID .... Madera Irrigation District
MMRP .... Mitigation Monitoring and Reporting Program
MND .... Mitigated Negative Declaration
MPO .... Metropolitan Pan Organizations
MRZ .... Mineral Resource Zones
MTCO2e .... Metric tons of carbon dioxide equivalent
MWD .... Madera Water District
NAAQS .... National Ambient Air Quality Standards
NAHC .... Native American Heritage Commission
ND .... Negative Declaration
NEPA .... National Environmental Policy Act
NHPA .... National Historic Preservation Act
NOx .... Nitrogen oxides
NPDES .... National Pollutant Discharge Elimination System
NRCS .... Natural Resources Conservation Service
NRHP .... National Register of Historic Places

O_3	Ozone
Pb	Lead
PG&E	Pacific Gas & Electric Company
PM_{10}	particulate matter 10 microns in size
$PM_{2.5}$	particulate matter 2.5 microns in size
ppb	parts per billion
ppm	parts per million
Project	Madera Lake Pump & Pipeline Project
Provost & Pritchard	Provost & Pritchard Consulting Group
QSD	Qualified SWPPP Developer
ROG	Reactive Organic Gases
RWQCB	Regional Water Quality Control Board
SGMA	Sustainable Groundwater Management Act
SHPO	(CA) State Historic Preservation Officer
SLIC	Spills-Leaks -Investigations-Cleanups
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SMARA	Surface Mining and Reclamation Act
SO_2	Sulfur Dioxide
SR	State Route
SSURGO	Soil Survey Geographic Database
STATSGO	State Soils Geographic Database
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	Toxic Air Contaminants
TNW	Traditional Navigable Waters
USACE	US Army Corps of Engineers
USBR	US Bureau of Reclamation
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	Underground Storage Tank
µg/m3	micrograms per cubic meter
WDRs	Waste Discharge Requirements

Chapter 1 Introduction

Provost & Pritchard Consulting Group (Provost & Pritchard) has prepared this Initial Study/Mitigated Negative Declaration (IS/MND) on behalf of Madera Water District (MWD or District) to address the environmental effects of the proposed Madera Lake Pump & Pipeline Project (Project). This document has been prepared in accordance with the California Environmental Quality Act (CEQA), Public Resources Code Section 21000 *et seq*. Madera Water District is the CEQA lead agency for this Project. This Project is being partially funded by a Sustainable Groundwater Management Act (SGMA) implementation grant that has been awarded to the Madera Water District Groundwater Sustainability Agency.

The site and the Project are described in detail in the **Chapter 2 Project Description**.

1.1 Regulatory Information

An Initial Study (IS) is a document prepared by a lead agency to determine whether a project may have a significant effect on the environment. In accordance with California Code of Regulations Title 14 (Chapter 3, Section 15000, *et seq*.)-- also known as the CEQA Guidelines--Section 15064 (a)(1) states that an environmental impact report (EIR) must be prepared if there is substantial evidence in light of the whole record that the proposed project under review may have a significant effect on the environment and should be further analyzed to determine mitigation measures or project alternatives that might avoid or reduce project impacts to less than significant levels. A negative declaration (ND) may be prepared instead if the lead agency finds that there is ***no*** substantial evidence in light of the whole record that the project may have a significant effect on the environment. An ND is a written statement describing the reasons why a proposed project, not otherwise exempt from CEQA, would not have a significant effect on the environment and, therefore, why it would not require the preparation of an EIR (CEQA Guidelines Section 15371). According to CEQA Guidelines Section 15070, a ND or *mitigated* ND shall be prepared for a project subject to CEQA when either:

a. The IS shows there is no substantial evidence, in light of the whole record before the agency, that the proposed project may have a significant effect on the environment, or

b. The IS identified potentially significant effects, but:

    1. Revisions in the project plans or proposals made by or agreed to by the applicant before the proposed IS/MND is released for public review would avoid the effects or mitigate the effects to a point where clearly no significant effects would occur is prepared, and

    2. There is no substantial evidence, in light of the whole record before the agency, that the proposed project *as revised* may have a significant effect on the environment.

1.2 Document Format

This IS/MND contains four chapters and four appendices, **Chapter 1 Introduction**, provides an overview of the Project and the CEQA process. **Chapter 2 Project Description**, provides a detailed description of Project components and objectives. **Chapter 3 Impact Analysis**, presents the CEQA checklist and environmental analysis for all impact areas, mandatory findings of significance, and feasible avoidance and mitigation measures. If the Project does not have the potential to significantly impact a given issue area, the relevant section provides a brief discussion of the reasons why no impacts are expected. If the Project could have a potentially significant impact on a resource, the issue area discussion provides a description of potential impacts, and appropriate mitigation measures and/or permit requirements that would reduce those impacts to a less than significant level. **Chapter 3** concludes with the Lead Agency's determination based upon this initial evaluation. **Chapter**

4 Mitigation Monitoring and Reporting Program (MMRP), provides the proposed mitigation measures, implementation timelines, and the entity/agency responsible for ensuring implementation.

The CalEEMod Output Files, Biological Report, Class III Inventory/Phase I Survey, and Natural Resources Conservation Service (NRCS) Soil Resource Report are provided as **Appendix A**, **Appendix B, Appendix C** and **Appendix D**, respectively, at the end of this document.

Chapter 2 Project Description

2.1 Project Background and Objectives

2.1.1 Project Title

Madera Lake Pump & Pipeline Project

2.1.2 Lead Agency Name and Address

Madera Water District
16943 Road 26, Suite 103
Madera, CA 93638

2.1.3 Contact Person and Phone Number

Lead Agency Contact
John Gies, District Manager
(559) 674-4944

CEQA Consultant
Provost & Pritchard Consulting Group
Amy Wilson Associate Planner
(559) 636-1166

2.1.4 Project Location

The Project is located in Madera, California, approximately 150 miles South of Sacramento and approximately 132 miles North of Bakersfield (see **Figure 2-1** and **Figure 2-2**). The proposed site of the Madera Lake Pipeline Project is located on Madera County Assessor's Parcel Numbers (APN) 031-151-010, 131-151-002, 031-191-001, 031-192-001, 031-151-013 and 031-151-014. The placement of proposed pipeline alignments, siphon, booster pump, sump, grower turnout and other related infrastructure and potential Area of Potential Effect (APE) (ground disturbance areas) are shown in **Figure 2-3** and consists of approximately 10.6-acres.

2.1.5 Latitude and Longitude

The centroid of the Project area is
Latitude: 37.01725 N
Longitude: -120.00183 W

2.1.6 General Plan Designation

Table 2-1. Madera County General Plan Designation

Project Area	General Plan Designation
Onsite	AE-Agriculture Exclusive, OS-Open Space
Adjacent Lands	AE-Agriculture Exclusive, OS-Open Space

2.1.7 Zoning

Table 2-2. Madera County Zone District

Project Area	Zone District
Onsite	ARE-40-Ag Rural Exclusive, 40-ac. minimum parcel size, POS-Public Open Space
Adjacent Lands	ARE-40-Ag Rural Exclusive, 40-ac. minimum parcel size, ARE-20-Ag Rural Exclusive, 20-ac. minimum parcel size, POS-Public Open Space

2.1.8 Description of Project

2.1.8.1 District Background

The Madera Water District (MWD or District) was formed in 1969 in Madera County, CA. Acting solely as an agricultural water district, MWD is responsible for providing irrigation water to approximately 3,700 acres. About 2,183 acres (net) of MWD were subordinately annexed into Madera Irrigation District (MID) in 1991 and the entire District is located within the Place of Use for water from the Central Valley Project. There is no residential water service provided by MWD at this time. MWD's boundary lies entirely within Madera County, north of the Fresno River and west of State Route (SR) 41.

2.1.8.2 Project Description

MWD proposes to develop a project that would allow water from MID or other sources to be brought into MWD through Madera Lake, which is owned and operated by MID. Madera Lake is supplied by an existing turnout off the Fresno River which is fed by the upstream watershed regulated by Hidden Dam on Hensley Lake and from water from the Madera Canal which originates from Millerton Lake. Water supplies could be from the Central Valley Project (CVP) Friant Division, Fresno River, or pre-1914 supplies. Water supplies without existing approvals would require future action for environmental compliance.

The Project entails the installation of a siphon in Madera Lake, siphon inlet channel, booster pump, pipelines, sump and grower turnout to obtain a flowrate of up to 8,000 gpm from Madera Lake, with up to 6,000 gpm delivered into MWD and up to 2,000 gpm delivered to the neighboring grower property from MID or other outside water supplies. Construction may be phased with the work within the Madera Lake property and sump at the siphon terminus being constructed first and the remaining facilities constructed later.

A 26 to 30-inch steel siphon pipe would be supported by a continuous concrete footing constructed on the lakebed below the normal water surface. A small inlet channel would be constructed in the lakebed to direct flows to the siphon at low lake levels. Once above the normal water surface, the steel pipeline would be installed on concrete saddles on the dam embankment side slopes, and buried through the top of the existing dam embankment/roadway. Upon reaching the existing dirt farm road west of Madera Lake, the siphon pipe would be buried three to four feet and then terminate at a sump with booster pump(s). Up to six orchard trees may require removal to facilitate construction of the sump/booster pump and associated electrical service.

The booster pump(s) at the siphon outlet sump will discharge into a 27-inch buried plastic pipeline that will then continue to traverse westerly between orchard rows for about 2,600 feet where the pipeline will continue in a northerly direction within the existing farm road for about 1,530 feet where a landowner turnout will be installed to serve orchard lands. After the landowner turnout, the pipeline will transition to a 24-inch buried plastic pipe and continue north another approximately 4,160 feet until terminating at a new booster pump station discharging into the existing MWD distribution system near existing MWD Well #3 and reservoir at the northwest corner of the intersection of Avenue 19-½ and Road 29-½ alignments.

Construction of the improvements may be in phases. The inlet channel, siphon and booster pump sump are anticipated to be constructed in the initial phase, whereas the pumps and pipeline may be constructed at a later date.

Figure 2-3 depicts the APE and layout and location for the construction and installation of the above described facilities.

2.1.8.2.1 Environmental Commitments Included in Project Proposal

Due to the potential of suitable grasslands habitat immediately around the lake for California Tiger Salamander (CTS), the following avoidance and mitigation measures will be incorporated into the Project:

- Obtain an Incidental Take Permit (ITP) from the California Department of Fish and Wildlife (CDFW), take authorization from the U.S. Fish and Wildlife Service (USFWS) if needed, and comply with all avoidance, minimization, and mitigation measures required by the ITP and USFWS take authorization;
- Minimize potential CTS burrow impacts in grassland habitat by installing the pipeline above ground on concrete saddles per Project design;
- Prohibit ground disturbance in all potential CTS breeding habitat; and
- Avoid an onsite ruderal pool as well as avoid work in grassland habitat after the first significant rainfall and until the onsite ruderal pool and two adjacent vernal pools are completely dry

2.1.8.3 Construction

Construction of the Project is anticipated to be completed in one or two phases, with a total five months of active construction time, occurring over a few years. Construction activities will include grading, site installation of the siphon in Madera Lake, booster pumps, pipeline, sump, grower turnout and all associated infrastructure. The inlet channel, siphon and booster pump sump is anticipated to be constructed in the initial phase, whereas the pumps and pipeline may be constructed at a later date. Construction equipment will likely include a post-hole type drill rig, excavators, backhoes, graders, skid steers, loaders, and hauling trucks.

Generally, construction will occur between the hours of 7 am and 7 pm, Monday through Friday, excluding holidays. Post-construction and pre-operation activities will include system testing, commissioning, and site clean-up. Construction will require temporary staging and storage of materials and equipment. There are three potential staging areas located onsite, approximately 1.5-acres in size each: 1) near the proposed sump/booster pump station; 2) northeast of the north/south pipeline alignment and the Avenue 19 alignment and 3) near the pipeline connection at the existing MWD Well No. 3 site. There is also a designated truck turn around area of about 1.1 acres to limit equipment operations on the lakebed (See **Figure 2-3**).

Although construction is not expected to generate hazardous waste, field equipment used during construction has the potential to contain various hazardous materials such as diesel fuel, hydraulic oil, grease, solvents, adhesives, paints, and other petroleum-based products.

2.1.8.4 Operation and Maintenance

Operation and maintenance of the new booster pump, pipelines, siphon, sump and grower turnout, will be done by the MWD's existing maintenance staff on an as needed and necessary basis.

2.1.9 Site and Surrounding Land Uses and Setting

The Project's pipeline alignments and related turnouts are surrounded by currently active agricultural lands on all four sides and Madera Lake lies to the east.

2.1.10 Other Public Agencies Whose Approval May Be Required

- Army Corp of Engineers
- California Department of Fish and Wildlife (CDFW) (for ITP and 1600 Agreement)
- County of Madera – Encroachment Permit and/or Building Permit (for electrical service)
- California Division of Safety of Dams
- State Water Resources Control Board – NPDES Construction General Permit
- State Water Resources Control Board – 401 Certification
- San Joaquin Valley Air Pollution Control District – rules and regulations (Regulation VIII, Rule 9510; Regulation IV, Rule 4702)
- United States Forestry and Wildlife Service (USFWS) – Environmental Site Assessment

2.1.11 Consultation with California Native American Tribes

Public Resources Code Section 21080.3.1, *et seq. (codification of Assembly Bill (AB) 52, 2013-14*) requires that a lead agency, within 14 days of determining that it will undertake a project, must notify in writing any California Native American Tribe traditionally and culturally affiliated with the geographic area of the project if that Tribe has previously requested notification about projects in that geographic area. The notice must briefly describe the project and inquire whether the Tribe wishes to initiate request formal consultation. Tribes have 30 days from receipt of notification to request formal consultation. The lead agency then has 30 days to initiate the consultation, which then continues until the parties come to an agreement regarding necessary mitigation or agree that no mitigation is needed, or one or both parties determine that negotiation occurred in good faith, but no agreement will be made.

Madera Water District has not received any written correspondence from a California native tribe pursuant to Public Resources Code Section 21080.3.1 requesting notification of this or any proposed District project.

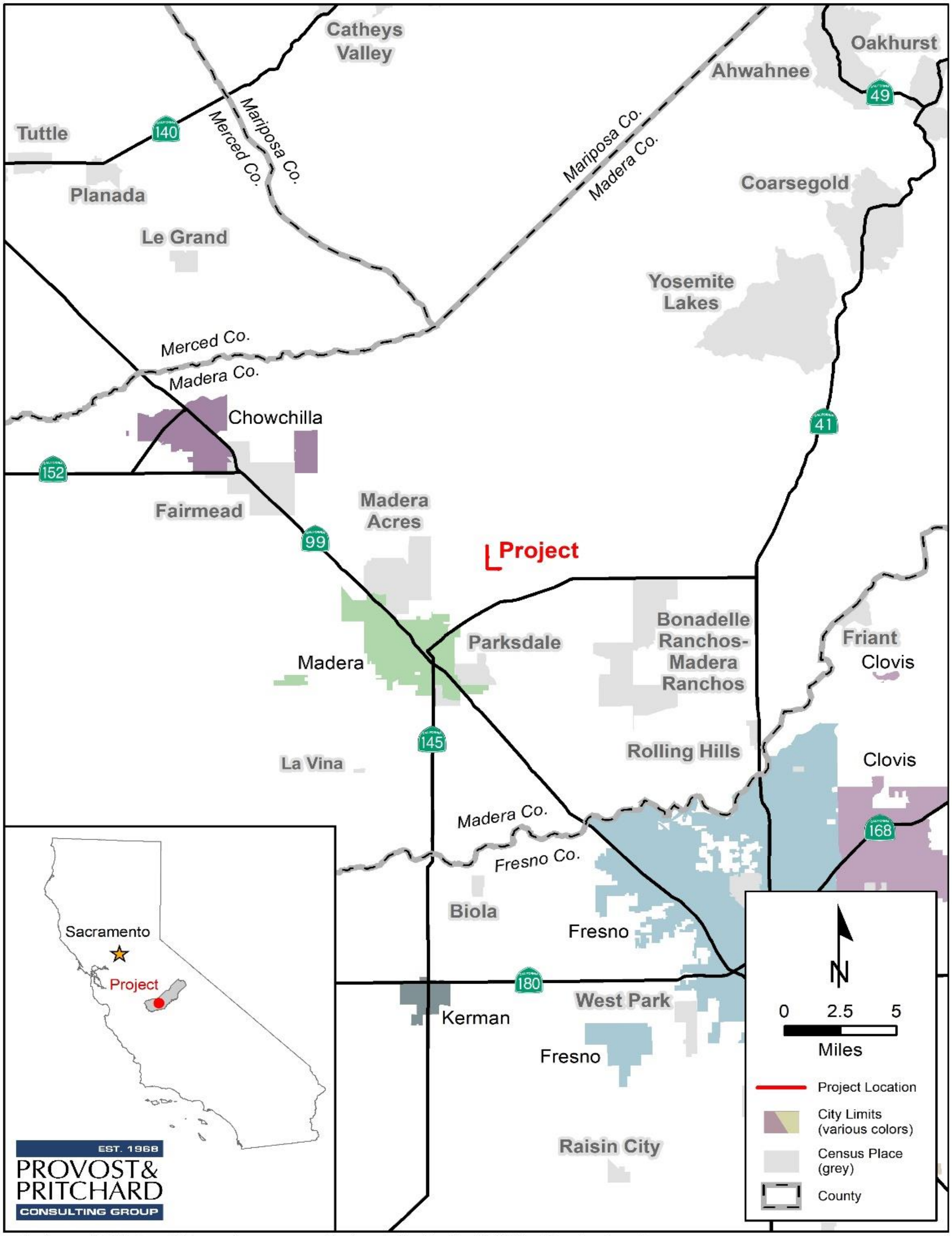

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Figure 2-1. Regional Location

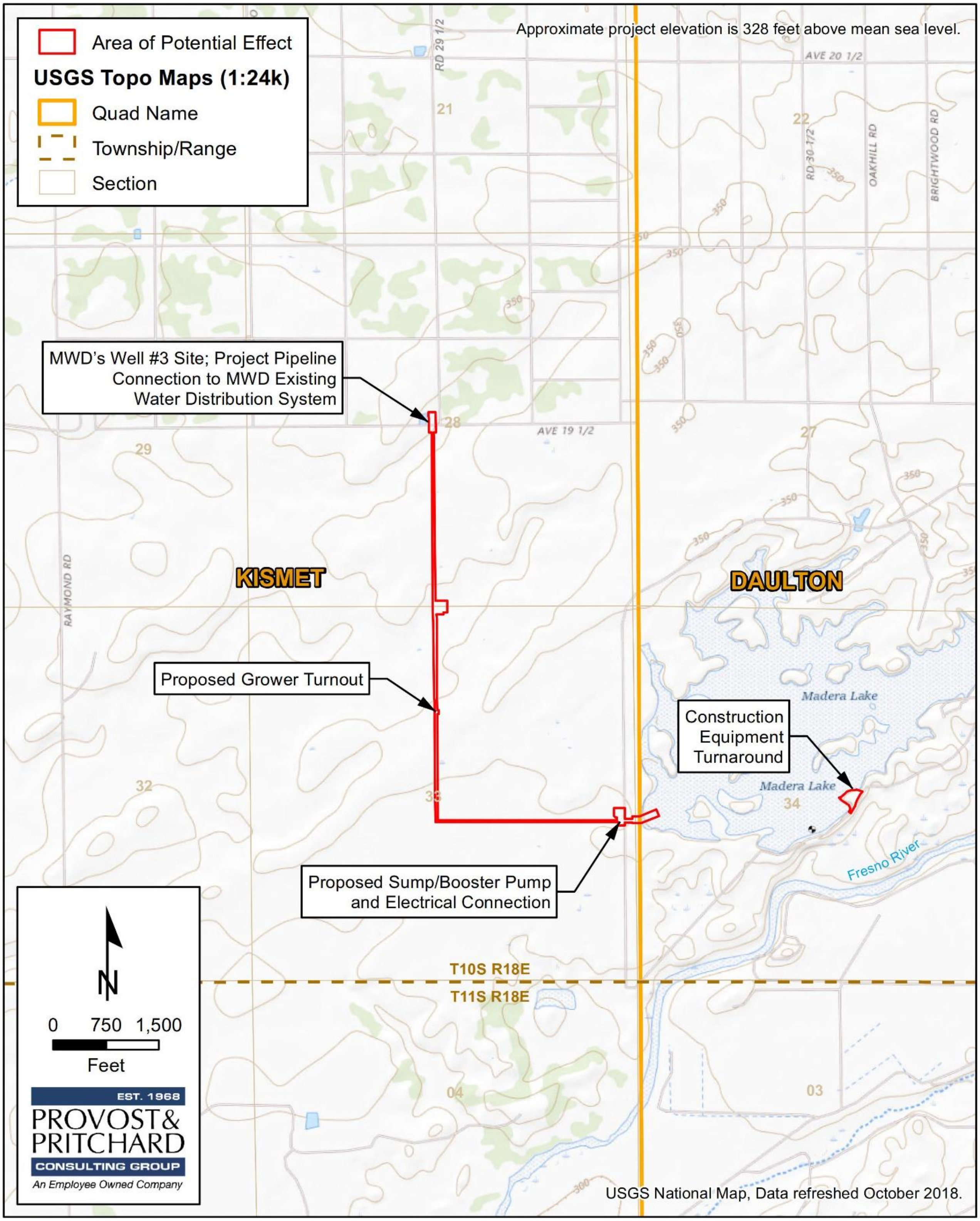

Figure 2-2. Topographic Quadrangle Map

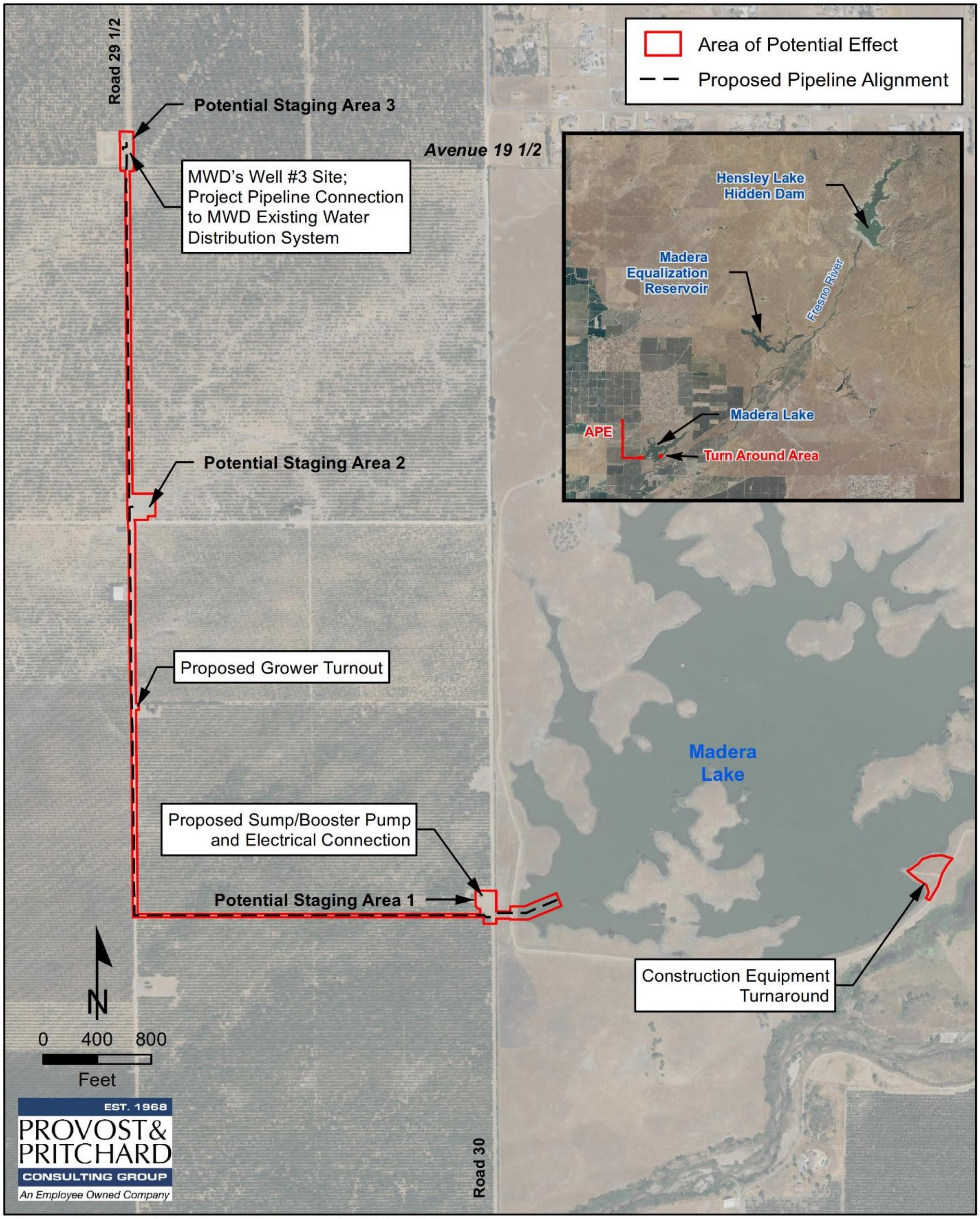

Figure 2-3. Area of Potential Effect Map

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Chapter 3 Impact Analysis

3.1 Environmental Factors Potentially Affected

As indicated by the discussions of existing and baseline conditions, and impact analyses that follow in this Chapter, environmental factors not checked below would have no impacts or less than significant impacts resulting from the project. Environmental factors that are. checked below would have potentially significant impacts resulting from the project. Mitigation measures are recommended for each of the potentially significant impacts that would reduce the impact to less than significant.

☐ Aesthetics	☐ Agriculture & Forestry Resources	☐ Air Quality
☒ Biological Resources	☒ Cultural Resources	☐ Energy
☐ Geology/Soils	☐ Greenhouse Gas Emissions	☐ Hazards & Hazardous Materials
☐ Hydrology/Water Quality	☐ Land Use/Planning	☐ Mineral Resources
☐ Noise	☐ Population/Housing	☐ Public Services
☐ Recreation	☐ Transportation	☒ Tribal Cultural Resources
☐ Utilities/Service Systems	☐ Wildfire	☐ Mandatory Findings of Significance

The analyses of environmental impacts here in **Chapter 3 Impact Analysis** are separated into the following categories:

Potentially Significant Impact. This category is applicable if there is substantial evidence that an effect may be significant, and no feasible mitigation measures can be identified to reduce impacts to a less than significant level. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

Less than Significant with Mitigation Incorporated. This category applies where the incorporation of mitigation measures would reduce an effect from a "Potentially Significant Impact" to a "Less than Significant Impact." The lead agency must describe the mitigation measure(s), and briefly explain how they would reduce the effect to a less than significant level (mitigation measures from earlier analyses may be cross-referenced).

Less than Significant Impact. This category is identified when the Project would result in impacts below the threshold of significance, and no mitigation measures are required.

No Impact. This category applies when a project would not create an impact in the specific environmental issue area. "No Impact" answers do not require a detailed explanation if they are adequately supported by the information sources cited by the lead agency, which show that the impact does not apply to the specific project (e.g. the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g. the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis)

3.2 Aesthetics

Table 3-1. Aesthetics Impacts

Aesthetics Impacts				
Except as provided in Public Resources Code Section 21099, would the project:	**Potentially Significant Impact**	**Less than Significant with Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

3.2.1 Environmental Setting and Baseline Conditions

The proposed Project is located in Madera County. Madera Lake borders the eastern portion of the APE. The approximately western half of Madera County lies on the floor of the San Joaquin Valley and the approximately eastern half includes the Sierra Nevada foothills and mountains. The county contains part of the Sierra and Inyo National Forests and Yosemite National Park. SR 99 provides the main north-south access through the valley portion of the county and is the principal transportation corridor connecting the county to points north and south.[1]

The north, west, east and south sides of the APE borders along agricultural farmland plots and also Madera Lake lies to the east. The booster pump(s) will discharge into a 27-inch buried plastic pipeline that goes through the orchard west of Madera Lake for about ½ mile and internal existing farm road on the Road 29 ½ alignment for about 1,530 feet at which point a turnout will be installed to serve the orchard, after which the pipeline will continue in the same alignment north for about another 4,160 feet. There will be no need to remove any orchard trees for the majority of the pipeline construction and its alignment will be laid and buried between the tree rows. However, construction of the new sump just west of Madera Lake will necessitate removal of approximately six orchard trees.

3.2.2 Impact Assessment

a) Would the project have a substantial adverse effect on a scenic vista?

Less than Significant Impact. Scenic features in the vicinity include the agricultural uses along all borders of the Project as well as the Madera Lake to the east. Any pipeline segments that are above ground, will be low in profile and be consistent in visual character with other agricultural equipment in the area that is used by

[1] Madera County General Plan Background Report, Chapter 1, Land Use Introduction, page 1-1, https://www.maderacounty.com/Home/ShowDocument?id=2852. Accessed April 18, 2020.

MWD or private landowners. Project site and it's components will not stand out from surroundings in any remarkable fashion. Impacts would be considered less than significant.

b) Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

No Impact. In Madera County, a portion of SR 180 has been officially identified by Caltrans as a "designated State Scenic Highway." However, Project activities would occur approximately 28-miles southwest and will not have the potential to affect the highway or any scenic views or resources associated with the highway. There would be no impact.

c) In non-urbanized areas, would the project substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public view are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

Less than Significant Impact. The Project site is surrounded by currently active agricultural farming plots on all four sides as well as Madera Lake to the east. The Project entails the installation of a siphon in Madera Lake, booster pumps and various sized pipeline segments to obtain surface water from Madera Lake, delivered into the MWD and delivered to the neighboring property from outside water supplies.

All the Project components are agricultural in nature and would be consistent with the visual character of the site and its surroundings. There will be no need to remove any orchard trees for the majority of the pipeline construction and its alignment will be laid and buried between the existing tree rows. However, construction of the new sump and booster pump just west of Madera Lake will necessitate removal of approximately six orchard trees and four trees along the Madera Lake westerly fence line hedgerow. Plus four trees along the Avenue 19 ½ fence line hedgerow. Additionally, the Project does not conflict with the zoning on or adjacent to the Project components. Impacts would be considered less than significant.

d) Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Less than Significant Impact. The Project area is surrounded by active agriculture farmland except to the east which is Madera Lake. Any lighting sources will be utilized during non-daylight hours to ensure safety of the public, maintenance personnel and the public water system; however, lighting would be directed downward to minimize light and glare on adjacent properties and roadways. Additional vehicular traffic after construction will be limited to maintenance and monitoring on an as-needed basis, which will be performed during daylight hours, except in an unforeseen emergency situation. Therefore, the Project will not create a new source of substantial light or glare that would adversely affect day or nighttime views in the area or be inconsistent with existing conditions. Any impacts due to light or glare would be considered less than significant.

3.3 Agriculture and Forestry Resources

Table 3-2. Agriculture and Forest Impacts

Agriculture and Forest Impacts				
Would the project:	**Potentially Significant Impact**	**Less than Significant With Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

3.3.1 Environmental Setting and Baseline Conditions

The Project is located in the California's San Joaquin Valley in Madera County. Madera County is located within California's Central San Joaquin Valley and agricultural heartland. For crop year 2017-2018, Madera County was ranked fourth in the San Joaquin Valley for the gross value of agricultural production by commodity in the annual market value of farm products.[2]

The Project area is surrounded by lands currently planted agricultural farmland plots and Madera Lake lies to the east. The Project site does not include nor is it near any forestry or timberland areas.

Farmland Mapping and Monitoring Program (FMMP): The FMMP produces maps and statistical data used for analyzing impacts to California's agricultural resources. Agricultural land is rated according to soil quality and irrigation status; the best quality land is called Prime Farmland. The maps are updated every two years with the use of a computer mapping system, aerial imagery, public review, and field reconnaissance. The California DOC's 2012 FMMP is a non-regulatory program that produces "Important Farmland" maps and statistical data

[2] California Department of Food and Agriculture, California County Agricultural Commissioners' Reports Crop Year 2017-2018. 2018cropyearcactb00.pdf (usda.gov) Accessed July, 2021.

used for analyzing impacts on California's agricultural resources. The Important Farmland maps identify eight land use categories, summarized below[3]:

• PRIME FARMLAND (P): Farmland with the best combination of physical and chemical features able to sustain long term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

• FARMLAND OF STATEWIDE IMPORTANCE (S): Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

• UNIQUE FARMLAND (U): Farmland of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated but may include non- irrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.

• FARMLAND OF LOCAL IMPORTANCE (L): Land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee.

• GRAZING LAND (G): Land on which the existing vegetation is suited to the grazing of livestock. The minimum mapping unit for Grazing Land is 40 acres.

• URBAN AND BUILT-UP LAND (D): Land occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, institutional, public administrative purposes, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes.

• OTHER LAND (X): Land not included in any other mapping category. Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry or aquaculture facilities; strip mines, borrow pits; and water bodies smaller than 40 acres. Vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 acres is mapped as Other Land.

•WATER (W): Perennial water bodies with an extent of at least 40 acres.

As demonstrated in **Figure 3-1**, the FMMP for Madera County designates the site of the Project as Prime Farmland, Unique Farmland and Farmland of State Importance.

Williamson Act: The Williamson Act, also known as the California Land Conservation Act of 1965, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. In return, landowners receive property tax assessments which are much lower than normal because they are based upon farming and open space uses as opposed to full market value.

The Department of Conservation assists all levels of government, and landowners in the interpretation of the Williamson Act related government code. The Department also researches, publishes and disseminates information regarding the policies, purposes, procedures, and administration of the Williamson Act according

[3] California Department of Conservation, Important Farmland Categories. https://www.conservation.ca.gov/dlrp/fmmp/Pages/Important-Farmland-Categories.aspx. Accessed April 18, 2020.

to government code. Participating counties and cities are required to establish their own rules and regulations regarding implementation of the Act within their jurisdiction. These rules include but are not limited to: enrollment guidelines, acreage minimums, enforcement procedures, allowable uses, and compatible uses.

There are two onsite parcels currently under a Williamson Act contract: APN 031-151-002 and 031-191-001 as illustrated in **Figure 3-1**. APN 031-151-013 is also currently under a Williamson Act contract. This parcel is located adjacent to the Well No. 3 site where the pipeline connection to MWD existing water distribution system will be located (See **Figure 3-1**).

3.3.2 Impact Assessment

a) Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

No Impact. As demonstrated in **Figure 3-1**, the FMMP for Madera County designates the Project site of as Farmland of Local Importance, Unique Farmland, Prime Farmland and Native Vegetation (the area of the Project leading into Madera Lake). Implementation of the Project will not result in the conversion of any farmland to a non-agricultural use. There will be no need to remove any orchard trees for the majority of the pipeline construction and its alignment. The pipeline will be laid and buried between the tree rows. However, construction of the new sump just west of Madera Lake will necessitate removal of approximately six orchard trees, thus converting farmland to non-agricultural use will not occur as pumps such as these are considered consistent with an agricultural use. There would be no impact.

b) Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

No Impact. There are two parcels covered under Williamson Act contract that extend into the Project site: APN's 031-151-002 and 031-191-001 as well as one parcel adjacent to the Project area. Williamson Act lands are shown in **Figure 3-1** and are all currently in agricultural use. The Project involves development that would allow water from MID or other sources to be brought into MWD through Madera Lake for irrigation purposes. The Project, therefore, is intended to support continued agricultural cultivation consistent with existing zoning and does not propose or necessitate a change to the current zoning or Williamson Act contracts. Implementation of the Project would not result in a conflict with existing zoning for agricultural use, nor will it conflict with Williamson Act contracts of agricultural uses in the vicinity. There would be no impact.

c) Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

d) Would the project result in the loss of forest land or conversion of forest land to non-forest use?

No Impact. There are no forest lands or timberlands within the Project site or vicinity. There would be no impact.

e) Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

No Impact. As discussed above in Impact Assessments a-d, the Project involves the construction and installation of a new booster pump, pipelines, siphon, sump and grower turnout that would allow water from MID or other sources to be brought into MWD through Madera Lake to be used for purposes of continued irrigation of agricultural lands. The Project does not propose a change in land use from agriculture use to non-agriculture use and would not result in land use conversion of forest land, either directly or indirectly. There would be no impact.

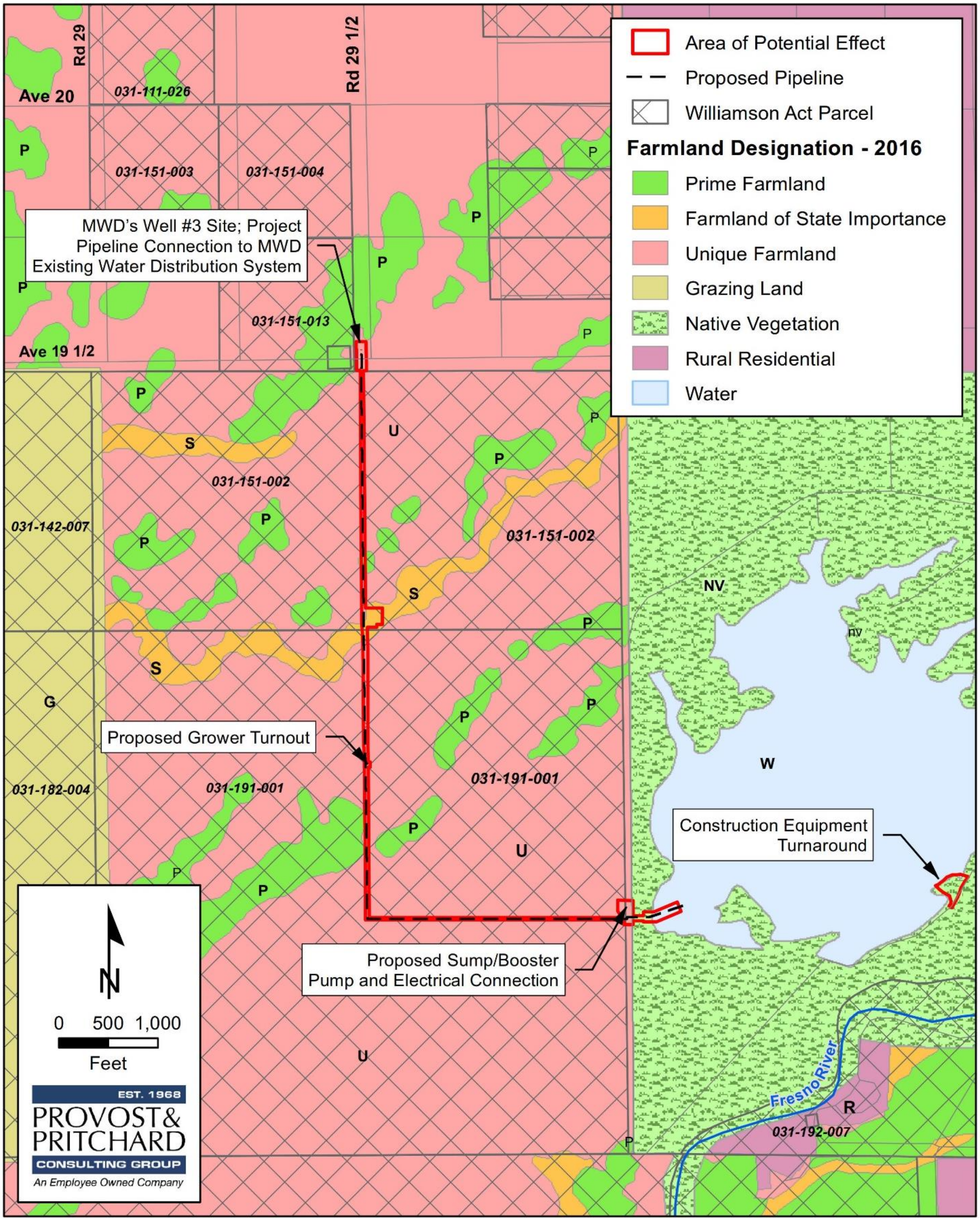

Figure 3-1. Farmland Designation Map

3.4 Air Quality

Table 3-3. Air Quality Impacts

Air Quality Impacts					
Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b)	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☐	☐	☒	☐
c)	Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
d)	Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☐	☒

3.4.1 Environmental Setting and Baseline Conditions

The Project is located in the San Joaquin Valley Air Basin (SJVAB or air basin). The San Joaquin Valley Air Pollution Control District (SJVAPCD) provides Guidelines for Assessing and Mitigating Air Quality Impacts (GAMAQI) for quantification of emissions and evaluation of potential impacts to air resources[4] and Guidance for Land-Use Agencies in addressing greenhouse gas (GHG) Emission Impacts for New Projects under CEQA.[5]

3.4.1.1 Regulatory Attainment Designations

Under the California Clean Air Act (CCAA), the CARB is required to designate areas of the State as attainment, nonattainment, or unclassified with respect to applicable standards. An "attainment" designation for an area signifies that pollutant concentrations did not violate the applicable standard in that area. A "nonattainment" designation indicates that a pollutant concentration violated the applicable standard at least once, excluding those occasions when a violation was caused by an exceptional event, as defined in the criteria. Depending on the frequency and severity of pollutants exceeding applicable standards, the nonattainment designation can be further classified as serious nonattainment, severe nonattainment, or extreme nonattainment, with extreme nonattainment being the most severe of the classifications. An "unclassified" designation signifies that the data does not support either an attainment or nonattainment designation. The CCAA divides districts into moderate, serious, and severe air pollution categories, with increasingly stringent control requirements mandated for each category.

The EPA designates areas for ozone, CO, and NO_2 as "does not meet the primary standards," "cannot be classified," or "better than national standards." For SO_2, areas are designated as "does not meet the primary standards," "does not meet the secondary standards," "cannot be classified," or "better than national

[4] SJVAPCD GAMAQI https://www.valleyair.org/transportation/GAMAQI-2015/FINAL-DRAFT-GAMAQI.PDF. Accessed September 2020.
[5] Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA. http://www.valleyair.org/Programs/CCAP/12-17-09/3%20CCAP%20-%20FINAL%20LU%20Guidance%20-%20Dec%2017%202009.pdf Accessed September 2020.

standards." However, the CARB terminology of attainment, nonattainment, and unclassified is more frequently used. The EPA uses the same sub-categories for nonattainment status: serious, severe, and extreme. In 1991, EPA assigned new nonattainment designations to areas that had previously been classified as Group I, II, or III for PM_{10} based on the likelihood that they would violate national PM_{10} standards. All other areas are designated "unclassified."

The State and national attainment status designations pertaining to the SJVAB are summarized in **Table 3-4** below. The SJVAB is currently designated as a nonattainment area with respect to the State $PM1_0$ standard, ozone, and $PM_{2.5}$ standards. The SJVAB is designated nonattainment for the NAAQS 8-hour ozone and $PM_{2.5}$ standards. On September 25, 2008, the EPA re-designated the San Joaquin Valley to attainment status for the PM_{10} NAAQS and approved the PM_{10} Maintenance Plan.

Table 3-4. Summary of Ambient Air Quality Standards and Attainment Designation

Pollutant	Averaging Time	California Standards*		National Standards*	
		Concentration*	Attainment Status	Primary	Attainment Status
Ozone (O_3)	1-hour	0.09 ppm	Nonattainment/ Severe	–	No Federal Standard
	8-hour	0.070 ppm	Nonattainment	0.075 ppm	Nonattainment (Extreme)**
Particulate Matter (PM_{10})	AAM	20 µg/m^3	Nonattainment	–	Attainment
	24-hour	50 µg/m^3		150 µg/m^3	
Fine Particulate Matter ($PM_{2.5}$)	AAM	12 µg/m^3	Nonattainment	12 µg/m^3	Nonattainment
	24-hour	No Standard		35 µg/m^3	
Carbon Monoxide (CO)	1-hour	20 ppm	Attainment/ Unclassified	35 ppm	Attainment/ Unclassified
	8-hour	9 ppm		9 ppm	
	8-hour (Lake Tahoe)	6 ppm		–	
Nitrogen Dioxide (NO_2)	AAM	0.030 ppm	Attainment	53 ppb	Attainment/ Unclassified
	1-hour	0.18 ppm		100 ppb	
Sulfur Dioxide (SO_2)	AAM	–	Attainment	--	Attainment/ Unclassified
	24-hour	0.04 ppm		--	
	3-hour	–		0.5 ppm	
	1-hour	0.25 ppm		75 ppb	
Lead (Pb)	30-day Average	1.5 µg/m^3	Attainment	–	No Designation/ Classification
	Calendar Quarter	–		--	
	Rolling 3-Month Average	–		0.15 µg/m^3	
Sulfates (SO_4)	24-hour	25 µg/m^3	Attainment	No Federal Standards	
Hydrogen Sulfide (H_2S)	1-hour	0.03 ppm (42 µg/m^3)	Unclassified		
Vinyl Chloride (C_2H_3Cl)	24-hour	0.01 ppm (26 µg/m^3)	Attainment		
Visibility-Reducing Particle Matter	8-hour	Extinction coefficient: 0.23/km-visibility of 10 miles or more due to particles when the relative humidity is less than 70%.	Unclassified		

** For more information on standards visit: https://ww3.arb.ca.gov/research/aaqs/aaqs2.pdf*
*** No Federal 1-hour standard. Reclassified extreme nonattainment for the Federal 8-hour standard September 2020.*
****Secondary Standard*
Source: CARB 2015; SJVAPCD 2015

3.4.2 Methodology of Determining the Significance of Air Quality Impacts

Conclusions in this Air Quality Impact Assessment rely on model calculations (CalEEMod version 2016.3.2), and information found in the Air Quality and Greenhouse Gas Emissions Evaluation Report (**Appendix A**). The sections below detail these conclusions and recommendations and utilize its conclusions in the impact determinations.

To assist local jurisdictions in the evaluation of air quality impacts, the SJVAPCD published the GAMAQI. This guidance document includes recommended thresholds of significance to be used for the evaluation of short-term construction, long-term operational, odor, toxic air contaminant, and cumulative air quality impacts. Accordingly, the SJVAPCD-recommended thresholds of significance are used to determine whether implementation of the Project would result in a significant air quality impact. Projects that exceed these recommended thresholds would be considered to have a potentially significant impact to human health and welfare. The thresholds of significance are included in **Table 3-7** through **Table 3-8** to provide for a comparative significance determination.

Assessment of the significance of project air quality impacts may be considered on a regional or localized level. Determination of project impacts on achieving the goal of air quality plans and evaluating impacts related to emissions of criteria pollutants are considered on both regional and localized levels in this analysis. Evaluation of impacts to sensitive receptors considers the project's localized criteria pollutant emissions in this analysis. Sources of the project's localized criteria pollutant emissions would include: reactive organic gases (ROG), Nitrogen oxides (NO_x), $PM_{2.5}$, PM_{10}, CO, NO_2, and Toxic Air Contaminants (TACs) which include acetaldehyde, benzene, 1.3 butadiene, carbon tetrachloride, hexavalent chromium, paradichlorobenzene, formaldehyde, methylene chloride, perchloroethylene, and diesel particulate matter a complex mixture of substances.

3.4.2.1 Short-Term Construction-Generated Emissions

Short-term construction emissions associated with the Project were estimated using CalEEMod. The emissions modeling includes emissions generated by construction and grading equipment most commonly associated with the site work, equipment delivery, and vehicle, equipment, and worker fuel usage. Emissions were quantified based on anticipated construction schedules and construction equipment requirements that would occur over approximately five months. While the Project will likely be completed in phases over multiple years, the total active construction time will be about five months. All remaining assumptions were based on the default parameters contained in the model. Modeling assumptions and output files are included in **Appendix A.**

The SJVAPCD is responsible for controlling emissions primarily from stationary sources. However, the SJVAPCD also coordinates with the APCD's eight county Councils of Government (COGs) or Metropolitan Planning Organizations (MPOs) that are responsible for regional transportation planning and funding programs. The COG and MPO Transportation Planning Programs are used by SJVAPCD in its responsibilities in developing, updating, and implementing air quality attainment plans for the air basin. The SJVAPCD has adopted ozone plans and particulate matter plans for purposes of controlling harmful emissions and achieving attainment of state and national attainment standards. A project that would exceed established thresholds for criteria pollutants would be considered to have a significant impact on the implementation of air quality plans and would also constitute a cumulatively considerable net increase of criteria pollutants for which the air basin is in non-attainment.

Construction of the Project is expected to begin after Project approval with full buildout completed in 2022 or later. The results of the emissions modeling for the Project construction are presented in **Table 3-5.**

Table 3-5 Short-Term - Construction-Generated Emissions of Criteria Air Pollutants

Year	Annual Emissions (Tons/Year)				
	ROG	NO_X	CO	PM_{10}	$PM_{2.5}$
2022	0.1	1.1	0.8	0.3	0.2
Maximum Annual Proposed Project Emissions:	**0.1**	**1.1**	**0.8**	**0.3**	**0.2**
SJVAPCD Significance Thresholds:	***10***	***10***	***100***	***15***	***15***
Exceed SJVAPCD Thresholds?	***No***	***No***	***No***	***No***	***No***

3.4.2.2 Long-Term - Operational Emissions

The unmitigated long-term operational emissions for the Project are listed in **Table 3-6**. Operational emissions would occur over the lifetime of the Project and result from two main Project-specific sources: maintenance, and motor vehicles (operations and maintenance crew) usage categorized as "Mobile" sources in the table. Mobile source emissions would be from any vehicle trips to the site for operations and maintenance. "Area" source emissions are defined as emissions resulting from landscaping and painting. "Energy" source emissions from this type of project would be from things on the site that require additional power such as the new booster pumps and water facility equipment, however emissions generated from these things are typically greenhouse gas emissions (GHG) and are addressed in impact **Section 3.9**. Completion of the Project is expected in 2022 or later and was used as the Project buildout modeling year as a conservative assumption. The SJVAPCD considers construction and operational assumptions separately when making significance determinations. Modeling assumptions and output files are included in **Appendix A**.

Table 3-6. Unmitigated Long-Term Operational Emissions

Source	Annual Emissions (Tons/Year)				
	ROG	NO_X	CO	PM_{10}	$PM_{2.5}$
Area	0.00	0.00	<0.01	0.00	0.00
Energy:	0.00	*0.00*	*0.00*	0.00	0.00
Mobile	<0.01	<0.01	<0.01	<0.01	<0.01
SJVAPCD Significance Thresholds:	***10***	***10***	***100***	***15***	***15***
Exceed SJVAPCD Thresholds?	***No***	***No***	***No***	***No***	***No***

3.4.3 Screening Thresholds for Determining Impacts to Sensitive Receptors

Impacts to sensitive receptors would occur primarily during Project construction. Construction activities could produce short-term emissions that have the potential in large concentrations to contribute to cancer risk over a 70-year exposure period. The Air Quality and GHG reports (**Appendix A**) provide technical information on the types of pollutants that have the potential to affect sensitive receptors.

The SJVAB includes screening thresholds for identifying projects that need detailed analysis for localized impacts. Projects with on-site emission increases from construction activities that exceed the 100 pounds per day screening level of any criteria pollutant after compliance with Rule 9510 and implementation of all applicable mitigation measures would require preparation of an ambient air quality analysis. The criteria pollutants of concern are NO_x, CO, PM_{10}, and $PM_{2.5}$. There is no localized emission standard for ROG and most types of ROG are not toxic and have no health-based standard, however, ROG was included for informational purposes only.

Table 3-7 lists the maximum daily air pollutant emissions generated by the Project during construction.

Table 3-7. Maximum Daily Air Pollutant Emissions During Construction

Maximum Daily Emissions by Year	Emissions (Pounds/Daily)				
	ROG	NO_X	CO	PM_{10}	$PM_{2.5}$
Construction 2021	4	42	22	20	12
Maximum Daily Proposed Project Emissions:	**4**	**42**	**22**	**20**	**12**
SJVAPCD Screening Thresholds	***100***	***100***	***100***	***100***	***100***

Operational emission would begin to accrue upon completion of the project. The Project is anticipated to be started in 2022 and completed within a few years. Table 3-8 lists the maximum daily air pollutant emissions generated by the Project during its operation.

Table 3-8. Maximum Daily Air Pollutant Emissions During Operation

Maximum Daily Emissions	Emissions (Pounds/Daily)				
	ROG	NO_X	CO	PM_{10}	$PM_{2.5}$
Area	0.2	<0.01	<0.01	0.00	<0.01
Energy	0.00	0.00	0.00	0.00	0.00
Mobile	<0.01	0.012	<0.01	<0.01	<0.01
Total Daily Emissions	**0.2**	**0.012**	**0.010**	**<0.01**	**<0.01**
SJVAPCD Screening Thresholds	***100***	***100***	***100***	***100***	***100***
Exceed SJVAPCD Thresholds?	***No***	***No***	***No***	***No***	***No***

Table 3-7 and Table 3-8 demonstrate the Project's impacts as evaluated against SJVAPCD screening thresholds for criteria pollutant emissions used to determine significance in accordance with health-based standards would not exceed and would be considerably below the significance thresholds

3.4.4 Impact Assessment

a) Would the project conflict with or obstruct implementation of the applicable air quality plan?

Less than Significant Impact. The CEQA Guidelines indicate that a significant impact would occur if the Project would conflict with or obstruct implementation of the applicable air quality plan. The GAMAQI does not provide specific guidance on analyzing conformity with the Air Quality Plan (AQP). Therefore, the Air Quality and GHG report (Appendix A) assumed the following criteria for determining Project consistency with the current AQPs:

1. Will the project result in an increase in the frequency or severity of existing air quality violations or cause or contribute to new violations, or delay timely attainment of air quality standards or the interim emission reductions specified in the AQPs?

   Whether this criterion is met is determined by comparison of Project emissions to the regional and localized thresholds identified by the SJVAPCD for regional and local air pollutants.

2. Will the project comply with applicable control measures set forth in the AQPs?

The primary control measures applicable to development projects in the SJVAPCD is the required compliance with *Regulation VIII-Fugitive PM_{10} Prohibitions* and *Rule 9510-Indirect Source Review*.

Regional air quality impacts and attainment of standards are the result of cumulative impacts of all emission sources within the air basin. Individual projects are generally not large enough to contribute measurably to an existing violation of air quality standards. Therefore, the cumulative impact of the Project is important because it is based on its cumulative contribution combined with one or more other closely related past, present, and reasonably foreseeable probably future projects emitting similar emissions. Because of the region's non-attainment status for ozone, $PM_{2.5}$, and PM_{10}, if Project generated emission of either of the ozone precursor pollutants ROG, NO_x, PM_{10}, or $PM_{2.5}$ would exceed the SJVAPCD's significance thresholds, then the Project would be considered to contribute to violations of the applicable standards and conflict with the attainment plans. As demonstrated in **Table 3-5** for construction-generated emissions, and in **Table 3-6**, operational emissions of criteria pollutants would not exceed the SJVAPCD's significance thresholds. Therefore, the Project will not contribute to air quality violations in conflict with attainment plans.

As stated in No. 2 above, the AQP contains a number of control measures, including *Regulation VIII-Fugitive PM_{10} Prohibitions* and *Rule 9510-Indirect Source Review* which are applicable to the Project. Both of these are adopted by the SJVAPCD and constitute enforceable requirements with which the Project must comply. The Project is expected to comply with all applicable SJVAPCD rules and regulations; therefore, the Project complies with the criterion and would not conflict with or obstruct implementation of the applicable air quality attainment plans and the impact would be less than significant.

b) Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?

Less than Significant Impact. To result in a less than significant impact, the following criteria must be true:

1. Regional analysis: emission of non-attainment pollutants must be below the SJVAPCD's regional significance thresholds.
   This is an approach recommended by the SJVAPCD in its GAMAQI.

2. Summary of projections: the project must be consistent with current air quality attainment plans including control measures and regulations.
   This is an approach consistent with Section 15130(b) of the CEQA Guidelines.

3. Cumulative health impacts: the project must result in less than significant cumulative health effects from the non-attainment pollutants.

This approach correlates the significance of the regional analysis with health effects, consistent with the court decision in *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1219-20.

As discussed in impact assessment a) above, Project generated emissions are below the SJVAPCD's regional significance thresholds and the Project is consistent with current air quality attainment plans including control measures and regulations.

With respect to cumulative health impacts, the air basin is in non-attainment for ozone, $PM_{2.5}$, and PM_{10} (state only), which means that the background levels of those pollutants are at times higher than the ambient air quality standards. The air quality standards were set to protect public health, including the health of sensitive individuals (such as children, the elderly, and persons with pre-existing respiratory or cardiovascular illnesses (the infirm)). Therefore, when the concentration of those pollutants exceeds the standard, it is likely that some sensitive individuals in the population would experience adverse health effects. Since the air basin is already in non-attainment, it is considered to have an existing significant cumulative health impact without the Project.

The issue is whether the Project's contribution to the existing violation of air quality standards is cumulatively considerable.

The SJVAPCD through its GAMAQI has determined that projects that exceed regional thresholds would have a cumulatively considerable health impact. As demonstrated in **Table 3-7** and **Table 3-8,** the Project would not exceed the SJVAPCD's significance thresholds and its cumulatively considerable impacts would be less than significant.

c) Would the project expose sensitive receptors to substantial pollutant concentrations?

Less than Significant Impact. Sensitive receptors are those who are sensitive to air pollution, including children, the elderly, and the infirm. The SJVAPCD considers a sensitive receptor a location that houses or attracts children, the elderly, people with illnesses, or others who are especially sensitive to the effects of air pollutants. Examples of sensitive receptors include hospitals, residences, convalescent facilities, and schools. The closest existing off-site sensitive receptors are single-family homes located on adjacent properties, approximately ½ miles southeast and Berenda Elementary School located 2.6 miles west of the APE.

As demonstrated in **Table 3-7** and **Table 3-8**, the Project would not exceed the SJVAPCD's thresholds established in accordance with health-based standard for determining significance of criteria pollutant emissions. Therefore, in accordance with these standards, the Project would have a less than significant impact related to exposure of sensitive receptors to substantial pollutant concentrations.

d) Would the project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

No Impact. Land uses that are typically identified as sources of objectionable odors include landfills, transfer stations, sewage treatment plants, wastewater pump stations, composting facilities, feed lots, coffee roaster, asphalt batch plants, and rendering plants, among other uses. The Project does not include any of these activities or land uses. The Project would therefore have no impact with respect to generation of emissions leading to odors or other adverse or objectionable emissions.

3.5 Biological Resources

Table 3-9. Biological Resources Impacts

Biological Resources Impacts				
Would the project:	**Potentially Significant Impact**	**Less than Significant with Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

3.5.1 Environmental Setting and Baseline Conditions

The geographical and biological setting of the Project provides the context for analyzing potential impacts to biological resources from future site development. The Project APE is located within a region of Madera County containing a matrix of agricultural, residential, and undeveloped lands at the eastern edge of the San Joaquin Valley, just south and west of the lowest foothills of the Sierra Nevada. The site consists of gently undulating to flat terrain with a median elevation of approximately 320 feet National Geodetic Vertical Datum (NGVD).

The principal drainage of the region is the Fresno River, which originates in the mountains south of Yosemite National Park. The river is dammed at Hensley Lake, following which it continues southwest through the Project vicinity, passing within 0.4 mile south of the APE at its closest point. It terminates at the San Joaquin River east of Los Banos, California. The Fresno River in the vicinity of the Project carries seasonal flows regulated at Hensley Lake. (See **Appendix B**)

Average annual precipitation in the general vicinity is approximately 12 inches, 85% of which falls between the months of October and March. Stormwater runoff readily infiltrates into the soils, but when field capacity has been reached or bedrock or an impervious hardpan layer encountered, surface water either enters swales and ephemeral drainages or perches on impervious soil layers to fill shallow topographic depressions creating what are commonly referred to as vernal pools. (See **Appendix B**)

The site itself primarily consists of orchard roads and other disturbed areas, with a portion of the proposed pipeline traversing non-native grassland habitat utilized for cattle grazing and extending into Madera Lake. (See **Appendix B**)

3.5.2 Methodology

A reconnaissance-level biological and aquatic resources field surveys were conducted on May 1, 2020, by Live Oak Associates, Inc. (LOA) (see **Appendix B** and **E,** respectively). The biological survey consisted of walking and driving through the APE while identifying principal land uses and biotic habitats, identifying plant and animal species encountered, and assessing the suitability of the habitats within the APE for special status species. In addition, all open rodent burrows in grassland habitats of the site were mapped, and an aquatic resources delineation was conducted. A previous survey of other potential project alternatives near and including a portion of the current Project APE was conducted by LOA on September 27, 2017.

The aquatic resources survey used GIS files of the proposed project APE projected over aerial photography and a USGS topographic map to guide the survey effort. The boundaries of potential jurisdictional waters were mapped using an EOS Arrow 100 GPS receiver paired with a mobile device running the ESRI Collector app. involved examination for aquatic features including gathering of vegetation, soils, and hydrology data at five sampling locations within and adjacent to such features. Aquatic resources delineated on the site included Madera Lake, a ruderal pool, and an ephemeral channel. Aquatic resources were delineated based on the boundaries of ordinary highwater indicators. Aquatic resource boundaries mapped during LOA's field investigation total approximately 29,525 sq. ft. or 0.677 acres.

LOA conducted an analysis of potential Project impacts based on the known and potential biotic and aquatic resources of the Project APE. Sources of information used in the preparation of this analysis included: (1) the California Natural Diversity Data Base (CDFW 2020), (2) the Online Inventory of Rare and Endangered Vascular Plants of California (CNPS 2020), and (3) manuals, reports, and references related to plants and animals of the San Joaquin Valley region. The California Natural Diversity Data Base (CNDDB) was queried for special status species occurrences in the nine U.S.G.S. 7.5-minute quadrangles containing and surrounding the APE. These quads included Le Grand, Berenda, Bonita Ranch, Daulton, Gregg, Madera, Kismet, Raynor Creek, and Raymond. These species, and their potential to occur on the APE, are listed in **Table 3-10** and **Table 3-11** on the following pages and more detail can be found in **Appendix B**. Sources of information used in the aquatic resources delineation included (1) United States Army Corps of Engineers (USACE) and (2) Wetland Training Institute, Inc.'s aquatic resources manuals, reports, guides and standards (See **Appendix E**).

LOA's field investigation did not include focused surveys for special status species. The field survey was sufficient to assess the possible biological and aquatic impacts associated with development of the APE.

Table 3-10. List of Special Status Animals with Potential to Occur Onsite and/or in the Vicinity

Species	Status	Habitat	Occurrence on Project Site
Federal Species of Special Concern			
Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)	FT	Primarily found in vernal pools of California's Central Valley.	**Possible**. Marginal habitat for this species in the form of a ruderal pool within the operational footprint of the onsite orchard occurs within the APE. While preferred habitat for this species is vernal pool habitat within grassland habitat, this species occasionally occurs in ruderal pools. A number of nearby occurrences of this species have been documented, the closest of which is approximately 1.7 miles to the southeast.
Vernal Pool Tadpole Shrimp (*Lepidurus packardi*)	FE	Primarily found in vernal pools of California's Central Valley.	**Unlikely**. Marginal habitat for this species in the form of a ruderal pool within the operational footprint of the onsite orchard occurs on the site. This species is not known to occur in the Project vicinity. The nearest documented occurrence of this species is approximately 12.5 miles northwest of the APE. Furthermore, a visual inspection of dried and inundated areas of the pool during the May 2020 field survey failed to find evidence of this relatively robust invertebrate.
Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)	FT	Lives in mature elderberry shrubs of California's Central Valley and Sierra foothills.	**Absent.** Blue elderberry shrubs required by this species are absent from the APE. Furthermore, the current opinion of the USFWS is that Madera County is outside the range of this subspecies.
California Tiger Salamander (*Ambystoma californiense*)	FT , CT	Found primarily in annual grasslands; requires vernal pools for breeding and rodent burrows for refuge.	**Possible.** Suitable breeding habitat in the form of large vernal pools occurs within the immediate vicinity of the APE. Ground squirrel and gopher burrows also provide suitable upland aestivation habitat for this species in grasslands of the site.
Foothill Yellow-legged Frog (*Rana boylii*)	CCT	Found primarily in swiftly flowing creeks.	**Absent.** No suitable habitat occurs on the site.
Blunt-Nosed Leopard Lizard (*Gambelia silus*)	FE	Frequents grasslands, alkali meadows and chenopod scrub of the San Joaquin Valley from Merced County south to Kern County.	**Absent.** Suitable habitat is absent from the APE. Furthermore, the APE is outside the known range of the species.
Bald Eagle (*Haliaeetus leucocephalus*)	CE, CFP	Winters near reservoirs of California's Central Valley. Mostly feeds on fish in large bodies of water or rivers.	**Possible.** Wintering and migratory bald eagles may occasionally forage and roost at Madera Lake. This species is not expected or known to nest at Madera Lake.
Swainson's Hawk (*Buteo swainsoni*)	CT	Summer migrant in the Central Valley. Forages in grasslands and fields close to riparian areas.	**Present.** This species was observed flying over the site during LOA's field survey. Grasslands of the site provide suitable foraging habitat for this species. Suitable breeding habitat is absent from the APE but occurs in trees within 0.5 miles of the site.
Tricolored Blackbird (*Agelaius tricolor*)	CT	Breeds colonially near fresh water in dense bulrush, cattails, or thickets of willows or shrubs. Occasionally nests in wheat fields. Forages in a wide variety of habitats.	**Possible.** Suitable nesting habitat for this species is absent. The grasslands of the site provide suitable foraging habitat.
Fresno Kangaroo Rat (*Dipodomys nitratoides exilis*)	FE, CE	Inhabits grassland on gentle slopes of generally less than 10°, with friable, sandy-loam soils.	**Absent.** This species is currently only known to occur in Kings County (ESRP 2020). The nearest documented occurrence of this species in the Project vicinity is 12 miles to the southwest from 1934. No kangaroo rat burrows or sign were observed anywhere on the APE.
San Joaquin Kit Fox (*Vulpes macrotis mutica*)	FE, CT	Desert alkali scrub, annual grass-lands of California's San Joaquin Valley and Tulare Basin, extending west into San Luis Obispo County. This species	**Absent.** No populations of kit fox are known to occur in eastern Madera County. Furthermore, there are no documented occurrences of this species within a 10-mile radius of the site (CDFW 2020).

Species	Status	Habitat	Occurrence on Project Site
		may forage in adjacent agricultural habitats.	
State Species of Special Concern			
Hardhead (*Mylopharodon conocephalus*)	CSC	Occurs in low- to mid-elevation streams in the Sacramento-San Joaquin watershed. Prefers clear, deep pools with rocky or sandy substrate. Generally absent from streams in which non-native fish predominate, as well as from streams heavily altered by human activity.	**Absent.** The Project contains no waters suitable for this species. Hydrologic conditions of Madera Lake are not conducive to this species' survival.
Western Spadefoot (*Spea hammondii*)	CSC	Primarily occurs in grasslands, but also occurs in valley and foothill hardwood woodlands. Requires vernal pools or other temporary wetlands for breeding.	**Present**. This species was observed in the form of larvae within the ruderal pool on the site and in adjacent vernal pools. It may also aestivate in rodent burrows within the site's grassland habitat.
Western Pond Turtle (*Emys marmorata*)	CSC	Occurs in slow moving water of southern Sierra foothill and Central Valley rivers and streams.	**Unlikely.** This species is not typically found in large reservoirs such as Madera Lake. Furthermore, the irregular inundation patterns of the lake that render it completely dry in some years further reduces the suitability of the lake for pond turtles. This species is not known from the lower reaches of the adjacent Fresno River, which also regularly dries. The nearest documented occurrence of this species is approximately 12 miles to the northwest.
Coast Horned Lizard (*Phrynosoma blainvillii*)	CSC	Occurs in a wide variety of habitats. Most common in lowlands along sandy washes with scattered low bushes where there are open areas for sunning, bushes for cover, patches of loose soil for burial, and abundant supply of ants and other insects.	**Absent.** Habitat on the site is extremely marginal for this species. This species is not known to occur in the immediate vicinity. The nearest documented occurrence is approximately 16 miles to the southwest.
Golden Eagle (*Aquila chrysaetos*)	CP	Typically frequents rolling foothills, mountain areas, sage-juniper flats and desert.	**Possible.** This species may occasionally forage on and over grasslands of the APE. Nesting habitat is absent.
White-tailed Kite (*Elanus caeruleus*)	CP	Open grasslands and agricultural areas throughout central Calif.	**Possible.** This species may occasionally forage on and over grasslands of the APE. Nesting habitat is absent from the APE.
Northern Harrier (*Circus cyaneus*)	CSC (nesting)	Frequents meadows, grasslands, open rangelands; uncommon in wooded habitats. Nests on the ground in tall concealing emergent or upland vegetation.	**Likely.** Grasslands within the APE provide foraging habitat for this species. Nesting habitat is absent from the APE due to the lack of tall concealing vegetation.
Burrowing Owl (*Athene cunicularia hypugaea*)	CSC	Found in open, dry grasslands, deserts and ruderal areas; requires ground squirrel burrows for cover and nesting.	**Possible.** While the grasslands associated with the Project provide suitable habitat for this species, no sign of burrowing owl occupation of these areas was observed during any of LOA's site surveys. No burrowing owl observations have been documented in the immediate Project vicinity; the nearest known occurrence is approximately 5 miles to the east (CDFW 2020, eBird 2020). However, this species is highly mobile and could possibly move onto the site at some time in the future.
Loggerhead Shrike (*Lanius ludovicianus*)	CSC	Grasslands and agricultural areas of California's Central Valley.	**Possible.** The APE provides suitable foraging habitat; marginal nesting habitat occurs in the site's orchard trees.

Species	Status	Habitat	Occurrence on Project Site
Pallid Bat (***Antrozous pallidus***)	CSC	Grasslands, chaparral, woodlands, and forests of California; most common in dry rocky open areas providing roosting opportunities.	**Possible.** The site could be used for foraging; roosting and breeding habitat is absent.
American Badger (***Taxidea taxus***)	CSC	This species inhabits open and dry sections of grasslands, shrub, and forest habitats with friable soil.	**Possible.** Grassland areas of the site provide suitable habitat for this species. No burrows of the shape and size typically created by badgers were found during LOA's field survey; however, this wide-ranging species could move onto grasslands of the site prior to construction.

Table 3-11. List of Special Status Plants with Potential to Occur Onsite and/or in the Vicinity

Species	Status	Habitat	Occurrence on Project Site
Succulent Owl's Clover (***Castilleja campestris* ssp. *succulenta***)	FT, CE CRPR 1B	Occurs in vernal pools and swales in valley foothills and grasslands of the San Joaquin and Sacramento Valleys from Fresno Co. on the south to Solano County on the north; blooms April to May.	**Absent**. Although vernal pool habitat potentially suitable for this species is present on adjacent lands, it is absent from the site itself.
San Joaquin Valley Orcutt Grass (***Orcuttia ineaqualis***)	FT, CE CRPR 1B	Occurs in deep vernal pools of California's San Joaquin Valley; blooms April to September.	**Absent**. Although vernal pool habitat potentially suitable for this species is present on adjacent lands, it is absent from the site itself.
Hairy Orcutt Grass (***Orcuttia pilosa***)	FE, CE CRPR 1B	Occurs in vernal pools of California's Central Valley. Requires deep pools with prolonged periods of inundation; blooms May to September.	**Absent**. Although vernal pool habitat potentially suitable for this species is present on adjacent lands, it is absent from the site itself.
Greene's Tuctoria (***Tuctoria greenei***)	FE CRPR 1B	Occurs in vernal pools of California's Central Valley from Shasta Co. on the north to Tulare Co. on the south; blooms May to September.	**Absent**. Although vernal pool habitat potentially suitable for this species is present on adjacent lands, it is absent from the site itself.
CNPS-listed Species			
Heartscale (***Atriplex cordulata var. cordulata***)	CRPR 1B	Occurs in saline and alkaline soils of shadscale scrub, valley grassland, and wetland-riparian habitats. Blooms April to October.	**Absent.** Saline and alkaline soils required by this species are absent from the APE. No Atriplex species were observed during the field survey.
Lesser Saltscale (***Atriplex minuscula***)	CRPR 1B	Occurs in sandy, alkaline soils of alkali sinks and grasslands. Blooms May to October.	**Absent.** Habitat and soils required by this species are absent from the APE. No Atriplex species were observed during the field survey.
Vernal Pool Smallscale (***Atriplex persistens***)	CRPR 1B	Occurs in vernal pools on alkaline soils. Blooms June-October.	**Absent.** Vernal pools and alkaline soils are absent from the APE. No Atriplex species were observed during the field survey.
Subtle Orache (***Atriplex subtilis***)	CRPR 1B	Occurs in valley and foothill grasslands of the San Joaquin Valley. Blooms August-October.	**Unlikely.** While grassland habitat required by this species occurs on the APE, this species is not known to occur in the Project vicinity. The nearest occurrences are more than 15 miles away. Furthermore, no Atriplex species were observed during the field survey.
Hoover's Calycadenia (***Calycadenia hooveri***)	CRPR 1B	Found in rocky soils, frequently of the Hornitos series, in Calaveras, Madera, Mariposa, and Stanislaus Counties.	**Absent.** Suitable rocky soils are absent from the APE.
Beaked Clarkia (***Clarkia rostrata***)	CRPR 1B	Occurs on north-facing slopes of cismontane woodland, and valley and foothill grassland. Blooms April to May.	**Absent.** North-facing slopes are absent from the APE. Furthermore, the APE is south of the known range of the species.
Spiny-sepaled Button Celery (***Eryngium spinosepalum***)	CRPR 1B	Found in vernal pools and swales at the eastern edge of the San Joaquin Valley. Blooms April to May.	**Absent**. Although vernal pool habitat potentially suitable for this species is present on adjacent lands, it is absent from the APE.

Species	Status	Habitat	Occurrence on Project Site
			Furthermore, Eryngium collected from adjacent vernal pools was *Eryngium vaseyi*.
Recurved Larkspur (*Delphinium recurvatum*)	CRPR 1B	Occurs in alkaline soils of cismontane woodland and valley and foothill grasslands. Blooms March-June.	**Unlikely.** While grassland habitat required by this species occurs on the APE, alkaline soils are absent. This species is not known to occur in the Project vicinity. The nearest occurrences are more than 15 miles away.
Munz's Tidy-tips (*Layia munzii*)	CRPR 1B	Occurs on hillsides, in white-grey alkaline clay soils, with grasses and chenopod scrub associates. Blooms March to April.	**Absent.** The APE provides unsuitable habitat for this species.
Madera Leptosiphon (*Leptosiphon serrulatus*)	CRPR 1B	Occurs in cismontane woodland, lower montane coniferous forests, and annual grasslands of the Sierra foothills from Madera Co. on the north to Kern Co. on the south. This species prefers dry slopes, often on decomposed granite in woodland. Blooms April to May.	**Absent.** The APE provides unsuitable habitat for this species. Furthermore, no Leptosiphon species were observed during the spring survey, at a time when members of this genus should be blooming and identifiable.
Shining Navarretia (*Navarretia nigelliformis ssp. radians*)	CRPR 1B	Occurs in cismontane woodland, vernal pools, and valley and foothill woodland. Blooms May to July.	**Absent**. Although habitat suitable for this species in the form of vernal pools and swales is present on adjacent lands, it is absent from the APE. Furthermore, no Navarretia species were observed during the spring survey, at a time when members of this genus should be blooming and identifiable.
Merced Phacelia (*Phacelia ciliate var. opaca*)	CRPR 1B	Occurs in heavy clay soils of the Central Valley and low foothills of the Sierra Nevada. Blooms February to May.	**Absent.** Suitable habitat and soils are absent from the APE.
California Alkali Grass (*Puccinellia simplex*)	CRPR 1B	Occurs in alkali sinks and flats within grassland and chenopod scrub habitats of the Central Valley, San Francisco Bay area and western Mojave Desert; elevations below 3,000 feet. Blooms March-May.	**Absent.** Suitable habitat and soils are absent from the APE.

EXPLANATION OF OCCURRENCE DESIGNATIONS AND STATUS CODES

Present:	Species observed on the site at time of field surveys or during recent past
Likely:	Species not observed on the site, but it may reasonably be expected to occur there on a regular basis
Possible:	Species not observed on the site, but it could occur there from time to time
Unlikely:	Species not observed on the site, and would not be expected to occur there except, perhaps, as a transient
Absent:	Species not observed on the site, and precluded from occurring there due to absence of suitable habitat

STATUS CODES

FE	Federally Endangered	CE	California Endangered
FT	Federally Threatened	CT	California Threatened
FPT	Federally Proposed Threatened	CSC	California Species of Special Concern
FC	Federal Candidate	CNPS	California Native Plant Society Listing
FPD	Federally (Proposed) Delisted	CFP	California Fully Protected
		CCE	California Candidate Endangered

3.5.3 Regulatory Setting

3.5.3.1 Threatened and Endangered Species

In California, imperiled plants and animals may be afforded special legal protections under the California Endangered Species Act (CESA) and/or Federal Endangered Species Act (FESA). Species may be listed as "threatened" or "endangered" under one or both Acts, and/or as "rare" under CESA. Under both Acts, "endangered" means a species is in danger of extinction throughout all or a significant portion of its range, and "threatened" means a species is likely to become endangered within the foreseeable future. Under CESA, "rare" means a species may become endangered if their present environment worsens. Both Acts prohibit "take" of listed species, defined under CESA as "to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill" (California Fish and Game Code, Section 86), and more broadly defined under FESA to include "harm" (16 USC, Section 1532(19), 50 CFR, Section 17.3). (See **Appendix B)**

When state and federally listed species have the potential to be impacted by a project, the USFWS and CDFW must be included in the CEQA process. These agencies review the environmental document to determine the adequacy of its treatment of endangered species issues and to make project-specific recommendations for the protection of listed species. Projects that may result in the "take" of listed species must generally enter into consultation with the USFWS and/or CDFW pursuant to FESA and CESA, respectively. In some cases, incidental take authorization(s) from these agencies may be required before the project can be implemented. (See **Appendix B)**

3.5.3.2 Designated Critical Habitat

The USFWS often designates areas of "critical habitat" when it lists species as threatened or endangered. Critical habitat is a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection.

Designated critical habitat is absent from the APE and immediately surrounding lands. The nearest critical habitat, for San Joaquin Valley Orcutt grass (*Orcuttia inaequalis*) and Green's tuctoria (*Tuctoria greenei*), is approximately 1.5 miles to the north of the Project, consisting of mostly developed land.

3.5.3.3 Migratory Birds

The Federal Migratory Bird Treaty Act (FMBTA: 16 USC 703-712) prohibits killing, possessing, or trading in any bird species covered in one of four international conventions to which the United States is a party, except in accordance with regulations prescribed by the Secretary of the Interior. The name of the act is misleading, as it actually covers almost all birds native to the United States, even those that are non-migratory. The FMBTA encompasses whole birds, parts of birds, and bird nests and eggs.

Native birds are also protected under California state law. The California Fish and Game Code makes it unlawful to take or possess any non-game bird covered by the FMBTA (Section 3513), as well as any other native non-game bird (Section 3800), even if incidental to lawful activities. Moreover, the California Migratory Bird Protection Act, enacted in September 2019, clarifies native bird protection and increases protections where California law previously deferred to federal law. (See **Appendix B)**

3.5.3.4 Birds of Prey

Birds of prey are protected in California under provisions of the Fish and Game Code (Section 3503.5), which states that it is unlawful to take, possess, or destroy any birds in the order Falconiformes (hawks and eagles) or Strigiformes (owls), as well as their nests and eggs. The bald eagle and golden eagle are afforded additional protection under the federal Bald and Golden Eagle Protection Act (16 USC 668), which makes it unlawful to kill birds or their eggs. (See **Appendix B)**

3.5.3.5 Nesting Birds

In California, protection is afforded to the nests and eggs of all birds. California Fish and Game Code (Section 3503) states that it is "unlawful to take, possess, or needlessly destroy the nest or eggs of any bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Breeding-season disturbance that causes nest abandonment and/or loss of reproductive effort is considered a form of "take" by the CDFW. (See **Appendix B)**

3.5.3.6 Wetlands and other "Jurisdictional Waters"

The USACE regulates the filling or grading of waters of the U.S. under the authority of Section 404 of the Clean Water Act (CWA). Drainage channels and adjacent wetlands may be considered "waters of the United States" or "jurisdictional waters" subject to the jurisdiction of the USACE.

Waters of the U.S. are defined by the Navigable Waters Protection Rule (33 CFR Part 328). The new rule was published in the Federal Register on April 21, 2020, and took effect on June 22, 2020.

The Navigable Waters Protection Rule identifies four categories of Waters of the U.S.: (1) territorial seas and traditional navigable waters, (2) tributaries, (3) lakes, ponds, and impoundments of jurisdictional waters, and (4) adjacent wetlands. These categories are defined as follows:

Territorial Seas and Traditional Navigable Waters (TNWs)

- *The territorial seas and traditional navigable waters include large rivers and lakes and tidally-influenced waterbodies used in interstate or foreign commerce.*

Tributaries

- *Tributaries include perennial and intermittent rivers and streams that contribute surface flow to traditional navigable waters in a typical year. These naturally occurring surface water channels must flow more often than just after a single precipitation event—that is, tributaries must be perennial or intermittent.*
- *Tributaries can connect to a traditional navigable water or territorial sea in a typical year either directly or through other "waters of the United States," through channelized non-jurisdictional surface waters, through artificial features (including culverts and spillways), or through natural features (including debris piles and boulder fields).*
- *Ditches are to be considered tributaries only where they satisfy the flow conditions of the perennial and intermittent tributary definition and either were constructed in or relocate a tributary or were constructed in an adjacent wetland and contribute perennial or intermittent flow to a traditional navigable water in a typical year.*

Lakes, Ponds, and Impoundments of Jurisdictional Waters

- *Lakes, ponds, and impoundments of jurisdictional waters are jurisdictional where they contribute surface water flow to a traditional navigable water or territorial sea in a typical year either directly or through other "waters of the United States," through channelized non-jurisdictional surface waters, through artificial features (including culverts and spillways), or through natural features (including debris piles and boulder fields).*
- *Lakes, ponds, and impoundments of jurisdictional waters are also jurisdictional where they are flooded by a "water of the United States" in a typical year, such as certain oxbow lakes that lie along the Mississippi River.*

Adjacent Wetlands

- *Wetlands that physically touch other jurisdictional waters are "adjacent wetlands,"*
- *Wetlands separated from a "water of the United States" by only a natural berm, bank or dune are also "adjacent."*
- *Wetlands inundated by flooding from a "water of the United States" in a typical year are "adjacent."*
- *Wetlands that are physically separated from a jurisdictional water by an artificial dike, barrier, or similar artificial structure are "adjacent" so long as that structure allows for a direct hydrologic surface connection between the wetlands and the jurisdictional water in a typical year, such as through a culvert, flood or tide gate, pump, or similar artificial feature.*
- *An adjacent wetland is jurisdictional in its entirety when a road or similar artificial structure divides the wetland, as long as the structure allows for a direct hydrologic surface connection through or over that structure in a typical year.*

The final rule also outlines what are not "waters of the United States." The following waters/features are not jurisdictional under the rule:

- *Waterbodies that are not included in the four categories of "waters of the United States" listed above.*
- *Groundwater, including groundwater drained through subsurface drainage systems, such as drains in agricultural lands.*
- *Ephemeral features, including ephemeral streams, swales, gullies, rills, and pools.*
- *Diffuse stormwater run-off and directional sheet flow over upland.*
- *Many farm and roadside ditches.*
- *Prior converted cropland retains its longstanding exclusion, but is defined for the first time in the final rule. The agencies are clarifying that this exclusion will cease to apply when cropland is abandoned (i.e., not used for, or in support of, agricultural purposes in the immediately preceding five years) and has reverted to wetlands.*
- *Artificially irrigated areas, including fields flooded for agricultural production, that would revert to upland should application of irrigation water to that area cease.*
- *Artificial lakes and ponds, including water storage reservoirs and farm, irrigation, stock watering, and log cleaning ponds, constructed or excavated in upland or in non-jurisdictional waters.*
- *Water-filled depressions constructed or excavated in upland or in non-jurisdictional waters incidental to mining or construction activity, and pits excavated in upland or in non-jurisdictional waters for the purpose of obtaining fill, sand, or gravel.*
- *Stormwater control features excavated or constructed in upland or in non-jurisdictional waters to convey, treat, infiltrate, or store stormwater run-off.*
- *Groundwater recharge, water reuse, and wastewater recycling structures, including detention, retention and infiltration basins and ponds, that are constructed in upland or in non-jurisdictional waters.*
- *Waste treatment systems have been excluded from the definition of "waters of the United States" since 1979 and will continue to be excluded under the final rule. Waste treatment systems include all components, including lagoons and treatment ponds (such as settling or cooling ponds), designed to either convey or retain, concentrate, settle, reduce, or remove pollutants, either actively or passively, from wastewater or stormwater prior to discharge (or eliminating any such discharge).*

All activities that involve the discharge of dredge or fill material into waters of the U.S. are subject to the permit requirements of the USACE. Such permits are typically issued on the condition that the applicant agrees to provide mitigation that result in no net loss of wetland functions or values. No permit can be issued until the RWQCB issues a Section 401 Water Quality Certification (or waiver of such certification) verifying that the proposed activity will meet state water quality standards.

Under the Porter-Cologne Water Quality Control Act of 1969, the State Water Resources Control Board has regulatory authority to protect the water quality of all surface water and groundwater in the State of California ("Waters of the State"). Nine RWQCBs oversee water quality at the local and regional level. The RWQCB for a given region regulates discharges of fill or pollutants into waters of the State through the issuance of various permits and orders. Discharges into waters of the State that are also waters of the U.S. require a Section 401 Water Quality Certification from the RWQCB as a prerequisite to obtaining certain federal permits, such as a Section 404 Clean Water Act permit. Discharges into all Waters of the State, even those that are not also waters of the U.S., require Waste Discharge Requirements (WDRs), or waivers of WDRs, from the RWQCB. The RWQCB also administers the Construction Storm Water Program and the federal National Pollution Discharge Elimination System (NPDES) program. Projects that disturb one or more acres of soil must obtain a Construction General Permit under the Construction Storm Water Program. A prerequisite for this permit is the development of a Storm Water Pollution Prevention Plan (SWPPP) by a certified Qualified SWPPP Developer. Projects that discharge wastewater, storm water, or other pollutants into a water of the U.S. may require a NPDES permit.

CDFW has jurisdiction over the bed and bank of natural drainages and lakes according to provisions of Section 1601 and 1602 of the California Fish and Game Code. Activities that may substantially modify such waters through the diversion or obstruction of their natural flow, change or use of any material from their bed or bank, or the deposition of debris require a Notification of Lake or Streambed Alteration. If CDFW determines that the activity may adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement will be prepared. Such an agreement typically stipulates that certain measures will be implemented to protect the habitat values of the lake or drainage in question. (See **Appendix B**)

3.5.3.7 Local

Madera County General Plan: In compliance with CEQA, the lead agency must consider project conformance with applicable goals and policies of the General Plan of Madera County. The Madera County General Plan includes goals and policies designed to protect significant biotic resources of the Planning Area. Resource elements addressed by this plan include: (1) wetland and riparian areas, (2) fish and wildlife habitat, (3) vegetation, and (4) open space for the preservation of natural resources. Madera County General Plan policies related to natural resources can be found in **Appendix D** of **Appendix B**.

3.5.4 Impact Assessment

a) Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Less Than Significant Impact with Mitigation Incorporated.

The following analysis is based upon all Project elements described in **Appendix B**, including measures designed to avoid and minimize impacts to CTS. Nearly all impacts will be temporary impacts resulting from trenching within ruderal areas of the site. Less than one tenth of an acre of permanent impacts are expected in the form of pipe saddles and earthen or cement pads. Nearly all of the permanent impacts will occur within ruderal areas of the orchard land.

3.5.4.1 Vernal Pool Fairy Shrimp

The federally threatened vernal pool fairy shrimp is an invertebrate species occurring in vernal pools and other seasonal aquatic habitat throughout most of California west of the Sierra Nevada. Shrimp eggs within the pool bottoms are dormant when the pools are dry, but hatch when the pools fill or partially fill with the advent of the fall and winter rains. During most winters, populations of adult shrimp peak in January and February. Warming pool temperatures and predation typically result in a sharp decline in shrimp populations in March.

The vernal pool fairy shrimp is not known to occur in vernal pools associated with grasslands surrounding Madera Lake, but has been documented in vernal pools within other grassland habitats within the region. While vernal pools within grassland habitat are absent from the APE, a ruderal pool within the operational footprint of the onsite orchard occurs on the site immediately west of grassland habitat and up-gradient of a large offsite vernal pool. This pool provides marginal habitat for vernal pool fairy shrimp. However, since western spadefoot toad larvae were observed in this ruderal pool it seems likely that the pool supports invertebrate populations that would be needed to support developing spadefoot larvae. Therefore, vernal pool fairy shrimp are considered potentially present on the APE.

3.5.4.2 California Tiger Salamander

As discussed in **Section 2.2.1**, California tiger salamanders have the potential to aestivate in onsite grassland habitat. Suitable breeding habitat occurs immediately adjacent to the APE and marginal breeding habitat occurs on the APE.

As described in the Project Description in **Section 1.1** of this document, the Project has been designed to minimize impacts to CTS. These minimization measures are as follows. The Project will: (1) Obtain an Incidental Take Permit (ITP) from the CDFW, take authorization from the USFWS if needed, and comply with all avoidance, minimization, and mitigation measures required by the ITP and USFWS take authorization; (2) Minimize potential CTS burrow impacts in grassland habitat by installing the pipeline above ground on concrete saddles per Project design; (3) Prohibit ground disturbance in all potential CTS breeding habitat; and (4) Avoid an onsite ruderal pool as well as avoid work in grassland habitat after the first significant rainfall and until the onsite ruderal pool and two adjacent vernal pools are completely dry.

The Project will temporarily utilize an area of the orchard occupied by a ruderal pool that is marginally suitable for CTS. Although no ground disturbance will occur within the pool, the pool, when dry, may be used for the storage of equipment and materials during construction. Because Project use of the area occupied by the ruderal pool will be limited to dry periods outside of the CTS breeding season, temporary Project related use of the area occupied by the pool does not have the potential to result in take of CTS individuals. After Project construction, the pool would return to pre-Project conditions and former level of suitability for this species. Therefore, loss of breeding habitat for the CTS is not considered to be a significant impact of the Project under CEQA.

Project impacts to potential CTS aestivation habitat will be almost entirely temporary. Only 5 square feet of permanent loss of potential aestivation habitat expected from placement of concrete saddles under the pipeline and a possible small equipment pad; however, this small impact area would not prohibit CTS from utilizing burrows potentially running beneath these areas. Temporary impacts will consist of trenching through 125 square feet of roadway and grassland at the upper banks of the dam embankment. With the exception of the 5 square feet of pipe saddles and possible small equipment pad, following construction, surface habitats are expected to return to pre-Project conditions and their former level of suitability for this species. Therefore, loss of aestivation habitat for the CTS is also not considered to be a significant impact of the Project under CEQA.

Ground-disturbing activities within grassland habitat of the APE that would only occur during the dry season could result in the injury or mortality of one or more aestivating CTS. In addition, work in ruderal areas adjacent to potential CTS breeding habitat (i.e. the two offsite vernal pools and the onsite ruderal pool) during the winter and spring could result in Project related injury or mortality of individual CTS that may be dispersing to or from these potential breeding pools. Such an impact on CTS is considered potentially significant under CEQA.

Implementation of the following measures would reduce impacts to CTS to a less then significant level.

3.5.4.3 Mitigation.

The following measures will be implemented for the protection of the CTS:

Mitigation Measure BIO - 1a (Take Authorization)

Take authorization from CDFW must be obtained and the USFWS shall be consulted. Required mitigations presented in take permits issued from these agencies must be adhered to. While such mitigations are project-specific, typical mitigation requirements of these permits include potential compensatory mitigation, as well as avoidance and minimization measures such as burrow excavation, construction monitoring by an approved biologist, mandatory capping of pipes, covering trenches, and maintaining escape ramps in trenches.

Mitigation Measure BIO - 1b (Environmental Awareness Training).

Prior to the start of construction, a qualified biologist will provide training on the CTS to all construction personnel. This training will include a description of the CTS and its habitat needs; a report of the occurrence of the species in the Project vicinity; an explanation of the status of the species and its protection under the state and federal Endangered Species Acts; and a list of the measures being taken to reduce impacts to CTS during Project implementation. Attendance will be documented on a sign-in sheet. Attendees will be provided a handout that summarizes all of the training information. The applicant will use this handout to train any construction personnel that were not in attendance at the first meeting, prior to those personnel starting work on the site.

Implementation of the above measures will reduce any potential Project-related impacts to CTS to a less than significant level under CEQA.

3.5.4.4 Western Spadefoot Toad

This species has similar habitat requirements and behavior patterns as the CTS. Therefore, potential Project impacts presented for CTS are applicable to spadefoots toads. The spadefoot toad is not a listed species like the CTS but a California Species of Special Concern and much more common than CTS. Project avoidance and minimization measures for the CTS described in the Project description section are pertinent for western spadefoot toads, as well. Impacts to western spadefoot aestivation habitat will be temporary. Following construction, surface habitats are expected to return to pre-Project conditions and their former level of suitability for this species. No ground-disturbing activities will be permitted within the area occupied by the ruderal pool, with Project disturbance of this pool limited to temporarily staging material and equipment after the pool has dried down. As a result, the disturbance of the site occupied by this pool will be similar to existing farming practices with no loss of habitat for the western spadefoot and no chance of mortality to larva that would be present here when the pool is inundated. As a result, the loss of habitat for the western spadefoot is also not considered to be a significant impact of the Project under CEQA. The small area of proposed ground disturbance in grassland habitat may injure or kill one or more individual western spadefoot toads. In addition, work in ruderal areas immediately surrounding the ruderal pool during winter and spring months could result in the injury or mortality of western spadefoot dispersing to or from the pool. Such impacts to this species are considered potentially significant under CEQA.

3.5.4.5 Mitigation.

The following measures will be implemented for the protection of the western spadefoot:

Mitigation Measure BIO - 2a

The project will comply with provisions of Mitigation Measure 4.1.1a, which, while designed for CTS, will offer protection measures relevant to western spadefoot.

Mitigation Measure BIO - 2b (Environmental Awareness Training).

Prior to the start of construction, a qualified biologist will provide training on the western spadefoot to all construction personnel. This training will include a description of the western spadefoot and its habitat needs; a report of the occurrence of the species in the Project vicinity; an explanation of the status of the species; and a list of the measures being taken to reduce impacts to western spadefoot during Project implementation. Attendance will be documented on a sign-in sheet. Attendees will be provided a handout that summarizes all of the training information. The applicant will use this handout to train any construction personnel that were not in attendance at the first meeting, prior to those personnel starting work on the site.

Implementation of the above measures will reduce any potential Project-related impacts to western spadefoot to a less than significant level under CEQA.

3.5.4.6 Swainson's Hawk

Potential Impacts. Swainson's hawks are occasionally sighted in the Project vicinity. In fact, an individual was observed during LOA's May 2020 field survey. However, there are no known nesting occurrences within 10 miles of the APE. Although nesting habitat is absent from the APE, Swainson's hawks could potentially nest in eucalyptus trees within 0.5 miles, and could forage in the site's grasslands from time to time. Construction activities do not have the potential to injure or kill foraging Swainson's hawks because the Swainson's hawk is highly mobile while foraging and would be expected to simply fly away from construction disturbance. The Project will result in the permanent loss of approximately 5 square feet of foraging habitat for this species. Therefore, impacts to Swainson's hawks due to the loss of foraging habitat are considered less than significant under CEQA. However, if Swainson's hawks are nesting adjacent to work areas at the time of construction, hawks could be disturbed and their nesting success could potentially be impacted. Project-related disturbance of nesting Swainson's hawks is considered a potentially significant impact of the Project under CEQA.

3.5.4.7 Mitigation.

The applicant will implement the following measures to avoid and minimize the potential for Project-related disturbance of nesting Swainson's hawks.

Mitigation Measure BIO - 3a (Construction Timing)

If feasible, construction activities will occur entirely outside the Swainson's hawk nesting season, typically defined as March 1-September 15.

Mitigation Measure BIO - 3b (Preconstruction Surveys)

If construction activities must occur between March 1 and September 15, then within 10 days prior to the start of work, a qualified biologist will conduct a preconstruction survey for Swainson's hawk nests on and within ½ mile of the APE.

Mitigation Measure BIO - 3c (Avoidance)

Should any active nests be identified, the biologist will establish a suitable disturbance-free buffer around the nest. This buffer will be identified on the ground with flagging or fencing, and will be maintained until the biologist has determined that the young have fledged.

Implementation of these measures will reduce potential impacts to the Swainson's hawk from Project-related disturbance to a less than significant level under CEQA and ensure compliance with state and federal laws protecting this species.

3.5.4.8 Burrowing Owl

Potential Impacts. Nearly the entire site is unsuitable for burrowing owl occupation. The small area of grassland habitat within the APE provides potential habitat for this species. Burrowing owls have not been documented in the Project vicinity. However, it is possible that this species could migrate onto the site prior to construction. Burrowing owls are highly mobile while foraging and it is anticipated that any burrowing owls attempting to forage on site at the time of construction would simply fly away from construction disturbance. The Project will result in the permanent loss of approximately5 square feet of potential habitat for this species. Therefore, impacts to burrowing owls due to the loss of habitat are considered less than significant under CEQA. However, if burrowing owls are occupying burrows on site at the time of construction or ground-disturbing operations and maintenance activities, owls could be vulnerable to Project-related injury or mortality. If construction or ground-disturbing operations and maintenance activities occur during the nesting season, burrowing owls could be disturbed by such activities such that they would abandon their young. Project-related injury, mortality, or disturbance of burrowing owls is considered a potentially significant impact under CEQA.

3.5.4.9 Mitigation.

In order to minimize construction-related impacts to burrowing owls, the applicant will implement the following measures:

Mitigation Measure BIO - 4a (Take Avoidance Surveys).

Take avoidance surveys for burrowing owls will be conducted by a qualified biologist within 30 days prior to the start of construction within grassland habitat of the site. The surveys will be conducted according to methods described in the Staff Report on Burrowing Owl Mitigation (CDFG 2012). The survey will cover grassland work areas and adjacent lands within 200 meters, where potential nesting or roosting habitat is present ("survey area").

Mitigation Measure BIO - 4b (Avoidance of Nest Burrows).

If construction activities within grassland habitats are to occur during the breeding season (February 1-August 31) and active nest burrows are identified within the survey area, a 200-meter disturbance-free buffer will be established around each burrow. The buffers will be enclosed with temporary fencing to prevent encroachment by construction equipment and workers. Buffers will remain in place for the duration of the breeding season, unless otherwise arranged with CDFW. After the breeding season, passive relocation of any remaining owls may take place as described below.

Mitigation Measure BIO - 4c (Avoidance or Passive Relocation of Resident Owls).

During the non-breeding season (September 1-January 31), resident owls occupying burrows in work areas may either be avoided, or passively relocated to alternative habitat. If the applicant chooses to avoid active owl burrows within the work area during the non-breeding season, a 50-meter disturbance-free buffer will be established around these burrows. If a 50-meter disturbance-free buffer is not feasible, then a qualified biologist will determine a minimum buffer distance based on site conditions and the biologist will be on site to monitor the owls during all activities conducted within 50 meters to ensure that the owls are not harmed. Buffers will be enclosed with temporary fencing, and will remain in place until a qualified biologist determines that the burrows are no longer active. If the applicant chooses to passively relocate owls during the non-breeding season, this activity will be conducted in accordance with a relocation plan prepared by a qualified biologist.

Compliance with the above mitigation measures will reduce potential impacts to the burrowing owl from Project-related injury, mortality, or disturbance to a less than significant level under CEQA, and will ensure that the Project is in compliance with state and federal laws protecting this species.

3.5.4.10 Project-Related Mortality/Disturbance of Other Nesting Birds and Raptors Including the Loggerhead Shrike

The APE has the potential to be used for nesting by a number of avian species protected by state and federal laws. Orchard trees have the potential to support nesting birds such as the loggerhead shrike, American robin, or mourning dove. Ruderal areas have the potential to support the disturbance-tolerant killdeer. Grasslands could support ground nesting birds such as the horned lark and western meadowlark. If any birds were to be nesting on or adjacent to work areas at the time of construction they could be injured, killed, or disturbed such that they would abandon their nests. Project-related injury or mortality of nesting birds or disturbance leading to nest abandonment would violate state and federal laws and be considered a significant impact of the Project under CEQA.

3.5.4.11 Mitigation.

The applicant will implement the following measures to avoid and minimize the potential for Project-related mortality/disturbance of nesting birds and raptors, as necessary.

Mitigation Measure BIO - 5a (Construction Timing).

If feasible, construction activities and/or vegetation removal will take place entirely outside of the avian nesting season, typically defined as February 1 to August 31.

Mitigation Measure BIO - 5b (Preconstruction Surveys).

If construction activities and/or vegetation removal must occur between February 1 and August 31, then within 10 days prior to the start of work, a qualified biologist will conduct preconstruction surveys for active bird nests on and within 500 feet of the APE.

Mitigation Measure BIO - 5c (Avoidance).

Should any active nests be identified, the biologist will establish suitable disturbance-free buffers around the nests. Buffers will be identified on the ground with flagging or fencing, and will be maintained until the biologist has determined that the young have fledged and the nests are no longer active.

Compliance with the above mitigation measures would reduce impacts to nesting birds and raptors, including the loggerhead shrike, to a less than significant level under CEQA and ensure compliance with state and federal laws protecting these species.

3.5.4.12 American Badger

Potential Impacts. The American badger (Taxidea taxus), a California Species of Special Concern, is a wide-ranging animal with some potential to forage and/or den within grasslands of the site. The Project will result in the permanent loss of approximately 5 square feet of habitat for this species. Therefore, impacts to American badger due to the loss of habitat are considered less than significant under CEQA. However, any individuals of this species present on site at the time of construction may be at risk of construction-related injury or mortality, particularly if they are raising young on the site. Construction-related mortality of American badgers would be considered a significant impact of the Project under CEQA.

3.5.4.13 Mitigation.

The following measures will be implemented for the protection of the American badger:

Mitigation Measure BIO - 6a (Pre-disturbance Surveys).

A pre-disturbance survey for American badgers will be conducted by a qualified biologist within 30 days prior to the start of construction. The survey area will include grassland areas within the APE and surrounding lands within 250 feet.

Mitigation Measure BIO - 6b (Avoidance).

Any non-maternity dens identified during the pre-disturbance survey shall be flagged and avoided with a minimum 50-foot no-disturbance buffer until a qualified biologist has determined that the den is no longer in use. Any maternity dens identified during pre-disturbance surveys shall be flagged and avoided, if feasible, with a minimum 200-foot no-disturbance buffer for the duration of the pup-rearing season, typically February 15 to July 1.

Mitigation Measure BIO - 6c (Minimization).

If a maternity den cannot feasibly be avoided, CDFW must be contacted to identify appropriate minimization measures prior to initiating any disturbance that would affect the den, including potential passive relocation by excavation before or after the rearing season.

Implementation of these measures will reduce potential Project impacts to the American badger to a less than significant level under CEQA.

b) Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

No Impact. Sensitive Natural Communities are those that are of limited distribution, distinguished by significant biological diversity, home to special status plant and animal species, of importance in maintaining water quality or sustaining flows, etc. Examples of sensitive natural communities include various types of wetlands, riparian habitat, and valley scrub habitats. CDFW has assigned State Ranks to California's natural communities that reflect the condition and imperilment of that community throughout its range within the state. State Ranks are represented with a letter and number score. Older ranks, which need to be updated in the CNDDB, may still contain a decimal "threat" rank of .1, .2, or .3, where .1 indicates very threatened status, .2 indicates moderate threat, and .3 indicates few or no current known threats.

The APE supports no sensitive natural communities. Therefore, there would be no impact.

c) Would the project have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

No Impact. Examples of sensitive natural communities include various types of wetlands and riparian habitats. As discussed above in question b), the APE supports no sensitive natural communities and therefore, there would be no impact.

d) Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

No Impact. The Project area does not contain features that would be likely to function as wildlife movement corridors. Furthermore, the Project is located in a region often disturbed by intensive agricultural cultivation practices and human disturbance which would discourage dispersal and migration. Therefore, implementation of the Project will have no impact on wildlife movement corridors.

e) Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

No Impact. The Project is in compliance with the goals and policies set forth in the Madera County General Plan. Project activities do include the removal of several trees, none of which are protected by any local policies or ordinances. There would be no impact.

f) Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

No Impact. Designated critical habitat, sensitive natural communities, and other sensitive habitats are absent from the APE and adjacent lands. The Project will have no impact on such habitats. The Project will be consistent with the goals and policies of the Madera County General Plan, and would not conflict with any other local policies or ordinances protecting biological resources. The Project is not subject to any Habitat Conservation Plans or Natural Community Conservation Plans. There would be no impact.

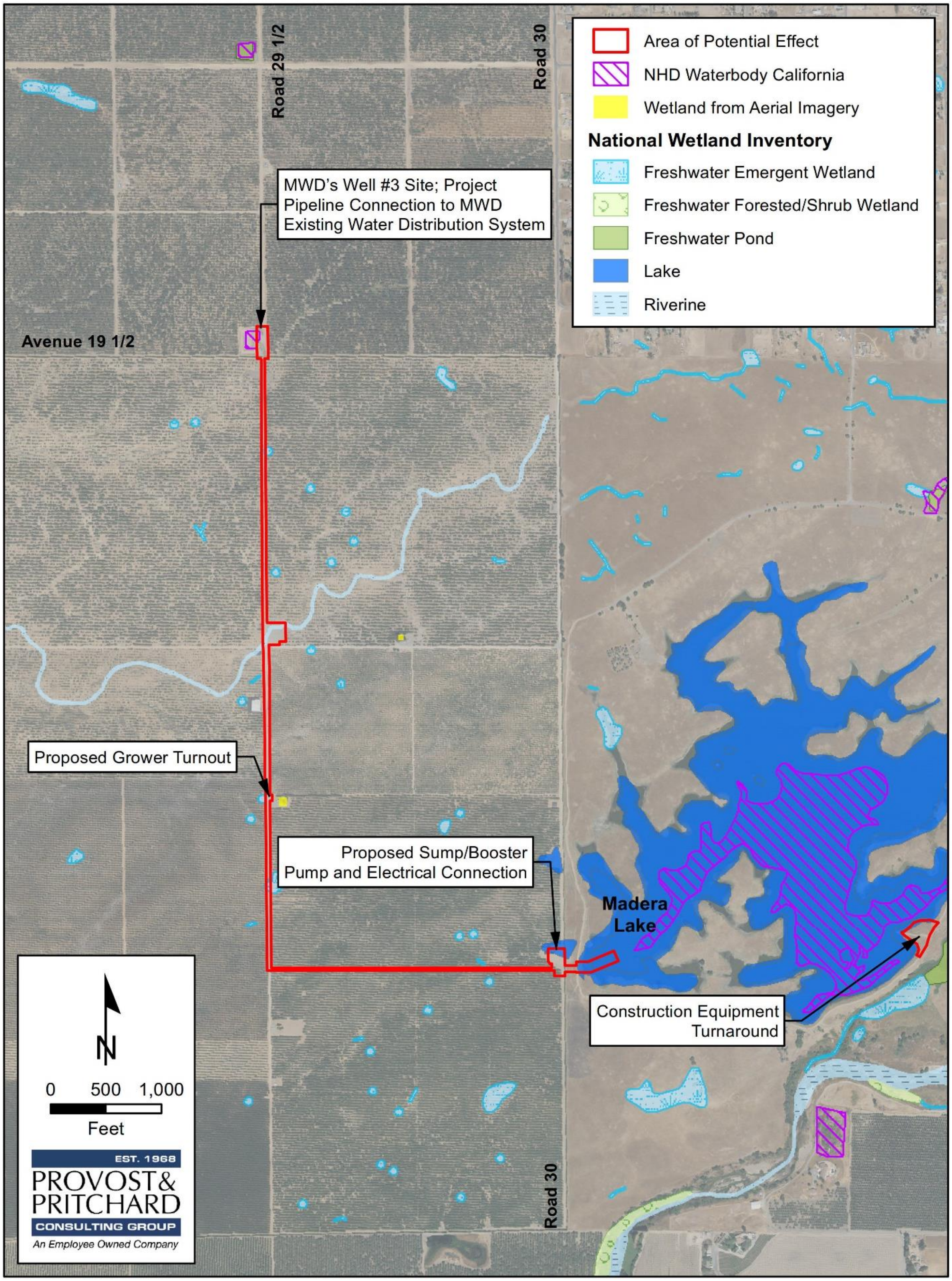

Figure 3-2. Wetlands Map

3.6 Cultural Resources

Table 3-12. Cultural Resources Impacts

Cultural Resources Impacts					
	Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Cause a substantial adverse change in the significance of a historical resource pursuant to in §15064.5?	☐	☐	☒	☐
b)	Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☒	☐	☐
c)	Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☒	☐	☐

3.6.1 Environmental Setting and Baseline Conditions

The Project APE is located on the eastern side of the San Joaquin Valley approximately 4-miles west of the base of the western foothills of the Sierra Nevada, approximately 400-ft north of the Fresno River, itself a tributary of the San Joaquin River. The area is low rolling hills currently covered by fig and pistachio orchards. The eastern terminus of the APE is within Madera Lake, an artificial reservoir created through diversion of the Fresno River and contained by topography and a series of earthen levees. Prior to the formation of Madera Lake in 1958, the area consisted of mostly flat to gradually rolling hills. Historically, and likely prehistorically, much of the APE would have been within a valley oak tree woodland environment, with riparian environments present along the Fresno River and its sloughs. See **Appendix C** for full Class III Inventory/Phase I survey report for complete cultural settings in the Project area.

Madera Lake specifically lies in a former side-slough of the Fresno River and would have been periodically inundated, both seasonally and during "mega-floods". These have been geologically documented back to AD 212 and they occur, on average, every 200 years. The last such flood occurred in 1861 – 1862. Although this is considered one of the milder examples of these events, which are caused by "atmospheric rivers," as much of 6-ft of rain fell in some locations. (See **Appendix C**)

3.6.2 Impact Assessment

a) Would the project cause a substantial adverse change in the significance of a historical resource pursuant to in §15064.5?

Less than Significant Impact. An intensive Class III inventory/Phase I survey of the MWD Madera Lake Pump & Pipeline Project APE and survey area was conducted by ASM Associate Archaeologist Robert Azpitarte, B.A., in April and August 2020, with a follow-up to survey the truck turn-around in September 2021. The Class III inventory/Phase I survey fieldwork was conducted with parallel transects spaced at 15-meter intervals along the APE and survey buffer. One cultural resource, historical Madera Lake, was identified and recorded. This lake was created in 1958 by the Madera County Recreation Commission to promote tourism with a warm water fishery. It proved impractical to obtain an adequate water supply and the lake was eventually acquired by the MID. It now serves as a storage, regulation and ground water recharge facility. No other archaeological resources or historical structures were identified within the Project APE and survey buffer. Given the geomorphological context of the Project, within a former side-slough of the Fresno River, and the

Very Low to Low archaeological sensitivity of this location, it is unlikely that buried archaeological remains would be present. (See **Appendix C**) Any impacts would be considered less than significant.

b) Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

Less than Significant Impact with Mitigation Incorporated. As mentioned above an intensive Class III cultural resources inventory/Phase I survey was conducted for the Madera Water District (MWD) Madera Lake Pump & Pipeline Project (Project), Madera County, California. The Project is located in Section 28, 33, and 34 (T10S/R18E; MDBM), west and northwest of Madera Lake. ASM Affiliates, Inc., conducted this study, with David S. Whitley, Ph.D., RPA, serving as principal investigator. The study (See **Appendix C**) was undertaken to assist the U.S. Army Corps of Engineers with compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, to be completed at a later date, and to assist with compliance with the California Environmental Quality Act (CEQA). The purpose of the Project is to provide MWD access to surface water from Madera Lake, which is owned by the MID, through a siphon in the lake to a pump station southwest of an existing levee, through approximately 5,700-feet (ft) of pipeline. The Project area of potential effect (APE) included the proposed pump location and the proposed pipeline including a buffer surrounding the Project components.

MWD proposes to develop a project that would allow water from MID or other sources to be brought into MWD from Madera Lake. Madera Lake is supplied by an existing turnout off the Fresno River which is fed by the upstream watershed regulated by Hidden Dam on Hensley Lake and from water from the Madera Canal. Water supplies could be from the Central Valley Project Friant Division, Fresno River, or pre-1914 supplies.

According to the geoarchaeological model developed by Meyer et al. (see reference citation in **Appendix C**), the APE has a Very Low to Low potential for buried archaeological deposits. Meyer et al.'s study involved first determining the location and ages of late Pleistocene (>25,000 years old) landforms in the southern San Joaquin Valley. These were identified by combining a synthesis of 2,400 published paleontological, soils and archaeological chronometric dates with geoarchaeological field testing. The ages of surface landforms were then mapped to provide an assessment for the potential for buried archaeological deposits. These ages were derived primarily from the Soil Survey Geographic Database (SSURGO) and the State Soils Geographic (STATSGO) database. A series of maps were created from this information that ranked locations in seven ordinal classes for sensitivity for buried soils, from Very Low to Very High. Buried sites and cultural resources are therefore considered to be unlikely within the Project APE. This conclusion is supported by the known distributions of historic Native American villages in the region. (See **Appendix C**)

3.6.2.1 Mitigation

Although it is unlikely that archeological resources will occur during construction or operation of the Project, with the implementation of Mitigation Measure CUL-1 the impact will remain less than significant.

Mitigation Measure CUL-1 (Archaeological Resources)

In the event that archaeological resources are encountered at any time during development or ground-moving activities within the entire project area, all work in the vicinity of the find shall halt until a qualified archaeologist can assess the discovery. MWD shall implement all recommendations of the archaeologist necessary to avoid or reduce to a less than significant level potential impacts to cultural resource. Appropriate actions could include a Data Recovery Plan or preservation in place.

c) Would the project disturb any human remains, including those interred outside of dedicated cemeteries?

Less than Significant Impact with Mitigation Incorporated. No formal cemeteries or other places of human internment are known to exist on the Project site; however, in accordance with Health and Safety Code

Section 7050.5 and Public Resource Code Section 5097.98, if human remains are uncovered, Mitigation Measure CUL-2 would be implemented.

Mitigation Measure CUL-2 (Human Remains)

If human remains are uncovered, or in any other case when human remains are discovered during construction, the Madera County Coroner is to be notified to arrange proper treatment and disposition. If the remains are identified—on the basis of archaeological context, age, cultural associations, or biological traits—as those of a Native American, California Health and Safety Code 7050.5 and Public Resource Code 5097.98 require that the coroner notify the NAHC within 24 hours of discovery. The NAHC will then identify the Most Likely Descendent who will determine the manner in which the remains are treated.

3.7 Energy

Table 3-13. Energy Impacts

Energy Impacts					
Would the project:		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☒	☐
b)	Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☒	☐

3.7.1 Environmental Setting and Baseline Conditions

The Project area lies within the electrical and gas service area of Pacific Gas & Electric Company. Much of the energy consumed in the region is for agricultural, residential, commercial, and transportation purposes.

Construction equipment and construction worker vehicles operated during Project construction would use fossil fuels.

3.7.2 Impact Assessment

a) Would the project result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation? And;

b) Would the project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

Less than Significant Impacts. Construction, operation and maintenance of the Project would directly consume energy, but would not be wasteful or inefficient, nor would it require new or expanded electric power or natural gas facilities. The marginal increases in fossil fuel use resulting from Project construction are not expected to have appreciable impacts on energy resources. Energy use during operation of the booster pumps will be by electric motors. Energy used during construction would allow the operation of the Project components, which would result in a reduction of long-term energy use due to replacement of groundwater pumping with use of surface water to meet irrigation demands. No features of the Project would conflict with or obstruct state or local plans for renewable energy or energy efficiency. The Project would not require the relocation or construction of new or expanded electric power or natural gas facilities. The impacts on energy use and energy plans would be less than significant.

3.8 Geology and Soils

Table 3-14. Geology and Soils Impacts

Geology and Soils Impacts					
Would the project:		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
	ii) Strong seismic ground shaking?	☐	☐	☒	☐
	iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
	iv) Landslides?	☐	☐	☐	☒
b)	Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c)	Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☒	☐
d)	Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994) creating substantial direct or indirect risks to life or property?	☐	☐	☒	☐
e)	Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
f)	Directly or indirectly destroy a unique paleontological resource or site or unique geological feature?	☐	☐	☒	☐

3.8.1 Environmental Setting and Baseline Conditions

Madera County is divided into two major physiographic and geologic provinces: the Sierra Nevada Range and the Central Valley. The Sierra Nevada physiographic province in the northeastern portion of the county is underlain by metamorphic and igneous rock. It consists mainly of homogenous types of granitic rocks, with several islands of older metamorphic rock. The central and western parts of the county are part of the Central Valley province, underlain by marine and non-marine sedimentary rocks. It is basically a flat, alluvial plain, with soil consisting of material shed by the uplifting of the mountains, as well as San Joaquin River alluvium in the western valley. Consolidated alluvium occurs at depths of 500 feet near the City of Madera, to approximately 20,000 feet in the western county.

The foothill area of the county is essentially a transition zone, containing old alluvial soils that have been dissected by the west-flowing rivers and streams which carry runoff from the Sierra Nevadas. This gently rolling topography is broken in many areas by outcroppings of bedrock. Soils here are generally quite dense and compact. [6]

Using the USDA NRCS soil survey of the Project area, a report of the onsite soils was generated and is provided in **Appendix D**. Topical information sourced from that report is summarized below.

3.8.1.1 Geology and Soils

The Project is located on the valley floor area of Madera County, in the northern section of California's Great Valley Geomorphic Province, or Central Valley. The Sacramento Valley makes up the northern third and the San Joaquin Valley, including the Project site, makes up the southern two-thirds of the geomorphic province. Both valleys are watered by large rivers flowing west from the Sierra Nevada Range, with smaller tributaries flowing east from the Coast Ranges. The nearest such river relative to the Project is the Fresno River. immediately south of the Project site. From the time the Valley first began to form, sediments derived from erosion of igneous and metamorphic rocks and consolidated marine sediments in the surrounding mountains have been transported into the Valley by streams.

Using the USDA NRCS soil survey of the Project site, an analysis of the soils onsite was performed (See **Appendix D**). Soils in the area consist of Cometa sandy loams, Cometa-Whitney sandy loams, Greenfield Sandy loam and Hanford sandy loam. (See **Appendix D**).

Table 3-15. Soils of the Study Area

Soils Series	Parent Material	Drainage Class	Runoff Class	Drainage Class	Approximate Acres of Project site
CuB	Cometa sandy loams, 3 to 8 percent slopes	Alluvium derived from granite	Very High	Well-Drained	6.6
CwC	Cometa-Whitney sandy loams, 8 to 15 percent slopes	Alluvium derived from granite	Very High	Well Drained	1.4
GvB	Greenfield sandy loam, moderately deep and deep over hardpan, 3 to 8 percent slopes	Alluvium derived from igneous, metamorphic and sedimentary rock	Very Low	Well Drained	0.2
HgA	Hanford sandy loam, moderately deep and deep over hardpan, 0 to 3 percent slopes	Alluvium derived from igneous rock	Very Low	Well Drained	0.9

[6] Madera County General Plan Background Report, Chapter 7 Safety, page 7-1, https://www.maderacounty.com/Home/ShowDocument?id=2852 Accessed October 16, 2020.

3.8.1.2 Faults and Seismicity

The Project site is not located within an Alquist-Priolo Earthquake Fault Zone and no known faults cut through the local soil at the site. The nearest major fault is the San Andrea Fault (Creeping Section), located approximately 70 miles southwest of the Project area. The San Andreas Fault is the dominant active tectonic feature of the Coast Ranges and represents the boundary of the North American and Pacific plates. The Ortigalita Fault, Los Banos (Valley section) is located approximately 50-miles west of the project site. (See **Appendix D**)

3.8.1.3 Liquefaction

The potential for liquefaction, which is the loss of soil strength due to seismic forces, is dependent on soil types and density, depth to groundwater, and the duration and intensity of ground shaking. No specific liquefaction hazard areas have been identified in the county. Using the USDA NRCS soil survey of Project site, an analysis of the soils onsite was performed (See **Appendix D**). Soils in the Project area consist of Cometa sandy loams, Cometa-Whitney sandy loams, Greenfield sandy loam and Hanford sandy loam, all of which are well drained and allows water to percolate through quickly and not pool, allowing it to stay strong.

3.8.1.4 Soil Subsidence

Subsidence can occur when groundwater levels decline due to excessive withdrawals of groundwater. Continued groundwater-level and land-subsidence monitoring in the San Joaquin Valley is warranted because groundwater levels are poised to decline when surface-water deliveries do not meet demand, which may result in additional land subsidence. Even in precipitation record-setting years such as 2010-11, water deliveries fell short of requests in the Central Valley. Therefore, it is likely that groundwater levels will decline in the future. Integrating subsidence, deformation, and water-level measurements—particularly continuous measurements—permits analysis of aquifer-system response, which enables identification of the pre-consolidation head and calculation of aquifer-system storage properties. This information could be used to improve numerical models of groundwater flow and aquifer-system compaction, to refine estimates of governing parameters, and to predict potential aquifer-system compaction which could be used to manage water resources while considering land subsidence.[7]

The San Joaquin Valley is one of the most productive agricultural regions in the nation. Beginning around the 1920's, farmers relied upon groundwater for water supply. Over time, over-pumping caused groundwater-level declines and associated aquifer-system compaction and land subsidence that resulted in permanent aquifer-system storage loss.[8]

California has experienced three droughts thus far in the 21st century (2001-2002, 2007-2009, and 2012-2016), bringing renewed subsidence to the San Joaquin Valley and the revitalization of the Monitoring Network. Four extensometers were refurbished in 2011-2012, which involved new reference tables and instrumentation, and the construction of new shelters. These were added to the six extensometers that were operating at five sites. Spirit-leveling and campaign GPS networks were generally maintained on major water-conveyance canals and highways only, and 13 Continuous GPS sites (maintained by various agencies/groups) are in operation on the Valley floor.[9]

The Project site is dominated by Delhi loamy sand, with a low to moderate risk of subsidence.

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[7] USGS Land Subsidence in the San Joaquin Valley - https://www.usgs.gov/centers/ca-water-ls/science/land-subsidence-san-joaquin-valley?qt-science_center_objects=0#qt-science_center_objects. Accessed August 4, 2021.
[8] Ibid.
[9] Ibid.

3.8.1.5 Dam and Levee Failure

Madera Equalization Reservoir is located on the Madera Canal and part of the USBR Central Valley Project facilities and operations (see **Figure 3-3 Flood Map** in **Section 3.3** below), is located approximately 4.5-miles northeast of the Project. Any overtopping of the Madera Equalization Reservoir would likely result in waters flowing back in local drainages and south toward the Fresno River and then carried further downstream.

The very easterly-most approximately 0.44-miles portion of the Project site APE lies within the inundation zones of Hensley Lake/Hidden Dam and Madera Lake, also shown in **Figure 3-3** in **Section 3.11** below.

3.8.2 Impact Assessment

a) Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

a-i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

a-ii) Strong seismic ground shaking?

Less than Significant Impact. The Project site and its vicinity are located in an area traditionally characterized by relatively low seismic activity. The site is not located in an Alquist-Priolo Earthquake Fault Zone as established by the Alquist-Priolo Fault Zoning Act (Section 2622 of Chapter 7.5, Division 2 of the California Public Resources Code). The nearest major fault is the San Andreas Fault, located approximately 70 miles southwest of the Project site. A smaller fault zone, the Ortigalita Fault is approximately 50 miles west of the site.

The Project involves the installation of a siphon and associated infrastructure, which does not include development of habitable residential structures. Operation of the Project would not require permanent staff onsite or an increase in the number of employees required for routine maintenance. Instead, routine maintenance and repairs would be performed infrequently, on an as-needed basis by current MWD employees or contractors. Therefore, implementation of the Project would not result in an increase of people or habitable structures onsite. Any impact would be less than significant.

a-iii) Seismic-related ground failure, including liquefaction?

Less than Significant Impact. Liquefaction is a process which involves the temporary transformation of soil from a solid state to a fluid form during intense and prolonged ground shaking. Water-saturated areas with shallow depth to groundwater and uniform sands, loose-to-medium in density, are prone to liquefaction[10]. The liquefaction risk is low in project area as the soils identified in **Section 3.8.1.1** are not uniform sands but primarily sandy loam and therefore the risk would be less than significant. (See **Appendix D**)

a-iv) Landslides?

No Impact. As the Project is located on the San Joaquin Valley floor, no major geologic landforms exist on or near the site that could result in a landslide event. The potential landslide impact at this location is minimal as the site is approximately 30 miles from the foothills and the local topography is essentially flat and level. There will be no impact.

b) Would the project result in substantial soil erosion or the loss of topsoil?

Less than Significant Impact. Earthmoving activities associated with the Project would include excavation, trenching, grading, and infrastructure construction within an area of approximately 10.6 acres. These activities

[10] Madera County General Plan Background Report. https://www.maderacounty.com/Home/ShowDocument?id=2852 Accessed April 27, 2020.

could expose soils to erosion processes and the extent of erosion would vary depending on slope steepness/stability, vegetation/cover, concentration of runoff, and weather conditions. Dischargers whose projects disturb one (1) or more acres of soil or whose projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity Construction General Permit Order 2009-0009-DWQ. Construction activity subject to this permit includes clearing, grading and disturbances to the ground such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development of a Storm Water Pollution Prevention Plan (SWPPP) by a certified Qualified SWPPP Developer (QSD). Since the Project site has relatively flat terrain with a low potential for soil erosion and would comply with the SWRCB requirements, the impact would be less than significant.

c) Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

d) Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?

Less than Significant Impacts. Soils onsite consist primarily of Cometa sandy loamy sand, which is classified as well drained with a very low runoff class and is not considered expansive in nature (See NRCS Soil Resource Report in **Appendix D**). The Project site and surrounding areas do not contain substantial grade changes. Risk of landslides, lateral spreading, subsidence, liquefaction, and collapse are minimal. The Project does not propose significant alteration of the topography of the site and it does not involve development of structures or facilities that could be affected by expansive soils or expose people to substantial risks to life or property. Furthermore, the Project and its activities will be consistent with the California Building Standards Code regarding all electrical components. Any impacts would be less than significant

e) Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

No Impact. Septic installation or alternative waste water disposal systems are not necessary for the Project. There would be no impact.

f) Would the project directly or indirectly destroy a unique paleontological resource or site or unique geological feature?

Less than Significant Impact. There are no known unique paleontological resources/sites or unique geologic features present on the Project site. Barring any evidence to the contrary it is not anticipated that the Project would directly or indirectly destroy a unique paleontological resource or site or unique geological feature. Construction activities associated with the Project are not expected to be conducted significantly below grade, at a level where they would have the potential to disturb any previously unknown paleontological resources or geologic features. Impacts would be less than significant. (See **Appendix C** for full Class III/Phase I Survey)

3.9 Greenhouse Gas Emissions

Table 3-16. Greenhouse Gas Emissions Impacts

Greenhouse Gas Emissions Impacts					
Would the project:		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b)	Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

3.9.1 Environmental Setting and Baseline Conditions

The Earth's climate has been warming for the past century. Experts believe this warming trend is related to the release of certain gases into the atmosphere. Greenhouse gases (GHG) absorb infrared energy that would otherwise escape from the Earth. As the infrared energy is absorbed, the air surrounding the Earth is heated. An overall warming trend has been recorded since the late 19th century, with the most rapid warming occurring over the past 35 years, with 16 of the 17 warmest years on record occurring since 2001. Not only was 2016 the warmest year on record, but eight of the 12 months that make up the year—from January through September, with the exception of June—were the warmest on record for those respective months. October, November, and December of 2016 were the second warmest of those months on record—in all three cases, behind records set in 2015.[11] Human activities have been attributed to an increase in the atmospheric abundance of greenhouse gases. The following is a brief description of the most commonly recognized GHGs.

3.9.1.1 Greenhouse Gases

Carbon dioxide (CO_2) is an odorless, colorless natural greenhouse gas. CO_2 is emitted from natural and anthropogenic sources. Natural sources include the following: decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic out gassing. Anthropogenic sources include the burning of coal, oil, natural gas, and wood.

Methane (CH_4) is a flammable greenhouse gas. A natural source of methane is the anaerobic decay of organic matter. Geological deposits, known as natural gas fields, also contain methane, which is extracted for fuel. Other sources are from landfills, fermentation of manure, and ruminants such as cattle.

Nitrous oxide (N_2O), also known as laughing gas, is a colorless greenhouse gas. Nitrous oxide is produced by microbial processes in soil and water, including those reactions that occur in fertilizer containing nitrogen. In addition to agricultural sources, some industrial processes (fossil fuel-fired power plants, nylon production, nitric acid production, and vehicle emissions) also contribute to its atmospheric load.

Water vapor is the most abundant, and variable greenhouse gas. It is not considered a pollutant; in the atmosphere, it maintains a climate necessary for life.

Ozone (O_3) is known as a photochemical pollutant and is a greenhouse gas; however, unlike other greenhouse gases, ozone in the troposphere is relatively short-lived and, therefore, is not global in

[11] NASA, NOAA Data Show 2016 Warmest Year on Record Globally. https://www.nasa.gov/press-release/nasa-noaa-data-show-2016-warmest-year-on-record-globally. January 18, 2017. Accessed September 8, 2020.

nature. Ozone is not emitted directly into the atmosphere but is formed by a complex series of chemical reactions between volatile organic compounds, nitrogen oxides, and sunlight.

Aerosols are suspensions of particulate matter in a gas emitted into the air through burning biomass (plant material) and fossil fuels. Aerosols can warm the atmosphere by absorbing and emitting heat and can cool the atmosphere by reflecting light.

Chlorofluorocarbons (CFCs) are nontoxic, nonflammable, insoluble, and chemically unreactive in the troposphere (the level of air at the earth's surface). CFCs were first synthesized in 1928 for use as refrigerants, aerosol propellants, and cleaning solvents. CFCs destroy stratospheric ozone; therefore, their production was stopped as required by the Montreal Protocol in 1987.

Hydrofluorocarbons (HFCs) are synthetic chemicals that are used as a substitute for CFCs. Of all the greenhouse gases, HFCs are one of three groups (the other two are perfluorocarbons and sulfur hexafluoride) with the highest global warming potential. HFCs are human-made for applications such as air conditioners and refrigerants.

Perfluorocarbons (PFCs) have stable molecular structures and do not break down through the chemical processes in the lower atmosphere; therefore, PFCs have long atmospheric lifetimes, between 10,000 and 50,000 years. The two main sources of PFCs are primary aluminum production and semiconductor manufacture.

Sulfur hexafluoride (SF_6) is an inorganic, odorless, colorless, nontoxic, nonflammable gas. It has the highest global warming potential of any gas evaluated. Sulfur hexafluoride is used for insulation in electric power transmission and distribution equipment, in the magnesium industry, in semiconductor manufacturing, and as a tracer gas for leak detection.

3.9.1.2 Effects of Climate Change

The impacts of climate change have yet to fully manifest. A hotter planet is causing the sea level to rise, disease to spread to non-endemic areas, as well as more frequent and severe storms, heat events, and air pollution episodes. Also affected are agricultural production, the water supply, the sustainability of ecosystems, and therefore the economy. The magnitude of these impacts is unknown.

Emissions of GHGs contributing to global climate change are largely attributable to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors. GHG emissions are typically expressed in metric tons (MT) of carbon dioxide-equivalents ($CO_{2}e$), based on the GHG's Global Warming Potential (GWP). The GWP is dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, one MT of CH_4 has the same contribution to the greenhouse effect as approximately 21 MT of CO_2. Therefore, CH_4 is a much more potent GHG than CO_2.

3.9.2 Methodology

An Air Quality and Greenhouse Gas Emissions Evaluation Report (**Appendix A**) was prepared in May 2020. The sections below detail the methodology of the report and its conclusions.

3.9.2.1 Short-Term Construction-Generated Emissions

Short-term construction GHG emissions associated with the Project were estimated using CalEEmod, Version 2016.3.2. Emissions' modeling was assumed to occur over an approximate 5-month period and covering a site area of approximately 10.6 acres ground disturbance. Remaining assumptions were based on the default parameters contained in the model. Modeling assumptions and output files are included in **Appendix A**.

3.9.2.2 Long-Term Operational Emissions

Long-term operational GHG emissions associated with the Project are estimated to be minimal in nature. Coming from maintenance operations, and booster pumps. Modeling assumptions and output files are included in **Appendix A**.

3.9.2.3 Thresholds of Significance

In accordance with SJVAPCD's *CEQA Greenhouse Gas Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects*[12], proposed projects complying with Best Performance Standards (BPS) would be determined to have a less-than-significant impact. Projects not complying with BPS would be considered less than significant if operational GHG emissions would be reduced or mitigated by a minimum of 29 percent, in comparison to business-as-usual (year 2004) conditions. In addition, project-generated emissions complying with an approved plan or mitigation program would also be determined to have a less-than-significant impact.

Sacramento Metro Air Quality Management District's Thresholds for Significance:

Sacramento Metro Air Quality Management District's approach to developing a threshold of significance for GHG emissions is to identify the emissions level for which a project would not be expected to substantially conflict with existing California legislation adopted to reduce Statewide GHG emissions. If a project would generate GHG emissions above the threshold level, it would be considered to contribute substantially to a cumulative impact, and would be considered significant. If mitigation can be applied to lessen the emissions such that the project meets its share of emission reductions needed to address the cumulative impact, the project would normally be considered less than significant. Although the proposed Project is not located in the Sacramento Area, the Sacramento Metro Air Quality Management District's thresholds for significance are based on the Statewide AB 32 objectives, are scientifically supported and are more appropriate to assess potential impacts related to GHG emissions. For land use development projects, the threshold is compliance with a qualified GHG Reduction Strategy or annual emissions less than 1,100 metric tons per year (MT/yr) of CO_2e. For stationary source projects, such as those requiring a permit from a local air district to operate, the threshold is 10,000 MT/yr of CO_2e. Although the SMAQMD thresholds are generally intended for ongoing sources of emissions (e.g., manufacturing facilities, refineries), their use in CEQA is appropriate for construction projects that occur over a relatively short period and contribute a relatively low total amount of GHGs, as compared to a land use development project that would generate substantial annual emissions indefinitely.

3.9.3 Impact Assessment

a) Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? And;

b) Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Less than Significant Impact.

Short-Term Construction-Generated Emissions

Estimated construction-generated emissions are summarized in **Appendix A**. As indicated, construction of the Project would generate maximum annual emissions of approximately 138 $MTCO_{2}e$. Construction-related production of GHGs would be temporary and last approximately five months. These emissions are totaled and amortized over 30 years and added to the operational emissions in Table 3-17 below.

[12] Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA. http://www.valleyair.org/Programs/CCAP/12-17-09/3%20CCAP%20-%20FINAL%20LU%20Guidance%20-%20Dec%2017%202009.pdf Accessed September 2020

Table 3-17. Short-Term Construction-Generated GHG Emissions

Year	Emissions (MT CO_2e)(1)
2022	138
Amortized over 30 years	*4.6*

1. *Emissions were quantified using the CalEEmod, Version 2016.3.2.*
2. *Refer to* ***Appendix A*** *for modeling results and assumptions. Totals may not sum due to rounding.*

Long-Term Operational Emissions

Estimated long-term operational emissions are summarized in **Table 3-18**.

Table 3-18. Long-Term Operational GHG Emissions

	Emissions (MT CO_2e)(1)
Estimated Annual Operation CO2e Emissions	65.7
Amortized Construction Emissions	4.6
Total Estimated Annual Operational CO2e Emissions	70.3
*AB 32 Consistency Threshold for Land-Use Development Projects**	*1,100*
Exceed Threshold?	*No*

1. *Emissions were quantified using the CalEEmod, Version 2016.3.2.*
2. *Refer to* ***Appendix A*** *for modeling results and assumptions. Totals may not sum due to rounding.*

* *As published in the Sacramento Metro Air Quality Management District's CEQA Air Quality Guidelines. Available online at* https://www.airquality.org/LandUseTransportation/Documents/CH2ThresholdsTable4-2020.pdf *Accessed September 2022.*

The County does not have an adopted GHG plan or MT/yr thresholds for CO_2e. The San Joaquin Valley Air Pollution Control District (SJVAPCD) CEQA guidance for GHG emissions recommends that a project not be considered to have a significant impact if it complies with an applicable air quality plan, results in a 29% reduction from business as usual (BAU) GHG emissions (2004 levels), or implements applicable Best Performance Standards (BPS). The SJVAPCD metrics (reduction from BAU, implementation of BPS) are not appropriate for this Project. The thresholds provided by the SMAQMD, while not in our area, are very stringent and based on Statewide AB 32 objectives. Because they are designed to avoid significant impacts from global climate change, which occurs at a global scale, they do not depend on site-specific characteristics. The Madera Water District has determined that the SMAQMD thresholds are the most conservatively appropriate threshold for this Project, which according to the two tables above, has predominantly short-term construction emissions, and extremely low operational emissions (70.3 CO_2e). Any impacts would be less than significant.

3.10 Hazards and Hazardous Materials

Table 3-19. Hazards and Hazardous Materials Impacts

Hazards and Hazardous Materials Impacts					
Would the project:		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b)	Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c)	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☒	☐
d)	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒
f)	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
g)	Expose people or structures, either directly or indirectly to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☐	☒

3.10.1 Environmental Setting and Baseline Conditions

Madera County has prepared a Hazardous Waste Management Plan (adopted January 1989) in accordance with Health and Safety Code Section 24135 et seq., which states that counties may prepare such plans "for the management of all hazardous waste produced in the county," as well as a plan for the siting of new facilities. County Hazardous Waste Management Plans (HWMPs) are to be integrated with other local land use planning efforts. These plans were originally to be reviewed by the State Department of Health Services (DHS). Subsequent to the formation of the California Environmental Protection Agency (CalEPA) in 1991, County Hazardous Waste Management Plans are now to be submitted to the CalEPA's Department of Toxic Substances Control.

3.10.1.1 Hazardous Materials

The Hazardous Waste and Substances Sites (Cortese) List is a planning document used by the State, local agencies, and developers to comply with CEQA requirements in providing information about the location of hazardous materials release sites. Government Code (GC) Section 65962.5 requires the California Environmental Protection Agency (CalEPA) to develop at least annually an updated Cortese List. The Department of Toxic Substances Control (DTSC) is responsible for a portion of the information contained in the Cortese List. Other State and local government agencies are required to provide additional hazardous material release information for the Cortese List. DTSC's EnviroStor database provides DTSC's component of Cortese List data (DTSC, 2010). In addition to the EnviroStor database, the State Water Resources Control Board (SWRCB) Geotracker database provides information on regulated hazardous waste facilities in California, including underground storage tank (UST) cases and non-UST cleanup programs, including Spills-Leaks-Investigations-Cleanups (SLIC) sites, Department of Defense (DOD) sites, and Land Disposal program. A search of the DTSC EnviroStor database and the SWRCB Geotracker performed on October 22, 2018 determined that there are [no known] active hazardous waste generators or hazardous material spill sites within the Project site or immediate surrounding vicinity.

3.10.1.2 Airports

The Madera Municipal Airport is located approximately 5.6 miles southwest and the Chowchilla Airport is located approximately 13.7 miles northwest of the Project.

3.10.1.3 Emergency Response Plan

The Madera County Office of Emergency Services coordinates the development and maintenance of the Madera County Operational area Master Plan.

3.10.1.4 Sensitive Receptors

There are two Elementary Schools inside the City limits of Madera, located near the Project site. Berenda Elementary School is the closest school, located approximately 2.6 miles west of the APE on Club Drive. John J. Pershing Elementary school is approximately 2.8 miles southwest of the APE on Ellis St.

3.10.2 Impact Assessment

a) Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? And;

b) Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment? And;

c) Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

Less than Significant Impact. Implementation of the Project would allow water supplies to be brought into MWD from various sources, including MID. Construction of the Project will involve the use of hazardous materials associated with construction equipment, such as diesel fuel, lubricants, and solvents. However, the contractor will implement a SWPPP and is also required and expected to comply with all Cal/OSHA regulations regarding regular maintenance and inspection of equipment, spill prevention, and spill remediation in order to reduce the potential for incidental release of pollutants or hazardous substances onsite. Furthermore, any potential accidental hazardous materials spills during construction are the responsibility of the contractor to remediate in accordance with industry best management practices and State and county regulations. The Project site currently surrounded by agricultural use farmland plots, and the presence of pesticides and other petrochemical fluids could be in the ground. Impacts would be less than significant.

d) Would the project be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

No Impact. The Project does not involve land that is listed as a hazardous materials site pursuant to Government Code Section 65962.5 and is not included on a list compiled by the Department of Toxic Substances Control. A search of the DTSC EnviroStor database and the SWRCB Geotracker performed on October 22, 2018 determined that there are no known active hazardous waste generators or hazardous material spill sites within the Project site or immediate surrounding vicinity. There would be no impact.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?

No Impact. The Project is not located within an airport land use plan or within two miles of an airport. The Madera Municipal Airport is located 5.6-miles southwest and Chowchilla Airport is located 13.7-miles northwest of the Project. There would be no impact.

f) Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

Less than Significant Impact. There are no known adopted emergency response plans or emergency evacuation plans for the Project site. The Project includes the installation of a new booster pump, pipelines, siphon, sump and grower turnout that would allow surface water to be brought into MWD from Madera Lake from authorized sources. Construction traffic associated with the Project would be minimal and temporary, lasting approximately five months. Operational traffic would consist of as-needed operations and maintenance trips and would have no effect on roadways or emergency access. Road closures and detours are not anticipated as part of the construction phase of the Project. Disturbances to traffic patterns, such as a potential lane diversion would be temporary and minimal in nature, as there would be alternate routes available. Therefore, Project-related impacts to emergency evacuation routes or emergency response routes on local roadways would be considered less than significant.

g) Would the project expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?

No Impact. The Project does not include any residential components, nor would it require any employees to be stationed permanently at the site on a daily basis that would put people at risk of wildland fires. The Project would therefore not expose people or structures either directly or indirectly to any significant risk of loss, injury or death involving wildfires as it is not located in a High Risk Severity Zone (See **Section 3.21** for further information). There would be no impact.

3.11 Hydrology and Water Quality

Table 3-20. Hydrology and Water Quality Impacts

Hydrology and Water Quality Impacts					
	Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☐	☒	☐
b)	Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☒	☐
c)	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
	i) result in substantial erosion or siltation on- or off-site;	☐	☐	☒	☐
	ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;	☐	☐	☒	☐
	iii) 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	☐	☐	☒	☐
	iv) impede or redirect flood flows?	☐	☐	☒	☐
d)	In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☒	☐
e)	Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☐	☒

3.11.1 Environmental Setting and Baseline Conditions

The Project is located in the southern part of Madera County in the Central San Joaquin Valley, part of the Great Valley of California. The Valley is bordered by the Sierra Nevada Mountain Range to the east, the Coast Range to the west, the Klamath Mountains and Cascade Range to the north, and the Transverse Range and Mojave Desert to the south. Valley floor hydrology generally emanates from stormwater and snowmelt run-off via the watersheds of surrounding mountain ranges.

Like most of California, the San Joaquin Valley experiences a Mediterranean climate. Warm, dry summers are followed by cool, moist winters. Summer temperatures often reach above 90 degrees Fahrenheit, and the humidity is generally low. Winter temperatures are often below 60 degrees Fahrenheit during the day and rarely exceed 70 degrees. The Central Valley receives an average of 12 inches of precipitation in the form of rainfall yearly, most of which occurs between October and March.

According to the U.S. Geological Survey (USGS) classification system, the Project is located within the Madera Lake watershed; Hydrologic Unit Code (HUC): 180400070304.[13]

The Project lies entirely within the Madera Groundwater Subbasin of the San Joaquin Valley Groundwater Basin 5-022.06.[14] The principal drainage in the vicinity of the Project is the Fresno River, which is located about 0.4 miles south to southeast of the project site. There are no tributaries, or distributaries located within the site boundaries or adjacent to the site.

3.11.2 Impact Assessment

a) Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?

Less than Significant Impact. The State Water Resources Control Board (SWRCB) requires that a Storm Water Pollution Prevention Plan (SWPPP) be prepared for projects that disturb one or more acres of soil. A SWPPP involves site planning and scheduling, limiting disturbed soil areas, and determining best management practices to minimize the risk of pollution and sediments being discharged from construction sites. Implementation of the SWPP would minimize the potential for the Project to substantially alter the existing drainage pattern in a manner that would result in substantial erosion or siltation onsite or offsite.

The intent of the Project is allow MID or other authorized surface water that could be placed in the Fresno River be delivered to the Madera Lake for later use during the times when it is needed for irrigation and thereby reducing groundwater pumping. The Project would not generate any type of process or wastewater, therefore, would be no discharge of Project water to any surface source. As such, there would be no discharge directly associated with Project implementation that could impact water quality standards of any nearby waters of the United States. Impacts would be less than significant.

b) Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

Less than Significant Impact. The Project will benefit groundwater storage by securing additional surface water supplies for irrigation in-lieu of continued pumping of groundwater. The purpose of the Project is to secure the surface water when it is available and store it in Madera Lake until it is needed for irrigation. As a result there will be less demand for groundwater. The Project will not interfere substantially with groundwater recharge, nor would the Project interfere substantially with the production rate of pre-existing nearby wells. The impacts would be less than significant.

c) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

c-i) result in substantial erosion or siltation on- or off-site;

c-ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;

[13] USGS April 20, 2020.
[14] DWR Bulletin 118 Groundwater Basin Boundary Assessment Tool. https://gis.water.ca.gov/app/bbat/ Accessed April 20, 2020.

c-iii) 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 Less Than Significant Impact. ~

c-iv) impede or redirect flood flows?

Less than Significant Impact. The Project does not propose significant alteration of the topography of the site. The Project entails constructing and installation of new booster pumps, pipelines, siphon, siphon inlet channel, sump and grower turnout that would transport surface water from Madera Lake. The pipeline that runs through the orchard will be buried between the rows and will not cause any interference with or removal or orchard trees, except for approximately six trees in the area of the proposed booster pump/sump. In order to minimize erosion and run-off during construction activities, a SWPPP will be implemented, and the contractor will comply with all Cal/OSHA regulations regarding regular maintenance and inspection of equipment, spill prevention, and spill remediation in order to reduce the potential for incidental release of pollutants or hazardous substances onsite. Impacts would be less than significant.

d) Would the project in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundations?

Less than Significant Impact. The Project is and does not involve any habitable structures or the storing of any pollutants. The Project would not have the potential to release pollutants due to inundations. Any impacts would be less than significant.

e) Would the project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

No Impact. The Project would not conflict or obstruct implementation of a water quality control plan or sustainable groundwater management plan in the Madera Subbasin. Furthermore, construction activities will require implementation of a SWPPP and compliance with all Cal/OSHA regulations in order to reduce the potential for incidental release of pollutants or hazardous substances into surface water or groundwater. The project is identified in the Madera Subbasin Joint GSP as a project to assist MWD in groundwater sustainability. There would be no impact.

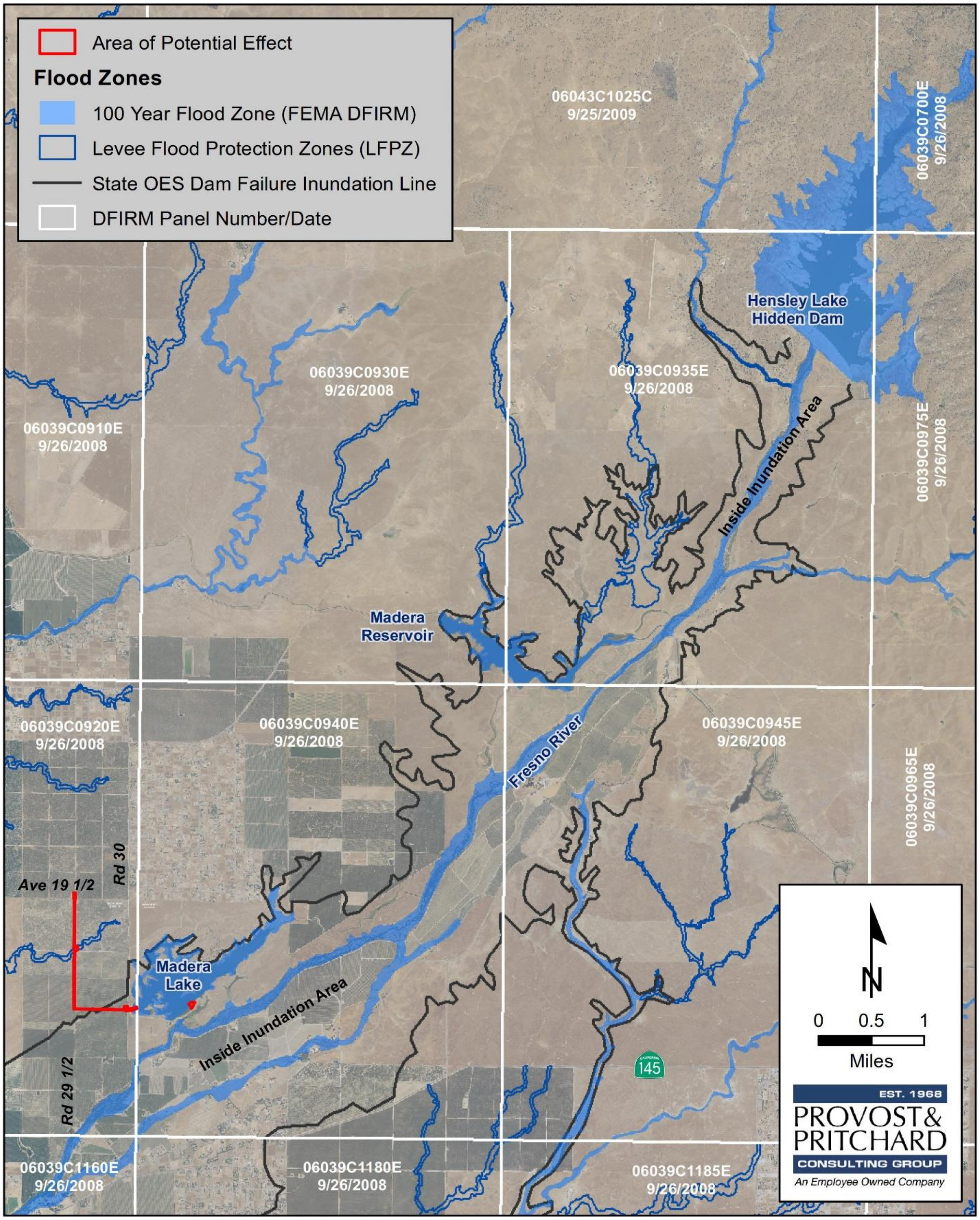

Figure 3-3. Flood Map

3.12 Land Use and Planning

Table 3-21. Land Use and Planning Impacts

Land Use and Planning Impacts					
Would the project:		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Physically divide an established community?	☐	☐	☐	☒
b)	Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒

3.12.1 Environmental Setting and Baseline Conditions

The Project site is located in the rural and agricultural portion of Madera County 2-miles south of Highway 145. The Project area is surrounded by agricultural farming lands and Madera Lake to the east.

The Madera County General Plan Designation Land Use Map designates this area as AE-Agriculture Exclusive, OS-Open Space. The pipeline and APE are located within land zoned ARE-40-Ag Rural Exclusive, 40 acres, by Madera County. The north, west, east and south sides of the APE borders along currently farmed agricultural plots (orchards) and Madera Lake lies to the east.

3.12.2 Impact Assessment

a) Would the project physically divide an established community?

No Impact. As illustrated in **Figure 2-3**, the Project site lies outside the established City of Madera and is not situated within an established county community. The Project site is bordered by the Madera Lake to the east and agricultural lands to the north, west and south. The Project does not include the permanent alteration of roads, trails, or paths that could be considered a connectivity network or that would divide an established community. There would be no impact.

b) Would the project cause a significant environmental conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

No Impact. The Madera County General Plan Land Use designates this area as AE-Agriculture Exclusive, OS-Open Space. The Project site is ARE-40 Rural Exclusive and POS – Public Open Space with the adjacent lands zoned ARE-40-Ag Rural Exclusive, 40-ac, ARE-20-Ag Rural Exclusive, 20-ac, POS-Public Open Space by the Madera County Zoning Element, 2018. The Project does not propose to impact the land use plan. There would be no impact.

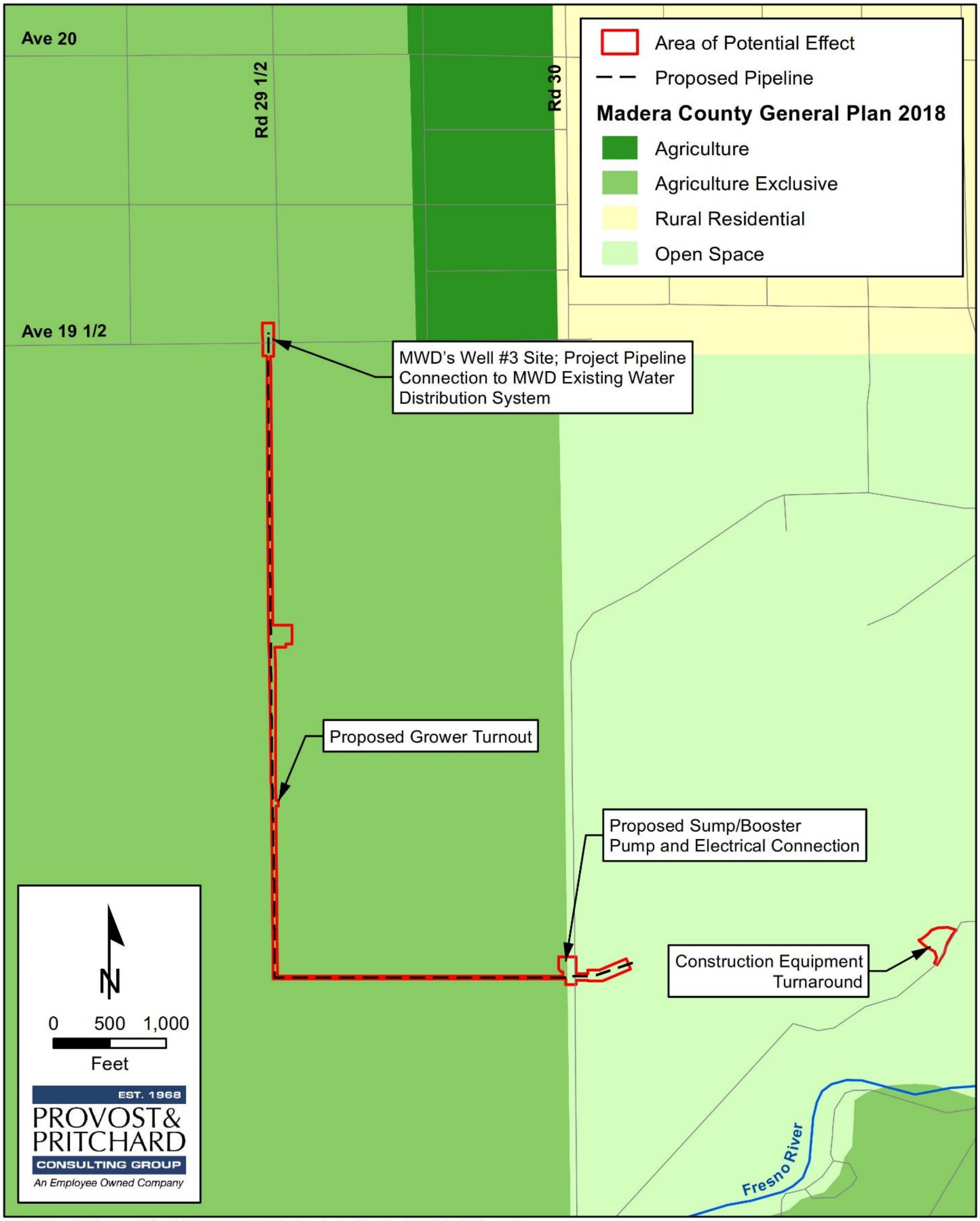

Figure 3-4. Madera County General Plan 2018 Land Use Designation Map

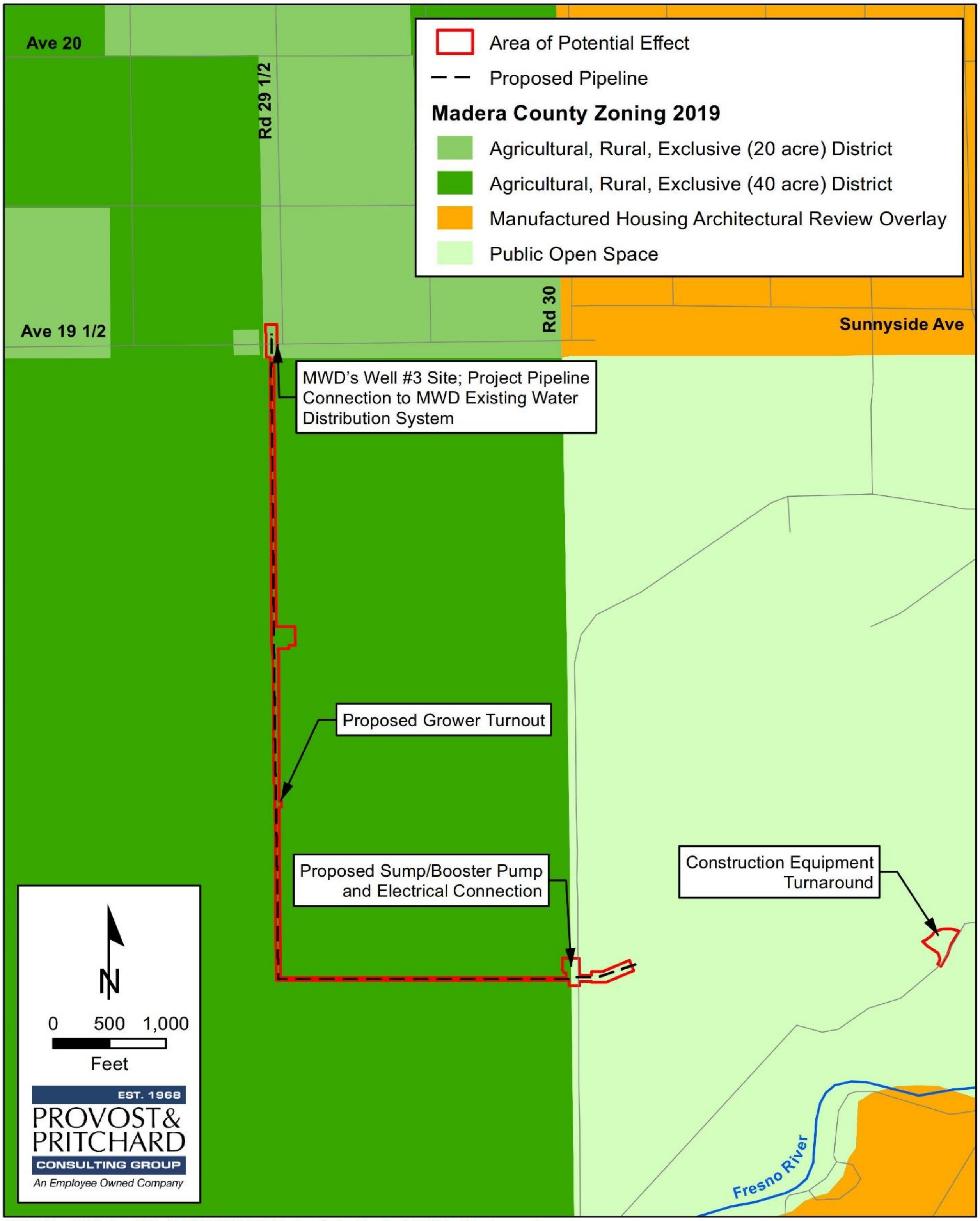

Figure 3-5. Madera County Zoning 2019 Map

3.13 Mineral Resources

Table 3-16. Mineral Resources Impacts

Mineral Resources Impacts					
Would the project:		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b)	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

3.13.1 Environmental Setting and Baseline Conditions

Extracted mineral resources in Madera County include aggregate (sand, gravel, and crushed stone), asbestos, copper, gold, iron, and silver. The most significant resource in terms of abundance, demand, and economic value, is aggregate. Sand, gravel, and crushed stone are building materials, and constitute crucial resources in a developing region.[15]

California Department of Conservation's Division of Oil, Gas, and Geothermal Resources (DOGGR) maintains a database of oil wells in the Project vicinity. According to the DOGGR Well Finder, there is one plugged oil well approximately 0.55-miles East from the vicinity of MWD's Well No. 3 site, where pipeline connection to the existing water distribution line will be located.[16] The Project site is not delineated on a local land use plan as a locally important mineral recovery site.

The California Geological Survey (CGS), previously known as California Department of Conservation, Division of Mines and Geology (DMG), has analyzed this region for the presence of aggregate resources in a 1988 mineral land classification report[17] and a subsequent 1999 update[18]. In each of these reports CGS has classified the Fresno-Madera Counties Production-Consumption region according to the presence or absence of significant aggregate deposits. The land classification is presented in the form of Mineral Resource Zones (MRZs). MRZ-1 represents areas where information indicates that there are no significant aggregate deposits. MRZ-2 represents areas where adequate information indicates that significant aggregate deposits ae present or where it is judged that a high likelihood exists for their presence. MRZ-3 represents areas containing mineral deposits the significance of which cannot be evaluated from available data. In both CGS reports, the Madera County area is largely classified as MRZ-3. All areas known to contain significant aggregate deposits within the Fresno-Madera PC region are located along the Fresno County boundary line near Millerton Lake.

There are no known current or historic mineral resource extraction or recovery operations in the Project vicinity nor are there any known significant mineral resources onsite. There is a sand and gravel mining operation located approximately 1.5-miles southeast from the APE.[19]

[15] Madera County General Plan. Background Report Chapter 6 Agricultural and Natural Resources, page 6-9. Accessed April 18, 2020.
[16] DOGGR Map of Oil and Gas Wells. https://maps.conservation.ca.gov/doggr/wellfinder/#openModal/-119.80553/36.52896/13 Accessed April 18, 2020.
[17] Special Report 158. Mineral Land Classification: Aggregate Materials in the Madera Production-Consumption Region. 1988. https://maps.conservation.ca.gov/cgs/informationwarehouse/index.html?map=mlc Accessed April 18, 2020.
[18] Open File Report 99-02. Update of Mineral Land Classification: Aggregate Materials in the Madera Production-Consumption Region, California. 1999. https://maps.conservation.ca.gov/cgs/informationwarehouse/index.html?map=mlc Accessed April 18, 2020 .
[19]California Department of Conservation Online Map locator https://maps.conservation.ca.gov/mol/index.html. Accessed October 23, 2020.

3.13.2 Impact Assessment

a) Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

No Impact. The Project or implementation of the Project would not result in the loss of availability of a known mineral resource that would be of value to the region or the residents. Furthermore, the Project area has not been designated as a locally important mineral resource recovery site by a general plan, specific plan, or land use plan. There would be no impact.

b) Would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

No Impact. The Project site is not delineated on a local land use plan as a locally important mineral resource recovery site; therefore, the existence of the Project would not result in the loss of availability of any mineral resources. There would be no impact.

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3.14 Noise

Table 3-22. Noise Impacts

Noise Impacts					
	Would the project result in:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b)	Generation of excessive ground borne vibration or ground borne noise levels?	☐	☐	☒	☐
c)	For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

3.14.1 Environmental Setting and Baseline Conditions

Roadway traffic is a major source of noise in Madera County, primarily from traffic State highways and major County roadways. Madera County is dominated by agricultural production, like much of the San Joaquin Valley. SR 145 is the nearest highway, which is 1.82 miles south of the APE. The Project area is surrounded by agricultural lands on the north, west, east and south sides and Madera Lake to the east of the APE. The area around the Project is accustomed to noises associated with agricultural use such as irrigation pumps, field tractors and standard four-wheel vehicles.

The Madera Municipal Airport is located 5.6-miles southwest and a Chowchilla Airport is located 13.7-miles northwest of the Project APE. The closest school, John J. Pershing Elementary School of Madera Unified School District is located 2.8 miles southwest of the APE.

Madera County Municipal Code Noise Control Ordinance[20]: Chapter 9.58 of the Madera County Municipal Code contains the Noise Control Regulations, which places limits on noise levels and hours of construction. Section 9.58.0202 – General Noise Regulations, Items G states that noise sources associated with construction activities are exempt from the provisions of the Noise Control Ordinance, as long as construction does not take place before 7:00 a.m. or after 7:00 p.m. Monday through Friday, or before 9:00 a.m. or after 5:00 p.m. on Saturday. Construction activities are prohibited on Sundays.

[20]Madera County Municipal Code Chapter 9.58
https://library.municode.com/ca/madera_county/codes/code_of_ordinances?nodeId=TIT9PESAMO_VOFAGPUPE_CH9.58NORE_9.58.020GENORE.
Accessed October 25, 2020.

3.14.2 **Impact Assessment**

a) Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Less than Significant Impact. The construction phase of the Project will involve temporary noise sources, originating predominately from off-road equipment, such as backhoes, excavators, and tractors. The Project is located adjacent and surrounded by currently maintained agricultural lands, accustomed to similar noises associated with farm equipment. Installation of the siphon, booster pump, pipeline and landowner turnout would not generate excessive noise beyond the noise associated with the currently farmed and irrigated land plots. Operational and maintenance activities would be on an as-needed basis with routine monitoring performed by existing staff and would not generate significant new noise. Any impacts would be mild and temporary and therefore, less than significant.

b) Would the project result in generation of excessive ground borne vibration or ground borne noise levels?

Less than Significant Impact. The construction phase of the Project will have excavation, trenching and grading as part of development of the associated infrastructure. Agricultural farmland surrounds the north, west, east and south sides of the Project area with Madera Lake immediately to the east. The use of farming equipment and farming activities occur on a regular basis. Conditions created by Project-related construction activities would not vary substantially from the baseline conditions routinely experienced onsite by agricultural and irrigation equipment used by MWD or the surrounding property owners. Impacts would be less than significant.

c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

No Impact. The Project is not located within an airport land use plan or within two miles of an airport and would not impact any adopted airport land use plans. The Madera Municipal Airport is located approximately 5.6-miles southwest and the Chowchilla Airport is located approximately 13.7-miles northwest of the Project. Furthermore, the Project does not involve the development of habitable structures or require the presence of permanent staff onsite. There would be no impact.

3.15 Population and Housing

Table 3-23. Population and Housing Impacts

Population and Housing Impacts					
Would the project:		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b)	Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

3.15.1 Environmental Setting and Baseline Conditions

The Project is located entirely outside the City of Madera and within the jurisdiction of the County of Madera. According to 2010 Census data, Madera County's population was 150,865 with an estimated percent change from 2010 to 2018 of 4.5%. As of 2010, there was an average population of 70.6 people per square mile[21]

3.15.2 Impact Assessment

a) Would the project induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

No Impact. The Project's purpose is to support sustainable and more energy efficient irrigation for existing agricultural operations. The Project does not propose additional housing or any related habitable housing infrastructure nor serve to promote population growth. The project will serve an area that is completely developed to irrigated agriculture. Therefore, the Project would not encourage population growth directly or indirectly beyond that previously analyzed by the Census Bureau. Therefore, there will be no impact.

b) Would the project displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

No Impact. The Project would allow water from MID or other sources to be brought into MWD through Madera Lake. The Project would not encourage population growth directly or indirectly. No housing or habitable structures would be built, nor will any be removed. Implementation of the Project will not result in displacement of people or existing housing. Therefore, there will be no impact.

[21] United States Census Bureau - Madera County, 2020. https://www.census.gov/quickfacts/fact/table/US/PST045219. Accessed April 27, 2020.

3.16 Public Services

Table 3-24. Public Services Impacts

Public Services Impacts					
Would the project:		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
	Fire protection?	☐	☐	☐	☒
	Police protection?	☐	☐	☐	☒
	Schools?	☐	☐	☐	☒
	Parks?	☐	☐	☐	☒
	Other public facilities?	☐	☐	☐	☒

3.16.1 Environmental Setting and Baseline Conditions

Fire Protection: The proposed Project area would be served by the Madera County Fire Department, Station 3 (Madera Acres) located 3.5 miles west of the APE, located at 25950 Ave 18 ½ in the City of Madera.

Police Protection: The Project area receives public safety protection provided by the Madera County Sheriff station in the City of Madera 4.7-miles south by southwest of the Project APE.

Schools: Public school services are provided by Madera Unified School District. John J. Pershing Elementary School in Madera Unified School District is located 2.8-miles southwest of the Project APE and would service the project area. John J. Pershing Elementary is the feeder school for Jack G. Desmond Middle School and Matilda Torres High School which also service the project area and are located approximately 5-miles from the Project APE.

Parks: Madera County has several regional parks, as well as State and national parks, national forest, wilderness areas, and recreational lakes. Madera Sunrise Rotary Sports Complex is the closest park, located approximately 3.2 miles southwest of the APE.

3.16.2 Impact Assessment

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

No Impact. The Project would not require the addition or alteration of any public services. The site is located completely within Madera County and is already served by Madera County Sheriff and Fire Departments. There would be no impact.

Fire Protection – The Project area would continue to be served by the Madera County Fire Department, Station 3, located approximately 3.5-miles west of the Project site. The buried pipeline portion of the Project would not be expected to generate a need for fire service. Any fire event involving the relatively small footprints of the ground-mounted equipment would not be expected to result in the provision of new or physically altered fire service facilities to maintain service ratios or response times to the site. There would be no impact related to public fire services.

Police Protection – Madera County would continue to provide sheriff protection services to the Project site upon implementation of the Project. Emergency response ability and timing is adequate to the Project site. The closest patrol station is located in the City of Madera, approximately 4.7-miles southwest of the Project site. No residential or office construction is proposed for this Project. The Project will result in the installation of pipelines and aboveground appurtenant equipment which would not be expected to generate significant additional police service. There would be no impact related to police protection services.

Schools – John J. Pershing Elementary of Madera Unified School District is the school that would service the Project area and is located 2.8-miles southwest of the Project APE. John J. Pershing Elementary is the feeder school for Jack G. Desmond Middle School and Matilda Torres High School which would also service the project area, located approximately 5-miles southwest and would not be impacted by the project or its implementation. Implementation would not include any construction of habitable residential structures that would induce population growth and lead to the need for more school services and therefore would not result in the generation of elementary school students. The Project would not result in an increase of population that would require additional school facilities; therefore, there would be no impact.

Parks and other public facilities –The Project would not induce population growth and would not create a need for additional park or recreational services. There would be no impact related to parks and other public facilities, see **3.17 Recreation**.

3.17 Recreation

Table 3-25. Recreation Impacts

Recreation Impacts					
	Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b)	Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

3.17.1 Environmental Setting and Baseline Conditions

Madera County's recreational amenities were realized very early. Yosemite Valley, in particular, has been a popular tourist attraction since the late 1800s. Several foothill and mountain communities have thrived because of the flow of people to Yosemite. Bass Lake, which was at one time a valley (Crane Valley), is now a popular resort community.[22]

The Project site is located within and surrounded by currently active agricultural lands. There are no parks within or adjacent to the Project site that would be affected by project activities.

3.17.2 Impact Assessment

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

No Impact. The Project would allow water from MID or other sources to be brought into MWD through Madera Lake to be used for agricultural irrigation. The proposed Project does not propose any residential development or job-creating commercial or industrial development and therefore is not expected to generate an increase in the demand for recreational facilities or put a strain on the existing recreational facilities in or around the area. There would be no impact.

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

No Impact. The Project does not include recreational facilities, nor the construction or expansion of any recreational facilities. There is no housing or population growth associated with the Project that could result in accelerated substantial physical deterioration of any such facilities. There would be no impact.

[22] Madera County General Plan Background Report Chapter 5 Cultural and Recreational Resources. Accessed October 18, 2020.

3.18 Transportation

Table 3-26. Transportation Impacts

Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	☐	☒	☐
b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)??	☐	☐	☒	☐
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
d) Result in inadequate emergency access?	☐	☐	☐	☒

3.18.1 Environmental Settings and Baseline Conditions

The APE is bordered by agricultural farmland plots on all sides and Madera Lake to the east. SR 145 is 1.82 miles south of the APE and SR 99 is 4.65 miles southwest of APE. The City of Madera is located 5.1 miles southwest of APE. The Madera Municipal Airport is located 5.6 miles northeast and the Chowchilla Airport is located 13.7 miles northwest of the APE.

3.18.2 Impact Assessment

a) Would the project conflict with a plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?

b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3 subdivision (b)?

Less than Significant Impact. The Project includes the installation of pipeline and related infrastructure that would allow water from MID or other sources to be brought into MWD through Madera Lake. Construction traffic associated with the Project would be minimal and temporary, lasting approximately five months. Operational traffic consists of as-needed operation and maintenance trips. There would not be a significant adverse effect to existing roadways in the area.

As mentioned above, the proposed Project is surrounded by agricultural farmland plots on all sides and Madera Lake is to the east and would involve some construction within existing dirt farm roads. The Project pipeline would cross under the Avenue 19-1/2 alignment but would likely require only temporary construction detours of the dirt rural public roadway. Any construction-related impacts that may occur would be temporary and insignificant. Any alternate routes that are needed will be available for use by vehicles, pedestrians, and bicycles. Although road closures are not anticipated as part of construction, any disturbances to existing dirt roadways, driveways, orchards or agricultural lands incurred from the Project will be temporary. Following construction, public and private roadways will reconstructed to their pre-project conditions.

There is no population growth associated with the Project, however, implementation of the Project will result in a need for MWD staff to make minimal as-needed operational and maintenance trips to the new facilities utilizing existing roadways in the area. Maintenance staff will likely integrate inspection of this Project's new facilities while on its current inspection rounds checking other existing district facilities, in particular the existing Well No. 3 site at the north terminus of the Project APE. Therefore, implementation of the Project is not anticipated to significantly increase the demand for any changes to congestion management programs or interfere with existing vehicle miles travelled standards during the operational phase. Construction-related public and private roadway interferences would be less than significant.

c) Would the project substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

No Impact. No new roadway design features are associated with the proposed Project. As mentioned in questions a) and b) above, all potential disturbances to public and private roadways will be temporary during the construction period and reconstructed to their pre-project conditions. Therefore, there would be no impact.

d) Would the project result in inadequate emergency access?

No Impact. As mentioned above in questions a), b), and c), the Project does not propose new roadway design features or permanent alterations to roadways that would affect existing emergency access. All potential disturbances to roadways during construction will be temporary and reconstructed to its pre-project condition prior to Project completion. Road closures and detours are not anticipated as part of the construction phase of the Project. The operational phase of the Project would have no effect on roadways or emergency access. Therefore, overall, there would be no potential Project-related impacts to emergency access on local roadways and would be considered to have no impact.

3.19 Tribal Cultural Resources

Table 3-27. Tribal Cultural Resources Impacts

Tribal Cultural Resources Impacts				
Would the project:	**Potentially Significant Impact**	**Less than Significant with Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
a) Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:	☐	☒	☐	☐
i. Listed or eligible for listing in the California Register of Historical Resources, or in the local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☒	☐
ii. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☒	☐	☐

3.19.1 Environmental Setting and Baseline Conditions

An intensive Class III cultural resources inventory/Phase I survey was conducted for the Project by ASM Affiliates, Inc., qualified archaeological consulting firm, in April and August of 2020, and September 2021. The majority of information contained in this section is drawn from that report which can be found in full in **Appendix C**. One cultural resource, Madera Lake, constructed initially for recreational activities by the Madera County Recreation Commission in 1958, was identified and recorded.

Madera Lake meets the National Register of Historic Places (NRHP) and California Register of Historical Resources (CRHR) age criterion for listing. Originally created as a recreational facility and subsequently acquired by the MID as part of their water conveyance system. However, it is not associated with an important historical event (Criterion A/1) or individual (Criterion B/2). Built with an earthen embankment across a natural valley forming a reservoir, it is a common property type that is not notable for engineering, craftsmanship or style. Madera Lake accordingly is recommended as not NRHP/CRHR eligible and does not constitute a historic property under NHPA Section 106 or a significant or unique historical resource under CEQA. A determination of No Historic Properties Affected and No Significant Adverse Impact is therefore recommended for the proposed Project.

Madera Lake specifically lies in a former side-slough of the Fresno River and would have been periodically inundated, both seasonally and during "mega-floods". These have been geologically documented back to AD 212 and they occur, on average, every 200 years. The last such flood occurred in 1861 – 1862. (See **Appendix C**.)

According to the geoarchaeological model developed by Meyer et al. (see reference citation in **Appendix C**), the APE has a Very Low to Low potential for buried archaeological deposits. Meyer et al.'s study involved first determining the location and ages of late Pleistocene (>25,000 years old) landforms in the southern San Joaquin Valley. These were identified by combining a synthesis of 2,400 published paleontological, soils and archaeological chronometric dates with geoarchaeological field testing. The ages of surface landforms were then mapped to provide an assessment for the potential for buried archaeological deposits. These ages were derived primarily from the Soil Survey Geographic Database (SSURGO) and the State Soils Geographic (STATSGO) database. A series of maps were created from this information that ranked locations in seven ordinal classes for sensitivity for buried soils, from Very Low to Very High. Buried sites and cultural resources are therefore considered to be unlikely within the Project APE. This conclusion is supported by the known distributions of historic Native American villages in the region north and south of the historic Fresno River flow and areas of seasonal inundation.

3.19.2 Impact Assessment

a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

a-i) Listed or eligible for listing in the California Register of Historical Resources, or in the local register of historical resources as defined in Public Resources Code section 5020.1(k), or

Less than Significant Impact. The Class III inventory/Phase I survey fieldwork was conducted with parallel transects spaced at 15-meter intervals along the APE and survey buffer. One cultural resource, historical Madera Lake, was identified and recorded. This lake was created in 1958 by the Madera County Recreation Commission to promote tourism with a warm water fishery. It proved impractical to obtain an adequate water supply and the lake was eventually acquired by the MID. It now serves as a storage, regulation and ground water recharge facility. No other archaeological resources or historical structures were identified within the Project APE and survey buffer. Given the geomorphological context of the Project, within a former side-slough of the Fresno River, and the Very Low to Low archaeological sensitivity of this location, it is unlikely that buried archaeological remains would be present. (See **Appendix C**) Any impacts would be considered less than significant.

a-ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

Less than Significant Impact with Mitigation Incorporated. Madera Water District, as a public lead agency has not received any formal requests for notification from any State tribes, pursuant to AB52, which might indicate concerns for potential impacts to Tribal cultural resources in the Project area. Nonetheless, an intensive Class III cultural resources inventory/Phase I survey of the Project area, including 15m parallel pedestrian survey transects, was conducted by ASM Affiliates, Inc. in April and August of 2020, with a follow up survey of the truck turn-around in September 2021. A records search was also conducted at the Southern San Joaquin Valley Archaeological Information Center, California State University, Bakersfield. This indicated that the APE had not been previously surveyed and that no cultural resources of any kind were known to exist within it. A record search of the Native American Heritage Commission (NAHC) Sacred Lands File was also conducted, which resulted in a declaration that no sacred sites or tribal cultural resources are known to exist within the Project site or in the vicinity.

In addition to the record search of the Sacred Lands File, NAHC provided a list of local Native American Tribal contacts, who may have knowledge of cultural resources in the vicinity or general interest in the Project. No comments were received in response to written consultation letters from ASM to each of the Tribes on the list. ASM further attempted to reach each Tribal contact by email on May 6, 2020 and received a response from two of the tribal contacts. One tribe requested an on-site visit, the other requested monitoring during ground disturbing activities. A copy of Tribal correspondence can be found within the Cultural Report (**Appendix C**).

No archaeological resources were identified by the ASM archaeologist during the pedestrian field survey of the Project area in April and August of 2020, and September 2021. Due to the sites Low to Very Low potential for buried archaeological deposits, and the known history of the site being seasonally inundated and not suitable for establishment of sustainable villages, there is little or no chance the Project will cause a substantial adverse change to the significance of a tribal cultural resource. In the unlikely event that cultural resources are discovered during the construction and operation of the Project, however, Mitigation Measures **CUL-1** and **CUL-2**, described above in **Section 3.6** are recommended in the event cultural materials or human remains are unearthed during excavation or construction of an archaeologist be contacted to evaluate the find and to assist with the development of a treatment plan, if warranted.

3.20 Utilities and Service Systems

Table 3-28. Utilities and Service Systems Impacts

Utilities and Service Systems Impacts					
	Would the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☐	☒
b)	Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☒	☐
c)	Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
d)	Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☒	☐
e)	Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☒	☐

3.20.1 Environmental Setting and Baseline Conditions

3.20.1.1 Water Supply

The Project lies entirely within the Madera Groundwater Subbasin of the San Joaquin Valley-Madera Groundwater Basin 5-022.06.[23] Declines in groundwater storage from groundwater overdraft are recurring problems in the Central Valley including the Madera Subbasin. Measures for ensuring the continued availability of groundwater for municipal needs as well as agricultural needs have been identified and planned in several areas of the county. The measures include groundwater conservation and recharge, and supplementing or replacing groundwater sources for irrigation with surface water.

The principal drainage of the region is the Fresno River, which originates in the mountains south of Yosemite National Park. The river is dammed at Hensley Lake, following which it continues southwest through the Project vicinity, passing within 0.4 mile south of the APE at its closest point. It terminates at the San Joaquin River east of Los Banos, California. The Fresno River in the vicinity of the Project carries seasonal flows regulated by Hensley Lake and flows directed into the Fresno River from the Madera Canal.

[23] California Department of Water Resources, Groundwater Basin Boundary Assessment Tool https://gis.water.ca.gov/app/bbat/. Accessed April 20, 2020.

3.20.1.2 Wastewater Collection and Treatment

No wastewater will be generated during Project construction or operation.

3.20.1.3 Landfills

Madera County is served by Fairmead Landfill which is located approximately 10.3-miles west/northwest of the Project site.

3.20.2 Impact Assessment

a) Would the project require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

No Impact. The Project entails the installation and maintenance of new booster pumps, pipelines, siphon, sump and grower turnout, to deliver surface water into Madera Water District and to the neighboring properties for agricultural irrigation from outside water supplies. The Project will not generate wastewater, exceed wastewater treatment requirements or require expansion of existing facilities. There would be no impact.

b) Would the project have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?

Less than Significant Impact. The proposed Project entails the installation of new booster pumps, pipelines, siphon, sump and grower turnout, to deliver into Madera Water District and its growers from surface water supplies, thereby reducing demands on declining groundwater supplies. The Project would have sufficient water supplies and be available to serve the project future development during normal, dry and multiple dry years. Impacts would be less than significant.

c) Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

No Impact. The Project does not require or propose any wastewater collection or treatment and therefore would not create or increase any wastewater demand on any wastewater treatment provider. or necessitate any sort of capacity determination by a wastewater treatment provider. There would be no impact.

d) Would the project generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

Less than Significant Impact. There will be no solid waste associated with the operational phase of the Project. Any solid waste associated with construction would be minimal and temporary, and would be the responsibility of the contractor to remove and dispose of at a County-approved landfill or recycling facility. Therefore, impacts would be less than significant.

e) Would the project comply with federal, state, and local management and reduction statutes and regulations related to solid waste?

Less than Significant Impact. The Project operation itself is not anticipated to produce any solid waste. However, the Project is required and would be expected to comply with any federal, State, and local regulations regarding solid waste management during the construction period. The impacts would be less than significant.

3.21 Wildfire

Table 3-29. Wildfire Impacts

Wildfire Impacts					
If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a)	Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
b)	Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrollable spread of wildfire?	☐	☐	☐	☒
c)	Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	☒
d)	Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☐	☒

3.21.1 Environmental Setting and Baseline Conditions

The proposed Project is located in Madera County within the jurisdiction of the County of Madera and the County of Madera Fire Department. The City of Madera is located approximately 5.1-miles southwest of the APE.

The Project site is surrounded by flat, non-urbanized agricultural land as well as Madera Lake to the east. The Project site and the adjacent lands are located in a Madera County Fire Department Local Responsibility Area for Non-Wildland, Non-Urban area. (**Figure 3-6**) The Project site is served by the Madera County Fire Department, Station No. 3, located just 3.5-miles west of the APE.

3.21.2 Impact Assessment

If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:

a) Substantially impair an adopted emergency response plan or emergency evacuation plan?

b) Due to slope, prevailing winds, and other factors exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

No Impact. No habitable structures are being constructed as part of the Project however, ground-mounted equipment will be constructed/present. The Project will occur on essentially flat land, with the exception of the siphon pipeline traversing the Madera Lake levee from the lakebed bottom to the booster pump/sump west of the levee. The above-ground mounted equipment has small footprints and pipelines will all be buried except for a portion within Madera Lake. As such, the Project will not impair any adopted emergency response or evacuation plans. As shown in **Figure 3-6,** the Project is located approximately 45.8-miles southwest of the nearest State Responsibility Area lands classified as a Very High Fire Hazard Severity Zone (FHSZ) by the California Department of Forestry and Fire Protection (CALFIRE). The proposed Project would not impair any emergency response plan set forth in the Madera County Wildfire Protection Plan, nor exacerbate fire risks due to wildfires. Further analysis of the Projects potential impacts to wildfire are not warranted. There would be no impacts.

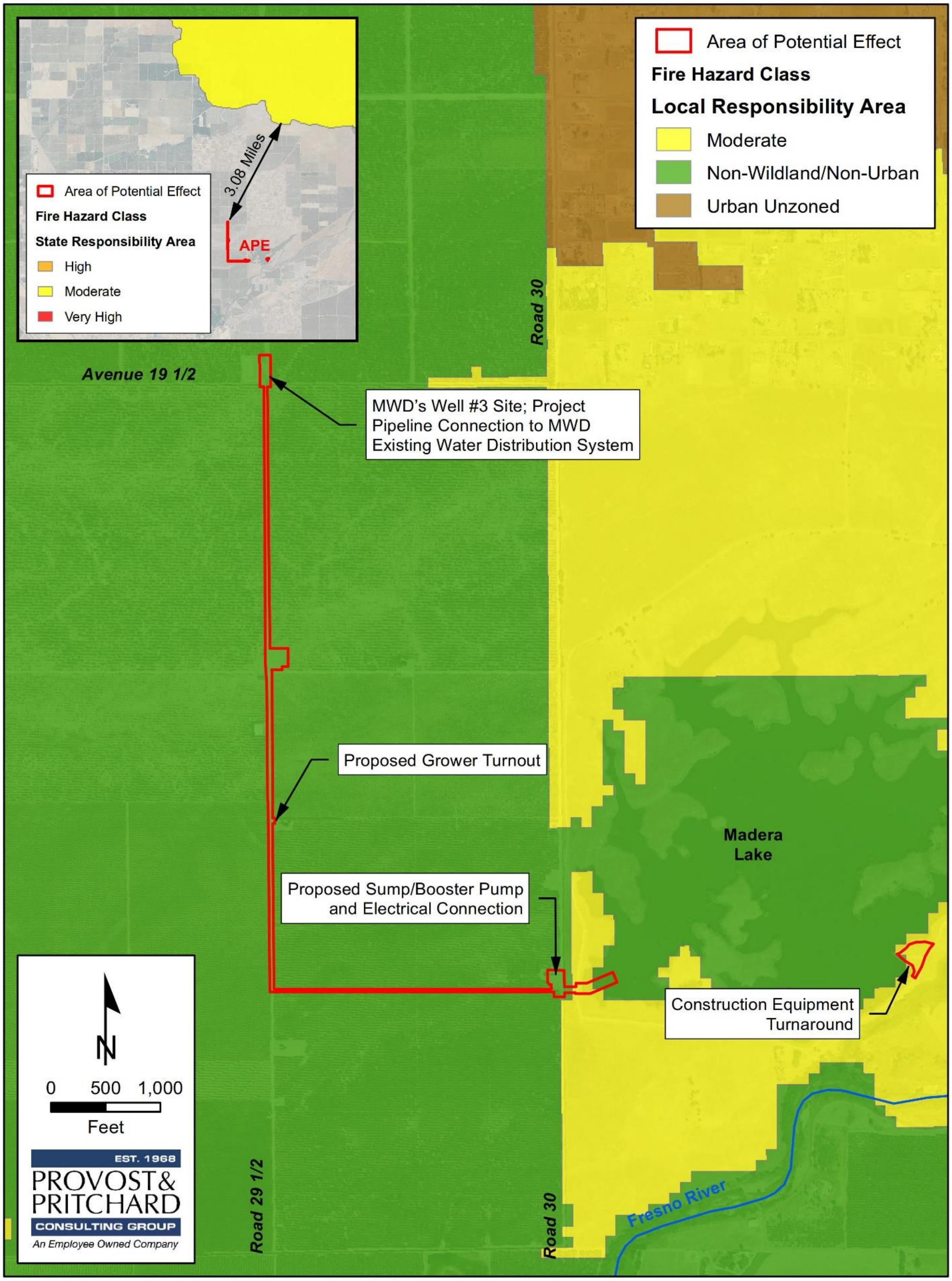

Figure 3-6. Fire Severity Hazard Map

3.22 CEQA Mandatory Findings of Significance

Table 3-30. Mandatory Findings of Significance Impacts

Mandatory Findings of Significance Impacts					
Does the project:	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact
a) Have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☒	☐
c) Have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

3.22.1 Impact Assessment

a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

Less than Significant Impact with Mitigation Incorporated. The analysis conducted in this Initial Study/Mitigated Negative Declaration results in a determination that the Project, with incorporation of mitigation measures, will have a less than significant effect on the environment. The potential for impacts to biological resources and cultural resources from the implementation of the Project will be less than significant with the incorporation of the mitigation measures discussed in this chapter and **Chapter 4 Mitigation Monitoring and Reporting Program**. Additionally, with implementation of the Best Management Practices for construction activities and obtaining the applicable permits and approvals required by state and federal law, the Project's potential to degrade the quality of the environment, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a protected species or eliminate important examples of the major periods of California history or prehistory would be less than significant with implementation of the above noted mitigation measure. The analysis conducted in this Initial Study/Mitigated Negative Declaration results in a determination that the Project would have a less than significant effect on the local environment.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Less than Significant Impact. CEQA Guidelines Section 15064(i) States that a Lead Agency shall consider whether the cumulative impact of a project is significant and whether the effects of the project are cumulatively considerable. The proposed Project entails the installation of new booster pumps, pipelines, siphon, siphon inlet channel, sump and grower turnout. The Project is intended to improve water availability and would not result in direct or indirect population growth, and no additional public services or utilities, or loss of or decline of significant environmental resources with mitigation incorporated. Therefore, implementation of the Project would not result in significant cumulative impacts and all potential impacts would be reduced to less than significant through the implementation of mitigation measures and basic regulatory requirements incorporated into future Project design.

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

Less than Significant Impact with Mitigation Incorporated. As discussed in this IS/MND, impacts associated with the Project are incremental and minor in nature, and would result in less than significant impacts to the environment with incorporation of all the recommended mitigation measures BIO-1a through BIO-6c, CULT 1 and 2. Implementation of the Project would assist to correct water availability issues experienced by the local agricultural land owners within the Madera Water District and the surrounding area. With implementation of Best Management Practices, requirements and regulations of state law, and adoption and implementation of recommended mitigation measures during construction and operations/maintenance of the proposed Project, all identified impacts will be less than significant with mitigation incorporated.

3.23 Determination: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

[signature] 9-15-2022
Signature Date

JOHN GIES
John Geis/District Manager

Chapter 4 Mitigation Monitoring and Reporting Program

This Mitigation Monitoring and Reporting Program (MMRP) has been formulated based upon the findings of the Initial Study/Mitigated Negative Declaration (IS/MND) for the Madera Lake Pipeline (Project) in the Madera Water District. The MMRP lists mitigation measures recommended in the IS/MND for the Project and identifies monitoring and reporting requirements.

Table 4-1 presents the mitigation measures identified for the Project. Each mitigation measure is numbered with a symbol indicating the topical section to which it pertains, a hyphen, and the impact number. For example, AIR-2 would be the second mitigation measure identified in the Air Quality analysis of the IS/MND.

The first column of **Table 4-1** identifies the mitigation measure. The second column, entitled "When Monitoring is to Occur," identifies the time the mitigation measure should be initiated. The third column, "Frequency of Monitoring," identifies the frequency of the monitoring of the mitigation measure. The fourth column, "Agency Responsible for Monitoring," names the party ultimately responsible for ensuring that the mitigation measure is implemented. The last columns will be used by MWD to ensure that individual mitigation measures have been complied with and monitored.

Table 4-1. Mitigation Monitoring and Reporting Program

Mitigation Monitoring and Reporting Program					
Mitigation Measure/Condition of Approval	**When Monitoring is to Occur**	**Frequency of Monitoring**	**Agency Responsible for Monitoring**	**Method to Verify Compliance**	**Verification of Compliance**
Biological Resources					
California Tiger Salamander					
BIO – 1a (Take Authorization)					
Take authorization from CDFW must be obtained and the USFWS must be consulted. Required mitigations presented in take permits issued from these agencies must be adhered to. While such mitigations are project-specific, typical mitigation requirements of these permits include potential compensatory mitigation, as well as avoidance and minimization measures such as burrow excavation, construction monitoring by an approved biologist, mandatory capping of pipes, covering trenches, and maintaining escape ramps in trenches.	Obtain take authorization prior to the start of any construction activities; carry out required mitigation in accordance with CDFW authorization	Monitor CDFW-required mitigation throughout construction activities at a frequency required by CDFW	MWD with assistance of a qualified biological subconsultant	Written reporting/photos to MWD and CDFW, if required, by biologist in accordance with and requirements of CDFW	
BIO – 1b (Environmental Awareness Training)					
Prior to the start of construction, a qualified biologist will provide training on the CTS to all construction personnel. This training will include a description of the CTS and its habitat needs; a report of the occurrence of the species in the Project vicinity; an explanation of the status of the species and its protection under the state and federal Endangered Species Acts; and a list of the measures being taken to reduce impacts to CTS during Project implementation. Attendance will be documented on a sign-in sheet. Attendees will be provided a handout that summarizes all of the training information. The applicant will use this handout to train any construction personnel that were not in attendance at the first meeting, prior to those personnel starting work on the site.	Prior to the start of any construction activities	As needed for any new construction personnel during construction activities	MWD with assistance of a qualified biological subconsultant	Written reporting/photos to MWD and CDFW, if required, by biologist in accordance with requirements of CDFW	
Western Spadefoot Toad					
BIO – 2a (Take Authorization)					
The Project will comply with provisions of Mitigation Measure BIO – 1a, which, while designed for CTS, will offer protection measures relevant to western spadefoot.	Prior to the start of any construction activities	During construction activities	MWD with assistance of a qualified biological subconsultant	Written reporting/photos to MWD and CDFW, if required, by biologist in accordance with requirements of CDFW	

Mitigation Monitoring and Reporting Program					
Mitigation Measure/Condition of Approval	**When Monitoring is to Occur**	**Frequency of Monitoring**	**Agency Responsible for Monitoring**	**Method to Verify Compliance**	**Verification of Compliance**
BIO – 2b (Environmental Awareness Training)					
Prior to the start of construction, a qualified biologist will provide training on the western spadefoot to all construction personnel. This training will include a description of the western spadefoot and its habitat needs; a report of the occurrence of the species in the Project vicinity; an explanation of the status of the species; and a list of the measures being taken to reduce impacts to western spadefoot during Project implementation. Attendance will be documented on a sign-in sheet. Attendees will be provided a handout that summarizes all of the training information. The applicant will use this handout to train any construction personnel that were not in attendance at the first meeting, prior to those personnel starting work on the site.	Prior to the start of any construction activities	As needed for any new construction personnel during construction activities	MWD with assistance of a qualified biological subconsultant	Written reporting/photos to MWD and CDFW, if required, by biologist in accordance with requirements of CDFW	
Swainson's Hawk					
BIO – 3a (Construction Timing)					
If feasible, construction activities will occur entirely outside the Swainson's hawk nesting season, typically defined as March 1-September 15.	March 1-September 15	During construction activities	MWD and construction contractor under agreement with MWD	By subconsultant report to MWD	
BIO – 3b (Preconstruction Surveys)					
If construction activities must occur between March 1 and September 15, then within 10 days prior to the start of work, a qualified biologist will conduct a preconstruction survey for Swainson's hawk nests on and within ½ mile of the APE.	If March 1 and September 15, then within 10 days prior to the start of construction activities	Prior to ground disturbing activities and the start of construction	MWD with assistance of a qualified biological subconsultant	By subconsultant report to MWD	
BIO – 3c (Avoidance)					
Should any active nests be identified, the biologist will establish a suitable disturbance-free buffer around the nest. This buffer will be identified on the ground with flagging or fencing, and will be maintained until the biologist has determined that the young have fledged.	Prior to the start of construction activities	Prior to ground disturbing activities and the start of construction	MWD with assistance of a qualified biological subconsultant	By subconsultant report to MWD	

Mitigation Monitoring and Reporting Program					
Mitigation Measure/Condition of Approval	**When Monitoring is to Occur**	**Frequency of Monitoring**	**Agency Responsible for Monitoring**	**Method to Verify Compliance**	**Verification of Compliance**
Burrowing Owl					
BIO – 4a (Take Avoidance Surveys)					
Take avoidance surveys for burrowing owls will be conducted by a qualified biologist within 30 days prior to the start of construction within grassland habitat of the site. The surveys will be conducted according to methods described in the Staff Report on Burrowing Owl Mitigation (CDFG 2012). The survey will cover grassland work areas and adjacent lands within 200 meters, where potential nesting or roosting habitat is present ("survey area").	Within 30 days prior to the start ground disturbing activities	Prior to and during construction activities	MWD with assistance of a qualified biological subconsultant	Written reporting/photos to MWD and CDFW, if required by biologist in accordance with requirements of CDFW	
BIO – 4b (Avoidance of Nest Burrows)					
If construction activities within grassland habitats are to occur during the breeding season (February 1-August 31) and active nest burrows are identified within the survey area, a 200-meter disturbance-free buffer will be established around each burrow. The buffers will be enclosed with temporary fencing to prevent encroachment by construction equipment and workers. Buffers will remain in place for the duration of the breeding season, unless otherwise arranged with CDFW. After the breeding season, passive relocation of any remaining owls may take place as described below.	February 1-August 31	As determined needed by biological subconsultant during construction activities	MWD with assistance of a qualified biological subconsultant	Written reporting/photos to MWD and CDFW, if required, by biologist in accordance with requirements of CDFW	
Project-Related Mortality/Disturbance of Other Nesting Birds and Raptors Including the Loggerhead Shrike					
BIO – 5a (Construction Timing)					
If feasible, construction activities and/or vegetation removal will take place entirely outside of the avian nesting season, typically defined as February 1 to August 31.	February 1-August 31	During construction activities	MWD	By subconsultant report to MWD	
BIO – 5b (Preconstruction Surveys)					
If construction activities and/or vegetation removal must occur between February 1 and August 31, then within 10 days prior to the start of work, a qualified biologist will conduct preconstruction surveys for active bird nests on and within 500 feet of the APE.	February 1-August 31	Once prior to initiating any ground disturbances	MWD with assistance of a qualified biological subconsultant	By subconsultant report to MWD	

Mitigation Monitoring and Reporting Program					
Mitigation Measure/Condition of Approval	**When Monitoring is to Occur**	**Frequency of Monitoring**	**Agency Responsible for Monitoring**	**Method to Verify Compliance**	**Verification of Compliance**
BIO – 5c (Avoidance)					
Should any active nests be identified, the biologist will establish suitable disturbance-free buffers around the nests. Buffers will be identified on the ground with flagging or fencing, and will be maintained until the biologist has determined that the young have fledged and the nests are no longer active.	During active nesting season February 1-August 31	As determined needed by biological subconsultant during construction activities	MWD with assistance of a qualified biological subconsultant	By subconsultant report to MWD	
American Badger					
BIO – 6a (Pre-disturbance Surveys)					
A pre-disturbance survey for American badgers will be conducted by a qualified biologist within 30 days prior to the start of construction. The survey area will include grassland areas within the APE and surrounding lands within 250 feet.	Within 30 days prior to the start of ground disturbing activities	Once prior to initiating any ground disturbance	MWD with assistance of a qualified biological subconsultant	By subconsultant report to MWD	
BIO – 6b (Avoidance)					
Any non-maternity dens identified during the pre-disturbance survey shall be flagged and avoided with a minimum 50-foot no-disturbance buffer until a qualified biologist has determined that the den is no longer in use. Any maternity dens identified during pre-disturbance surveys shall be flagged and avoided, if feasible, with a minimum 200-foot no-disturbance buffer for the duration of the pup-rearing season, typically February 15 to July 1.	During pup-rearing season February 15 to July 1	As determined needed by biological sub consultant, during ground disturbing activities	MWD with assistance of a qualified biological subconsultant	By subconsultant report to MWD	
BIO – 6c (Minimization)					
If a maternity den cannot feasibly be avoided, CDFW must be contacted to identify appropriate minimization measures prior to initiating any disturbance that would affect the den, including potential passive relocation by excavation before or after the rearing season.	Prior to initiating any construction-related site disturbance	Once prior to initiating any ground disturbances	MWD with assistance of a qualified biological subconsultant	Written reporting/photos to MWD and CDFW, if required by biologist in accordance with requirements of CDFW	

Mitigation Monitoring and Reporting Program					
Mitigation Measure/Condition of Approval	**When Monitoring is to Occur**	**Frequency of Monitoring**	**Agency Responsible for Monitoring**	**Method to Verify Compliance**	**Verification of Compliance**
Cultural Resources					
CULT – 1 (Archaeological Remains)					
Should archaeological remains or artifacts be unearthed during any stage of Project activities, work in the area of discovery shall cease until the area is evaluated by a qualified archaeologist. If mitigation is warranted, the Project proponent shall abide by recommendations of the archaeologist.	During ground disturbing activities and in the event potential archaeological artifacts or resources are uncovered	Daily during ground disturbing activities	MWD with assistance of a qualified cultural subconsultant	By subconsultant/contractor reports to MWD	
CULT – 2 (Human Remains)					
In the event that any human remains are discovered on the APE, the Madera County Coroner must be notified of the discovery (California Health and Safety Code, Section 7050.5) and all activities in the immediate area of the find or in any nearby area reasonably suspected to overlie adjacent human remains must cease until appropriate and lawful measures have been implemented. If the Coroner determines that the remains are not recent, but rather of Native American origin, the Coroner shall notify the Native American Heritage Commission (NAHC) in Sacramento within 24 hours to permit the NAHC to determine the Most Likely Descendent of the deceased Native American.	During ground disturbing activities and in the event human remains are uncovered	Daily during ground disturbing activities	MWD with assistance of a qualified cultural subconsultant	By subconsultant/contractor reports to MWD, Fresno County Coroner notification and report, and notification to NAHC, if applicable	

Appendix A

CalEEMod Emissions Modeling Output

Madera Lake Pipeline Project

Madera County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	9.10	Acre	9.10	396,396.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.9	**Precipitation Freq (Days)**	51
Climate Zone	3			**Operational Year**	2021
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	290	**CH4 Intensity (lb/MWhr)**	0.025	**N2O Intensity (lb/MWhr)**	0.005

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Current PG&E Intensity Factors

Land Use -

Construction Phase - Project will take approximatly 5 months. No buildings will be constructed. Work will predominately be installing a pipeline.

Trips and VMT - Work will have approximately 15 worker trips per day and 10 vendor trips per day. Hauling done with 20 CY trucks.

Grading - Approximately 150 cubic yards of dirt may be moved offsite.

Vehicle Trips - Approx 180 trips per year (once a day for 6 months) by district staff.

Construction Off-road Equipment Mitigation -

Energy Use - assuming 150 hp pumps operating for 6 months out of the year.

Madera Lake Pipeline Project - Madera County, Annual

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	230.00	20.00
tblConstructionPhase	NumDays	20.00	45.00
tblConstructionPhase	PhaseEndDate	3/11/2022	6/25/2021
tblConstructionPhase	PhaseEndDate	4/23/2021	5/28/2021
tblConstructionPhase	PhaseEndDate	4/8/2022	7/23/2021
tblConstructionPhase	PhaseStartDate	4/24/2021	5/29/2021
tblConstructionPhase	PhaseStartDate	3/12/2022	6/26/2021
tblEnergyUse	NT24E	0.00	1.24
tblFleetMix	HHD	0.10	0.10
tblFleetMix	LDA	0.52	0.53
tblFleetMix	LDT1	0.03	0.03
tblFleetMix	LDT2	0.17	0.17
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD2	5.7790e-003	5.4560e-003
tblFleetMix	MCY	7.3190e-003	7.1390e-003
tblFleetMix	MDV	0.12	0.12
tblFleetMix	MH	1.0280e-003	9.4900e-004
tblFleetMix	MHD	0.01	0.01
tblFleetMix	OBUS	2.7760e-003	2.7350e-003
tblFleetMix	SBUS	1.2650e-003	1.2430e-003
tblFleetMix	UBUS	1.7430e-003	1.7040e-003
tblGrading	AcresOfGrading	22.50	10.00
tblGrading	MaterialExported	0.00	150.00
tblProjectCharacteristics	CH4IntensityFactor	0.029	0.025
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblProjectCharacteristics	N2OIntensityFactor	0.006	0.005

tblTripsAndVMT	HaulingTripNumber	19.00	8.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	65.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	WorkerTripNumber	166.00	15.00
tblVehicleEF	HHD	1.72	1.72
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	0.17	0.15
tblVehicleEF	HHD	3.18	3.01
tblVehicleEF	HHD	0.69	0.67
tblVehicleEF	HHD	1.59	1.45
tblVehicleEF	HHD	6,012.03	5,955.32
tblVehicleEF	HHD	1,571.74	1,551.07
tblVehicleEF	HHD	3.44	3.23
tblVehicleEF	HHD	24.59	23.13
tblVehicleEF	HHD	3.55	3.13
tblVehicleEF	HHD	20.49	20.51
tblVehicleEF	HHD	0.03	0.02
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.04	0.04
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	5.8000e-005	5.3000e-005
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	8.9440e-003	8.9450e-003
tblVehicleEF	HHD	0.02	0.01

tblVehicleEF	HHD	5.3000e-005	4.9000e-005
tblVehicleEF	HHD	1.0100e-004	9.1000e-005
tblVehicleEF	HHD	3.4120e-003	3.0900e-003
tblVehicleEF	HHD	0.85	0.80
tblVehicleEF	HHD	5.1000e-005	4.6000e-005
tblVehicleEF	HHD	0.13	0.12
tblVehicleEF	HHD	2.9600e-004	2.6100e-004
tblVehicleEF	HHD	0.05	0.05
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	6.1000e-005	5.7000e-005
tblVehicleEF	HHD	1.0100e-004	9.1000e-005
tblVehicleEF	HHD	3.4120e-003	3.0900e-003
tblVehicleEF	HHD	0.97	0.92
tblVehicleEF	HHD	5.1000e-005	4.6000e-005
tblVehicleEF	HHD	0.15	0.14
tblVehicleEF	HHD	2.9600e-004	2.6100e-004
tblVehicleEF	HHD	0.06	0.05
tblVehicleEF	HHD	1.62	1.62
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	0.16	0.14
tblVehicleEF	HHD	2.32	2.19
tblVehicleEF	HHD	0.70	0.67
tblVehicleEF	HHD	1.46	1.33
tblVehicleEF	HHD	6,366.52	6,308.78
tblVehicleEF	HHD	1,571.74	1,551.07
tblVehicleEF	HHD	3.44	3.23

tblVehicleEF	HHD	25.38	23.87
tblVehicleEF	HHD	3.39	2.99
tblVehicleEF	HHD	20.48	20.50
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.04	0.04
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	5.8000e-005	5.3000e-005
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	8.9440e-003	8.9450e-003
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	5.3000e-005	4.9000e-005
tblVehicleEF	HHD	2.5500e-004	2.2900e-004
tblVehicleEF	HHD	3.9440e-003	3.5590e-003
tblVehicleEF	HHD	0.80	0.76
tblVehicleEF	HHD	1.1900e-004	1.0600e-004
tblVehicleEF	HHD	0.13	0.12
tblVehicleEF	HHD	3.0200e-004	2.6600e-004
tblVehicleEF	HHD	0.05	0.04
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	5.9000e-005	5.5000e-005
tblVehicleEF	HHD	2.5500e-004	2.2900e-004
tblVehicleEF	HHD	3.9440e-003	3.5590e-003
tblVehicleEF	HHD	0.91	0.86
tblVehicleEF	HHD	1.1900e-004	1.0600e-004

tblVehicleEF	HHD	0.15	0.14
tblVehicleEF	HHD	3.0200e-004	2.6600e-004
tblVehicleEF	HHD	0.06	0.05
tblVehicleEF	HHD	1.86	1.86
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	0.18	0.17
tblVehicleEF	HHD	4.37	4.15
tblVehicleEF	HHD	0.69	0.66
tblVehicleEF	HHD	1.77	1.61
tblVehicleEF	HHD	5,522.51	5,467.20
tblVehicleEF	HHD	1,571.74	1,551.07
tblVehicleEF	HHD	3.44	3.23
tblVehicleEF	HHD	23.51	22.11
tblVehicleEF	HHD	3.62	3.19
tblVehicleEF	HHD	20.50	20.51
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.04	0.04
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	5.8000e-005	5.3000e-005
tblVehicleEF	HHD	0.03	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	8.9440e-003	8.9450e-003
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	5.3000e-005	4.9000e-005
tblVehicleEF	HHD	2.6000e-005	2.4000e-005
tblVehicleEF	HHD	3.5620e-003	3.2190e-003

tblVehicleEF	HHD	0.91	0.87
tblVehicleEF	HHD	1.6000e-005	1.5000e-005
tblVehicleEF	HHD	0.13	0.12
tblVehicleEF	HHD	3.1600e-004	2.7900e-004
tblVehicleEF	HHD	0.06	0.05
tblVehicleEF	HHD	0.05	0.05
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	6.4000e-005	5.9000e-005
tblVehicleEF	HHD	2.6000e-005	2.4000e-005
tblVehicleEF	HHD	3.5620e-003	3.2190e-003
tblVehicleEF	HHD	1.04	0.99
tblVehicleEF	HHD	1.6000e-005	1.5000e-005
tblVehicleEF	HHD	0.15	0.14
tblVehicleEF	HHD	3.1600e-004	2.7900e-004
tblVehicleEF	HHD	0.07	0.06
tblVehicleEF	LDA	4.9310e-003	4.4560e-003
tblVehicleEF	LDA	6.5030e-003	5.6330e-003
tblVehicleEF	LDA	0.65	0.61
tblVehicleEF	LDA	1.36	1.22
tblVehicleEF	LDA	274.92	263.92
tblVehicleEF	LDA	59.67	57.56
tblVehicleEF	LDA	0.05	0.05
tblVehicleEF	LDA	0.08	0.07
tblVehicleEF	LDA	1.9650e-003	1.9270e-003
tblVehicleEF	LDA	2.3150e-003	2.2930e-003
tblVehicleEF	LDA	1.8110e-003	1.7760e-003
tblVehicleEF	LDA	2.1290e-003	2.1090e-003

tblVehicleEF	LDA	0.05	0.05
tblVehicleEF	LDA	0.12	0.11
tblVehicleEF	LDA	0.04	0.03
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.03	0.03
tblVehicleEF	LDA	0.09	0.08
tblVehicleEF	LDA	2.7540e-003	2.6430e-003
tblVehicleEF	LDA	6.2000e-004	5.9600e-004
tblVehicleEF	LDA	0.05	0.05
tblVehicleEF	LDA	0.12	0.11
tblVehicleEF	LDA	0.04	0.03
tblVehicleEF	LDA	0.02	0.02
tblVehicleEF	LDA	0.03	0.03
tblVehicleEF	LDA	0.10	0.08
tblVehicleEF	LDA	5.6740e-003	5.1250e-003
tblVehicleEF	LDA	5.3270e-003	4.6140e-003
tblVehicleEF	LDA	0.80	0.75
tblVehicleEF	LDA	1.11	1.00
tblVehicleEF	LDA	301.64	289.52
tblVehicleEF	LDA	59.67	57.56
tblVehicleEF	LDA	0.05	0.05
tblVehicleEF	LDA	0.08	0.07
tblVehicleEF	LDA	1.9650e-003	1.9270e-003
tblVehicleEF	LDA	2.3150e-003	2.2930e-003
tblVehicleEF	LDA	1.8110e-003	1.7760e-003
tblVehicleEF	LDA	2.1290e-003	2.1090e-003
tblVehicleEF	LDA	0.12	0.11

tblVehicleEF	LDA	0.14	0.13
tblVehicleEF	LDA	0.08	0.07
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.03	0.03
tblVehicleEF	LDA	0.07	0.06
tblVehicleEF	LDA	3.0230e-003	2.9010e-003
tblVehicleEF	LDA	6.1500e-004	5.9200e-004
tblVehicleEF	LDA	0.12	0.11
tblVehicleEF	LDA	0.14	0.13
tblVehicleEF	LDA	0.08	0.07
tblVehicleEF	LDA	0.02	0.02
tblVehicleEF	LDA	0.03	0.03
tblVehicleEF	LDA	0.08	0.07
tblVehicleEF	LDA	4.6340e-003	4.1850e-003
tblVehicleEF	LDA	7.7260e-003	6.6890e-003
tblVehicleEF	LDA	0.60	0.56
tblVehicleEF	LDA	1.67	1.50
tblVehicleEF	LDA	264.74	254.16
tblVehicleEF	LDA	59.67	57.56
tblVehicleEF	LDA	0.06	0.05
tblVehicleEF	LDA	0.09	0.08
tblVehicleEF	LDA	1.9650e-003	1.9270e-003
tblVehicleEF	LDA	2.3150e-003	2.2930e-003
tblVehicleEF	LDA	1.8110e-003	1.7760e-003
tblVehicleEF	LDA	2.1290e-003	2.1090e-003
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.11	0.11

tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.04	0.04
tblVehicleEF	LDA	0.10	0.09
tblVehicleEF	LDA	2.6510e-003	2.5450e-003
tblVehicleEF	LDA	6.2500e-004	6.0100e-004
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.11	0.11
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.02	0.02
tblVehicleEF	LDA	0.04	0.04
tblVehicleEF	LDA	0.11	0.10
tblVehicleEF	LDT1	0.02	0.01
tblVehicleEF	LDT1	0.02	0.02
tblVehicleEF	LDT1	1.76	1.58
tblVehicleEF	LDT1	4.30	3.86
tblVehicleEF	LDT1	342.00	331.08
tblVehicleEF	LDT1	73.99	72.18
tblVehicleEF	LDT1	0.17	0.15
tblVehicleEF	LDT1	0.24	0.22
tblVehicleEF	LDT1	3.3140e-003	3.1150e-003
tblVehicleEF	LDT1	4.1450e-003	3.9000e-003
tblVehicleEF	LDT1	3.0530e-003	2.8690e-003
tblVehicleEF	LDT1	3.8120e-003	3.5870e-003
tblVehicleEF	LDT1	0.22	0.21
tblVehicleEF	LDT1	0.40	0.38
tblVehicleEF	LDT1	0.14	0.13

tblVehicleEF	LDT1	0.04	0.03
tblVehicleEF	LDT1	0.25	0.23
tblVehicleEF	LDT1	0.30	0.27
tblVehicleEF	LDT1	3.4430e-003	3.3310e-003
tblVehicleEF	LDT1	8.1600e-004	7.9000e-004
tblVehicleEF	LDT1	0.22	0.21
tblVehicleEF	LDT1	0.40	0.38
tblVehicleEF	LDT1	0.14	0.13
tblVehicleEF	LDT1	0.06	0.05
tblVehicleEF	LDT1	0.25	0.23
tblVehicleEF	LDT1	0.33	0.29
tblVehicleEF	LDT1	0.02	0.02
tblVehicleEF	LDT1	0.02	0.02
tblVehicleEF	LDT1	2.13	1.92
tblVehicleEF	LDT1	3.50	3.14
tblVehicleEF	LDT1	373.48	361.65
tblVehicleEF	LDT1	73.99	72.18
tblVehicleEF	LDT1	0.15	0.14
tblVehicleEF	LDT1	0.22	0.20
tblVehicleEF	LDT1	3.3140e-003	3.1150e-003
tblVehicleEF	LDT1	4.1450e-003	3.9000e-003
tblVehicleEF	LDT1	3.0530e-003	2.8690e-003
tblVehicleEF	LDT1	3.8120e-003	3.5870e-003
tblVehicleEF	LDT1	0.54	0.50
tblVehicleEF	LDT1	0.51	0.48
tblVehicleEF	LDT1	0.31	0.30
tblVehicleEF	LDT1	0.04	0.04

tblVehicleEF	LDT1	0.24	0.22
tblVehicleEF	LDT1	0.25	0.22
tblVehicleEF	LDT1	3.7630e-003	3.6410e-003
tblVehicleEF	LDT1	8.0200e-004	7.7700e-004
tblVehicleEF	LDT1	0.54	0.50
tblVehicleEF	LDT1	0.51	0.48
tblVehicleEF	LDT1	0.31	0.30
tblVehicleEF	LDT1	0.06	0.06
tblVehicleEF	LDT1	0.24	0.22
tblVehicleEF	LDT1	0.27	0.24
tblVehicleEF	LDT1	0.01	0.01
tblVehicleEF	LDT1	0.03	0.02
tblVehicleEF	LDT1	1.66	1.49
tblVehicleEF	LDT1	5.33	4.77
tblVehicleEF	LDT1	329.99	319.43
tblVehicleEF	LDT1	73.99	72.18
tblVehicleEF	LDT1	0.19	0.17
tblVehicleEF	LDT1	0.27	0.24
tblVehicleEF	LDT1	3.3140e-003	3.1150e-003
tblVehicleEF	LDT1	4.1450e-003	3.9000e-003
tblVehicleEF	LDT1	3.0530e-003	2.8690e-003
tblVehicleEF	LDT1	3.8120e-003	3.5870e-003
tblVehicleEF	LDT1	0.06	0.05
tblVehicleEF	LDT1	0.41	0.38
tblVehicleEF	LDT1	0.04	0.04
tblVehicleEF	LDT1	0.04	0.03
tblVehicleEF	LDT1	0.30	0.28

tblVehicleEF	LDT1	0.36	0.32
tblVehicleEF	LDT1	3.3210e-003	3.2130e-003
tblVehicleEF	LDT1	8.3400e-004	8.0600e-004
tblVehicleEF	LDT1	0.06	0.05
tblVehicleEF	LDT1	0.41	0.38
tblVehicleEF	LDT1	0.04	0.04
tblVehicleEF	LDT1	0.05	0.05
tblVehicleEF	LDT1	0.30	0.28
tblVehicleEF	LDT1	0.39	0.35
tblVehicleEF	LDT2	8.6560e-003	7.8170e-003
tblVehicleEF	LDT2	0.01	0.01
tblVehicleEF	LDT2	1.02	0.94
tblVehicleEF	LDT2	2.32	2.07
tblVehicleEF	LDT2	387.30	373.86
tblVehicleEF	LDT2	84.10	81.53
tblVehicleEF	LDT2	0.11	0.10
tblVehicleEF	LDT2	0.19	0.17
tblVehicleEF	LDT2	2.0600e-003	2.0350e-003
tblVehicleEF	LDT2	2.5600e-003	2.5250e-003
tblVehicleEF	LDT2	1.8950e-003	1.8720e-003
tblVehicleEF	LDT2	2.3540e-003	2.3210e-003
tblVehicleEF	LDT2	0.09	0.09
tblVehicleEF	LDT2	0.18	0.17
tblVehicleEF	LDT2	0.07	0.06
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.10	0.09
tblVehicleEF	LDT2	0.16	0.14

tblVehicleEF	LDT2	3.8830e-003	3.7470e-003
tblVehicleEF	LDT2	8.8100e-004	8.5100e-004
tblVehicleEF	LDT2	0.09	0.09
tblVehicleEF	LDT2	0.18	0.17
tblVehicleEF	LDT2	0.07	0.06
tblVehicleEF	LDT2	0.03	0.03
tblVehicleEF	LDT2	0.10	0.09
tblVehicleEF	LDT2	0.18	0.15
tblVehicleEF	LDT2	9.9160e-003	8.9540e-003
tblVehicleEF	LDT2	9.7390e-003	8.5370e-003
tblVehicleEF	LDT2	1.25	1.16
tblVehicleEF	LDT2	1.90	1.69
tblVehicleEF	LDT2	423.85	409.14
tblVehicleEF	LDT2	84.10	81.53
tblVehicleEF	LDT2	0.10	0.09
tblVehicleEF	LDT2	0.18	0.15
tblVehicleEF	LDT2	2.0600e-003	2.0350e-003
tblVehicleEF	LDT2	2.5600e-003	2.5250e-003
tblVehicleEF	LDT2	1.8950e-003	1.8720e-003
tblVehicleEF	LDT2	2.3540e-003	2.3210e-003
tblVehicleEF	LDT2	0.23	0.21
tblVehicleEF	LDT2	0.22	0.21
tblVehicleEF	LDT2	0.15	0.14
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.09	0.09
tblVehicleEF	LDT2	0.13	0.12
tblVehicleEF	LDT2	4.2510e-003	4.1030e-003

tblVehicleEF	LDT2	8.7400e-004	8.4400e-004
tblVehicleEF	LDT2	0.23	0.21
tblVehicleEF	LDT2	0.22	0.21
tblVehicleEF	LDT2	0.15	0.14
tblVehicleEF	LDT2	0.04	0.03
tblVehicleEF	LDT2	0.09	0.09
tblVehicleEF	LDT2	0.14	0.13
tblVehicleEF	LDT2	8.1640e-003	7.3650e-003
tblVehicleEF	LDT2	0.01	0.01
tblVehicleEF	LDT2	0.95	0.87
tblVehicleEF	LDT2	2.85	2.54
tblVehicleEF	LDT2	373.37	360.41
tblVehicleEF	LDT2	84.10	81.53
tblVehicleEF	LDT2	0.12	0.11
tblVehicleEF	LDT2	0.21	0.19
tblVehicleEF	LDT2	2.0600e-003	2.0350e-003
tblVehicleEF	LDT2	2.5600e-003	2.5250e-003
tblVehicleEF	LDT2	1.8950e-003	1.8720e-003
tblVehicleEF	LDT2	2.3540e-003	2.3210e-003
tblVehicleEF	LDT2	0.03	0.02
tblVehicleEF	LDT2	0.18	0.17
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.12	0.11
tblVehicleEF	LDT2	0.19	0.17
tblVehicleEF	LDT2	3.7420e-003	3.6120e-003
tblVehicleEF	LDT2	8.9100e-004	8.5900e-004

tblVehicleEF	LDT2	0.03	0.02
tblVehicleEF	LDT2	0.18	0.17
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.03	0.03
tblVehicleEF	LDT2	0.12	0.11
tblVehicleEF	LDT2	0.21	0.18
tblVehicleEF	LHD1	4.6790e-003	4.4800e-003
tblVehicleEF	LHD1	0.03	0.02
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	0.13	0.13
tblVehicleEF	LHD1	1.61	1.52
tblVehicleEF	LHD1	2.71	2.56
tblVehicleEF	LHD1	9.58	9.58
tblVehicleEF	LHD1	687.67	683.65
tblVehicleEF	LHD1	25.91	25.60
tblVehicleEF	LHD1	0.11	0.11
tblVehicleEF	LHD1	2.73	2.61
tblVehicleEF	LHD1	0.89	0.87
tblVehicleEF	LHD1	1.1880e-003	1.1860e-003
tblVehicleEF	LHD1	0.01	0.01
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.8900e-004	9.4500e-004
tblVehicleEF	LHD1	1.1370e-003	1.1350e-003
tblVehicleEF	LHD1	2.6000e-003	2.6050e-003
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.1000e-004	8.6900e-004
tblVehicleEF	LHD1	3.8660e-003	3.7950e-003

tblVehicleEF	LHD1	0.11	0.11
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.5710e-003	1.5580e-003
tblVehicleEF	LHD1	0.19	0.18
tblVehicleEF	LHD1	0.35	0.36
tblVehicleEF	LHD1	0.27	0.25
tblVehicleEF	LHD1	6.7290e-003	6.6870e-003
tblVehicleEF	LHD1	3.1000e-004	3.0400e-004
tblVehicleEF	LHD1	3.8660e-003	3.7950e-003
tblVehicleEF	LHD1	0.11	0.11
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.5710e-003	1.5580e-003
tblVehicleEF	LHD1	0.23	0.22
tblVehicleEF	LHD1	0.35	0.36
tblVehicleEF	LHD1	0.29	0.28
tblVehicleEF	LHD1	4.6790e-003	4.4800e-003
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	0.13	0.13
tblVehicleEF	LHD1	1.64	1.55
tblVehicleEF	LHD1	2.50	2.35
tblVehicleEF	LHD1	9.58	9.58
tblVehicleEF	LHD1	687.67	683.65
tblVehicleEF	LHD1	25.91	25.60
tblVehicleEF	LHD1	0.11	0.11
tblVehicleEF	LHD1	2.59	2.48
tblVehicleEF	LHD1	0.84	0.82

tblVehicleEF	LHD1	1.1880e-003	1.1860e-003
tblVehicleEF	LHD1	0.01	0.01
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.8900e-004	9.4500e-004
tblVehicleEF	LHD1	1.1370e-003	1.1350e-003
tblVehicleEF	LHD1	2.6000e-003	2.6050e-003
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.1000e-004	8.6900e-004
tblVehicleEF	LHD1	9.3930e-003	9.1900e-003
tblVehicleEF	LHD1	0.13	0.13
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	3.4290e-003	3.3720e-003
tblVehicleEF	LHD1	0.19	0.18
tblVehicleEF	LHD1	0.35	0.35
tblVehicleEF	LHD1	0.25	0.24
tblVehicleEF	LHD1	6.7300e-003	6.6870e-003
tblVehicleEF	LHD1	3.0600e-004	3.0000e-004
tblVehicleEF	LHD1	9.3930e-003	9.1900e-003
tblVehicleEF	LHD1	0.13	0.13
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	3.4290e-003	3.3720e-003
tblVehicleEF	LHD1	0.23	0.22
tblVehicleEF	LHD1	0.35	0.35
tblVehicleEF	LHD1	0.28	0.26
tblVehicleEF	LHD1	4.6790e-003	4.4800e-003
tblVehicleEF	LHD1	0.03	0.02
tblVehicleEF	LHD1	0.02	0.02

tblVehicleEF	LHD1	0.13	0.13
tblVehicleEF	LHD1	1.57	1.49
tblVehicleEF	LHD1	2.98	2.80
tblVehicleEF	LHD1	9.58	9.58
tblVehicleEF	LHD1	687.67	683.65
tblVehicleEF	LHD1	25.91	25.60
tblVehicleEF	LHD1	0.11	0.11
tblVehicleEF	LHD1	2.79	2.67
tblVehicleEF	LHD1	0.96	0.93
tblVehicleEF	LHD1	1.1880e-003	1.1860e-003
tblVehicleEF	LHD1	0.01	0.01
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.8900e-004	9.4500e-004
tblVehicleEF	LHD1	1.1370e-003	1.1350e-003
tblVehicleEF	LHD1	2.6000e-003	2.6050e-003
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.1000e-004	8.6900e-004
tblVehicleEF	LHD1	1.0610e-003	1.0550e-003
tblVehicleEF	LHD1	0.12	0.12
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	5.7400e-004	5.7600e-004
tblVehicleEF	LHD1	0.19	0.18
tblVehicleEF	LHD1	0.39	0.39
tblVehicleEF	LHD1	0.29	0.27
tblVehicleEF	LHD1	6.7290e-003	6.6860e-003
tblVehicleEF	LHD1	3.1500e-004	3.0800e-004
tblVehicleEF	LHD1	1.0610e-003	1.0550e-003

tblVehicleEF	LHD1	0.12	0.12
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	5.7400e-004	5.7600e-004
tblVehicleEF	LHD1	0.23	0.22
tblVehicleEF	LHD1	0.39	0.39
tblVehicleEF	LHD1	0.31	0.29
tblVehicleEF	LHD2	3.3940e-003	3.2400e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	8.8390e-003	7.9850e-003
tblVehicleEF	LHD2	0.12	0.12
tblVehicleEF	LHD2	0.88	0.83
tblVehicleEF	LHD2	1.27	1.19
tblVehicleEF	LHD2	14.86	14.79
tblVehicleEF	LHD2	724.85	719.33
tblVehicleEF	LHD2	21.71	21.59
tblVehicleEF	LHD2	0.13	0.13
tblVehicleEF	LHD2	2.04	1.84
tblVehicleEF	LHD2	0.52	0.49
tblVehicleEF	LHD2	1.4130e-003	1.3900e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	4.0500e-004	3.8200e-004
tblVehicleEF	LHD2	1.3520e-003	1.3300e-003
tblVehicleEF	LHD2	2.7160e-003	2.7170e-003
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	3.7200e-004	3.5100e-004
tblVehicleEF	LHD2	1.5000e-003	1.4190e-003

tblVehicleEF	LHD2	0.04	0.04
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	6.5200e-004	6.3000e-004
tblVehicleEF	LHD2	0.15	0.14
tblVehicleEF	LHD2	0.10	0.09
tblVehicleEF	LHD2	0.12	0.11
tblVehicleEF	LHD2	7.0400e-003	6.9860e-003
tblVehicleEF	LHD2	2.4100e-004	2.3800e-004
tblVehicleEF	LHD2	1.5000e-003	1.4190e-003
tblVehicleEF	LHD2	0.04	0.04
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	6.5200e-004	6.3000e-004
tblVehicleEF	LHD2	0.17	0.16
tblVehicleEF	LHD2	0.10	0.09
tblVehicleEF	LHD2	0.13	0.12
tblVehicleEF	LHD2	3.3940e-003	3.2400e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	8.3310e-003	7.5320e-003
tblVehicleEF	LHD2	0.12	0.12
tblVehicleEF	LHD2	0.89	0.83
tblVehicleEF	LHD2	1.17	1.10
tblVehicleEF	LHD2	14.86	14.79
tblVehicleEF	LHD2	724.85	719.33
tblVehicleEF	LHD2	21.71	21.59
tblVehicleEF	LHD2	0.13	0.13
tblVehicleEF	LHD2	1.94	1.75
tblVehicleEF	LHD2	0.49	0.46

tblVehicleEF	LHD2	1.4130e-003	1.3900e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	4.0500e-004	3.8200e-004
tblVehicleEF	LHD2	1.3520e-003	1.3300e-003
tblVehicleEF	LHD2	2.7160e-003	2.7170e-003
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	3.7200e-004	3.5100e-004
tblVehicleEF	LHD2	3.6230e-003	3.4150e-003
tblVehicleEF	LHD2	0.05	0.05
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	1.4050e-003	1.3440e-003
tblVehicleEF	LHD2	0.15	0.14
tblVehicleEF	LHD2	0.10	0.09
tblVehicleEF	LHD2	0.11	0.10
tblVehicleEF	LHD2	7.0400e-003	6.9860e-003
tblVehicleEF	LHD2	2.3900e-004	2.3600e-004
tblVehicleEF	LHD2	3.6230e-003	3.4150e-003
tblVehicleEF	LHD2	0.05	0.05
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	1.4050e-003	1.3440e-003
tblVehicleEF	LHD2	0.17	0.16
tblVehicleEF	LHD2	0.10	0.09
tblVehicleEF	LHD2	0.12	0.11
tblVehicleEF	LHD2	3.3940e-003	3.2400e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	9.4080e-003	8.4930e-003

tblVehicleEF	LHD2	0.12	0.12
tblVehicleEF	LHD2	0.87	0.82
tblVehicleEF	LHD2	1.38	1.30
tblVehicleEF	LHD2	14.86	14.79
tblVehicleEF	LHD2	724.85	719.33
tblVehicleEF	LHD2	21.71	21.59
tblVehicleEF	LHD2	0.13	0.13
tblVehicleEF	LHD2	2.08	1.87
tblVehicleEF	LHD2	0.55	0.52
tblVehicleEF	LHD2	1.4130e-003	1.3900e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	4.0500e-004	3.8200e-004
tblVehicleEF	LHD2	1.3520e-003	1.3300e-003
tblVehicleEF	LHD2	2.7160e-003	2.7170e-003
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	3.7200e-004	3.5100e-004
tblVehicleEF	LHD2	4.2900e-004	4.1300e-004
tblVehicleEF	LHD2	0.04	0.04
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	2.4300e-004	2.3800e-004
tblVehicleEF	LHD2	0.15	0.14
tblVehicleEF	LHD2	0.11	0.10
tblVehicleEF	LHD2	0.13	0.11
tblVehicleEF	LHD2	7.0400e-003	6.9860e-003
tblVehicleEF	LHD2	2.4300e-004	2.4000e-004
tblVehicleEF	LHD2	4.2900e-004	4.1300e-004

tblVehicleEF	LHD2	0.04	0.04
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	2.4300e-004	2.3800e-004
tblVehicleEF	LHD2	0.17	0.16
tblVehicleEF	LHD2	0.11	0.10
tblVehicleEF	LHD2	0.14	0.13
tblVehicleEF	MCY	0.46	0.47
tblVehicleEF	MCY	0.17	0.17
tblVehicleEF	MCY	21.92	21.44
tblVehicleEF	MCY	10.08	10.10
tblVehicleEF	MCY	174.22	174.96
tblVehicleEF	MCY	48.65	48.25
tblVehicleEF	MCY	1.18	1.18
tblVehicleEF	MCY	0.32	0.32
tblVehicleEF	MCY	2.0840e-003	2.1270e-003
tblVehicleEF	MCY	4.1610e-003	4.0990e-003
tblVehicleEF	MCY	1.9570e-003	1.9960e-003
tblVehicleEF	MCY	3.9390e-003	3.8780e-003
tblVehicleEF	MCY	1.58	1.59
tblVehicleEF	MCY	1.05	1.04
tblVehicleEF	MCY	0.85	0.85
tblVehicleEF	MCY	2.65	2.62
tblVehicleEF	MCY	0.51	0.51
tblVehicleEF	MCY	2.30	2.28
tblVehicleEF	MCY	2.1770e-003	2.1760e-003
tblVehicleEF	MCY	7.1900e-004	7.1500e-004
tblVehicleEF	MCY	1.58	1.59

tblVehicleEF	MCY	1.05	1.04
tblVehicleEF	MCY	0.85	0.85
tblVehicleEF	MCY	3.21	3.18
tblVehicleEF	MCY	0.51	0.51
tblVehicleEF	MCY	2.50	2.48
tblVehicleEF	MCY	0.45	0.46
tblVehicleEF	MCY	0.14	0.14
tblVehicleEF	MCY	22.00	21.52
tblVehicleEF	MCY	9.14	9.13
tblVehicleEF	MCY	174.22	174.96
tblVehicleEF	MCY	48.65	48.25
tblVehicleEF	MCY	1.02	1.02
tblVehicleEF	MCY	0.29	0.29
tblVehicleEF	MCY	2.0840e-003	2.1270e-003
tblVehicleEF	MCY	4.1610e-003	4.0990e-003
tblVehicleEF	MCY	1.9570e-003	1.9960e-003
tblVehicleEF	MCY	3.9390e-003	3.8780e-003
tblVehicleEF	MCY	4.08	4.09
tblVehicleEF	MCY	1.56	1.56
tblVehicleEF	MCY	2.20	2.20
tblVehicleEF	MCY	2.56	2.54
tblVehicleEF	MCY	0.50	0.50
tblVehicleEF	MCY	1.92	1.91
tblVehicleEF	MCY	6.9200e-004	6.8800e-004
tblVehicleEF	MCY	4.08	4.09
tblVehicleEF	MCY	1.56	1.56
tblVehicleEF	MCY	2.20	2.20

tblVehicleEF	MCY	3.10	3.08
tblVehicleEF	MCY	0.50	0.50
tblVehicleEF	MCY	2.09	2.08
tblVehicleEF	MCY	0.48	0.49
tblVehicleEF	MCY	0.20	0.20
tblVehicleEF	MCY	23.79	23.23
tblVehicleEF	MCY	11.74	11.77
tblVehicleEF	MCY	174.22	174.96
tblVehicleEF	MCY	48.65	48.25
tblVehicleEF	MCY	1.29	1.28
tblVehicleEF	MCY	0.35	0.35
tblVehicleEF	MCY	2.0840e-003	2.1270e-003
tblVehicleEF	MCY	4.1610e-003	4.0990e-003
tblVehicleEF	MCY	1.9570e-003	1.9960e-003
tblVehicleEF	MCY	3.9390e-003	3.8780e-003
tblVehicleEF	MCY	0.34	0.34
tblVehicleEF	MCY	1.08	1.07
tblVehicleEF	MCY	0.19	0.19
tblVehicleEF	MCY	2.81	2.77
tblVehicleEF	MCY	0.59	0.59
tblVehicleEF	MCY	2.79	2.77
tblVehicleEF	MCY	2.2120e-003	2.2100e-003
tblVehicleEF	MCY	7.6200e-004	7.5700e-004
tblVehicleEF	MCY	0.34	0.34
tblVehicleEF	MCY	1.08	1.07
tblVehicleEF	MCY	0.19	0.19
tblVehicleEF	MCY	3.39	3.36

tblVehicleEF	MCY	0.59	0.59
tblVehicleEF	MCY	3.04	3.02
tblVehicleEF	MDV	0.02	0.01
tblVehicleEF	MDV	0.02	0.02
tblVehicleEF	MDV	1.62	1.44
tblVehicleEF	MDV	4.23	3.82
tblVehicleEF	MDV	531.90	516.32
tblVehicleEF	MDV	114.25	111.66
tblVehicleEF	MDV	0.19	0.17
tblVehicleEF	MDV	0.38	0.34
tblVehicleEF	MDV	2.0130e-003	1.9750e-003
tblVehicleEF	MDV	2.7040e-003	2.5760e-003
tblVehicleEF	MDV	1.8570e-003	1.8210e-003
tblVehicleEF	MDV	2.4900e-003	2.3690e-003
tblVehicleEF	MDV	0.12	0.12
tblVehicleEF	MDV	0.25	0.24
tblVehicleEF	MDV	0.10	0.09
tblVehicleEF	MDV	0.04	0.03
tblVehicleEF	MDV	0.14	0.14
tblVehicleEF	MDV	0.34	0.30
tblVehicleEF	MDV	5.3330e-003	5.1740e-003
tblVehicleEF	MDV	1.2180e-003	1.1840e-003
tblVehicleEF	MDV	0.12	0.12
tblVehicleEF	MDV	0.25	0.24
tblVehicleEF	MDV	0.10	0.09
tblVehicleEF	MDV	0.06	0.05
tblVehicleEF	MDV	0.14	0.14

tblVehicleEF	MDV	0.37	0.33
tblVehicleEF	MDV	0.02	0.02
tblVehicleEF	MDV	0.02	0.02
tblVehicleEF	MDV	1.98	1.77
tblVehicleEF	MDV	3.49	3.13
tblVehicleEF	MDV	580.82	563.80
tblVehicleEF	MDV	114.25	111.66
tblVehicleEF	MDV	0.18	0.16
tblVehicleEF	MDV	0.36	0.32
tblVehicleEF	MDV	2.0130e-003	1.9750e-003
tblVehicleEF	MDV	2.7040e-003	2.5760e-003
tblVehicleEF	MDV	1.8570e-003	1.8210e-003
tblVehicleEF	MDV	2.4900e-003	2.3690e-003
tblVehicleEF	MDV	0.29	0.28
tblVehicleEF	MDV	0.29	0.28
tblVehicleEF	MDV	0.20	0.20
tblVehicleEF	MDV	0.05	0.04
tblVehicleEF	MDV	0.14	0.13
tblVehicleEF	MDV	0.28	0.24
tblVehicleEF	MDV	5.8270e-003	5.6540e-003
tblVehicleEF	MDV	1.2040e-003	1.1720e-003
tblVehicleEF	MDV	0.29	0.28
tblVehicleEF	MDV	0.29	0.28
tblVehicleEF	MDV	0.20	0.20
tblVehicleEF	MDV	0.07	0.06
tblVehicleEF	MDV	0.14	0.13
tblVehicleEF	MDV	0.30	0.27

tblVehicleEF	MDV	0.01	0.01
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	1.52	1.34
tblVehicleEF	MDV	5.18	4.70
tblVehicleEF	MDV	513.26	498.22
tblVehicleEF	MDV	114.25	111.66
tblVehicleEF	MDV	0.21	0.19
tblVehicleEF	MDV	0.43	0.38
tblVehicleEF	MDV	2.0130e-003	1.9750e-003
tblVehicleEF	MDV	2.7040e-003	2.5760e-003
tblVehicleEF	MDV	1.8570e-003	1.8210e-003
tblVehicleEF	MDV	2.4900e-003	2.3690e-003
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.25	0.24
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.04	0.03
tblVehicleEF	MDV	0.17	0.16
tblVehicleEF	MDV	0.40	0.36
tblVehicleEF	MDV	5.1450e-003	4.9920e-003
tblVehicleEF	MDV	1.2350e-003	1.2000e-003
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.25	0.24
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.06	0.05
tblVehicleEF	MDV	0.17	0.16
tblVehicleEF	MDV	0.44	0.39
tblVehicleEF	MH	0.05	0.05

tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	3.79	3.32
tblVehicleEF	MH	7.18	6.69
tblVehicleEF	MH	1,237.85	1,233.89
tblVehicleEF	MH	58.35	58.02
tblVehicleEF	MH	2.19	2.09
tblVehicleEF	MH	0.99	0.95
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	0.05	0.04
tblVehicleEF	MH	1.3210e-003	1.2470e-003
tblVehicleEF	MH	3.2400e-003	3.2420e-003
tblVehicleEF	MH	0.04	0.04
tblVehicleEF	MH	1.2150e-003	1.1470e-003
tblVehicleEF	MH	1.70	1.61
tblVehicleEF	MH	0.11	0.10
tblVehicleEF	MH	0.46	0.43
tblVehicleEF	MH	0.17	0.15
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	0.41	0.39
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	7.0900e-004	6.9700e-004
tblVehicleEF	MH	1.70	1.61
tblVehicleEF	MH	0.11	0.10
tblVehicleEF	MH	0.46	0.43
tblVehicleEF	MH	0.23	0.21
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	0.45	0.42

tblVehicleEF	MH	0.06	0.05
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	3.95	3.46
tblVehicleEF	MH	6.42	5.98
tblVehicleEF	MH	1,237.85	1,233.89
tblVehicleEF	MH	58.35	58.02
tblVehicleEF	MH	2.04	1.95
tblVehicleEF	MH	0.93	0.89
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	0.05	0.04
tblVehicleEF	MH	1.3210e-003	1.2470e-003
tblVehicleEF	MH	3.2400e-003	3.2420e-003
tblVehicleEF	MH	0.04	0.04
tblVehicleEF	MH	1.2150e-003	1.1470e-003
tblVehicleEF	MH	4.16	3.93
tblVehicleEF	MH	0.13	0.12
tblVehicleEF	MH	0.98	0.93
tblVehicleEF	MH	0.17	0.16
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	0.38	0.36
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	6.9600e-004	6.8500e-004
tblVehicleEF	MH	4.16	3.93
tblVehicleEF	MH	0.13	0.12
tblVehicleEF	MH	0.98	0.93
tblVehicleEF	MH	0.24	0.21
tblVehicleEF	MH	0.03	0.03

tblVehicleEF	MH	0.42	0.39
tblVehicleEF	MH	0.05	0.04
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	3.63	3.18
tblVehicleEF	MH	8.12	7.55
tblVehicleEF	MH	1,237.85	1,233.89
tblVehicleEF	MH	58.35	58.02
tblVehicleEF	MH	2.28	2.16
tblVehicleEF	MH	1.07	1.02
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	0.05	0.04
tblVehicleEF	MH	1.3210e-003	1.2470e-003
tblVehicleEF	MH	3.2400e-003	3.2420e-003
tblVehicleEF	MH	0.04	0.04
tblVehicleEF	MH	1.2150e-003	1.1470e-003
tblVehicleEF	MH	0.44	0.43
tblVehicleEF	MH	0.12	0.11
tblVehicleEF	MH	0.20	0.19
tblVehicleEF	MH	0.16	0.14
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	0.45	0.42
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	7.2500e-004	7.1100e-004
tblVehicleEF	MH	0.44	0.43
tblVehicleEF	MH	0.12	0.11
tblVehicleEF	MH	0.20	0.19
tblVehicleEF	MH	0.22	0.20

tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	0.49	0.46
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	0.01	9.7490e-003
tblVehicleEF	MHD	0.07	0.06
tblVehicleEF	MHD	0.45	0.44
tblVehicleEF	MHD	0.76	0.65
tblVehicleEF	MHD	7.34	6.36
tblVehicleEF	MHD	159.95	162.15
tblVehicleEF	MHD	1,217.42	1,212.48
tblVehicleEF	MHD	51.70	50.10
tblVehicleEF	MHD	0.82	0.79
tblVehicleEF	MHD	1.89	1.78
tblVehicleEF	MHD	12.29	12.44
tblVehicleEF	MHD	7.7980e-003	7.5720e-003
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	1.0160e-003	9.0400e-004
tblVehicleEF	MHD	7.4610e-003	7.2440e-003
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	9.3400e-004	8.3100e-004
tblVehicleEF	MHD	1.9230e-003	1.6520e-003
tblVehicleEF	MHD	0.06	0.05
tblVehicleEF	MHD	0.05	0.05
tblVehicleEF	MHD	7.9500e-004	6.9300e-004
tblVehicleEF	MHD	0.10	0.09
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.44	0.38

tblVehicleEF	MHD	1.5370e-003	1.5570e-003
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	6.4600e-004	6.1200e-004
tblVehicleEF	MHD	1.9230e-003	1.6520e-003
tblVehicleEF	MHD	0.06	0.05
tblVehicleEF	MHD	0.06	0.06
tblVehicleEF	MHD	7.9500e-004	6.9300e-004
tblVehicleEF	MHD	0.12	0.10
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.48	0.41
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	0.01	9.9950e-003
tblVehicleEF	MHD	0.07	0.06
tblVehicleEF	MHD	0.32	0.31
tblVehicleEF	MHD	0.77	0.66
tblVehicleEF	MHD	6.76	5.86
tblVehicleEF	MHD	169.57	171.90
tblVehicleEF	MHD	1,217.42	1,212.48
tblVehicleEF	MHD	51.70	50.10
tblVehicleEF	MHD	0.85	0.82
tblVehicleEF	MHD	1.79	1.69
tblVehicleEF	MHD	12.23	12.38
tblVehicleEF	MHD	6.5740e-003	6.3830e-003
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	1.0160e-003	9.0400e-004
tblVehicleEF	MHD	6.2900e-003	6.1070e-003
tblVehicleEF	MHD	0.02	0.02

tblVehicleEF	MHD	9.3400e-004	8.3100e-004
tblVehicleEF	MHD	4.7640e-003	4.0640e-003
tblVehicleEF	MHD	0.07	0.06
tblVehicleEF	MHD	0.04	0.04
tblVehicleEF	MHD	1.8110e-003	1.5590e-003
tblVehicleEF	MHD	0.10	0.09
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.41	0.35
tblVehicleEF	MHD	1.6270e-003	1.6490e-003
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	6.3600e-004	6.0400e-004
tblVehicleEF	MHD	4.7640e-003	4.0640e-003
tblVehicleEF	MHD	0.07	0.06
tblVehicleEF	MHD	0.06	0.05
tblVehicleEF	MHD	1.8110e-003	1.5590e-003
tblVehicleEF	MHD	0.12	0.10
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.45	0.39
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	0.01	9.4880e-003
tblVehicleEF	MHD	0.08	0.07
tblVehicleEF	MHD	0.60	0.58
tblVehicleEF	MHD	0.74	0.63
tblVehicleEF	MHD	8.06	6.98
tblVehicleEF	MHD	146.98	149.00
tblVehicleEF	MHD	1,217.42	1,212.48
tblVehicleEF	MHD	51.70	50.10

tblVehicleEF	MHD	0.78	0.76
tblVehicleEF	MHD	1.93	1.81
tblVehicleEF	MHD	12.36	12.50
tblVehicleEF	MHD	9.4890e-003	9.2130e-003
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	1.0160e-003	9.0400e-004
tblVehicleEF	MHD	9.0780e-003	8.8150e-003
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	9.3400e-004	8.3100e-004
tblVehicleEF	MHD	4.9600e-004	4.3700e-004
tblVehicleEF	MHD	0.06	0.05
tblVehicleEF	MHD	0.05	0.05
tblVehicleEF	MHD	2.6900e-004	2.4000e-004
tblVehicleEF	MHD	0.09	0.09
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.47	0.40
tblVehicleEF	MHD	1.4140e-003	1.4330e-003
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	6.5800e-004	6.2300e-004
tblVehicleEF	MHD	4.9600e-004	4.3700e-004
tblVehicleEF	MHD	0.06	0.05
tblVehicleEF	MHD	0.06	0.06
tblVehicleEF	MHD	2.6900e-004	2.4000e-004
tblVehicleEF	MHD	0.11	0.10
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.51	0.44
tblVehicleEF	OBUS	0.01	0.01

tblVehicleEF	OBUS	0.02	0.02
tblVehicleEF	OBUS	0.04	0.04
tblVehicleEF	OBUS	0.30	0.30
tblVehicleEF	OBUS	1.33	1.18
tblVehicleEF	OBUS	8.42	7.88
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tblVehicleEF	OBUS	1,340.76	1,334.51
tblVehicleEF	OBUS	65.97	65.29
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tblVehicleEF	OBUS	2.10	1.93
tblVehicleEF	OBUS	3.94	3.97
tblVehicleEF	OBUS	3.1600e-004	1.8300e-004
tblVehicleEF	OBUS	9.1150e-003	7.8950e-003
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tblVehicleEF	OBUS	3.5040e-003	3.3840e-003
tblVehicleEF	OBUS	0.03	0.03
tblVehicleEF	OBUS	0.05	0.05
tblVehicleEF	OBUS	1.0590e-003	1.0350e-003
tblVehicleEF	OBUS	0.11	0.10
tblVehicleEF	OBUS	0.06	0.05
tblVehicleEF	OBUS	0.51	0.47
tblVehicleEF	OBUS	1.5560e-003	1.6030e-003
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	8.0700e-004	7.9100e-004

tblVehicleEF	OBUS	3.5040e-003	3.3840e-003
tblVehicleEF	OBUS	0.03	0.03
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	1.0590e-003	1.0350e-003
tblVehicleEF	OBUS	0.14	0.13
tblVehicleEF	OBUS	0.06	0.05
tblVehicleEF	OBUS	0.56	0.52
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	0.02	0.02
tblVehicleEF	OBUS	0.04	0.04
tblVehicleEF	OBUS	0.28	0.27
tblVehicleEF	OBUS	1.37	1.21
tblVehicleEF	OBUS	7.58	7.10
tblVehicleEF	OBUS	170.55	175.75
tblVehicleEF	OBUS	1,340.76	1,334.51
tblVehicleEF	OBUS	65.97	65.29
tblVehicleEF	OBUS	0.93	0.84
tblVehicleEF	OBUS	1.98	1.82
tblVehicleEF	OBUS	3.86	3.89
tblVehicleEF	OBUS	2.6600e-004	1.5400e-004
tblVehicleEF	OBUS	9.1150e-003	7.8950e-003
tblVehicleEF	OBUS	1.0280e-003	1.0160e-003
tblVehicleEF	OBUS	2.5500e-004	1.4700e-004
tblVehicleEF	OBUS	8.6970e-003	7.5300e-003
tblVehicleEF	OBUS	9.4500e-004	9.3400e-004
tblVehicleEF	OBUS	8.5820e-003	8.2620e-003
tblVehicleEF	OBUS	0.04	0.04

tblVehicleEF	OBUS	0.05	0.04
tblVehicleEF	OBUS	2.2860e-003	2.2150e-003
tblVehicleEF	OBUS	0.11	0.10
tblVehicleEF	OBUS	0.06	0.05
tblVehicleEF	OBUS	0.47	0.44
tblVehicleEF	OBUS	1.6390e-003	1.6880e-003
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tblVehicleEF	OBUS	7.9300e-004	7.7800e-004
tblVehicleEF	OBUS	8.5820e-003	8.2620e-003
tblVehicleEF	OBUS	0.04	0.04
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	2.2860e-003	2.2150e-003
tblVehicleEF	OBUS	0.14	0.13
tblVehicleEF	OBUS	0.06	0.05
tblVehicleEF	OBUS	0.52	0.48
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	0.02	0.02
tblVehicleEF	OBUS	0.05	0.04
tblVehicleEF	OBUS	0.34	0.33
tblVehicleEF	OBUS	1.29	1.14
tblVehicleEF	OBUS	9.40	8.81
tblVehicleEF	OBUS	149.94	154.42
tblVehicleEF	OBUS	1,340.76	1,334.51
tblVehicleEF	OBUS	65.97	65.29
tblVehicleEF	OBUS	0.86	0.77
tblVehicleEF	OBUS	2.16	1.98
tblVehicleEF	OBUS	4.05	4.07

tblVehicleEF	OBUS	3.8400e-004	2.2200e-004
tblVehicleEF	OBUS	9.1150e-003	7.8950e-003
tblVehicleEF	OBUS	1.0280e-003	1.0160e-003
tblVehicleEF	OBUS	3.6800e-004	2.1300e-004
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tblVehicleEF	OBUS	9.7200e-004	9.5200e-004
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tblVehicleEF	OBUS	0.05	0.05
tblVehicleEF	OBUS	4.5800e-004	4.5200e-004
tblVehicleEF	OBUS	0.11	0.10
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	0.55	0.51
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tblVehicleEF	OBUS	8.2400e-004	8.0700e-004
tblVehicleEF	OBUS	9.7200e-004	9.5200e-004
tblVehicleEF	OBUS	0.03	0.03
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	4.5800e-004	4.5200e-004
tblVehicleEF	OBUS	0.13	0.12
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	0.60	0.56
tblVehicleEF	SBUS	0.86	0.84
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.10	0.09
tblVehicleEF	SBUS	3.75	3.74

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tblVehicleEF	SBUS	4.99	4.58
tblVehicleEF	SBUS	1,373.57	1,366.84
tblVehicleEF	SBUS	1,163.98	1,159.43
tblVehicleEF	SBUS	22.42	22.68
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tblVehicleEF	SBUS	17.49	17.40
tblVehicleEF	SBUS	0.02	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.03	0.03
tblVehicleEF	SBUS	3.8700e-004	3.6700e-004
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	2.7930e-003	2.7910e-003
tblVehicleEF	SBUS	0.03	0.03
tblVehicleEF	SBUS	3.5600e-004	3.3700e-004
tblVehicleEF	SBUS	3.3960e-003	2.9420e-003
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.45	0.44
tblVehicleEF	SBUS	9.8300e-004	8.9700e-004
tblVehicleEF	SBUS	0.14	0.13
tblVehicleEF	SBUS	0.01	9.0840e-003
tblVehicleEF	SBUS	0.24	0.22
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	3.1000e-004	3.0600e-004
tblVehicleEF	SBUS	3.3960e-003	2.9420e-003

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tblVehicleEF	SBUS	0.63	0.62
tblVehicleEF	SBUS	9.8300e-004	8.9700e-004
tblVehicleEF	SBUS	0.17	0.16
tblVehicleEF	SBUS	0.01	9.0840e-003
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tblVehicleEF	SBUS	0.86	0.84
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.08	0.07
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tblVehicleEF	SBUS	3.35	3.08
tblVehicleEF	SBUS	1,448.60	1,441.40
tblVehicleEF	SBUS	1,163.98	1,159.43
tblVehicleEF	SBUS	22.42	22.68
tblVehicleEF	SBUS	14.84	14.08
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tblVehicleEF	SBUS	17.46	17.37
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.03	0.03
tblVehicleEF	SBUS	3.8700e-004	3.6700e-004
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	2.7930e-003	2.7910e-003
tblVehicleEF	SBUS	0.03	0.03
tblVehicleEF	SBUS	3.5600e-004	3.3700e-004
tblVehicleEF	SBUS	8.3020e-003	7.1450e-003

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tblVehicleEF	SBUS	0.44	0.44
tblVehicleEF	SBUS	2.1190e-003	1.8970e-003
tblVehicleEF	SBUS	0.14	0.13
tblVehicleEF	SBUS	9.7900e-003	7.8320e-003
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tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	2.8300e-004	2.8100e-004
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tblVehicleEF	SBUS	2.1190e-003	1.8970e-003
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tblVehicleEF	SBUS	3.8700e-004	3.6700e-004
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tblVehicleEF	SBUS	2.7930e-003	2.7910e-003
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tblVehicleEF	SBUS	3.5600e-004	3.3700e-004
tblVehicleEF	SBUS	9.5800e-004	8.6500e-004
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.45	0.45
tblVehicleEF	SBUS	4.3300e-004	4.0300e-004
tblVehicleEF	SBUS	0.14	0.13
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tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	3.3900e-004	3.3200e-004
tblVehicleEF	SBUS	9.5800e-004	8.6500e-004
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.63	0.63
tblVehicleEF	SBUS	4.3300e-004	4.0300e-004
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tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.32	0.29
tblVehicleEF	UBUS	1.50	1.42

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tblVehicleEF	UBUS	8.59	8.19
tblVehicleEF	UBUS	16.71	16.21
tblVehicleEF	UBUS	1,898.75	1,883.52
tblVehicleEF	UBUS	146.85	147.57
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tblVehicleEF	UBUS	13.12	12.99
tblVehicleEF	UBUS	0.48	0.48
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.2860e-003	1.3150e-003
tblVehicleEF	UBUS	0.21	0.20
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.1830e-003	1.2090e-003
tblVehicleEF	UBUS	8.8250e-003	8.6040e-003
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tblVehicleEF	UBUS	3.3300e-003	3.3050e-003
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tblVehicleEF	UBUS	1.18	1.16
tblVehicleEF	UBUS	0.01	0.01
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tblVehicleEF	UBUS	8.8250e-003	8.6040e-003
tblVehicleEF	UBUS	0.11	0.11
tblVehicleEF	UBUS	3.3300e-003	3.3050e-003
tblVehicleEF	UBUS	2.17	2.03
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	1.29	1.27

tblVehicleEF	UBUS	1.50	1.42
tblVehicleEF	UBUS	0.08	0.08
tblVehicleEF	UBUS	8.69	8.30
tblVehicleEF	UBUS	13.34	12.95
tblVehicleEF	UBUS	1,898.75	1,883.52
tblVehicleEF	UBUS	146.85	147.57
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tblVehicleEF	UBUS	12.97	12.85
tblVehicleEF	UBUS	0.48	0.48
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.2860e-003	1.3150e-003
tblVehicleEF	UBUS	0.21	0.20
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.1830e-003	1.2090e-003
tblVehicleEF	UBUS	0.02	0.02
tblVehicleEF	UBUS	0.14	0.14
tblVehicleEF	UBUS	7.5590e-003	7.4060e-003
tblVehicleEF	UBUS	0.61	0.56
tblVehicleEF	UBUS	0.01	0.01
tblVehicleEF	UBUS	1.04	1.02
tblVehicleEF	UBUS	0.01	0.01
tblVehicleEF	UBUS	0.02	0.02
tblVehicleEF	UBUS	0.14	0.14
tblVehicleEF	UBUS	7.5590e-003	7.4060e-003
tblVehicleEF	UBUS	2.18	2.04
tblVehicleEF	UBUS	0.01	0.01
tblVehicleEF	UBUS	1.13	1.12

tblVehicleEF	UBUS	1.50	1.42
tblVehicleEF	UBUS	0.10	0.10
tblVehicleEF	UBUS	8.48	8.09
tblVehicleEF	UBUS	20.62	20.01
tblVehicleEF	UBUS	1,898.75	1,883.52
tblVehicleEF	UBUS	146.85	147.57
tblVehicleEF	UBUS	6.49	5.94
tblVehicleEF	UBUS	13.28	13.15
tblVehicleEF	UBUS	0.48	0.48
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.2860e-003	1.3150e-003
tblVehicleEF	UBUS	0.21	0.20
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.1830e-003	1.2090e-003
tblVehicleEF	UBUS	2.5290e-003	2.5040e-003
tblVehicleEF	UBUS	0.11	0.11
tblVehicleEF	UBUS	1.3870e-003	1.4040e-003
tblVehicleEF	UBUS	0.60	0.55
tblVehicleEF	UBUS	0.02	0.02
tblVehicleEF	UBUS	1.34	1.32
tblVehicleEF	UBUS	0.01	0.01
tblVehicleEF	UBUS	1.8340e-003	1.8310e-003
tblVehicleEF	UBUS	2.5290e-003	2.5040e-003
tblVehicleEF	UBUS	0.11	0.11
tblVehicleEF	UBUS	1.3870e-003	1.4040e-003
tblVehicleEF	UBUS	2.16	2.02
tblVehicleEF	UBUS	0.02	0.02

tblVehicleEF	UBUS	1.47	1.45
tblVehicleTrips	CW_TTP	0.00	100.00
tblVehicleTrips	DV_TP	0.00	100.00
tblVehicleTrips	ST_TR	0.00	0.10
tblVehicleTrips	SU_TR	0.00	0.10
tblVehicleTrips	WD_TR	0.00	0.10

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.1073	1.1171	0.8088	1.5500e-003	0.2402	0.0529	0.2930	0.1272	0.0489	0.1760	0.0000	136.7611	136.7611	0.0376	0.0000	137.7016
Maximum	**0.1073**	**1.1171**	**0.8088**	**1.5500e-003**	**0.2402**	**0.0529**	**0.2930**	**0.1272**	**0.0489**	**0.1760**	**0.0000**	**136.7611**	**136.7611**	**0.0376**	**0.0000**	**137.7016**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.1073	1.1171	0.8088	1.5500e-003	0.1130	0.0529	0.1659	0.0586	0.0489	0.1074	0.0000	136.7609	136.7609	0.0376	0.0000	137.7015
Maximum	**0.1073**	**1.1171**	**0.8088**	**1.5500e-003**	**0.1130**	**0.0529**	**0.1659**	**0.0586**	**0.0489**	**0.1074**	**0.0000**	**136.7609**	**136.7609**	**0.0376**	**0.0000**	**137.7015**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**52.94**	**0.00**	**43.38**	**53.93**	**0.00**	**38.96**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**3-15-2021**	**6-14-2021**	0.9569	0.9569
2	**6-15-2021**	**9-14-2021**	0.2346	0.2346
		Highest	0.9569	0.9569

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0339	0.0000	8.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.6000e-004	1.6000e-004	0.0000	0.0000	1.7000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	64.6569	64.6569	5.5700e-003	1.1100e-003	65.1284
Mobile	2.5000e-004	2.1800e-003	1.6900e-003	1.0000e-005	3.0000e-004	1.0000e-005	3.0000e-004	8.0000e-005	1.0000e-005	9.0000e-005	0.0000	0.5927	0.5927	8.0000e-005	0.0000	0.5946
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0342**	**2.1800e-003**	**1.7700e-003**	**1.0000e-005**	**3.0000e-004**	**1.0000e-005**	**3.0000e-004**	**8.0000e-005**	**1.0000e-005**	**9.0000e-005**	**0.0000**	**65.2497**	**65.2497**	**5.6500e-003**	**1.1100e-003**	**65.7232**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0339	0.0000	8.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.6000e-004	1.6000e-004	0.0000	0.0000	1.7000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	64.6569	64.6569	5.5700e-003	1.1100e-003	65.1284
Mobile	2.5000e-004	2.1800e-003	1.6900e-003	1.0000e-005	3.0000e-004	1.0000e-005	3.0000e-004	8.0000e-005	1.0000e-005	9.0000e-005	0.0000	0.5927	0.5927	8.0000e-005	0.0000	0.5946
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0342**	**2.1800e-003**	**1.7700e-003**	**1.0000e-005**	**3.0000e-004**	**1.0000e-005**	**3.0000e-004**	**8.0000e-005**	**1.0000e-005**	**9.0000e-005**	**0.0000**	**65.2497**	**65.2497**	**5.6500e-003**	**1.1100e-003**	**65.7232**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	3/15/2021	3/26/2021	5	10	
2	Grading	Grading	3/27/2021	5/28/2021	5	45	
3	Building Construction	Building Construction	5/29/2021	6/25/2021	5	20	
4	Paving	Paving	6/26/2021	7/23/2021	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 10

Acres of Paving: 9.1

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Excavators	1	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	7	18.00	10.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	10.00	8.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	15.00	10.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	10.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Site Preparation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0903	0.0000	0.0903	0.0497	0.0000	0.0497	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0194	0.2025	0.1058	1.9000e-004		0.0102	0.0102		9.4000e-003	9.4000e-003	0.0000	16.7179	16.7179	5.4100e-003	0.0000	16.8530
Total	**0.0194**	**0.2025**	**0.1058**	**1.9000e-004**	**0.0903**	**0.0102**	**0.1006**	**0.0497**	**9.4000e-003**	**0.0591**	**0.0000**	**16.7179**	**16.7179**	**5.4100e-003**	**0.0000**	**16.8530**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.8000e-004	5.4300e-003	1.2800e-003	1.0000e-005	3.3000e-004	2.0000e-005	3.5000e-004	1.0000e-004	2.0000e-005	1.1000e-004	0.0000	1.3433	1.3433	1.1000e-004	0.0000	1.3460
Worker	3.8000e-004	2.4000e-004	2.6700e-003	1.0000e-005	7.2000e-004	1.0000e-005	7.2000e-004	1.9000e-004	1.0000e-005	2.0000e-004	0.0000	0.6399	0.6399	2.0000e-005	0.0000	0.6404
Total	**5.6000e-004**	**5.6700e-003**	**3.9500e-003**	**2.0000e-005**	**1.0500e-003**	**3.0000e-005**	**1.0700e-003**	**2.9000e-004**	**3.0000e-005**	**3.1000e-004**	**0.0000**	**1.9832**	**1.9832**	**1.3000e-004**	**0.0000**	**1.9864**

3.2 Site Preparation - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0407	0.0000	0.0407	0.0223	0.0000	0.0223	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0194	0.2025	0.1058	1.9000e-004		0.0102	0.0102		9.4000e-003	9.4000e-003	0.0000	16.7178	16.7178	5.4100e-003	0.0000	16.8530
Total	**0.0194**	**0.2025**	**0.1058**	**1.9000e-004**	**0.0407**	**0.0102**	**0.0509**	**0.0223**	**9.4000e-003**	**0.0317**	**0.0000**	**16.7178**	**16.7178**	**5.4100e-003**	**0.0000**	**16.8530**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.8000e-004	5.4300e-003	1.2800e-003	1.0000e-005	3.3000e-004	2.0000e-005	3.5000e-004	1.0000e-004	2.0000e-005	1.1000e-004	0.0000	1.3433	1.3433	1.1000e-004	0.0000	1.3460
Worker	3.8000e-004	2.4000e-004	2.6700e-003	1.0000e-005	7.2000e-004	1.0000e-005	7.2000e-004	1.9000e-004	1.0000e-005	2.0000e-004	0.0000	0.6399	0.6399	2.0000e-005	0.0000	0.6404
Total	**5.6000e-004**	**5.6700e-003**	**3.9500e-003**	**2.0000e-005**	**1.0500e-003**	**3.0000e-005**	**1.0700e-003**	**2.9000e-004**	**3.0000e-005**	**3.1000e-004**	**0.0000**	**1.9832**	**1.9832**	**1.3000e-004**	**0.0000**	**1.9864**

3.3 Grading - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1408	0.0000	0.1408	0.0751	0.0000	0.0751	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0515	0.5566	0.3568	6.7000e-004		0.0261	0.0261		0.0240	0.0240	0.0000	58.6208	58.6208	0.0190	0.0000	59.0948
Total	**0.0515**	**0.5566**	**0.3568**	**6.7000e-004**	**0.1408**	**0.0261**	**0.1669**	**0.0751**	**0.0240**	**0.0991**	**0.0000**	**58.6208**	**58.6208**	**0.0190**	**0.0000**	**59.0948**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.0300e-003	1.7000e-004	0.0000	7.0000e-005	0.0000	7.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3009	0.3009	2.0000e-005	0.0000	0.3013
Vendor	8.2000e-004	0.0244	5.7800e-003	6.0000e-005	1.4900e-003	7.0000e-005	1.5600e-003	4.3000e-004	7.0000e-005	5.0000e-004	0.0000	6.0451	6.0451	4.8000e-004	0.0000	6.0572
Worker	1.4100e-003	9.0000e-004	0.0100	3.0000e-005	2.6900e-003	2.0000e-005	2.7100e-003	7.1000e-004	2.0000e-005	7.3000e-004	0.0000	2.3996	2.3996	7.0000e-005	0.0000	2.4014
Total	**2.2600e-003**	**0.0264**	**0.0160**	**9.0000e-005**	**4.2500e-003**	**9.0000e-005**	**4.3400e-003**	**1.1600e-003**	**9.0000e-005**	**1.2500e-003**	**0.0000**	**8.7456**	**8.7456**	**5.7000e-004**	**0.0000**	**8.7598**

3.3 Grading - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0634	0.0000	0.0634	0.0338	0.0000	0.0338	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0515	0.5566	0.3568	6.7000e-004		0.0261	0.0261		0.0240	0.0240	0.0000	58.6208	58.6208	0.0190	0.0000	59.0947
Total	**0.0515**	**0.5566**	**0.3568**	**6.7000e-004**	**0.0634**	**0.0261**	**0.0895**	**0.0338**	**0.0240**	**0.0578**	**0.0000**	**58.6208**	**58.6208**	**0.0190**	**0.0000**	**59.0947**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0000e-005	1.0300e-003	1.7000e-004	0.0000	7.0000e-005	0.0000	7.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.3009	0.3009	2.0000e-005	0.0000	0.3013
Vendor	8.2000e-004	0.0244	5.7800e-003	6.0000e-005	1.4900e-003	7.0000e-005	1.5600e-003	4.3000e-004	7.0000e-005	5.0000e-004	0.0000	6.0451	6.0451	4.8000e-004	0.0000	6.0572
Worker	1.4100e-003	9.0000e-004	0.0100	3.0000e-005	2.6900e-003	2.0000e-005	2.7100e-003	7.1000e-004	2.0000e-005	7.3000e-004	0.0000	2.3996	2.3996	7.0000e-005	0.0000	2.4014
Total	**2.2600e-003**	**0.0264**	**0.0160**	**9.0000e-005**	**4.2500e-003**	**9.0000e-005**	**4.3400e-003**	**1.1600e-003**	**9.0000e-005**	**1.2500e-003**	**0.0000**	**8.7456**	**8.7456**	**5.7000e-004**	**0.0000**	**8.7598**

3.4 Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0190	0.1743	0.1658	2.7000e-004		9.5900e-003	9.5900e-003		9.0100e-003	9.0100e-003	0.0000	23.1637	23.1637	5.5900e-003	0.0000	23.3034
Total	**0.0190**	**0.1743**	**0.1658**	**2.7000e-004**		**9.5900e-003**	**9.5900e-003**		**9.0100e-003**	**9.0100e-003**	**0.0000**	**23.1637**	**23.1637**	**5.5900e-003**	**0.0000**	**23.3034**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.6000e-004	0.0109	2.5700e-003	3.0000e-005	6.6000e-004	3.0000e-005	6.9000e-004	1.9000e-004	3.0000e-005	2.2000e-004	0.0000	2.6867	2.6867	2.2000e-004	0.0000	2.6921
Worker	6.3000e-004	4.0000e-004	4.4400e-003	1.0000e-005	1.1900e-003	1.0000e-005	1.2000e-003	3.2000e-004	1.0000e-005	3.3000e-004	0.0000	1.0665	1.0665	3.0000e-005	0.0000	1.0673
Total	**9.9000e-004**	**0.0113**	**7.0100e-003**	**4.0000e-005**	**1.8500e-003**	**4.0000e-005**	**1.8900e-003**	**5.1000e-004**	**4.0000e-005**	**5.5000e-004**	**0.0000**	**3.7532**	**3.7532**	**2.5000e-004**	**0.0000**	**3.7594**

3.4 Building Construction - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0190	0.1743	0.1658	2.7000e-004		9.5900e-003	9.5900e-003		9.0100e-003	9.0100e-003	0.0000	23.1637	23.1637	5.5900e-003	0.0000	23.3034
Total	**0.0190**	**0.1743**	**0.1658**	**2.7000e-004**		**9.5900e-003**	**9.5900e-003**		**9.0100e-003**	**9.0100e-003**	**0.0000**	**23.1637**	**23.1637**	**5.5900e-003**	**0.0000**	**23.3034**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.6000e-004	0.0109	2.5700e-003	3.0000e-005	6.6000e-004	3.0000e-005	6.9000e-004	1.9000e-004	3.0000e-005	2.2000e-004	0.0000	2.6867	2.6867	2.2000e-004	0.0000	2.6921
Worker	6.3000e-004	4.0000e-004	4.4400e-003	1.0000e-005	1.1900e-003	1.0000e-005	1.2000e-003	3.2000e-004	1.0000e-005	3.3000e-004	0.0000	1.0665	1.0665	3.0000e-005	0.0000	1.0673
Total	**9.9000e-004**	**0.0113**	**7.0100e-003**	**4.0000e-005**	**1.8500e-003**	**4.0000e-005**	**1.8900e-003**	**5.1000e-004**	**4.0000e-005**	**5.5000e-004**	**0.0000**	**3.7532**	**3.7532**	**2.5000e-004**	**0.0000**	**3.7594**

3.5 Paving - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0126	0.1292	0.1465	2.3000e-004		6.7800e-003	6.7800e-003		6.2400e-003	6.2400e-003	0.0000	20.0235	20.0235	6.4800e-003	0.0000	20.1854
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0126**	**0.1292**	**0.1465**	**2.3000e-004**		**6.7800e-003**	**6.7800e-003**		**6.2400e-003**	**6.2400e-003**	**0.0000**	**20.0235**	**20.0235**	**6.4800e-003**	**0.0000**	**20.1854**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.6000e-004	0.0109	2.5700e-003	3.0000e-005	6.6000e-004	3.0000e-005	6.9000e-004	1.9000e-004	3.0000e-005	2.2000e-004	0.0000	2.6867	2.6867	2.2000e-004	0.0000	2.6921
Worker	6.3000e-004	4.0000e-004	4.4400e-003	1.0000e-005	1.1900e-003	1.0000e-005	1.2000e-003	3.2000e-004	1.0000e-005	3.3000e-004	0.0000	1.0665	1.0665	3.0000e-005	0.0000	1.0673
Total	**9.9000e-004**	**0.0113**	**7.0100e-003**	**4.0000e-005**	**1.8500e-003**	**4.0000e-005**	**1.8900e-003**	**5.1000e-004**	**4.0000e-005**	**5.5000e-004**	**0.0000**	**3.7532**	**3.7532**	**2.5000e-004**	**0.0000**	**3.7594**

3.5 Paving - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0126	0.1292	0.1465	2.3000e-004		6.7800e-003	6.7800e-003		6.2400e-003	6.2400e-003	0.0000	20.0235	20.0235	6.4800e-003	0.0000	20.1854
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0126**	**0.1292**	**0.1465**	**2.3000e-004**		**6.7800e-003**	**6.7800e-003**		**6.2400e-003**	**6.2400e-003**	**0.0000**	**20.0235**	**20.0235**	**6.4800e-003**	**0.0000**	**20.1854**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.6000e-004	0.0109	2.5700e-003	3.0000e-005	6.6000e-004	3.0000e-005	6.9000e-004	1.9000e-004	3.0000e-005	2.2000e-004	0.0000	2.6867	2.6867	2.2000e-004	0.0000	2.6921
Worker	6.3000e-004	4.0000e-004	4.4400e-003	1.0000e-005	1.1900e-003	1.0000e-005	1.2000e-003	3.2000e-004	1.0000e-005	3.3000e-004	0.0000	1.0665	1.0665	3.0000e-005	0.0000	1.0673
Total	**9.9000e-004**	**0.0113**	**7.0100e-003**	**4.0000e-005**	**1.8500e-003**	**4.0000e-005**	**1.8900e-003**	**5.1000e-004**	**4.0000e-005**	**5.5000e-004**	**0.0000**	**3.7532**	**3.7532**	**2.5000e-004**	**0.0000**	**3.7594**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	2.5000e-004	2.1800e-003	1.6900e-003	1.0000e-005	3.0000e-004	1.0000e-005	3.0000e-004	8.0000e-005	1.0000e-005	9.0000e-005	0.0000	0.5927	0.5927	8.0000e-005	0.0000	0.5946
Unmitigated	2.5000e-004	2.1800e-003	1.6900e-003	1.0000e-005	3.0000e-004	1.0000e-005	3.0000e-004	8.0000e-005	1.0000e-005	9.0000e-005	0.0000	0.5927	0.5927	8.0000e-005	0.0000	0.5946

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.91	0.91	0.91	787	787
Total	0.91	0.91	0.91	787	787

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	100.00	0.00	0.00	0	100	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.530844	0.031753	0.165023	0.117863	0.020860	0.005456	0.014179	0.100253	0.002735	0.001704	0.007139	0.001243	0.000949

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	64.6569	64.6569	5.5700e-003	1.1100e-003	65.1284
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	64.6569	64.6569	5.5700e-003	1.1100e-003	65.1284
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	491531	64.6569	5.5700e-003	1.1100e-003	65.1284
Total		**64.6569**	**5.5700e-003**	**1.1100e-003**	**65.1284**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	491531	64.6569	5.5700e-003	1.1100e-003	65.1284
Total		**64.6569**	**5.5700e-003**	**1.1100e-003**	**65.1284**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0339	0.0000	8.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.6000e-004	1.6000e-004	0.0000	0.0000	1.7000e-004
Unmitigated	0.0339	0.0000	8.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.6000e-004	1.6000e-004	0.0000	0.0000	1.7000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	8.2700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0256					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	8.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.6000e-004	1.6000e-004	0.0000	0.0000	1.7000e-004
Total	**0.0339**	**0.0000**	**8.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.6000e-004**	**1.6000e-004**	**0.0000**	**0.0000**	**1.7000e-004**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	8.2700e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0256					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	8.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.6000e-004	1.6000e-004	0.0000	0.0000	1.7000e-004
Total	**0.0339**	**0.0000**	**8.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.6000e-004**	**1.6000e-004**	**0.0000**	**0.0000**	**1.7000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Madera Lake Pipeline Project

Madera County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	9.10	Acre	9.10	396,396.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.9	**Precipitation Freq (Days)**	51
Climate Zone	3			**Operational Year**	2021
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	290	**CH4 Intensity (lb/MWhr)**	0.025	**N2O Intensity (lb/MWhr)**	0.005

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Current PG&E Intensity Factors

Land Use -

Construction Phase - Project will take approximatly 5 months. No buildings will be constructed. Work will predominately be installing a pipeline.

Trips and VMT - Work will have approximately 15 worker trips per day and 10 vendor trips per day. Hauling done with 20 CY trucks.

Grading - Approximately 150 cubic yards of dirt may be moved offsite.

Vehicle Trips - Approx 180 trips per year (once a day for 6 months) by district staff.

Energy Use - assuming 150 hp pumps operating for 6 months out of the year.

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	230.00	20.00
tblConstructionPhase	NumDays	20.00	45.00
tblEnergyUse	NT24E	0.00	1.24
tblFleetMix	HHD	0.10	0.10
tblFleetMix	LDA	0.52	0.53
tblFleetMix	LDT1	0.03	0.03
tblFleetMix	LDT2	0.17	0.17
tblFleetMix	LHD1	0.02	0.02
tblFleetMix	LHD2	5.7790e-003	5.4560e-003
tblFleetMix	MCY	7.3190e-003	7.1390e-003
tblFleetMix	MDV	0.12	0.12
tblFleetMix	MH	1.0280e-003	9.4900e-004
tblFleetMix	MHD	0.01	0.01
tblFleetMix	OBUS	2.7760e-003	2.7350e-003
tblFleetMix	SBUS	1.2650e-003	1.2430e-003
tblFleetMix	UBUS	1.7430e-003	1.7040e-003
tblGrading	AcresOfGrading	22.50	10.00
tblGrading	MaterialExported	0.00	150.00
tblProjectCharacteristics	CH4IntensityFactor	0.029	0.025
tblProjectCharacteristics	CO2IntensityFactor	641.35	290
tblProjectCharacteristics	N2OIntensityFactor	0.006	0.005
tblTripsAndVMT	HaulingTripNumber	19.00	8.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	65.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00

tblTripsAndVMT	WorkerTripNumber	166.00	15.00
tblVehicleEF	HHD	1.72	1.72
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	0.17	0.15
tblVehicleEF	HHD	3.18	3.01
tblVehicleEF	HHD	0.69	0.67
tblVehicleEF	HHD	1.59	1.45
tblVehicleEF	HHD	6,012.03	5,955.32
tblVehicleEF	HHD	1,571.74	1,551.07
tblVehicleEF	HHD	3.44	3.23
tblVehicleEF	HHD	24.59	23.13
tblVehicleEF	HHD	3.55	3.13
tblVehicleEF	HHD	20.49	20.51
tblVehicleEF	HHD	0.03	0.02
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.04	0.04
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	5.8000e-005	5.3000e-005
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	8.9440e-003	8.9450e-003
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	5.3000e-005	4.9000e-005
tblVehicleEF	HHD	1.0100e-004	9.1000e-005
tblVehicleEF	HHD	3.4120e-003	3.0900e-003
tblVehicleEF	HHD	0.85	0.80
tblVehicleEF	HHD	5.1000e-005	4.6000e-005

tblVehicleEF	HHD	0.13	0.12
tblVehicleEF	HHD	2.9600e-004	2.6100e-004
tblVehicleEF	HHD	0.05	0.05
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	6.1000e-005	5.7000e-005
tblVehicleEF	HHD	1.0100e-004	9.1000e-005
tblVehicleEF	HHD	3.4120e-003	3.0900e-003
tblVehicleEF	HHD	0.97	0.92
tblVehicleEF	HHD	5.1000e-005	4.6000e-005
tblVehicleEF	HHD	0.15	0.14
tblVehicleEF	HHD	2.9600e-004	2.6100e-004
tblVehicleEF	HHD	0.06	0.05
tblVehicleEF	HHD	1.62	1.62
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	0.16	0.14
tblVehicleEF	HHD	2.32	2.19
tblVehicleEF	HHD	0.70	0.67
tblVehicleEF	HHD	1.46	1.33
tblVehicleEF	HHD	6,366.52	6,308.78
tblVehicleEF	HHD	1,571.74	1,551.07
tblVehicleEF	HHD	3.44	3.23
tblVehicleEF	HHD	25.38	23.87
tblVehicleEF	HHD	3.39	2.99
tblVehicleEF	HHD	20.48	20.50
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	0.06	0.06

tblVehicleEF	HHD	0.04	0.04
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	5.8000e-005	5.3000e-005
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	8.9440e-003	8.9450e-003
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	5.3000e-005	4.9000e-005
tblVehicleEF	HHD	2.5500e-004	2.2900e-004
tblVehicleEF	HHD	3.9440e-003	3.5590e-003
tblVehicleEF	HHD	0.80	0.76
tblVehicleEF	HHD	1.1900e-004	1.0600e-004
tblVehicleEF	HHD	0.13	0.12
tblVehicleEF	HHD	3.0200e-004	2.6600e-004
tblVehicleEF	HHD	0.05	0.04
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	5.9000e-005	5.5000e-005
tblVehicleEF	HHD	2.5500e-004	2.2900e-004
tblVehicleEF	HHD	3.9440e-003	3.5590e-003
tblVehicleEF	HHD	0.91	0.86
tblVehicleEF	HHD	1.1900e-004	1.0600e-004
tblVehicleEF	HHD	0.15	0.14
tblVehicleEF	HHD	3.0200e-004	2.6600e-004
tblVehicleEF	HHD	0.06	0.05
tblVehicleEF	HHD	1.86	1.86
tblVehicleEF	HHD	0.01	0.01

tblVehicleEF	HHD	0.18	0.17
tblVehicleEF	HHD	4.37	4.15
tblVehicleEF	HHD	0.69	0.66
tblVehicleEF	HHD	1.77	1.61
tblVehicleEF	HHD	5,522.51	5,467.20
tblVehicleEF	HHD	1,571.74	1,551.07
tblVehicleEF	HHD	3.44	3.23
tblVehicleEF	HHD	23.51	22.11
tblVehicleEF	HHD	3.62	3.19
tblVehicleEF	HHD	20.50	20.51
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.04	0.04
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	5.8000e-005	5.3000e-005
tblVehicleEF	HHD	0.03	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	8.9440e-003	8.9450e-003
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	5.3000e-005	4.9000e-005
tblVehicleEF	HHD	2.6000e-005	2.4000e-005
tblVehicleEF	HHD	3.5620e-003	3.2190e-003
tblVehicleEF	HHD	0.91	0.87
tblVehicleEF	HHD	1.6000e-005	1.5000e-005
tblVehicleEF	HHD	0.13	0.12
tblVehicleEF	HHD	3.1600e-004	2.7900e-004
tblVehicleEF	HHD	0.06	0.05

tblVehicleEF	HHD	0.05	0.05
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	6.4000e-005	5.9000e-005
tblVehicleEF	HHD	2.6000e-005	2.4000e-005
tblVehicleEF	HHD	3.5620e-003	3.2190e-003
tblVehicleEF	HHD	1.04	0.99
tblVehicleEF	HHD	1.6000e-005	1.5000e-005
tblVehicleEF	HHD	0.15	0.14
tblVehicleEF	HHD	3.1600e-004	2.7900e-004
tblVehicleEF	HHD	0.07	0.06
tblVehicleEF	LDA	4.9310e-003	4.4560e-003
tblVehicleEF	LDA	6.5030e-003	5.6330e-003
tblVehicleEF	LDA	0.65	0.61
tblVehicleEF	LDA	1.36	1.22
tblVehicleEF	LDA	274.92	263.92
tblVehicleEF	LDA	59.67	57.56
tblVehicleEF	LDA	0.05	0.05
tblVehicleEF	LDA	0.08	0.07
tblVehicleEF	LDA	1.9650e-003	1.9270e-003
tblVehicleEF	LDA	2.3150e-003	2.2930e-003
tblVehicleEF	LDA	1.8110e-003	1.7760e-003
tblVehicleEF	LDA	2.1290e-003	2.1090e-003
tblVehicleEF	LDA	0.05	0.05
tblVehicleEF	LDA	0.12	0.11
tblVehicleEF	LDA	0.04	0.03
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.03	0.03

tblVehicleEF	LDA	0.09	0.08
tblVehicleEF	LDA	2.7540e-003	2.6430e-003
tblVehicleEF	LDA	6.2000e-004	5.9600e-004
tblVehicleEF	LDA	0.05	0.05
tblVehicleEF	LDA	0.12	0.11
tblVehicleEF	LDA	0.04	0.03
tblVehicleEF	LDA	0.02	0.02
tblVehicleEF	LDA	0.03	0.03
tblVehicleEF	LDA	0.10	0.08
tblVehicleEF	LDA	5.6740e-003	5.1250e-003
tblVehicleEF	LDA	5.3270e-003	4.6140e-003
tblVehicleEF	LDA	0.80	0.75
tblVehicleEF	LDA	1.11	1.00
tblVehicleEF	LDA	301.64	289.52
tblVehicleEF	LDA	59.67	57.56
tblVehicleEF	LDA	0.05	0.05
tblVehicleEF	LDA	0.08	0.07
tblVehicleEF	LDA	1.9650e-003	1.9270e-003
tblVehicleEF	LDA	2.3150e-003	2.2930e-003
tblVehicleEF	LDA	1.8110e-003	1.7760e-003
tblVehicleEF	LDA	2.1290e-003	2.1090e-003
tblVehicleEF	LDA	0.12	0.11
tblVehicleEF	LDA	0.14	0.13
tblVehicleEF	LDA	0.08	0.07
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.03	0.03
tblVehicleEF	LDA	0.07	0.06

tblVehicleEF	LDA	3.0230e-003	2.9010e-003
tblVehicleEF	LDA	6.1500e-004	5.9200e-004
tblVehicleEF	LDA	0.12	0.11
tblVehicleEF	LDA	0.14	0.13
tblVehicleEF	LDA	0.08	0.07
tblVehicleEF	LDA	0.02	0.02
tblVehicleEF	LDA	0.03	0.03
tblVehicleEF	LDA	0.08	0.07
tblVehicleEF	LDA	4.6340e-003	4.1850e-003
tblVehicleEF	LDA	7.7260e-003	6.6890e-003
tblVehicleEF	LDA	0.60	0.56
tblVehicleEF	LDA	1.67	1.50
tblVehicleEF	LDA	264.74	254.16
tblVehicleEF	LDA	59.67	57.56
tblVehicleEF	LDA	0.06	0.05
tblVehicleEF	LDA	0.09	0.08
tblVehicleEF	LDA	1.9650e-003	1.9270e-003
tblVehicleEF	LDA	2.3150e-003	2.2930e-003
tblVehicleEF	LDA	1.8110e-003	1.7760e-003
tblVehicleEF	LDA	2.1290e-003	2.1090e-003
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.11	0.11
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.04	0.04
tblVehicleEF	LDA	0.10	0.09
tblVehicleEF	LDA	2.6510e-003	2.5450e-003

tblVehicleEF	LDA	6.2500e-004	6.0100e-004
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.11	0.11
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.02	0.02
tblVehicleEF	LDA	0.04	0.04
tblVehicleEF	LDA	0.11	0.10
tblVehicleEF	LDT1	0.02	0.01
tblVehicleEF	LDT1	0.02	0.02
tblVehicleEF	LDT1	1.76	1.58
tblVehicleEF	LDT1	4.30	3.86
tblVehicleEF	LDT1	342.00	331.08
tblVehicleEF	LDT1	73.99	72.18
tblVehicleEF	LDT1	0.17	0.15
tblVehicleEF	LDT1	0.24	0.22
tblVehicleEF	LDT1	3.3140e-003	3.1150e-003
tblVehicleEF	LDT1	4.1450e-003	3.9000e-003
tblVehicleEF	LDT1	3.0530e-003	2.8690e-003
tblVehicleEF	LDT1	3.8120e-003	3.5870e-003
tblVehicleEF	LDT1	0.22	0.21
tblVehicleEF	LDT1	0.40	0.38
tblVehicleEF	LDT1	0.14	0.13
tblVehicleEF	LDT1	0.04	0.03
tblVehicleEF	LDT1	0.25	0.23
tblVehicleEF	LDT1	0.30	0.27
tblVehicleEF	LDT1	3.4430e-003	3.3310e-003
tblVehicleEF	LDT1	8.1600e-004	7.9000e-004

tblVehicleEF	LDT1	0.22	0.21
tblVehicleEF	LDT1	0.40	0.38
tblVehicleEF	LDT1	0.14	0.13
tblVehicleEF	LDT1	0.06	0.05
tblVehicleEF	LDT1	0.25	0.23
tblVehicleEF	LDT1	0.33	0.29
tblVehicleEF	LDT1	0.02	0.02
tblVehicleEF	LDT1	0.02	0.02
tblVehicleEF	LDT1	2.13	1.92
tblVehicleEF	LDT1	3.50	3.14
tblVehicleEF	LDT1	373.48	361.65
tblVehicleEF	LDT1	73.99	72.18
tblVehicleEF	LDT1	0.15	0.14
tblVehicleEF	LDT1	0.22	0.20
tblVehicleEF	LDT1	3.3140e-003	3.1150e-003
tblVehicleEF	LDT1	4.1450e-003	3.9000e-003
tblVehicleEF	LDT1	3.0530e-003	2.8690e-003
tblVehicleEF	LDT1	3.8120e-003	3.5870e-003
tblVehicleEF	LDT1	0.54	0.50
tblVehicleEF	LDT1	0.51	0.48
tblVehicleEF	LDT1	0.31	0.30
tblVehicleEF	LDT1	0.04	0.04
tblVehicleEF	LDT1	0.24	0.22
tblVehicleEF	LDT1	0.25	0.22
tblVehicleEF	LDT1	3.7630e-003	3.6410e-003
tblVehicleEF	LDT1	8.0200e-004	7.7700e-004
tblVehicleEF	LDT1	0.54	0.50

tblVehicleEF	LDT1	0.51	0.48
tblVehicleEF	LDT1	0.31	0.30
tblVehicleEF	LDT1	0.06	0.06
tblVehicleEF	LDT1	0.24	0.22
tblVehicleEF	LDT1	0.27	0.24
tblVehicleEF	LDT1	0.01	0.01
tblVehicleEF	LDT1	0.03	0.02
tblVehicleEF	LDT1	1.66	1.49
tblVehicleEF	LDT1	5.33	4.77
tblVehicleEF	LDT1	329.99	319.43
tblVehicleEF	LDT1	73.99	72.18
tblVehicleEF	LDT1	0.19	0.17
tblVehicleEF	LDT1	0.27	0.24
tblVehicleEF	LDT1	3.3140e-003	3.1150e-003
tblVehicleEF	LDT1	4.1450e-003	3.9000e-003
tblVehicleEF	LDT1	3.0530e-003	2.8690e-003
tblVehicleEF	LDT1	3.8120e-003	3.5870e-003
tblVehicleEF	LDT1	0.06	0.05
tblVehicleEF	LDT1	0.41	0.38
tblVehicleEF	LDT1	0.04	0.04
tblVehicleEF	LDT1	0.04	0.03
tblVehicleEF	LDT1	0.30	0.28
tblVehicleEF	LDT1	0.36	0.32
tblVehicleEF	LDT1	3.3210e-003	3.2130e-003
tblVehicleEF	LDT1	8.3400e-004	8.0600e-004
tblVehicleEF	LDT1	0.06	0.05
tblVehicleEF	LDT1	0.41	0.38

tblVehicleEF	LDT1	0.04	0.04
tblVehicleEF	LDT1	0.05	0.05
tblVehicleEF	LDT1	0.30	0.28
tblVehicleEF	LDT1	0.39	0.35
tblVehicleEF	LDT2	8.6560e-003	7.8170e-003
tblVehicleEF	LDT2	0.01	0.01
tblVehicleEF	LDT2	1.02	0.94
tblVehicleEF	LDT2	2.32	2.07
tblVehicleEF	LDT2	387.30	373.86
tblVehicleEF	LDT2	84.10	81.53
tblVehicleEF	LDT2	0.11	0.10
tblVehicleEF	LDT2	0.19	0.17
tblVehicleEF	LDT2	2.0600e-003	2.0350e-003
tblVehicleEF	LDT2	2.5600e-003	2.5250e-003
tblVehicleEF	LDT2	1.8950e-003	1.8720e-003
tblVehicleEF	LDT2	2.3540e-003	2.3210e-003
tblVehicleEF	LDT2	0.09	0.09
tblVehicleEF	LDT2	0.18	0.17
tblVehicleEF	LDT2	0.07	0.06
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.10	0.09
tblVehicleEF	LDT2	0.16	0.14
tblVehicleEF	LDT2	3.8830e-003	3.7470e-003
tblVehicleEF	LDT2	8.8100e-004	8.5100e-004
tblVehicleEF	LDT2	0.09	0.09
tblVehicleEF	LDT2	0.18	0.17
tblVehicleEF	LDT2	0.07	0.06

tblVehicleEF	LDT2	0.03	0.03
tblVehicleEF	LDT2	0.10	0.09
tblVehicleEF	LDT2	0.18	0.15
tblVehicleEF	LDT2	9.9160e-003	8.9540e-003
tblVehicleEF	LDT2	9.7390e-003	8.5370e-003
tblVehicleEF	LDT2	1.25	1.16
tblVehicleEF	LDT2	1.90	1.69
tblVehicleEF	LDT2	423.85	409.14
tblVehicleEF	LDT2	84.10	81.53
tblVehicleEF	LDT2	0.10	0.09
tblVehicleEF	LDT2	0.18	0.15
tblVehicleEF	LDT2	2.0600e-003	2.0350e-003
tblVehicleEF	LDT2	2.5600e-003	2.5250e-003
tblVehicleEF	LDT2	1.8950e-003	1.8720e-003
tblVehicleEF	LDT2	2.3540e-003	2.3210e-003
tblVehicleEF	LDT2	0.23	0.21
tblVehicleEF	LDT2	0.22	0.21
tblVehicleEF	LDT2	0.15	0.14
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.09	0.09
tblVehicleEF	LDT2	0.13	0.12
tblVehicleEF	LDT2	4.2510e-003	4.1030e-003
tblVehicleEF	LDT2	8.7400e-004	8.4400e-004
tblVehicleEF	LDT2	0.23	0.21
tblVehicleEF	LDT2	0.22	0.21
tblVehicleEF	LDT2	0.15	0.14
tblVehicleEF	LDT2	0.04	0.03

tblVehicleEF	LDT2	0.09	0.09
tblVehicleEF	LDT2	0.14	0.13
tblVehicleEF	LDT2	8.1640e-003	7.3650e-003
tblVehicleEF	LDT2	0.01	0.01
tblVehicleEF	LDT2	0.95	0.87
tblVehicleEF	LDT2	2.85	2.54
tblVehicleEF	LDT2	373.37	360.41
tblVehicleEF	LDT2	84.10	81.53
tblVehicleEF	LDT2	0.12	0.11
tblVehicleEF	LDT2	0.21	0.19
tblVehicleEF	LDT2	2.0600e-003	2.0350e-003
tblVehicleEF	LDT2	2.5600e-003	2.5250e-003
tblVehicleEF	LDT2	1.8950e-003	1.8720e-003
tblVehicleEF	LDT2	2.3540e-003	2.3210e-003
tblVehicleEF	LDT2	0.03	0.02
tblVehicleEF	LDT2	0.18	0.17
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.12	0.11
tblVehicleEF	LDT2	0.19	0.17
tblVehicleEF	LDT2	3.7420e-003	3.6120e-003
tblVehicleEF	LDT2	8.9100e-004	8.5900e-004
tblVehicleEF	LDT2	0.03	0.02
tblVehicleEF	LDT2	0.18	0.17
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.03	0.03
tblVehicleEF	LDT2	0.12	0.11

tblVehicleEF	LDT2	0.21	0.18
tblVehicleEF	LHD1	4.6790e-003	4.4800e-003
tblVehicleEF	LHD1	0.03	0.02
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	0.13	0.13
tblVehicleEF	LHD1	1.61	1.52
tblVehicleEF	LHD1	2.71	2.56
tblVehicleEF	LHD1	9.58	9.58
tblVehicleEF	LHD1	687.67	683.65
tblVehicleEF	LHD1	25.91	25.60
tblVehicleEF	LHD1	0.11	0.11
tblVehicleEF	LHD1	2.73	2.61
tblVehicleEF	LHD1	0.89	0.87
tblVehicleEF	LHD1	1.1880e-003	1.1860e-003
tblVehicleEF	LHD1	0.01	0.01
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.8900e-004	9.4500e-004
tblVehicleEF	LHD1	1.1370e-003	1.1350e-003
tblVehicleEF	LHD1	2.6000e-003	2.6050e-003
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.1000e-004	8.6900e-004
tblVehicleEF	LHD1	3.8660e-003	3.7950e-003
tblVehicleEF	LHD1	0.11	0.11
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.5710e-003	1.5580e-003
tblVehicleEF	LHD1	0.19	0.18
tblVehicleEF	LHD1	0.35	0.36

tblVehicleEF	LHD1	0.27	0.25
tblVehicleEF	LHD1	6.7290e-003	6.6870e-003
tblVehicleEF	LHD1	3.1000e-004	3.0400e-004
tblVehicleEF	LHD1	3.8660e-003	3.7950e-003
tblVehicleEF	LHD1	0.11	0.11
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.5710e-003	1.5580e-003
tblVehicleEF	LHD1	0.23	0.22
tblVehicleEF	LHD1	0.35	0.36
tblVehicleEF	LHD1	0.29	0.28
tblVehicleEF	LHD1	4.6790e-003	4.4800e-003
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	0.13	0.13
tblVehicleEF	LHD1	1.64	1.55
tblVehicleEF	LHD1	2.50	2.35
tblVehicleEF	LHD1	9.58	9.58
tblVehicleEF	LHD1	687.67	683.65
tblVehicleEF	LHD1	25.91	25.60
tblVehicleEF	LHD1	0.11	0.11
tblVehicleEF	LHD1	2.59	2.48
tblVehicleEF	LHD1	0.84	0.82
tblVehicleEF	LHD1	1.1880e-003	1.1860e-003
tblVehicleEF	LHD1	0.01	0.01
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.8900e-004	9.4500e-004
tblVehicleEF	LHD1	1.1370e-003	1.1350e-003

tblVehicleEF	LHD1	2.6000e-003	2.6050e-003
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.1000e-004	8.6900e-004
tblVehicleEF	LHD1	9.3930e-003	9.1900e-003
tblVehicleEF	LHD1	0.13	0.13
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	3.4290e-003	3.3720e-003
tblVehicleEF	LHD1	0.19	0.18
tblVehicleEF	LHD1	0.35	0.35
tblVehicleEF	LHD1	0.25	0.24
tblVehicleEF	LHD1	6.7300e-003	6.6870e-003
tblVehicleEF	LHD1	3.0600e-004	3.0000e-004
tblVehicleEF	LHD1	9.3930e-003	9.1900e-003
tblVehicleEF	LHD1	0.13	0.13
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	3.4290e-003	3.3720e-003
tblVehicleEF	LHD1	0.23	0.22
tblVehicleEF	LHD1	0.35	0.35
tblVehicleEF	LHD1	0.28	0.26
tblVehicleEF	LHD1	4.6790e-003	4.4800e-003
tblVehicleEF	LHD1	0.03	0.02
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	0.13	0.13
tblVehicleEF	LHD1	1.57	1.49
tblVehicleEF	LHD1	2.98	2.80
tblVehicleEF	LHD1	9.58	9.58
tblVehicleEF	LHD1	687.67	683.65

tblVehicleEF	LHD1	25.91	25.60
tblVehicleEF	LHD1	0.11	0.11
tblVehicleEF	LHD1	2.79	2.67
tblVehicleEF	LHD1	0.96	0.93
tblVehicleEF	LHD1	1.1880e-003	1.1860e-003
tblVehicleEF	LHD1	0.01	0.01
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.8900e-004	9.4500e-004
tblVehicleEF	LHD1	1.1370e-003	1.1350e-003
tblVehicleEF	LHD1	2.6000e-003	2.6050e-003
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	9.1000e-004	8.6900e-004
tblVehicleEF	LHD1	1.0610e-003	1.0550e-003
tblVehicleEF	LHD1	0.12	0.12
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	5.7400e-004	5.7600e-004
tblVehicleEF	LHD1	0.19	0.18
tblVehicleEF	LHD1	0.39	0.39
tblVehicleEF	LHD1	0.29	0.27
tblVehicleEF	LHD1	6.7290e-003	6.6860e-003
tblVehicleEF	LHD1	3.1500e-004	3.0800e-004
tblVehicleEF	LHD1	1.0610e-003	1.0550e-003
tblVehicleEF	LHD1	0.12	0.12
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	5.7400e-004	5.7600e-004
tblVehicleEF	LHD1	0.23	0.22
tblVehicleEF	LHD1	0.39	0.39

tblVehicleEF	LHD1	0.31	0.29
tblVehicleEF	LHD2	3.3940e-003	3.2400e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	8.8390e-003	7.9850e-003
tblVehicleEF	LHD2	0.12	0.12
tblVehicleEF	LHD2	0.88	0.83
tblVehicleEF	LHD2	1.27	1.19
tblVehicleEF	LHD2	14.86	14.79
tblVehicleEF	LHD2	724.85	719.33
tblVehicleEF	LHD2	21.71	21.59
tblVehicleEF	LHD2	0.13	0.13
tblVehicleEF	LHD2	2.04	1.84
tblVehicleEF	LHD2	0.52	0.49
tblVehicleEF	LHD2	1.4130e-003	1.3900e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	4.0500e-004	3.8200e-004
tblVehicleEF	LHD2	1.3520e-003	1.3300e-003
tblVehicleEF	LHD2	2.7160e-003	2.7170e-003
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	3.7200e-004	3.5100e-004
tblVehicleEF	LHD2	1.5000e-003	1.4190e-003
tblVehicleEF	LHD2	0.04	0.04
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	6.5200e-004	6.3000e-004
tblVehicleEF	LHD2	0.15	0.14
tblVehicleEF	LHD2	0.10	0.09

tblVehicleEF	LHD2	0.12	0.11
tblVehicleEF	LHD2	7.0400e-003	6.9860e-003
tblVehicleEF	LHD2	2.4100e-004	2.3800e-004
tblVehicleEF	LHD2	1.5000e-003	1.4190e-003
tblVehicleEF	LHD2	0.04	0.04
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	6.5200e-004	6.3000e-004
tblVehicleEF	LHD2	0.17	0.16
tblVehicleEF	LHD2	0.10	0.09
tblVehicleEF	LHD2	0.13	0.12
tblVehicleEF	LHD2	3.3940e-003	3.2400e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	8.3310e-003	7.5320e-003
tblVehicleEF	LHD2	0.12	0.12
tblVehicleEF	LHD2	0.89	0.83
tblVehicleEF	LHD2	1.17	1.10
tblVehicleEF	LHD2	14.86	14.79
tblVehicleEF	LHD2	724.85	719.33
tblVehicleEF	LHD2	21.71	21.59
tblVehicleEF	LHD2	0.13	0.13
tblVehicleEF	LHD2	1.94	1.75
tblVehicleEF	LHD2	0.49	0.46
tblVehicleEF	LHD2	1.4130e-003	1.3900e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	4.0500e-004	3.8200e-004
tblVehicleEF	LHD2	1.3520e-003	1.3300e-003

tblVehicleEF	LHD2	2.7160e-003	2.7170e-003
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	3.7200e-004	3.5100e-004
tblVehicleEF	LHD2	3.6230e-003	3.4150e-003
tblVehicleEF	LHD2	0.05	0.05
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	1.4050e-003	1.3440e-003
tblVehicleEF	LHD2	0.15	0.14
tblVehicleEF	LHD2	0.10	0.09
tblVehicleEF	LHD2	0.11	0.10
tblVehicleEF	LHD2	7.0400e-003	6.9860e-003
tblVehicleEF	LHD2	2.3900e-004	2.3600e-004
tblVehicleEF	LHD2	3.6230e-003	3.4150e-003
tblVehicleEF	LHD2	0.05	0.05
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	1.4050e-003	1.3440e-003
tblVehicleEF	LHD2	0.17	0.16
tblVehicleEF	LHD2	0.10	0.09
tblVehicleEF	LHD2	0.12	0.11
tblVehicleEF	LHD2	3.3940e-003	3.2400e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	9.4080e-003	8.4930e-003
tblVehicleEF	LHD2	0.12	0.12
tblVehicleEF	LHD2	0.87	0.82
tblVehicleEF	LHD2	1.38	1.30
tblVehicleEF	LHD2	14.86	14.79
tblVehicleEF	LHD2	724.85	719.33

tblVehicleEF	LHD2	21.71	21.59
tblVehicleEF	LHD2	0.13	0.13
tblVehicleEF	LHD2	2.08	1.87
tblVehicleEF	LHD2	0.55	0.52
tblVehicleEF	LHD2	1.4130e-003	1.3900e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	4.0500e-004	3.8200e-004
tblVehicleEF	LHD2	1.3520e-003	1.3300e-003
tblVehicleEF	LHD2	2.7160e-003	2.7170e-003
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	3.7200e-004	3.5100e-004
tblVehicleEF	LHD2	4.2900e-004	4.1300e-004
tblVehicleEF	LHD2	0.04	0.04
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	2.4300e-004	2.3800e-004
tblVehicleEF	LHD2	0.15	0.14
tblVehicleEF	LHD2	0.11	0.10
tblVehicleEF	LHD2	0.13	0.11
tblVehicleEF	LHD2	7.0400e-003	6.9860e-003
tblVehicleEF	LHD2	2.4300e-004	2.4000e-004
tblVehicleEF	LHD2	4.2900e-004	4.1300e-004
tblVehicleEF	LHD2	0.04	0.04
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	2.4300e-004	2.3800e-004
tblVehicleEF	LHD2	0.17	0.16
tblVehicleEF	LHD2	0.11	0.10

tblVehicleEF	LHD2	0.14	0.13
tblVehicleEF	MCY	0.46	0.47
tblVehicleEF	MCY	0.17	0.17
tblVehicleEF	MCY	21.92	21.44
tblVehicleEF	MCY	10.08	10.10
tblVehicleEF	MCY	174.22	174.96
tblVehicleEF	MCY	48.65	48.25
tblVehicleEF	MCY	1.18	1.18
tblVehicleEF	MCY	0.32	0.32
tblVehicleEF	MCY	2.0840e-003	2.1270e-003
tblVehicleEF	MCY	4.1610e-003	4.0990e-003
tblVehicleEF	MCY	1.9570e-003	1.9960e-003
tblVehicleEF	MCY	3.9390e-003	3.8780e-003
tblVehicleEF	MCY	1.58	1.59
tblVehicleEF	MCY	1.05	1.04
tblVehicleEF	MCY	0.85	0.85
tblVehicleEF	MCY	2.65	2.62
tblVehicleEF	MCY	0.51	0.51
tblVehicleEF	MCY	2.30	2.28
tblVehicleEF	MCY	2.1770e-003	2.1760e-003
tblVehicleEF	MCY	7.1900e-004	7.1500e-004
tblVehicleEF	MCY	1.58	1.59
tblVehicleEF	MCY	1.05	1.04
tblVehicleEF	MCY	0.85	0.85
tblVehicleEF	MCY	3.21	3.18
tblVehicleEF	MCY	0.51	0.51
tblVehicleEF	MCY	2.50	2.48

tblVehicleEF	MCY	0.45	0.46
tblVehicleEF	MCY	0.14	0.14
tblVehicleEF	MCY	22.00	21.52
tblVehicleEF	MCY	9.14	9.13
tblVehicleEF	MCY	174.22	174.96
tblVehicleEF	MCY	48.65	48.25
tblVehicleEF	MCY	1.02	1.02
tblVehicleEF	MCY	0.29	0.29
tblVehicleEF	MCY	2.0840e-003	2.1270e-003
tblVehicleEF	MCY	4.1610e-003	4.0990e-003
tblVehicleEF	MCY	1.9570e-003	1.9960e-003
tblVehicleEF	MCY	3.9390e-003	3.8780e-003
tblVehicleEF	MCY	4.08	4.09
tblVehicleEF	MCY	1.56	1.56
tblVehicleEF	MCY	2.20	2.20
tblVehicleEF	MCY	2.56	2.54
tblVehicleEF	MCY	0.50	0.50
tblVehicleEF	MCY	1.92	1.91
tblVehicleEF	MCY	6.9200e-004	6.8800e-004
tblVehicleEF	MCY	4.08	4.09
tblVehicleEF	MCY	1.56	1.56
tblVehicleEF	MCY	2.20	2.20
tblVehicleEF	MCY	3.10	3.08
tblVehicleEF	MCY	0.50	0.50
tblVehicleEF	MCY	2.09	2.08
tblVehicleEF	MCY	0.48	0.49
tblVehicleEF	MCY	0.20	0.20

tblVehicleEF	MCY	23.79	23.23
tblVehicleEF	MCY	11.74	11.77
tblVehicleEF	MCY	174.22	174.96
tblVehicleEF	MCY	48.65	48.25
tblVehicleEF	MCY	1.29	1.28
tblVehicleEF	MCY	0.35	0.35
tblVehicleEF	MCY	2.0840e-003	2.1270e-003
tblVehicleEF	MCY	4.1610e-003	4.0990e-003
tblVehicleEF	MCY	1.9570e-003	1.9960e-003
tblVehicleEF	MCY	3.9390e-003	3.8780e-003
tblVehicleEF	MCY	0.34	0.34
tblVehicleEF	MCY	1.08	1.07
tblVehicleEF	MCY	0.19	0.19
tblVehicleEF	MCY	2.81	2.77
tblVehicleEF	MCY	0.59	0.59
tblVehicleEF	MCY	2.79	2.77
tblVehicleEF	MCY	2.2120e-003	2.2100e-003
tblVehicleEF	MCY	7.6200e-004	7.5700e-004
tblVehicleEF	MCY	0.34	0.34
tblVehicleEF	MCY	1.08	1.07
tblVehicleEF	MCY	0.19	0.19
tblVehicleEF	MCY	3.39	3.36
tblVehicleEF	MCY	0.59	0.59
tblVehicleEF	MCY	3.04	3.02
tblVehicleEF	MDV	0.02	0.01
tblVehicleEF	MDV	0.02	0.02
tblVehicleEF	MDV	1.62	1.44

tblVehicleEF	MDV	4.23	3.82
tblVehicleEF	MDV	531.90	516.32
tblVehicleEF	MDV	114.25	111.66
tblVehicleEF	MDV	0.19	0.17
tblVehicleEF	MDV	0.38	0.34
tblVehicleEF	MDV	2.0130e-003	1.9750e-003
tblVehicleEF	MDV	2.7040e-003	2.5760e-003
tblVehicleEF	MDV	1.8570e-003	1.8210e-003
tblVehicleEF	MDV	2.4900e-003	2.3690e-003
tblVehicleEF	MDV	0.12	0.12
tblVehicleEF	MDV	0.25	0.24
tblVehicleEF	MDV	0.10	0.09
tblVehicleEF	MDV	0.04	0.03
tblVehicleEF	MDV	0.14	0.14
tblVehicleEF	MDV	0.34	0.30
tblVehicleEF	MDV	5.3330e-003	5.1740e-003
tblVehicleEF	MDV	1.2180e-003	1.1840e-003
tblVehicleEF	MDV	0.12	0.12
tblVehicleEF	MDV	0.25	0.24
tblVehicleEF	MDV	0.10	0.09
tblVehicleEF	MDV	0.06	0.05
tblVehicleEF	MDV	0.14	0.14
tblVehicleEF	MDV	0.37	0.33
tblVehicleEF	MDV	0.02	0.02
tblVehicleEF	MDV	0.02	0.02
tblVehicleEF	MDV	1.98	1.77
tblVehicleEF	MDV	3.49	3.13

tblVehicleEF	MDV	580.82	563.80
tblVehicleEF	MDV	114.25	111.66
tblVehicleEF	MDV	0.18	0.16
tblVehicleEF	MDV	0.36	0.32
tblVehicleEF	MDV	2.0130e-003	1.9750e-003
tblVehicleEF	MDV	2.7040e-003	2.5760e-003
tblVehicleEF	MDV	1.8570e-003	1.8210e-003
tblVehicleEF	MDV	2.4900e-003	2.3690e-003
tblVehicleEF	MDV	0.29	0.28
tblVehicleEF	MDV	0.29	0.28
tblVehicleEF	MDV	0.20	0.20
tblVehicleEF	MDV	0.05	0.04
tblVehicleEF	MDV	0.14	0.13
tblVehicleEF	MDV	0.28	0.24
tblVehicleEF	MDV	5.8270e-003	5.6540e-003
tblVehicleEF	MDV	1.2040e-003	1.1720e-003
tblVehicleEF	MDV	0.29	0.28
tblVehicleEF	MDV	0.29	0.28
tblVehicleEF	MDV	0.20	0.20
tblVehicleEF	MDV	0.07	0.06
tblVehicleEF	MDV	0.14	0.13
tblVehicleEF	MDV	0.30	0.27
tblVehicleEF	MDV	0.01	0.01
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	1.52	1.34
tblVehicleEF	MDV	5.18	4.70
tblVehicleEF	MDV	513.26	498.22

tblVehicleEF	MDV	114.25	111.66
tblVehicleEF	MDV	0.21	0.19
tblVehicleEF	MDV	0.43	0.38
tblVehicleEF	MDV	2.0130e-003	1.9750e-003
tblVehicleEF	MDV	2.7040e-003	2.5760e-003
tblVehicleEF	MDV	1.8570e-003	1.8210e-003
tblVehicleEF	MDV	2.4900e-003	2.3690e-003
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.25	0.24
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.04	0.03
tblVehicleEF	MDV	0.17	0.16
tblVehicleEF	MDV	0.40	0.36
tblVehicleEF	MDV	5.1450e-003	4.9920e-003
tblVehicleEF	MDV	1.2350e-003	1.2000e-003
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.25	0.24
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.06	0.05
tblVehicleEF	MDV	0.17	0.16
tblVehicleEF	MDV	0.44	0.39
tblVehicleEF	MH	0.05	0.05
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	3.79	3.32
tblVehicleEF	MH	7.18	6.69
tblVehicleEF	MH	1,237.85	1,233.89
tblVehicleEF	MH	58.35	58.02

tblVehicleEF	MH	2.19	2.09
tblVehicleEF	MH	0.99	0.95
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	0.05	0.04
tblVehicleEF	MH	1.3210e-003	1.2470e-003
tblVehicleEF	MH	3.2400e-003	3.2420e-003
tblVehicleEF	MH	0.04	0.04
tblVehicleEF	MH	1.2150e-003	1.1470e-003
tblVehicleEF	MH	1.70	1.61
tblVehicleEF	MH	0.11	0.10
tblVehicleEF	MH	0.46	0.43
tblVehicleEF	MH	0.17	0.15
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	0.41	0.39
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	7.0900e-004	6.9700e-004
tblVehicleEF	MH	1.70	1.61
tblVehicleEF	MH	0.11	0.10
tblVehicleEF	MH	0.46	0.43
tblVehicleEF	MH	0.23	0.21
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	0.45	0.42
tblVehicleEF	MH	0.06	0.05
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	3.95	3.46
tblVehicleEF	MH	6.42	5.98
tblVehicleEF	MH	1,237.85	1,233.89

tblVehicleEF	MH	58.35	58.02
tblVehicleEF	MH	2.04	1.95
tblVehicleEF	MH	0.93	0.89
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	0.05	0.04
tblVehicleEF	MH	1.3210e-003	1.2470e-003
tblVehicleEF	MH	3.2400e-003	3.2420e-003
tblVehicleEF	MH	0.04	0.04
tblVehicleEF	MH	1.2150e-003	1.1470e-003
tblVehicleEF	MH	4.16	3.93
tblVehicleEF	MH	0.13	0.12
tblVehicleEF	MH	0.98	0.93
tblVehicleEF	MH	0.17	0.16
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	0.38	0.36
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	6.9600e-004	6.8500e-004
tblVehicleEF	MH	4.16	3.93
tblVehicleEF	MH	0.13	0.12
tblVehicleEF	MH	0.98	0.93
tblVehicleEF	MH	0.24	0.21
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	0.42	0.39
tblVehicleEF	MH	0.05	0.04
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	3.63	3.18
tblVehicleEF	MH	8.12	7.55

tblVehicleEF	MH	1,237.85	1,233.89
tblVehicleEF	MH	58.35	58.02
tblVehicleEF	MH	2.28	2.16
tblVehicleEF	MH	1.07	1.02
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	0.05	0.04
tblVehicleEF	MH	1.3210e-003	1.2470e-003
tblVehicleEF	MH	3.2400e-003	3.2420e-003
tblVehicleEF	MH	0.04	0.04
tblVehicleEF	MH	1.2150e-003	1.1470e-003
tblVehicleEF	MH	0.44	0.43
tblVehicleEF	MH	0.12	0.11
tblVehicleEF	MH	0.20	0.19
tblVehicleEF	MH	0.16	0.14
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	0.45	0.42
tblVehicleEF	MH	0.01	0.01
tblVehicleEF	MH	7.2500e-004	7.1100e-004
tblVehicleEF	MH	0.44	0.43
tblVehicleEF	MH	0.12	0.11
tblVehicleEF	MH	0.20	0.19
tblVehicleEF	MH	0.22	0.20
tblVehicleEF	MH	0.03	0.03
tblVehicleEF	MH	0.49	0.46
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	0.01	9.7490e-003
tblVehicleEF	MHD	0.07	0.06

tblVehicleEF	MHD	0.45	0.44
tblVehicleEF	MHD	0.76	0.65
tblVehicleEF	MHD	7.34	6.36
tblVehicleEF	MHD	159.95	162.15
tblVehicleEF	MHD	1,217.42	1,212.48
tblVehicleEF	MHD	51.70	50.10
tblVehicleEF	MHD	0.82	0.79
tblVehicleEF	MHD	1.89	1.78
tblVehicleEF	MHD	12.29	12.44
tblVehicleEF	MHD	7.7980e-003	7.5720e-003
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	1.0160e-003	9.0400e-004
tblVehicleEF	MHD	7.4610e-003	7.2440e-003
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	9.3400e-004	8.3100e-004
tblVehicleEF	MHD	1.9230e-003	1.6520e-003
tblVehicleEF	MHD	0.06	0.05
tblVehicleEF	MHD	0.05	0.05
tblVehicleEF	MHD	7.9500e-004	6.9300e-004
tblVehicleEF	MHD	0.10	0.09
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.44	0.38
tblVehicleEF	MHD	1.5370e-003	1.5570e-003
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	6.4600e-004	6.1200e-004
tblVehicleEF	MHD	1.9230e-003	1.6520e-003
tblVehicleEF	MHD	0.06	0.05

tblVehicleEF	MHD	0.06	0.06
tblVehicleEF	MHD	7.9500e-004	6.9300e-004
tblVehicleEF	MHD	0.12	0.10
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.48	0.41
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	0.01	9.9950e-003
tblVehicleEF	MHD	0.07	0.06
tblVehicleEF	MHD	0.32	0.31
tblVehicleEF	MHD	0.77	0.66
tblVehicleEF	MHD	6.76	5.86
tblVehicleEF	MHD	169.57	171.90
tblVehicleEF	MHD	1,217.42	1,212.48
tblVehicleEF	MHD	51.70	50.10
tblVehicleEF	MHD	0.85	0.82
tblVehicleEF	MHD	1.79	1.69
tblVehicleEF	MHD	12.23	12.38
tblVehicleEF	MHD	6.5740e-003	6.3830e-003
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	1.0160e-003	9.0400e-004
tblVehicleEF	MHD	6.2900e-003	6.1070e-003
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	9.3400e-004	8.3100e-004
tblVehicleEF	MHD	4.7640e-003	4.0640e-003
tblVehicleEF	MHD	0.07	0.06
tblVehicleEF	MHD	0.04	0.04
tblVehicleEF	MHD	1.8110e-003	1.5590e-003

tblVehicleEF	MHD	0.10	0.09
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.41	0.35
tblVehicleEF	MHD	1.6270e-003	1.6490e-003
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	6.3600e-004	6.0400e-004
tblVehicleEF	MHD	4.7640e-003	4.0640e-003
tblVehicleEF	MHD	0.07	0.06
tblVehicleEF	MHD	0.06	0.05
tblVehicleEF	MHD	1.8110e-003	1.5590e-003
tblVehicleEF	MHD	0.12	0.10
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.45	0.39
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	0.01	9.4880e-003
tblVehicleEF	MHD	0.08	0.07
tblVehicleEF	MHD	0.60	0.58
tblVehicleEF	MHD	0.74	0.63
tblVehicleEF	MHD	8.06	6.98
tblVehicleEF	MHD	146.98	149.00
tblVehicleEF	MHD	1,217.42	1,212.48
tblVehicleEF	MHD	51.70	50.10
tblVehicleEF	MHD	0.78	0.76
tblVehicleEF	MHD	1.93	1.81
tblVehicleEF	MHD	12.36	12.50
tblVehicleEF	MHD	9.4890e-003	9.2130e-003
tblVehicleEF	MHD	0.02	0.02

tblVehicleEF	MHD	1.0160e-003	9.0400e-004
tblVehicleEF	MHD	9.0780e-003	8.8150e-003
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	9.3400e-004	8.3100e-004
tblVehicleEF	MHD	4.9600e-004	4.3700e-004
tblVehicleEF	MHD	0.06	0.05
tblVehicleEF	MHD	0.05	0.05
tblVehicleEF	MHD	2.6900e-004	2.4000e-004
tblVehicleEF	MHD	0.09	0.09
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.47	0.40
tblVehicleEF	MHD	1.4140e-003	1.4330e-003
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	6.5800e-004	6.2300e-004
tblVehicleEF	MHD	4.9600e-004	4.3700e-004
tblVehicleEF	MHD	0.06	0.05
tblVehicleEF	MHD	0.06	0.06
tblVehicleEF	MHD	2.6900e-004	2.4000e-004
tblVehicleEF	MHD	0.11	0.10
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	0.51	0.44
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	0.02	0.02
tblVehicleEF	OBUS	0.04	0.04
tblVehicleEF	OBUS	0.30	0.30
tblVehicleEF	OBUS	1.33	1.18
tblVehicleEF	OBUS	8.42	7.88

tblVehicleEF	OBUS	161.89	166.79
tblVehicleEF	OBUS	1,340.76	1,334.51
tblVehicleEF	OBUS	65.97	65.29
tblVehicleEF	OBUS	0.90	0.81
tblVehicleEF	OBUS	2.10	1.93
tblVehicleEF	OBUS	3.94	3.97
tblVehicleEF	OBUS	3.1600e-004	1.8300e-004
tblVehicleEF	OBUS	9.1150e-003	7.8950e-003
tblVehicleEF	OBUS	1.0280e-003	1.0160e-003
tblVehicleEF	OBUS	3.0200e-004	1.7500e-004
tblVehicleEF	OBUS	8.6970e-003	7.5300e-003
tblVehicleEF	OBUS	9.4500e-004	9.3400e-004
tblVehicleEF	OBUS	3.5040e-003	3.3840e-003
tblVehicleEF	OBUS	0.03	0.03
tblVehicleEF	OBUS	0.05	0.05
tblVehicleEF	OBUS	1.0590e-003	1.0350e-003
tblVehicleEF	OBUS	0.11	0.10
tblVehicleEF	OBUS	0.06	0.05
tblVehicleEF	OBUS	0.51	0.47
tblVehicleEF	OBUS	1.5560e-003	1.6030e-003
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	8.0700e-004	7.9100e-004
tblVehicleEF	OBUS	3.5040e-003	3.3840e-003
tblVehicleEF	OBUS	0.03	0.03
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	1.0590e-003	1.0350e-003
tblVehicleEF	OBUS	0.14	0.13

tblVehicleEF	OBUS	0.06	0.05
tblVehicleEF	OBUS	0.56	0.52
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	0.02	0.02
tblVehicleEF	OBUS	0.04	0.04
tblVehicleEF	OBUS	0.28	0.27
tblVehicleEF	OBUS	1.37	1.21
tblVehicleEF	OBUS	7.58	7.10
tblVehicleEF	OBUS	170.55	175.75
tblVehicleEF	OBUS	1,340.76	1,334.51
tblVehicleEF	OBUS	65.97	65.29
tblVehicleEF	OBUS	0.93	0.84
tblVehicleEF	OBUS	1.98	1.82
tblVehicleEF	OBUS	3.86	3.89
tblVehicleEF	OBUS	2.6600e-004	1.5400e-004
tblVehicleEF	OBUS	9.1150e-003	7.8950e-003
tblVehicleEF	OBUS	1.0280e-003	1.0160e-003
tblVehicleEF	OBUS	2.5500e-004	1.4700e-004
tblVehicleEF	OBUS	8.6970e-003	7.5300e-003
tblVehicleEF	OBUS	9.4500e-004	9.3400e-004
tblVehicleEF	OBUS	8.5820e-003	8.2620e-003
tblVehicleEF	OBUS	0.04	0.04
tblVehicleEF	OBUS	0.05	0.04
tblVehicleEF	OBUS	2.2860e-003	2.2150e-003
tblVehicleEF	OBUS	0.11	0.10
tblVehicleEF	OBUS	0.06	0.05
tblVehicleEF	OBUS	0.47	0.44

tblVehicleEF	OBUS	1.6390e-003	1.6880e-003
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	7.9300e-004	7.7800e-004
tblVehicleEF	OBUS	8.5820e-003	8.2620e-003
tblVehicleEF	OBUS	0.04	0.04
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	2.2860e-003	2.2150e-003
tblVehicleEF	OBUS	0.14	0.13
tblVehicleEF	OBUS	0.06	0.05
tblVehicleEF	OBUS	0.52	0.48
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	0.02	0.02
tblVehicleEF	OBUS	0.05	0.04
tblVehicleEF	OBUS	0.34	0.33
tblVehicleEF	OBUS	1.29	1.14
tblVehicleEF	OBUS	9.40	8.81
tblVehicleEF	OBUS	149.94	154.42
tblVehicleEF	OBUS	1,340.76	1,334.51
tblVehicleEF	OBUS	65.97	65.29
tblVehicleEF	OBUS	0.86	0.77
tblVehicleEF	OBUS	2.16	1.98
tblVehicleEF	OBUS	4.05	4.07
tblVehicleEF	OBUS	3.8400e-004	2.2200e-004
tblVehicleEF	OBUS	9.1150e-003	7.8950e-003
tblVehicleEF	OBUS	1.0280e-003	1.0160e-003
tblVehicleEF	OBUS	3.6800e-004	2.1300e-004
tblVehicleEF	OBUS	8.6970e-003	7.5300e-003

tblVehicleEF	OBUS	9.4500e-004	9.3400e-004
tblVehicleEF	OBUS	9.7200e-004	9.5200e-004
tblVehicleEF	OBUS	0.03	0.03
tblVehicleEF	OBUS	0.05	0.05
tblVehicleEF	OBUS	4.5800e-004	4.5200e-004
tblVehicleEF	OBUS	0.11	0.10
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	0.55	0.51
tblVehicleEF	OBUS	1.4420e-003	1.4850e-003
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	8.2400e-004	8.0700e-004
tblVehicleEF	OBUS	9.7200e-004	9.5200e-004
tblVehicleEF	OBUS	0.03	0.03
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	4.5800e-004	4.5200e-004
tblVehicleEF	OBUS	0.13	0.12
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	0.60	0.56
tblVehicleEF	SBUS	0.86	0.84
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.10	0.09
tblVehicleEF	SBUS	3.75	3.74
tblVehicleEF	SBUS	1.11	0.97
tblVehicleEF	SBUS	4.99	4.58
tblVehicleEF	SBUS	1,373.57	1,366.84
tblVehicleEF	SBUS	1,163.98	1,159.43
tblVehicleEF	SBUS	22.42	22.68

tblVehicleEF	SBUS	14.38	13.64
tblVehicleEF	SBUS	5.49	5.08
tblVehicleEF	SBUS	17.49	17.40
tblVehicleEF	SBUS	0.02	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.03	0.03
tblVehicleEF	SBUS	3.8700e-004	3.6700e-004
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	2.7930e-003	2.7910e-003
tblVehicleEF	SBUS	0.03	0.03
tblVehicleEF	SBUS	3.5600e-004	3.3700e-004
tblVehicleEF	SBUS	3.3960e-003	2.9420e-003
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.45	0.44
tblVehicleEF	SBUS	9.8300e-004	8.9700e-004
tblVehicleEF	SBUS	0.14	0.13
tblVehicleEF	SBUS	0.01	9.0840e-003
tblVehicleEF	SBUS	0.24	0.22
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	3.1000e-004	3.0600e-004
tblVehicleEF	SBUS	3.3960e-003	2.9420e-003
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.63	0.62
tblVehicleEF	SBUS	9.8300e-004	8.9700e-004
tblVehicleEF	SBUS	0.17	0.16
tblVehicleEF	SBUS	0.01	9.0840e-003

tblVehicleEF	SBUS	0.27	0.24
tblVehicleEF	SBUS	0.86	0.84
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.08	0.07
tblVehicleEF	SBUS	3.57	3.57
tblVehicleEF	SBUS	1.14	1.00
tblVehicleEF	SBUS	3.35	3.08
tblVehicleEF	SBUS	1,448.60	1,441.40
tblVehicleEF	SBUS	1,163.98	1,159.43
tblVehicleEF	SBUS	22.42	22.68
tblVehicleEF	SBUS	14.84	14.08
tblVehicleEF	SBUS	5.21	4.83
tblVehicleEF	SBUS	17.46	17.37
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.03	0.03
tblVehicleEF	SBUS	3.8700e-004	3.6700e-004
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	2.7930e-003	2.7910e-003
tblVehicleEF	SBUS	0.03	0.03
tblVehicleEF	SBUS	3.5600e-004	3.3700e-004
tblVehicleEF	SBUS	8.3020e-003	7.1450e-003
tblVehicleEF	SBUS	0.03	0.02
tblVehicleEF	SBUS	0.44	0.44
tblVehicleEF	SBUS	2.1190e-003	1.8970e-003
tblVehicleEF	SBUS	0.14	0.13
tblVehicleEF	SBUS	9.7900e-003	7.8320e-003

tblVehicleEF	SBUS	0.19	0.18
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	2.8300e-004	2.8100e-004
tblVehicleEF	SBUS	8.3020e-003	7.1450e-003
tblVehicleEF	SBUS	0.03	0.02
tblVehicleEF	SBUS	0.62	0.62
tblVehicleEF	SBUS	2.1190e-003	1.8970e-003
tblVehicleEF	SBUS	0.17	0.16
tblVehicleEF	SBUS	9.7900e-003	7.8320e-003
tblVehicleEF	SBUS	0.21	0.19
tblVehicleEF	SBUS	0.86	0.84
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.12	0.11
tblVehicleEF	SBUS	4.00	3.98
tblVehicleEF	SBUS	1.08	0.95
tblVehicleEF	SBUS	6.75	6.20
tblVehicleEF	SBUS	1,269.94	1,263.87
tblVehicleEF	SBUS	1,163.98	1,159.43
tblVehicleEF	SBUS	22.42	22.68
tblVehicleEF	SBUS	13.74	13.03
tblVehicleEF	SBUS	5.60	5.19
tblVehicleEF	SBUS	17.52	17.43
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.03	0.03
tblVehicleEF	SBUS	3.8700e-004	3.6700e-004

tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	2.7930e-003	2.7910e-003
tblVehicleEF	SBUS	0.03	0.03
tblVehicleEF	SBUS	3.5600e-004	3.3700e-004
tblVehicleEF	SBUS	9.5800e-004	8.6500e-004
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.45	0.45
tblVehicleEF	SBUS	4.3300e-004	4.0300e-004
tblVehicleEF	SBUS	0.14	0.13
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.29	0.26
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	3.3900e-004	3.3200e-004
tblVehicleEF	SBUS	9.5800e-004	8.6500e-004
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.63	0.63
tblVehicleEF	SBUS	4.3300e-004	4.0300e-004
tblVehicleEF	SBUS	0.17	0.15
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.32	0.29
tblVehicleEF	UBUS	1.50	1.42
tblVehicleEF	UBUS	0.09	0.09
tblVehicleEF	UBUS	8.59	8.19
tblVehicleEF	UBUS	16.71	16.21
tblVehicleEF	UBUS	1,898.75	1,883.52
tblVehicleEF	UBUS	146.85	147.57

tblVehicleEF	UBUS	6.33	5.78
tblVehicleEF	UBUS	13.12	12.99
tblVehicleEF	UBUS	0.48	0.48
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.2860e-003	1.3150e-003
tblVehicleEF	UBUS	0.21	0.20
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.1830e-003	1.2090e-003
tblVehicleEF	UBUS	8.8250e-003	8.6040e-003
tblVehicleEF	UBUS	0.11	0.11
tblVehicleEF	UBUS	3.3300e-003	3.3050e-003
tblVehicleEF	UBUS	0.61	0.56
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	1.18	1.16
tblVehicleEF	UBUS	0.01	0.01
tblVehicleEF	UBUS	1.7670e-003	1.7660e-003
tblVehicleEF	UBUS	8.8250e-003	8.6040e-003
tblVehicleEF	UBUS	0.11	0.11
tblVehicleEF	UBUS	3.3300e-003	3.3050e-003
tblVehicleEF	UBUS	2.17	2.03
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	1.29	1.27
tblVehicleEF	UBUS	1.50	1.42
tblVehicleEF	UBUS	0.08	0.08
tblVehicleEF	UBUS	8.69	8.30
tblVehicleEF	UBUS	13.34	12.95
tblVehicleEF	UBUS	1,898.75	1,883.52

tblVehicleEF	UBUS	146.85	147.57
tblVehicleEF	UBUS	5.96	5.45
tblVehicleEF	UBUS	12.97	12.85
tblVehicleEF	UBUS	0.48	0.48
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.2860e-003	1.3150e-003
tblVehicleEF	UBUS	0.21	0.20
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.1830e-003	1.2090e-003
tblVehicleEF	UBUS	0.02	0.02
tblVehicleEF	UBUS	0.14	0.14
tblVehicleEF	UBUS	7.5590e-003	7.4060e-003
tblVehicleEF	UBUS	0.61	0.56
tblVehicleEF	UBUS	0.01	0.01
tblVehicleEF	UBUS	1.04	1.02
tblVehicleEF	UBUS	0.01	0.01
tblVehicleEF	UBUS	0.02	0.02
tblVehicleEF	UBUS	0.14	0.14
tblVehicleEF	UBUS	7.5590e-003	7.4060e-003
tblVehicleEF	UBUS	2.18	2.04
tblVehicleEF	UBUS	0.01	0.01
tblVehicleEF	UBUS	1.13	1.12
tblVehicleEF	UBUS	1.50	1.42
tblVehicleEF	UBUS	0.10	0.10
tblVehicleEF	UBUS	8.48	8.09
tblVehicleEF	UBUS	20.62	20.01
tblVehicleEF	UBUS	1,898.75	1,883.52

tblVehicleEF	UBUS	146.85	147.57
tblVehicleEF	UBUS	6.49	5.94
tblVehicleEF	UBUS	13.28	13.15
tblVehicleEF	UBUS	0.48	0.48
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.2860e-003	1.3150e-003
tblVehicleEF	UBUS	0.21	0.20
tblVehicleEF	UBUS	0.08	0.07
tblVehicleEF	UBUS	1.1830e-003	1.2090e-003
tblVehicleEF	UBUS	2.5290e-003	2.5040e-003
tblVehicleEF	UBUS	0.11	0.11
tblVehicleEF	UBUS	1.3870e-003	1.4040e-003
tblVehicleEF	UBUS	0.60	0.55
tblVehicleEF	UBUS	0.02	0.02
tblVehicleEF	UBUS	1.34	1.32
tblVehicleEF	UBUS	0.01	0.01
tblVehicleEF	UBUS	1.8340e-003	1.8310e-003
tblVehicleEF	UBUS	2.5290e-003	2.5040e-003
tblVehicleEF	UBUS	0.11	0.11
tblVehicleEF	UBUS	1.3870e-003	1.4040e-003
tblVehicleEF	UBUS	2.16	2.02
tblVehicleEF	UBUS	0.02	0.02
tblVehicleEF	UBUS	1.47	1.45
tblVehicleTrips	CW_TTP	0.00	100.00
tblVehicleTrips	DV_TP	0.00	100.00
tblVehicleTrips	ST_TR	0.00	0.10
tblVehicleTrips	SU_TR	0.00	0.10

tblVehicleTrips	WD_TR	0.00	0.10

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	4.0053	41.6325	21.9600	0.0422	18.2819	2.0490	20.3309	9.9894	1.8852	11.8746	0.0000	4,112.3421	4,112.3421	1.2215	0.0000	4,142.8788
Maximum	**4.0053**	**41.6325**	**21.9600**	**0.0422**	**18.2819**	**2.0490**	**20.3309**	**9.9894**	**1.8852**	**11.8746**	**0.0000**	**4,112.3421**	**4,112.3421**	**1.2215**	**0.0000**	**4,142.8788**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	4.0053	41.6325	21.9600	0.0422	8.3455	2.0490	10.3944	4.5276	1.8852	6.4127	0.0000	4,112.3421	4,112.3421	1.2215	0.0000	4,142.8788
Maximum	**4.0053**	**41.6325**	**21.9600**	**0.0422**	**8.3455**	**2.0490**	**10.3944**	**4.5276**	**1.8852**	**6.4127**	**0.0000**	**4,112.3421**	**4,112.3421**	**1.2215**	**0.0000**	**4,142.8788**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	54.35	0.00	48.87	54.68	0.00	46.00	0.00	0.00	0.00	0.00	0.00	0.00

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.1858	1.0000e-005	9.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.9900e-003	1.9900e-003	1.0000e-005		2.1200e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	1.2700e-003	0.0119	0.0102	3.0000e-005	1.6900e-003	3.0000e-005	1.7200e-003	4.5000e-004	3.0000e-005	4.8000e-004		3.4477	3.4477	5.0000e-004		3.4602
Total	**0.1871**	**0.0119**	**0.0111**	**3.0000e-005**	**1.6900e-003**	**3.0000e-005**	**1.7200e-003**	**4.5000e-004**	**3.0000e-005**	**4.8000e-004**		**3.4497**	**3.4497**	**5.1000e-004**	**0.0000**	**3.4623**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.1858	1.0000e-005	9.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.9900e-003	1.9900e-003	1.0000e-005		2.1200e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	1.2700e-003	0.0119	0.0102	3.0000e-005	1.6900e-003	3.0000e-005	1.7200e-003	4.5000e-004	3.0000e-005	4.8000e-004		3.4477	3.4477	5.0000e-004		3.4602
Total	**0.1871**	**0.0119**	**0.0111**	**3.0000e-005**	**1.6900e-003**	**3.0000e-005**	**1.7200e-003**	**4.5000e-004**	**3.0000e-005**	**4.8000e-004**		**3.4497**	**3.4497**	**5.1000e-004**	**0.0000**	**3.4623**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	3/15/2021	3/26/2021	5	10	
2	Grading	Grading	3/27/2021	5/28/2021	5	45	
3	Building Construction	Building Construction	5/29/2021	6/25/2021	5	20	
4	Paving	Paving	6/26/2021	7/23/2021	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 10

Acres of Paving: 9.1

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Excavators	1	8.00	158	0.38
Grading	Graders	1	8.00	187	0.41
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Site Preparation	7	18.00	10.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	15.00	10.00	8.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	15.00	10.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	10.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

3.2 Site Preparation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					18.0663	0.0000	18.0663	9.9307	0.0000	9.9307			0.0000			0.0000
Off-Road	3.8882	40.4971	21.1543	0.0380		2.0445	2.0445		1.8809	1.8809		3,685.6569	3,685.6569	1.1920		3,715.4573
Total	**3.8882**	**40.4971**	**21.1543**	**0.0380**	**18.0663**	**2.0445**	**20.1107**	**9.9307**	**1.8809**	**11.8116**		**3,685.6569**	**3,685.6569**	**1.1920**		**3,715.4573**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0375	1.0827	0.2798	2.7800e-003	0.0678	3.3800e-003	0.0712	0.0195	3.2300e-003	0.0228		290.6176	290.6176	0.0254		291.2528
Worker	0.0796	0.0527	0.5260	1.3700e-003	0.1479	1.1200e-003	0.1490	0.0392	1.0300e-003	0.0403		136.0676	136.0676	4.0500e-003		136.1688
Total	**0.1171**	**1.1354**	**0.8057**	**4.1500e-003**	**0.2157**	**4.5000e-003**	**0.2202**	**0.0587**	**4.2600e-003**	**0.0630**		**426.6852**	**426.6852**	**0.0295**		**427.4216**

3.2 Site Preparation - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					8.1298	0.0000	8.1298	4.4688	0.0000	4.4688			0.0000			0.0000
Off-Road	3.8882	40.4971	21.1543	0.0380		2.0445	2.0445		1.8809	1.8809	0.0000	3,685.656 9	3,685.656 9	1.1920		3,715.457 3
Total	**3.8882**	**40.4971**	**21.1543**	**0.0380**	**8.1298**	**2.0445**	**10.1743**	**4.4688**	**1.8809**	**6.3497**	**0.0000**	**3,685.656 9**	**3,685.656 9**	**1.1920**		**3,715.457 3**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0375	1.0827	0.2798	2.7800e-003	0.0678	3.3800e-003	0.0712	0.0195	3.2300e-003	0.0228		290.6176	290.6176	0.0254		291.2528
Worker	0.0796	0.0527	0.5260	1.3700e-003	0.1479	1.1200e-003	0.1490	0.0392	1.0300e-003	0.0403		136.0676	136.0676	4.0500e-003		136.1688
Total	**0.1171**	**1.1354**	**0.8057**	**4.1500e-003**	**0.2157**	**4.5000e-003**	**0.2202**	**0.0587**	**4.2600e-003**	**0.0630**		**426.6852**	**426.6852**	**0.0295**		**427.4216**

3.3 Grading - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.2583	0.0000	6.2583	3.3358	0.0000	3.3358			0.0000			0.0000
Off-Road	2.2903	24.7367	15.8575	0.0296		1.1599	1.1599		1.0671	1.0671		2,871.9285	2,871.9285	0.9288		2,895.1495
Total	**2.2903**	**24.7367**	**15.8575**	**0.0296**	**6.2583**	**1.1599**	**7.4182**	**3.3358**	**1.0671**	**4.4029**		**2,871.9285**	**2,871.9285**	**0.9288**		**2,895.1495**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.3900e-003	0.0458	7.8400e-003	1.4000e-004	3.1200e-003	1.5000e-004	3.2700e-003	8.5000e-004	1.4000e-004	1.0000e-003		14.5477	14.5477	8.9000e-004		14.5700
Vendor	0.0375	1.0827	0.2798	2.7800e-003	0.0678	3.3800e-003	0.0712	0.0195	3.2300e-003	0.0228		290.6176	290.6176	0.0254		291.2528
Worker	0.0663	0.0439	0.4383	1.1400e-003	0.1232	9.3000e-004	0.1242	0.0327	8.6000e-004	0.0335		113.3897	113.3897	3.3700e-003		113.4740
Total	**0.1053**	**1.1724**	**0.7259**	**4.0600e-003**	**0.1941**	**4.4600e-003**	**0.1986**	**0.0531**	**4.2300e-003**	**0.0573**		**418.5550**	**418.5550**	**0.0297**		**419.2967**

3.3 Grading - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.8162	0.0000	2.8162	1.5011	0.0000	1.5011			0.0000			0.0000
Off-Road	2.2903	24.7367	15.8575	0.0296		1.1599	1.1599		1.0671	1.0671	0.0000	2,871.9285	2,871.9285	0.9288		2,895.1495
Total	**2.2903**	**24.7367**	**15.8575**	**0.0296**	**2.8162**	**1.1599**	**3.9761**	**1.5011**	**1.0671**	**2.5682**	**0.0000**	**2,871.9285**	**2,871.9285**	**0.9288**		**2,895.1495**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	1.3900e-003	0.0458	7.8400e-003	1.4000e-004	3.1200e-003	1.5000e-004	3.2700e-003	8.5000e-004	1.4000e-004	1.0000e-003		14.5477	14.5477	8.9000e-004		14.5700
Vendor	0.0375	1.0827	0.2798	2.7800e-003	0.0678	3.3800e-003	0.0712	0.0195	3.2300e-003	0.0228		290.6176	290.6176	0.0254		291.2528
Worker	0.0663	0.0439	0.4383	1.1400e-003	0.1232	9.3000e-004	0.1242	0.0327	8.6000e-004	0.0335		113.3897	113.3897	3.3700e-003		113.4740
Total	**0.1053**	**1.1724**	**0.7259**	**4.0600e-003**	**0.1941**	**4.4600e-003**	**0.1986**	**0.0531**	**4.2300e-003**	**0.0573**		**418.5550**	**418.5550**	**0.0297**		**419.2967**

3.4 Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013		2,553.3639	2,553.3639	0.6160		2,568.7643
Total	**1.9009**	**17.4321**	**16.5752**	**0.0269**		**0.9586**	**0.9586**		**0.9013**	**0.9013**		**2,553.3639**	**2,553.3639**	**0.6160**		**2,568.7643**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0375	1.0827	0.2798	2.7800e-003	0.0678	3.3800e-003	0.0712	0.0195	3.2300e-003	0.0228		290.6176	290.6176	0.0254		291.2528
Worker	0.0663	0.0439	0.4383	1.1400e-003	0.1232	9.3000e-004	0.1242	0.0327	8.6000e-004	0.0335		113.3897	113.3897	3.3700e-003		113.4740
Total	**0.1039**	**1.1266**	**0.7181**	**3.9200e-003**	**0.1910**	**4.3100e-003**	**0.1953**	**0.0522**	**4.0900e-003**	**0.0563**		**404.0073**	**404.0073**	**0.0288**		**404.7268**

3.4 Building Construction - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013	0.0000	2,553.3639	2,553.3639	0.6160		2,568.7643
Total	**1.9009**	**17.4321**	**16.5752**	**0.0269**		**0.9586**	**0.9586**		**0.9013**	**0.9013**	**0.0000**	**2,553.3639**	**2,553.3639**	**0.6160**		**2,568.7643**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0375	1.0827	0.2798	2.7800e-003	0.0678	3.3800e-003	0.0712	0.0195	3.2300e-003	0.0228		290.6176	290.6176	0.0254		291.2528
Worker	0.0663	0.0439	0.4383	1.1400e-003	0.1232	9.3000e-004	0.1242	0.0327	8.6000e-004	0.0335		113.3897	113.3897	3.3700e-003		113.4740
Total	**0.1039**	**1.1266**	**0.7181**	**3.9200e-003**	**0.1910**	**4.3100e-003**	**0.1953**	**0.0522**	**4.0900e-003**	**0.0563**		**404.0073**	**404.0073**	**0.0288**		**404.7268**

3.5 Paving - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235		2,207.2109	2,207.2109	0.7139		2,225.0573
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2556**	**12.9191**	**14.6532**	**0.0228**		**0.6777**	**0.6777**		**0.6235**	**0.6235**		**2,207.2109**	**2,207.2109**	**0.7139**		**2,225.0573**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0375	1.0827	0.2798	2.7800e-003	0.0678	3.3800e-003	0.0712	0.0195	3.2300e-003	0.0228		290.6176	290.6176	0.0254		291.2528
Worker	0.0663	0.0439	0.4383	1.1400e-003	0.1232	9.3000e-004	0.1242	0.0327	8.6000e-004	0.0335		113.3897	113.3897	3.3700e-003		113.4740
Total	**0.1039**	**1.1266**	**0.7181**	**3.9200e-003**	**0.1910**	**4.3100e-003**	**0.1953**	**0.0522**	**4.0900e-003**	**0.0563**		**404.0073**	**404.0073**	**0.0288**		**404.7268**

3.5 Paving - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235	0.0000	2,207.2109	2,207.2109	0.7139		2,225.0573
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2556**	**12.9191**	**14.6532**	**0.0228**		**0.6777**	**0.6777**		**0.6235**	**0.6235**	**0.0000**	**2,207.2109**	**2,207.2109**	**0.7139**		**2,225.0573**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0375	1.0827	0.2798	2.7800e-003	0.0678	3.3800e-003	0.0712	0.0195	3.2300e-003	0.0228		290.6176	290.6176	0.0254		291.2528
Worker	0.0663	0.0439	0.4383	1.1400e-003	0.1232	9.3000e-004	0.1242	0.0327	8.6000e-004	0.0335		113.3897	113.3897	3.3700e-003		113.4740
Total	**0.1039**	**1.1266**	**0.7181**	**3.9200e-003**	**0.1910**	**4.3100e-003**	**0.1953**	**0.0522**	**4.0900e-003**	**0.0563**		**404.0073**	**404.0073**	**0.0288**		**404.7268**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.2700e-003	0.0119	0.0102	3.0000e-005	1.6900e-003	3.0000e-005	1.7200e-003	4.5000e-004	3.0000e-005	4.8000e-004		3.4477	3.4477	5.0000e-004		3.4602
Unmitigated	1.2700e-003	0.0119	0.0102	3.0000e-005	1.6900e-003	3.0000e-005	1.7200e-003	4.5000e-004	3.0000e-005	4.8000e-004		3.4477	3.4477	5.0000e-004		3.4602

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.91	0.91	0.91	787	787
Total	0.91	0.91	0.91	787	787

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	9.50	7.30	7.30	100.00	0.00	0.00	0	100	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.530844	0.031753	0.165023	0.117863	0.020860	0.005456	0.014179	0.100253	0.002735	0.001704	0.007139	0.001243	0.000949

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.1858	1.0000e-005	9.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.9900e-003	1.9900e-003	1.0000e-005		2.1200e-003
Unmitigated	0.1858	1.0000e-005	9.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.9900e-003	1.9900e-003	1.0000e-005		2.1200e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0453					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.1404					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	9.0000e-005	1.0000e-005	9.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.9900e-003	1.9900e-003	1.0000e-005		2.1200e-003
Total	**0.1858**	**1.0000e-005**	**9.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.9900e-003**	**1.9900e-003**	**1.0000e-005**		**2.1200e-003**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0453					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.1404					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	9.0000e-005	1.0000e-005	9.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		1.9900e-003	1.9900e-003	1.0000e-005		2.1200e-003
Total	**0.1858**	**1.0000e-005**	**9.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**1.9900e-003**	**1.9900e-003**	**1.0000e-005**		**2.1200e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Appendix B

Biological Evaluation

an Ecological Consulting Firm

BIOLOGICAL EVALUATION
MADERA LAKE PUMP AND PIPELINE PROJECT
MADERA COUNTY, CALIFORNIA

Prepared by

Live Oak Associates, Inc.

Austin Pearson (Director of Ecological Services)
Jeff Gurule (Senior Project Manager)

Prepared for

Madera Water District
C/O Eric A. Abrahamsen, P.E.
Provost & Pritchard Consulting Group
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September 7, 2021 File No. 2194-02

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EXECUTIVE SUMMARY

Live Oak Associates, Inc. (LOA) investigated potential impacts to biological resources associated with the proposed development of the Madera Lake Pump and Pipeline Project (Project) in Madera County. Madera Water District (MWD) plans to construct a siphon in Madera Lake; siphon inlet channel; booster pumps in orchard land; and a pipeline that would be supported by a continuous footing constructed on top of the lakebed, buried through the Madera Lake dam, installed above ground through grassland habitat, and buried within orchard rows and roads. The pipeline would terminate at existing water delivery infrastructure. Project impacts to onsite habitats would be almost entirely temporary, with 0.08 acres of permanent impacts.

A number of measures have been designed and incorporated into the Project plan to avoid and minimize impacts to the California tiger salamander (CTS; *Ambystoma californiense*). The Project would: (1) Obtain an Incidental Take Permit (ITP) from the California Department of Fish and Wildlife (CDFW), take authorization from the U.S. Fish and Wildlife Service (USFWS) if needed, and comply with all avoidance, minimization, and mitigation measures required by the ITP and USFWS take authorization; (2) Minimize potential CTS burrow impacts in grassland habitat by installing the pipeline above ground on concrete saddles per Project design; (3) Prohibit ground disturbance in all potential CTS breeding habitat; and (4) Avoid an onsite ruderal pool as well as avoid work in grassland habitat after the first significant rainfall and until the onsite ruderal pool and two adjacent vernal pools are completely dry.

On May 1, 2020, LOA ecologist Jeff Gurule surveyed the Area of Potential Effect (APE) for its biotic habitats, the plants and animals occurring in those habitats, and significant habitat values that may be protected by state and federal law. At the time of the field survey, the APE consisted primarily of ruderal areas within orchard land. Other areas of the site include Madera Lake, and non-native grassland. Three land uses/biotic habitats were identified within the APE ruderal, non-native grassland, and reservoir. Lands within the vicinity of the APE consist of a matrix of agricultural, residential, and undeveloped lands.

Project construction has the potential to result in significant impacts to the CTS, western spadefoot (*Spea hammondii*), Swainson's hawk (*Buteo swainsoni*), burrowing owl (*Athene cunicularia*), other nesting birds including the loggerhead shrike (*Lanius ludovicianus*), and the American badger (*Taxidea taxus*) through possible construction related injury or mortality. These impacts are considered potentially significant under the California Environmental Quality Act (CEQA). Adherence to ITP and U.S. Fish and Wildlife Service take authorization conservation measures, implementation of a CTS and western spadefoot employee training, Project avoidance of active nests and dens identified during preconstruction surveys, and relocation of resident burrowing owls or non-breeding American badgers will reduce the magnitude of these potential impacts to a less than significant level under CEQA.

No other biological resources would be significantly impacted by the Project as defined by CEQA. Impacts associated with Project development would be less than significant for all locally occurring special status plant species, nine special status animals absent from or unlikely to use the APE, six special status animals that would use the site for foraging only, wildlife movement corridors, jurisdictional waters and wetlands, designated critical habitat, sensitive natural communities, and other sensitive or critical habitat. Loss of habitat for special status animal species is not considered a significant impact of the Project under CEQA. The Project does not appear to conflict with the goals and policies of the Madera County General Plan, or with any other local policies.

TABLE OF CONTENTS

1.0 INTRODUCTION

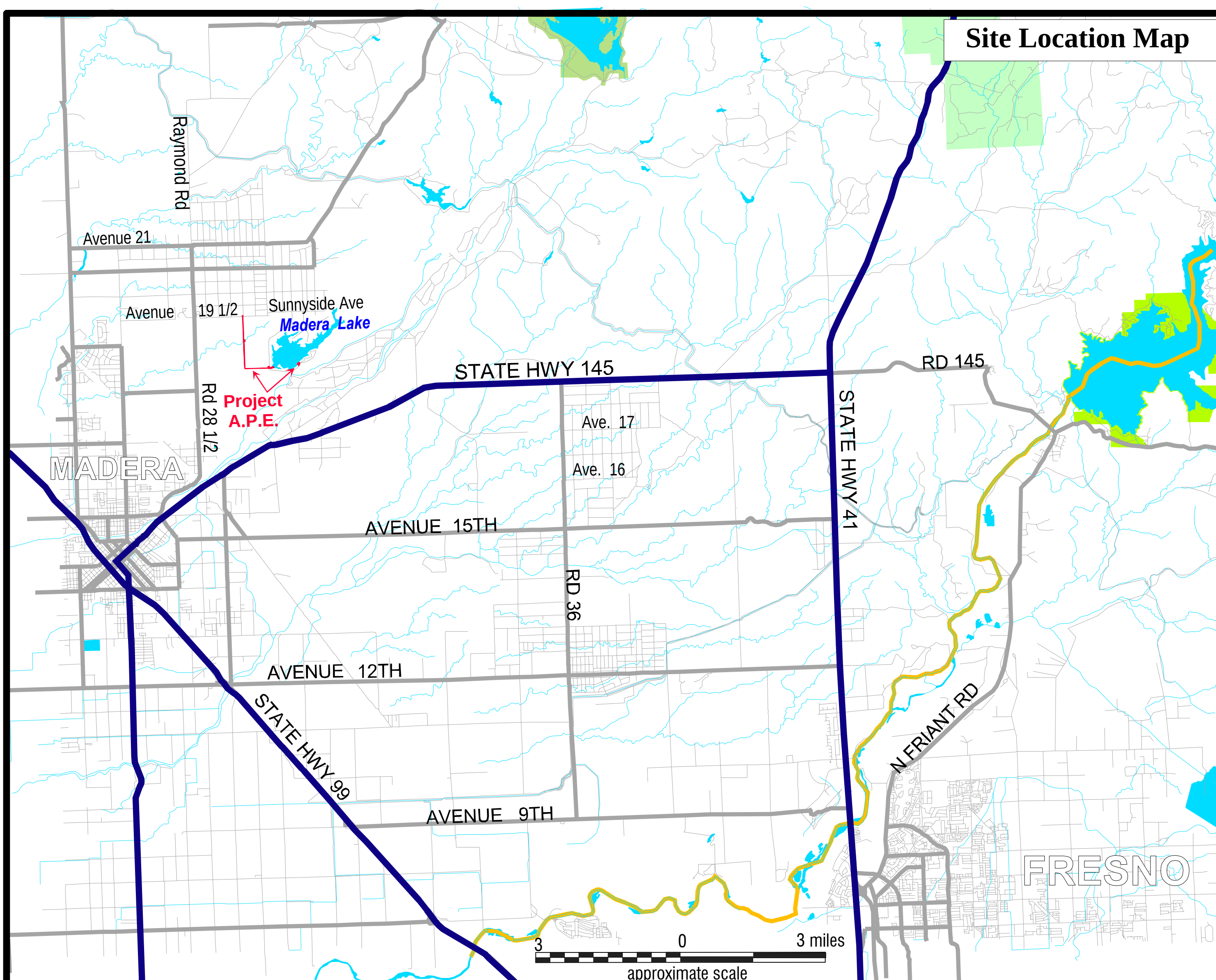
This report describes the biotic resources associated with the proposed Madera Lake Pump and Pipeline Project ("Project") and assesses potential Project-related impacts to those resources. The Area of Potential Effect (APE) of this linear Project is approximately 10.6 acres and extends from Madera Lake into the interior of orchard lands to the west and north for a distance of approximately 1.7 miles, plus a noncontiguous 1.1-acre portion of the APE near the lakeshore. The Project is located in rural Madera County in and adjacent to Madera Lake, southeast of the community of Lake Madera Country Estates and north of the Fresno River (Figure 1). The site can be found primarily in the Kismet 7.5" U.S. Geological Survey (USGS) 7.5-minute quadrangle with a small portion in the Daulton quad; Sections 28, 33, and 34 of Township 11 and 12 South, Range 20 East, Mount Diablo Base and Meridian (Figure 2).

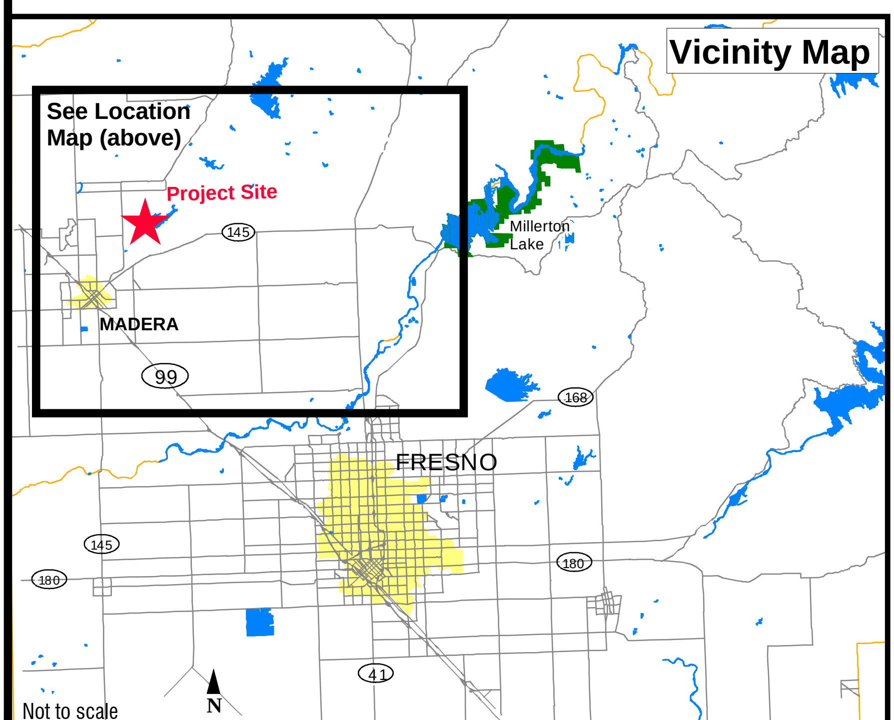
1.1 PROJECT DESCRIPTION

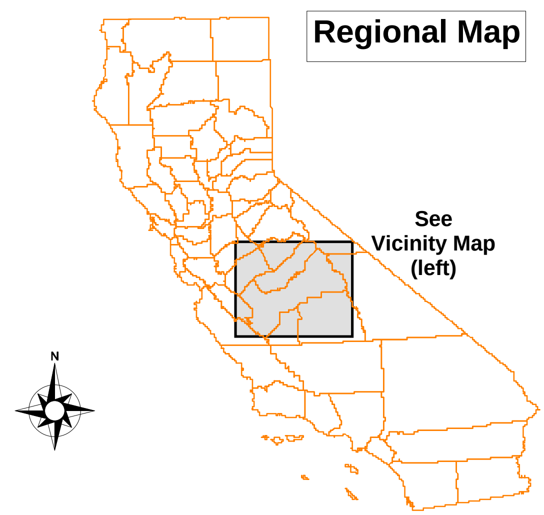
Madera Water District (MWD) proposes to develop a project that would allow water from Madera Irrigation District (MID) or other sources to be brought into MWD through Madera Lake. Madera Lake is supplied by an existing turnout off the Fresno River which is fed by the upstream watershed regulated by Hidden Dam on Hensley Lake and by Madera Canal water that originates from Millerton Lake. Water supplies could be from the Central Valley Project Friant Division, Fresno River, or pre-1914 supplies.

The proposed Project entails the installation of a siphon in Madera Lake, siphon inlet channel, booster pumps, and a pipeline to obtain a flowrate of up to 8,000 gpm from Madera Lake, with up to 6,000 gpm delivered into MWD and up to 2,000 gpm delivered to the neighboring property from outside water supplies.

A 26- to 30-inch steel siphon pipe would be installed on a continuous concrete footing constructed on the lakebed below the water surface at high water levels. A small inlet channel would be constructed in the lakebed to direct water to the siphon at low water levels. Upon exiting the lake, the pipe will be aboveground until buried through the top of the dam embankment and associated dirt roadway.





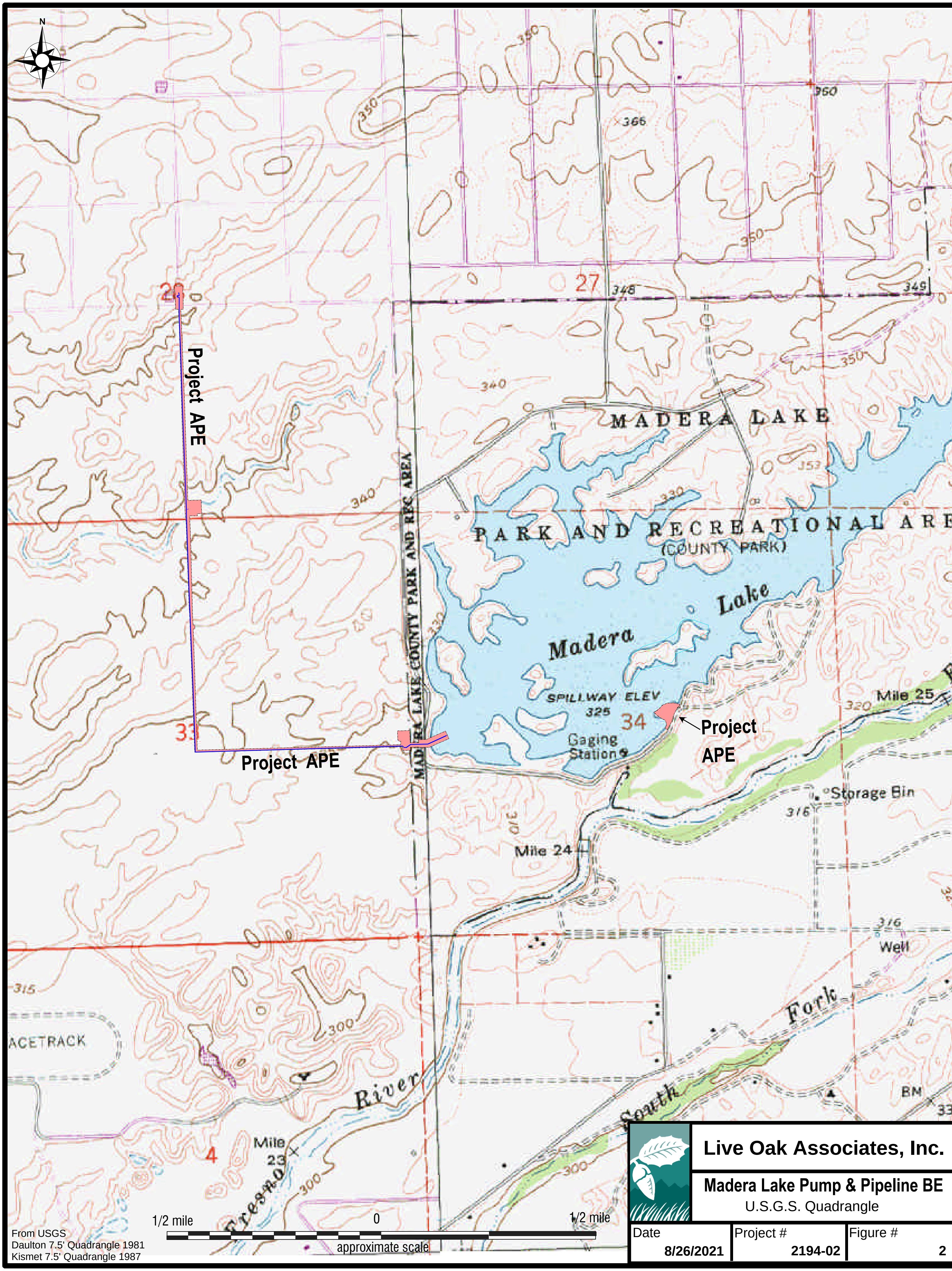


Live Oak Associates, Inc.

Madera Lake Pump & Pipeline BE

Site / Vicinity Map

Date	Project #	Figure #
8/26/2021	2194-02	1



Live Oak Associates, Inc.		
Madera Lake Pump & Pipeline BE U.S.G.S. Quadrangle		
Date	Project #	Figure #
8/26/2021	2194-02	2

Once the pipeline reaches the existing dirt farm road, west of the grassland, the siphon pipe would be buried three to four feet below ground and would then terminate at the proposed sump with booster pump(s).

The booster pump(s) would discharge into a 27-inch buried plastic pipeline that passes through the orchard west of Madera Lake for about 2,690 feet and existing farm road along the Road 29 ½ alignment for about 5,700 feet before terminating at a new booster pump station discharging into the existing MWD distribution system near the existing Well #3 and reservoir north of the Avenue 19 ½ alignment. A landowner turnout would be installed to serve the orchard along the north/south portion of the pipeline alignment. At the landowner turnout, the 27-inch pipe would transition to a 24-inch buried plastic pipe.

Construction of the improvements may be in phases. The inlet channel, siphon, sump, and booster pumps are anticipated to be constructed in the initial phase, where the pipeline, orchard turnout, and terminus pumps may be constructed at a later date.

The temporary disturbance corridor anticipated for pipeline installation is approximately 100 feet wide for the siphon pipe and 25 feet wide for the buried plastic pipe. During construction, equipment and materials would be staged within the temporary disturbance corridor and/or within two approximately ½ acre agricultural storage areas located along the alignment within the interior and eastern edge of the orchard property ("staging areas"). Additionally, an approximately 1.1-acre area of grassland habitat adjacent to the existing lake embankment roadway would experience temporary disturbance as an equipment turnaround area. All project-related disturbances would be limited to an area of approximately 10.6 acres consisting almost entirely of the temporary impacts associated with the pipeline corridor, staging areas, equipment turnaround, and work areas associated with the sump, booster pump stations, and pipeline turnout supplying the orchard. Permanent impacts would amount to 0.08 acres, most of which would be from the excavation of the lakebed to construct the inlet channel and the construction of the concrete pad that would support the siphon.

Due to the potential for California tiger salamander (CTS) (*Ambystoma californiense*) to occur in grassland habitat within the APE, the following avoidance and minimization measures would be incorporated into the Project. The Project would: (1) Obtain an Incidental Take Permit (ITP) from the California Department of Fish and Wildlife (CDFW), take authorization from the U.S. Fish and Wildlife Service (USFWS) if needed, and comply with all avoidance, minimization, and mitigation measures required by the ITP and USFWS take authorization; (2) Minimize potential CTS burrow impacts in grassland habitat by installing the pipeline above ground on concrete saddles per Project design; (3) Prohibit ground disturbance in all potential CTS breeding habitat; and (4) Avoid an onsite ruderal pool as well as avoid work in grassland habitat after the first significant rainfall and until the onsite ruderal pool and two adjacent vernal pools are completely dry.

1.2 REPORT OBJECTIVES

Water projects have the potential to damage or modify biological resources such as sensitive biotic habitats and the plant and wildlife species using them. In such cases, site development may be regulated by city, county, and state agencies and subject to provisions of the California Environmental Quality Act (CEQA) and county general plans. This report addresses issues related to sensitive biotic resources occurring or potentially occurring within the APE. Accordingly, this report describes the existing environmental conditions of the site, assesses likely Project impacts to biological resources, and proposes mitigation measures for those impacts meeting the CEQA definition of "significant."

Therefore, the objectives of this report are as follows:

- Summarize all site-specific information related to existing biological resources;
- Make reasonable inferences about the biological resources that could occur on site based on habitat suitability and the proximity of the site to a species' known range;
- Summarize all state and federal natural resource protection laws that may be relevant to future site development;
- Identify and discuss Project impacts to biological resources likely to occur on the site;
- Identify avoidance and other mitigation measures that would reduce any significant impact to biological resources of the APE to a less than significant level.

1.3 STUDY METHODOLOGY

A reconnaissance-level field survey was conducted on May 1, 2020 by Live Oak Associates, Inc. (LOA) biologist Jeff Gurule. The survey consisted of walking and driving through the APE while identifying principal land uses and biotic habitats, identifying plant and animal species encountered, and assessing the suitability of the habitats within the APE for special status species. In addition, all open rodent burrows in grassland habitats of the site were mapped, and an aquatic resources delineation was conducted. A previous survey of other potential project alternatives near the current Project APE was conducted by Mr. Gurule on September 27, 2017.

LOA conducted an analysis of potential Project impacts based on the known and potential biotic resources of the Project APE. Sources of information used in the preparation of this analysis included: (1) the *California Natural Diversity Data Base* (CDFW 2020), (2) the *Online Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2020), and (3) manuals, reports, and references related to plants and animals of the San Joaquin Valley region.

LOA's field investigation did not include focused surveys for special status species. The field survey was sufficient to assess the possible biological impacts associated with development of the APE.

2.0 EXISTING CONDITIONS

The geographical and biological setting of the Project provides the context for analyzing potential impacts to biological resources from future site development. The Project APE is located within a region of Madera County containing a matrix of agricultural, residential, and undeveloped lands at the eastern edge of the San Joaquin Valley, just south and west of the lowest foothills of the Sierra Nevada. The site consists of gently undulating to flat terrain with a median elevation of approximately 320 feet National Geodetic Vertical Datum (NGVD).

The principal drainage of the region is the Fresno River, which originates in the mountains south of Yosemite National Park. The river is dammed at Hensley Lake, following which it continues southwest through the Project vicinity, passing within 0.4 mile south of the APE at its closest point. It terminates at the San Joaquin River east of Los Banos, California. The Fresno River in the vicinity of the Project carries seasonal flows regulated at Hensley Lake.

Average annual precipitation in the general vicinity is approximately 12 inches, 85% of which falls between the months of October and March. Stormwater runoff readily infiltrates into the soils, but when field capacity has been reached or bedrock or an impervious hardpan layer encountered, surface water either enters swales and ephemeral drainages or perches on impervious soil layers to fill shallow topographic depressions creating what are commonly referred to as vernal pools.

The soil type within grasslands of the site is Cometa-Whitney sandy loams, 8 to 15 percent slopes. This soil mapping unit is considered hydric and regularly supports vernal pools, which commonly support a unique flora and fauna endemic to such pools. In fact, two vernal pools are located within grassland habitat immediately north and south of the APE.

Soils within the orchard boundaries include Cometa sandy loams, 3 to 8 percent slopes; Cometa-Whitney sandy loams, 8 to 15 percent slopes; Greenfield sandy loam, moderately deep and deep over hardpan, 3 to 8 percent slopes; and Hanford sandy loam, moderately deep and deep over hardpan, 0 to 3 percent slopes. Although some of these mapping units are considered hydric, the orchard's soils no longer maintain their native soil characteristics due to soil disturbing activities commonly associated with the development and maintenance of orchards in the region. Such activities include deep-ripping, trenching, discing, grading, road building, and regular orchard maintenance and harvest activities.

The site itself primarily consists of orchard roads and other disturbed areas, with a portion of the proposed pipeline traversing non-native grassland habitat utilized for cattle grazing and extending into Madera Lake.

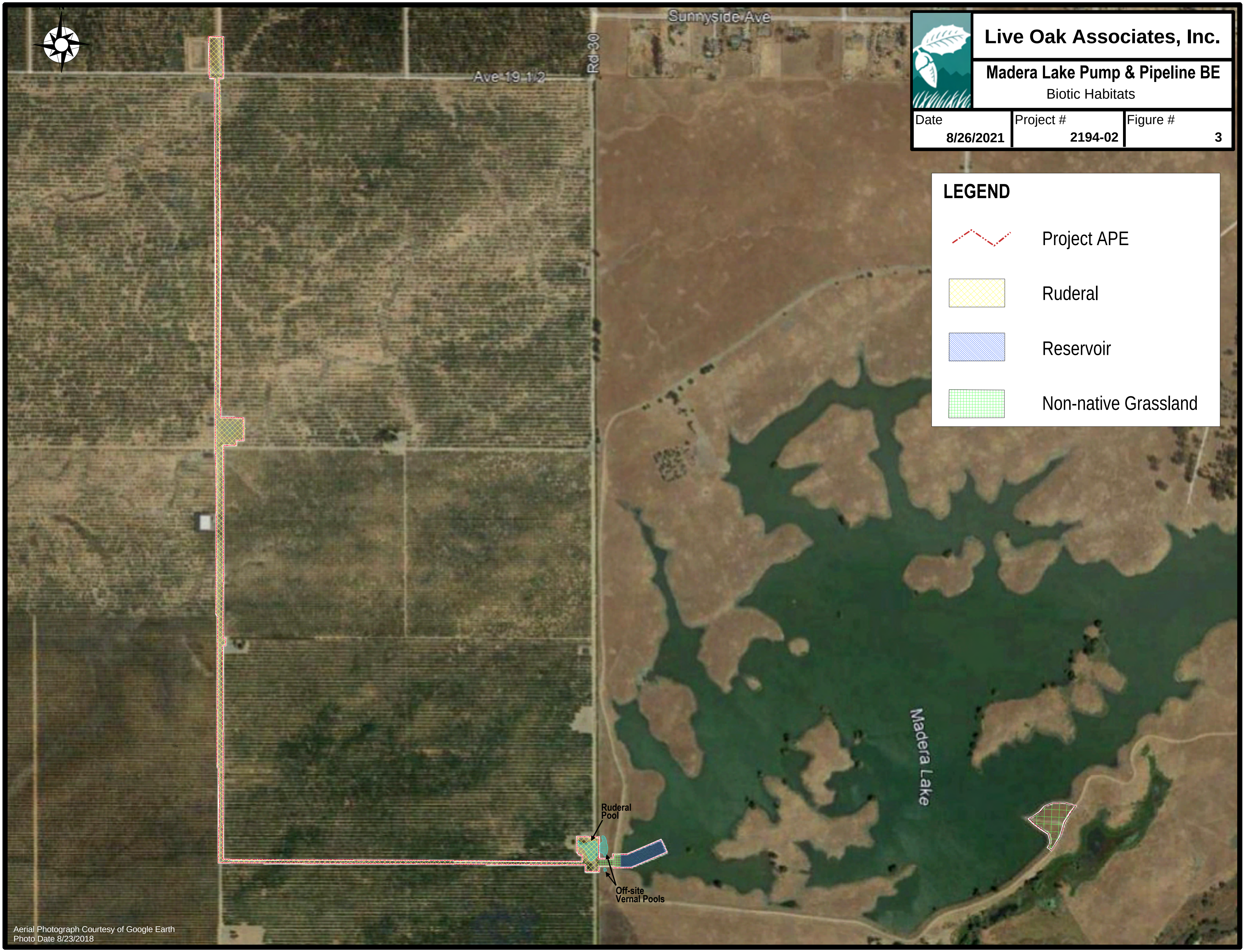
2.1 BIOTIC HABITATS

Biotic habitats of the APE include ruderal (the most extensive habitat), non-native grassland, and reservoir (Figure 3). A list of the vascular plant species observed within the APE and the terrestrial vertebrates using, or potentially using, the site are provided in Appendices A and B, respectively. Representative photos of the site are presented in Appendix C.

2.1.1 Ruderal

The APE consists primarily of ruderal, or regularly disturbed, areas of a fig (*Ficus carica*) and pistachio (*Pistacia vera*) orchard. Such areas include orchard roads, disturbed areas between tree rows, open maintenance and storage areas, and a few orchard trees. A maintenance/storage area at the eastern end of the orchard supports ponded water during late winter through spring. When water is not present the area is used for regular orchard operations. Ruderal areas of the site were mostly barren of vegetation at the time of the May 2020 field survey. Where vegetation was present, it consisted of non-native agricultural weed species such as foxtail barley (*Hordeum murinum*), flax-leaved horseweed (*Erigeron bonariensis*), rough cats ear (*Hypochaeris radicata*), pigweed amaranth (*Amaranthus albus*), and prickly lettuce (*Lactuca serriola*), among others.

Ruderal habitats of the site are of relatively low value to native wildlife because they offer almost no vegetative cover and are subjected to regular human disturbance. However, some of the region's fauna certainly pass through or use these habitats from time to time. Due to intensive disturbance and the lack of aquatic habitat, ruderal areas provide mostly marginal habitat for amphibians; however, the ruderal area supporting ponded water was found to support western spadefoot toad (*Spea hammondii*) larva during the May 2020 field survey. Other


Live Oak Associates, Inc.
Madera Lake Pump & Pipeline BE
Biotic Habitats
Date 8/26/2021
Project # 2194-02
Figure # 3
LEGEND
Project APE
Ruderal
Reservoir
Non-native Grassland
Sunnyside Ave
Rd 30
Ave 19 1/2
Madera Lake
Ruderal Pool
Off-site Vernal Pools
Aerial Photograph Courtesy of Google Earth
Photo Date 8/23/2018

amphibians expected in ruderal areas include American bullfrogs (*Lithobates catesbeianus*), Sierran treefrogs (*Pseudacris sierra*), and western toads (*Bufo boreas*) that could breed in adjacent agricultural basins or the aforementioned ruderal pool. A limited number of reptile species would be expected to forage in ruderal areas due to the lack of vegetation and burrows available for cover. However, the western fence lizard (*Sceloporus occidentalis*), common side-blotched lizard (*Uta stansburiana*), Pacific gopher snake (*Pituophis catenifer catenifer*), and northern pacific rattlesnake (*Crotalus oreganus oreganus*) may occasionally occur here.

The orchard trees of the site's ruderal areas provide nesting habitat for avian species. Birds potentially nesting in the orchard trees include the American robin (*Turdus migratorius*), California scrub jay (*Aphelocoma californica*), mourning dove (*Zenaida macroura*), and northern mockingbird (*Mimus polyglottos*). Open areas could potentially be used for nesting by killdeer (*Charadrius vociferus*). A limited amount of foraging habitat occurs on orchard roads for birds that forage on open ground, such as the mourning dove, white-crowned sparrow (*Zonotrichia leucophrys*), savannah sparrow (Passerculus sandwichensis), American pipit (*Anthus rubenscens*), western kingbird (*Tyrannis verticalis*), and Brewer's blackbird (*Euphagus cyanocephalus*).

Although small mammal burrows were almost entirely absent from the site's ruderal areas at the time of the survey, a few small mammal species would be expected to occasionally occur within ruderal areas. These include California ground squirrels (*Otospermophilus beecheyi*), deer mice (*Peromyscus maniculatus*), house mice (*Mus musculus*), Botta's pocket gophers (*Thomomys bottae*), and Audubon cottontail rabbits (*Sylvilagus audubonii*). Various species of bat may also forage over ruderal areas for flying insects.

Foraging raptors and mammalian predators may pass through ruderal areas from time to time. Raptors adapted to hunt within the tree canopy such as Cooper's hawks (*Accipiter cooperii*) and sharp-shinned hawks (*Accipiter striatus*) may occasionally pass through ruderal areas of the site. Mammalian predators potentially passing through ruderal areas include the raccoon (*Procyon lotor*), coyote (*Canis latrans*), and gray fox (*Urocyon cinereoargenteus*).

2.1.2 Non-native Grassland

A small portion of non-native grassland habitat occurs between the orchard and Madera Lake, as well as an area of grassland associated with a vehicle turnaround. The dominant species are non-native annual grasses and forbs. The dominant grass species in this habitat include soft chess (*Bromus hordeaceus*), red brome (*Bromus madritensis*), wild oats (*Avena fatua*), and rattail fescue (*Vulpia myuros*). The dominant forbs are also non-native annuals such as rose clover (*Trifolium hirtum*), smooth cat's-ear (*Hypochaeris glabra*) and burr clover (*Medicago polymorpha*). Native forbs found on the site include Heermann's tarweed (*Holocarpha heermannii*), harvest brodiaea (*Brodiaea elegans*), Eastwood's fiddleneck (*Amsinckia eastwoodiae*), and bi-color lupine (*Lupinus bicolor*).

Non-native grasslands of the site provide significant habitat for native terrestrial vertebrates, including amphibians, reptiles, birds, and mammals. Amphibians typically seek cover in rodent burrows common to grassland habitats. California tiger salamanders, western spadefoot toads, and western toads are all amphibian species potentially occurring within grasslands of the APE. Common reptiles would include lizards such as common side-blotched lizards, and common snakes such as the Pacific gopher snake, common kingsnake (*Lampropeltis getula californiea*), and northern pacific rattlesnake.

Common grassland birds of the site would include residents such as the western meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), and loggerhead shrike (*Lanius ludovicianus*). Winter species would include savannah sparrows, American pipits, and mountain bluebirds (*Scialia currucoides*). During the summer, western kingbirds are common to grasslands of the site and nearby lands. Raptors that commonly forage over grasslands of the region include American kestrels (*Falco sparverius*) and red-tailed hawks (*Buteo jamaicensis*).

Grasslands within the APE contained few small mammal burrows at the time of the field survey and only exhibited evidence of Botta's pocket gopher burrowing and one California ground squirrel burrow. Other small mammals potentially occurring here include deer mice, California voles (*Microtus californicus*), and western harvest mice (*Reithrodontomys megalotus*). Mammalian predators may include striped skunks (*Mephitis mephitis*), gray foxes, and coyotes.

2.1.3 Reservoir

A portion of the Project would be constructed within Madera Lake. This reservoir is fed by the Fresno River by way of a manmade diversion channel. When necessary, excess water in the reservoir can be diverted back to the Fresno River through a pipe regulated by a valve, which is located at the southernmost end of the reservoir. Water levels in the reservoir fluctuate greatly depending on water diversion activities. At the time of the field survey, the area of reservoir within the APE was dry. Riparian and emergent wetland vegetation were absent from the reservoir within the APE. Herbaceous plant species observed within the lakebed included water speedwell (*Veronica anagallis*-aquatica), slender woolly heads (*Psilocarphus tenellus* ssp. *tenellus*), Jersey cudweed (*Pseudognaphalium* luteoalbum), salt heliotrope (*Heliotropium curassavicum*), and Hyssop's loosestrife (*Lythrum hyssopifolium*), among others.

Amphibians such as American bullfrogs, western toads, and Sierran treefrogs may breed in the reservoir during inundated periods and forage within the lakebed when dry. In fact, numerous bullfrogs were observed in the reservoir during LOA's September 2017 survey when the reservoir was full. These species could in turn attract valley gartersnakes (*Thamnophis sirtalis fitchi*) to forage in this habitat.

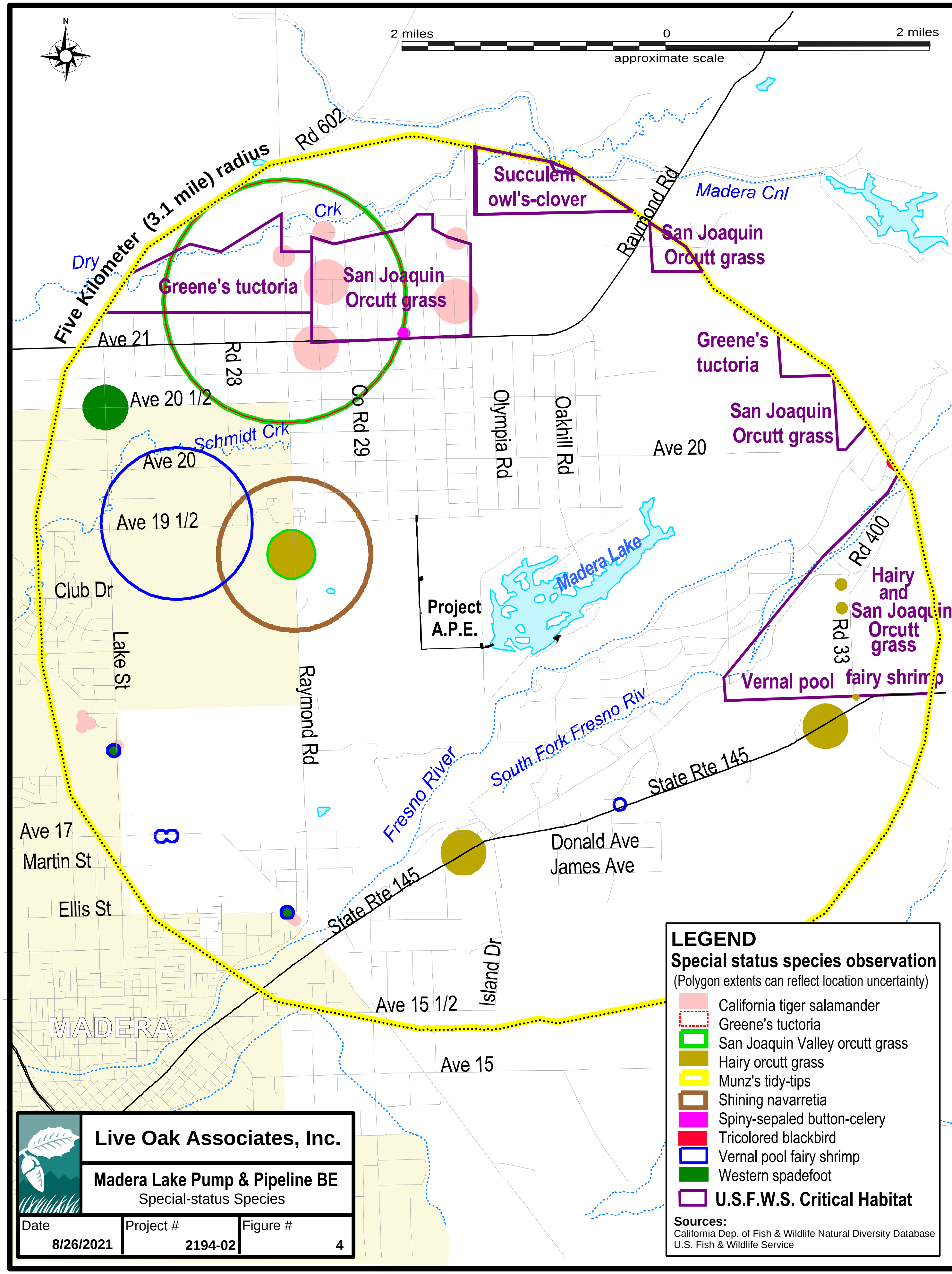
When inundated, a large number of avian species are expected to utilize the reservoir habitat including double-crested cormorants (*Phalacrocorax auritus*), pied-billed grebes (*Podilymbus podiceps*), American coots (*Fulica americana*), Canada geese (*Branta canadensis*), mallard ducks (*Anas platyrhynchos*), great blue herons (*Ardea herodias*), great egret (*Ardea alba*), and killdeer. Barn and cliff swallows (*Hirundo rustica* and *Petrochelidon pyrrhonota*, respectively) would be expected to forage over the open water of the reservoir.

Relatively few mammals are found in such habitats but several species such as the raccoon may come here to forage along the shoreline. A number of bat species likely forage over the lake at various times of the year, as well.

2.2 SPECIAL STATUS PLANTS AND ANIMALS

A number of species of plants and animals within the state of California have low populations and/or limited distributions. Such species may be considered "rare" and are vulnerable to extirpation as the state's human population grows and the habitats these species occupy are converted to agricultural and urban uses. As described more fully in Section 3.1, state and federal laws have provided the CDFW and the USFWS with a mechanism for conserving and protecting the diversity of plant and animal species native to the state. A sizable number of native plants and animals have been formally designated as "threatened" or "endangered" under state and federal endangered species legislation. Others have been designated as candidates for such listing. Still others have been designated as "species of special concern" by the CDFW. The California Native Plant Society (CNPS) has developed its own set of lists (i.e., California Rare Plant Ranks, or CRPR) of native plants considered rare, threatened, or endangered (CNPS 2020). Collectively, these plants and animals are referred to as "special status species."

The California Natural Diversity Data Base (CNDDB) was queried for special status species occurrences in the nine U.S.G.S. 7.5-minute quadrangles containing and surrounding the APE. These quads included Le Grand, Berenda, Bonita Ranch, Daulton, Gregg, Madera, Kismet, Raynor Creek, and Raymond. These species, and their potential to occur on the APE, are listed in Table 1 on the following pages and illustrated in Figure 4. Sources of information for this table included *California's Wildlife, Volumes I, II, and III* (Zeiner et. al 1988-1990), *California Natural Diversity Data Base* (CDFW 2020), *Endangered and Threatened Wildlife and Plants* (USFWS 2020), *The Jepson Manual: Vascular Plants of California, second edition* (Baldwin et al 2012), the *California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California* (CNPS 2020), *Calflora.org,* and *eBird.org*.



N
2 miles
0
2 miles
approximate scale
Rd 602
Five Kilometer (3.1 mile) radius
Dry
Crk
Madera Cnl
Raymond Rd
Succulent owl's-clover
San Joaquin Orcutt grass
Greene's tuctoria
San Joaquin Orcutt grass
Ave 21
Rd 28
Ave 20 1/2
Co Rd 29
Olympia Rd
Oakhill Rd
Greene's tuctoria
San Joaquin Orcutt grass
Ave 20
Schmidt Crk
Ave 20
Ave 19 1/2
Club Dr
Lake St
Madera Lake
Project A.P.E.
Rd 400
Hairy and San Joaquin Orcutt grass
Rd 33
Vernal pool fairy shrimp
Raymond Rd
South Fork Fresno Riv
Fresno River
State Rte 145
Donald Ave
James Ave
Ave 17
Martin St
Ellis St
State Rte 145
Island Dr
Ave 15 1/2
MADERA
Ave 15
LEGEND
Special status species observation
(Polygon extents can reflect location uncertainty)
California tiger salamander
Greene's tuctoria
San Joaquin Valley orcutt grass
Hairy orcutt grass
Munz's tidy-tips
Shining navarretia
Spiny-sepaled button-celery
Tricolored blackbird
Vernal pool fairy shrimp
Western spadefoot
U.S.F.W.S. Critical Habitat
Sources:
California Dep. of Fish & Wildlife Natural Diversity Database
U.S. Fish & Wildlife Service
Live Oak Associates, Inc.
Madera Lake Pump & Pipeline BE
Special-status Species
Date
8/26/2021
Project #
2194-02
Figure #
4

TABLE 1. LIST OF SPECIAL STATUS SPECIES POTENTIALLY OCCURRING WITHIN HABITATS OF THE MADERA LAKE PUMP AND PIPELINE PROJECT

PLANTS: Adapted from the California Natural Diversity Base (CDFW 2020) and the Inventory of Rare and Endangered Vascular Plant Species of California (CNPS 2020)

Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act

Species	Status	Habitat/Range	*Occurrence within the APE
Succulent Owl's Clover (*Castilleja campestris* ssp. *succulenta*)	FT, CE CRPR 1B	Occurs in vernal pools and swales in valley foothills and grasslands of the San Joaquin and Sacramento Valleys from Fresno Co. on the south to Solano County on the north; blooms April to May.	**Absent**. Although vernal pool habitat potentially suitable for this species is present on adjacent lands, it is absent from the site itself.
San Joaquin Valley Orcutt Grass (*Orcuttia ineaqualis*)	FT, CE CRPR 1B	Occurs in deep vernal pools of California's San Joaquin Valley; blooms April to September.	**Absent**. Although vernal pool habitat potentially suitable for this species is present on adjacent lands, it is absent from the site itself.
Hairy Orcutt Grass (*Orcuttia pilosa*)	FE, CE CRPR 1B	Occurs in vernal pools of California's Central Valley. Requires deep pools with prolonged periods of inundation; blooms May to September.	**Absent**. Although vernal pool habitat potentially suitable for this species is present on adjacent lands, it is absent from the site itself.
Greene's Tuctoria (*Tuctoria greenei*)	FE CRPR 1B	Occurs in vernal pools of California's Central Valley from Shasta Co. on the north to Tulare Co. on the south; blooms May to September.	**Absent**. Although vernal pool habitat potentially suitable for this species is present on adjacent lands, it is absent from the site itself.

CNPS-listed Species

Heartscale (*Atriplex cordulata var. cordulata*)	CRPR 1B	Occurs in saline and alkaline soils of shadscale scrub, valley grassland, and wetland-riparian habitats. Blooms April to October.	**Absent.** Saline and alkaline soils required by this species are absent from the APE. No Atriplex species were observed during the field survey.
Lesser Saltscale (*Atriplex minuscula*)	CRPR 1B	Occurs in sandy, alkaline soils of alkali sinks and grasslands. Blooms May to October.	**Absent.** Habitat and soils required by this species are absent from the APE. No Atriplex species were observed during the field survey.
Vernal Pool Smallscale (*Atriplex persistens*)	CRPR 1B	Occurs in vernal pools on alkaline soils. Blooms June-October.	**Absent.** Vernal pools and alkaline soils are absent from the APE. No Atriplex species were observed during the field survey.
Subtle Orache (*Atriplex subtilis*)	CRPR 1B	Occurs in valley and foothill grasslands of the San Joaquin Valley. Blooms August-October.	**Unlikely.** While grassland habitat required by this species occurs on the APE, this species is not known to occur in the Project vicinity. The nearest occurrences are more than 15 miles away. Furthermore, no Atriplex species were observed during the field survey.
Hoover's Calycadenia (*Calycadenia hooveri*)	CRPR 1B	Found in rocky soils, frequently of the Hornitos series, in Calaveras, Madera, Mariposa, and Stanislaus Counties.	**Absent.** Suitable rocky soils are absent from the APE.
Beaked Clarkia (*Clarkia rostrata*)	CRPR 1B	Occurs on north-facing slopes of cismontane woodland, and valley and foothill grassland. Blooms April to May.	**Absent.** North-facing slopes are absent from the APE. Furthermore, the APE is south of the known range of the species.

TABLE 1. LIST OF SPECIAL STATUS SPECIES POTENTIALLY OCCURRING WITHIN HABITATS OF THE MADERA LAKE PUMP AND PIPELINE PROJECT

PLANTS: Adapted from the California Natural Diversity Base (CDFW 2020) and the Inventory of Rare and Endangered Vascular Plant Species of California (CNPS 2020)

CNPS-listed Species (cont.)

Species	Status	Habitat	*Occurrence within the APE
Spiny-sepaled Button Celery (*Eryngium spinosepalum*)	CRPR 1B	Found in vernal pools and swales at the eastern edge of the San Joaquin Valley. Blooms April to May.	**Absent**. Although vernal pool habitat potentially suitable for this species is present on adjacent lands, it is absent from the APE. Furthermore, Eryngium collected from adjacent vernal pools was *Eryngium vaseyi*.
Recurved Larkspur (*Delphinium recurvatum*)	CRPR 1B	Occurs in alkaline soils of cismontane woodland and valley and foothill grasslands. Blooms March-June.	**Unlikely.** While grassland habitat required by this species occurs on the APE, alkaline soils are absent. This species is not known to occur in the Project vicinity. The nearest occurrences are more than 15 miles away.
Munz's Tidy-tips (*Layia munzii*)	CRPR 1B	Occurs on hillsides, in white-grey alkaline clay soils, with grasses and chenopod scrub associates. Blooms March to April.	**Absent.** The APE provides unsuitable habitat for this species.
Madera Leptosiphon (*Leptosiphon serrulatus*)	CRPR 1B	Occurs in cismontane woodland, lower montane coniferous forests, and annual grasslands of the Sierra foothills from Madera Co. on the north to Kern Co. on the south. This species prefers dry slopes, often on decomposed granite in woodland. Blooms April to May.	**Absent.** The APE provides unsuitable habitat for this species. Furthermore, no Leptosiphon species were observed during the spring survey, at a time when members of this genus should be blooming and identifiable.
Shining Navarretia *(Navarretia nigelliformis ssp. radians)*	CRPR 1B	Occurs in cismontane woodland, vernal pools, and valley and foothill woodland. Blooms May to July.	**Absent**. Although habitat suitable for this species in the form of vernal pools and swales is present on adjacent lands, it is absent from the APE. Furthermore, no Navarretia species were observed during the spring survey, at a time when members of this genus should be blooming and identifiable.
Merced Phacelia (*Phacelia ciliate var. opaca*)	CRPR 1B	Occurs in heavy clay soils of the Central Valley and low foothills of the Sierra Nevada. Blooms February to May.	**Absent.** Suitable habitat and soils are absent from the APE.
California Alkali Grass (*Puccinellia simplex*)	CRPR 1B	Occurs in alkali sinks and flats within grassland and chenopod scrub habitats of the Central Valley, San Francisco Bay area and western Mojave Desert; elevations below 3,000 feet. Blooms March-May.	**Absent.** Suitable habitat and soils are absent from the APE.

TABLE 1. LIST OF SPECIAL STATUS SPECIES POTENTIALLY OCCURRING WITHIN HABITATS OF THE MADERA LAKE PUMP AND PIPELINE PROJECT

ANIMALS (adapted from CDFW 2020)

Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act

Species	Status	Habitat	*Occurrence within the APE
Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)	FT	Primarily found in vernal pools of California's Central Valley.	**Possible**. Marginal habitat for this species in the form of a ruderal pool within the operational footprint of the onsite orchard occurs within the APE. While preferred habitat for this species is vernal pool habitat within grassland habitat, this species occasionally occurs in ruderal pools. A number of nearby occurrences of this species have been documented, the closest of which is approximately 1.7 miles to the southeast.
Vernal Pool Tadpole Shrimp (*Lepidurus packardi*)	FE	Primarily found in vernal pools of California's Central Valley.	**Unlikely**. Marginal habitat for this species in the form of a ruderal pool within the operational footprint of the onsite orchard occurs on the site. This species is not known to occur in the Project vicinity. The nearest documented occurrence of this species is approximately 12.5 miles northwest of the APE. Furthermore, a visual inspection of dried and inundated areas of the pool during the May 2020 field survey failed to find evidence of this relatively robust invertebrate.
Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)	FT	Lives in mature elderberry shrubs of California's Central Valley and Sierra foothills.	**Absent.** Blue elderberry shrubs required by this species are absent from the APE. Furthermore, the current opinion of the USFWS is that Madera County is outside the range of this subspecies.
California Tiger Salamander (*Ambystoma californiense*)	FT , CT	Found primarily in annual grasslands; requires vernal pools for breeding and rodent burrows for refuge.	**Possible.** Suitable breeding habitat in the form of large vernal pools occurs within the immediate vicinity of the APE. Ground squirrel and gopher burrows also provide suitable upland aestivation habitat for this species in grasslands of the site.
Foothill Yellow-legged Frog (*Rana boylii*)	CCT	Found primarily in swiftly flowing creeks.	**Absent.** No suitable habitat occurs on the site.
Blunt-Nosed Leopard Lizard (*Gambelia silus*)	FE	Frequents grasslands, alkali meadows and chenopod scrub of the San Joaquin Valley from Merced County south to Kern County.	**Absent.** Suitable habitat is absent from the APE. Furthermore, the APE is outside the known range of the species.
Bald Eagle (*Haliaeetus leucocephalus*)	CE, CFP	Winters near reservoirs of California's Central Valley. Mostly feeds on fish in large bodies of water or rivers.	**Possible.** Wintering and migratory bald eagles may occasionally forage and roost at Madera Lake. This species is not expected or known to nest at Madera Lake.
Swainson's Hawk (*Buteo swainsoni*)	CT	Summer migrant in the Central Valley. Forages in grasslands and fields close to riparian areas.	**Present.** This species was observed flying over the site during LOA's field survey. Grasslands of the site provide suitable foraging habitat for this species. Suitable breeding habitat is absent from the APE but occurs in trees within 0.5 miles of the site.
Tricolored Blackbird (*Agelaius tricolor*)	CT	Breeds colonially near fresh water in dense bulrush, cattails, or thickets of willows or shrubs. Occasionally nests in wheat fields. Forages in a wide variety of habitats.	**Possible.** Suitable nesting habitat for this species is absent. The grasslands of the site provide suitable foraging habitat.

TABLE 1. LIST OF SPECIAL STATUS SPECIES POTENTIALLY OCCURRING WITHIN HABITATS OF THE MADERA LAKE PUMP AND PIPELINE PROJECT

ANIMALS (adapted from CDFW 2020)

Species Listed as Threatened or Endangered under the State and/or Federal Endangered Species Act (cont.)

Species	Status	Habitat	*Occurrence within the APE
Fresno Kangaroo Rat (*Dipodomys nitratoides exilis*)	FE, CE	Inhabits grassland on gentle slopes of generally less than 10°, with friable, sandy-loam soils.	**Absent.** This species is currently only known to occur in Kings County (ESRP 2020). The nearest documented occurrence of this species in the Project vicinity is 12 miles to the southwest from 1934. No kangaroo rat burrows or sign were observed anywhere on the APE.
San Joaquin Kit Fox (*Vulpes macrotis mutica*)	FE, CT	Desert alkali scrub, annual grass-lands of California's San Joaquin Valley and Tulare Basin, extending west into San Luis Obispo County. This species may forage in adjacent agricultural habitats.	**Absent.** No populations of kit fox are known to occur in eastern Madera County. Furthermore, there are no documented occurrences of this species within a 10-mile radius of the site (CDFW 2020).

State Species of Special Concern

Hardhead (*Mylopharodon conocephalus*)	CSC	Occurs in low- to mid-elevation streams in the Sacramento-San Joaquin watershed. Prefers clear, deep pools with rocky or sandy substrate. Generally absent from streams in which non-native fish predominate, as well as from streams heavily altered by human activity.	**Absent.** The Project contains no waters suitable for this species. Hydrologic conditions of Madera Lake are not conducive to this species' survival.
Western Spadefoot (*Spea hammondii*)	CSC	Primarily occurs in grasslands, but also occurs in valley and foothill hardwood woodlands. Requires vernal pools or other temporary wetlands for breeding.	**Present**. This species was observed in the form of larvae within the ruderal pool on the site and in adjacent vernal pools. It may also aestivate in rodent burrows within the site's grassland habitat.
Western Pond Turtle (*Emys marmorata*)	CSC	Occurs in slow moving water of southern Sierra foothill and Central Valley rivers and streams.	**Unlikely.** This species is not typically found in large reservoirs such as Madera Lake. Furthermore, the irregular inundation patterns of the lake that render it completely dry in some years further reduces the suitability of the lake for pond turtles. This species is not known from the lower reaches of the adjacent Fresno River, which also regularly dries. The nearest documented occurrence of this species is approximately 12 miles to the northwest.
Coast Horned Lizard (*Phrynosoma blainvillii*)	CSC	Occurs in a wide variety of habitats. Most common in lowlands along sandy washes with scattered low bushes where there are open areas for sunning, bushes for cover, patches of loose soil for burial, and abundant supply of ants and other insects.	**Absent.** Habitat on the site is extremely marginal for this species. This species is not known to occur in the immediate vicinity. The nearest documented occurrence is approximately 16 miles to the southwest.
Golden Eagle (*Aquila chrysaetos*)	CP	Typically frequents rolling foothills, mountain areas, sage-juniper flats and desert.	**Possible.** This species may occasionally forage on and over grasslands of the APE. Nesting habitat is absent.
White-tailed Kite (*Elanus caeruleus*)	CP	Open grasslands and agricultural areas throughout central Calif.	**Possible.** This species may occasionally forage on and over grasslands of the APE. Nesting habitat is absent from the APE.

TABLE 1. LIST OF SPECIAL STATUS SPECIES POTENTIALLY OCCURRING WITHIN HABITATS OF THE MADERA LAKE PUMP AND PIPELINE PROJECT

ANIMALS (adapted from CDFW 2020)

State Species of Special Concern (cont.)

Species	Status	Habitat	*Occurrence within the APE
Northern Harrier (*Circus cyaneus*)	CSC (nesting)	Frequents meadows, grasslands, open rangelands; uncommon in wooded habitats. Nests on the ground in tall concealing emergent or upland vegetation.	**Likely.** Grasslands within the APE provide foraging habitat for this species. Nesting habitat is absent from the APE due to the lack of tall concealing vegetation.
Burrowing Owl (*Athene cunicularia hypugaea*)	CSC	Found in open, dry grasslands, deserts and ruderal areas; requires ground squirrel burrows for cover and nesting.	**Possible.** While the grasslands associated with the Project provide suitable habitat for this species, no sign of burrowing owl occupation of these areas was observed during any of LOA's site surveys. No burrowing owl observations have been documented in the immediate Project vicinity; the nearest known occurrence is approximately 5 miles to the east (CDFW 2020, eBird 2020). However, this species is highly mobile and could possibly move onto the site at some time in the future.
Loggerhead Shrike (*Lanius ludovicianus*)	CSC	Grasslands and agricultural areas of California's Central Valley.	**Possible.** The APE provides suitable foraging habitat; marginal nesting habitat occurs in the site's orchard trees.
Pallid Bat (*Antrozous pallidus*)	CSC	Grasslands, chaparral, woodlands, and forests of California; most common in dry rocky open areas providing roosting opportunities.	**Possible.** The site could be used for foraging; roosting and breeding habitat is absent.
American Badger (*Taxidea taxus*)	CSC	This species inhabits open and dry sections of grasslands, shrub, and forest habitats with friable soil.	**Possible.** Grassland areas of the site provide suitable habitat for this species. No burrows of the shape and size typically created by badgers were found during LOA's field survey; however, this wide-ranging species could move onto grasslands of the site prior to construction.

* Explanation of Occurrence, Designations, and Status Codes

Present: Species observed on the Site at time of field surveys or during recent past.
Likely: Species not observed on the Site, but it may reasonably be expected to occur there on a regular basis.
Possible: Species not observed on the Site, but it could occur there from time to time.
Unlikely: Species not observed on the Site, and would not be expected to occur there except, perhaps, as a transient
Absent: Species not observed on the Site and precluded from occurring there because habitat requirements not met.

STATUS CODES

FE	Federally Endangered	CE	California Endangered
FT	Federally Threatened	CT	California Threatened
FPT	Federally Proposed Threatened	CSC	California Species of Special Concern
FC	Federal Candidate	CNPS	California Native Plant Society Listing
FPD	Federally (Proposed) Delisted	CFP	California Fully Protected
		CCE	California Candidate Endangered

2.3 ENDANGERED, THREATENED, OR SPECIAL STATUS PLANT AND ANIMAL SPECIES MERITING FURTHER DISCUSSION

2.3.1 Vernal Pool Fairy Shrimp

The federally threatened vernal pool fairy shrimp is an invertebrate species occurring in vernal pools and other seasonal aquatic habitat throughout most of California west of the Sierra Nevada. Shrimp eggs within the pool bottoms are dormant when the pools are dry, but hatch when the pools fill or partially fill with the advent of the fall and winter rains. During most winters, populations of adult shrimp peak in January and February. Warming pool temperatures and predation typically result in a sharp decline in shrimp populations in March.

The vernal pool fairy shrimp is not known to occur in vernal pools associated with grasslands surrounding Madera Lake, but has been documented in vernal pools within other grassland habitats within the region. While vernal pools within grassland habitat are absent from the APE, a ruderal pool within the operational footprint of the onsite orchard occurs on the site immediately west of grassland habitat and up-gradient of a large offsite vernal pool. This pool provides marginal habitat for vernal pool fairy shrimp. However, since western spadefoot toad larvae were observed in this ruderal pool it seems likely that the pool supports invertebrate populations that would be needed to support developing spadefoot larvae. Therefore, vernal pool fairy shrimp are considered potentially present on the APE.

2.3.2 California Tiger Salamander

The state and federally threatened CTS occurs in areas within Madera and Fresno Counties where vernal pool complexes are located within extensive grassland habitats. Vernal pools that hold water for 3-4 months of the winter and spring provide suitable breeding habitat for the CTS. Eggs are deposited and attached to vegetation. Upon hatching, CTS larvae mature in these vernal pools until they begin to dry in April and May, at which time they metamorphose into juveniles that can then disperse into upland habitats. The juvenile CTS leave the drying pools to find the burrows of California ground squirrels and pocket gophers which serve as underground refugia in which CTS over-summer during the warm, dry months of late May through mid-October or later (depending on when the fall rains start). While CTS may wander a mile or more from their pools in search of over-summering habitat, one CTS study found that most post-breeding adult salamanders seek out rodent burrow refugia within 0.4 mile of breeding habitat (Trenham and Shaffer 2005). The CDFW and USFWS typically assume CTS to be present in grassland habitat within 1.3 miles of known or potential breeding pools, unless proven absent through accepted results of protocol level surveys.

While CTS have never been documented in vernal pools within grasslands surrounding Madera Lake, they have been documented in vernal pools within grasslands in the region. Two adjacent vernal pools in grassland habitat provide potential breeding habitat for the CTS. These pools were inundated during LOA's May 2020 field survey and contained western spadefoot toad larvae, which is a species that commonly co-occurs with CTS and has similar habitat requirements. An onsite ruderal pool within an open and barren area of the orchard, immediately up-gradient from the largest adjacent vernal pool, is only marginally suitable as breeding habitat for CTS due to the lack of vegetation typically required by CTS to attach eggs and escape predation.

The grasslands within the APE provide suitable upland aestivation (i.e. over-summering) habitat for this species in the form of gopher and ground squirrel burrows.

2.3.3 Western Spadefoot

The CDFW has designated the western spadefoot a California Species of Special Concern. The western spadefoot typically breeds between January and May in seasonal ponds occurring in non-native grasslands, chaparral, short grass plains, or coastal sage scrub. Breeding pools are often turbid with little to no cover. Eggs are deposited and attached to vegetation or detritus. For the larvae to survive, larval development must be complete before the ponds dry. Mostly active at night, the spadefoot has adapted to digging in sandy soils and finding refugia in small rodent burrows that create over-summering habitat that protect it from hot, arid daytime conditions.

Two adjacent vernal pools and one onsite ruderal pool contained numerous western spadefoot larvae at the time of the May 2020 field survey. As with the CTS, rodent burrows within the grasslands of the site provide suitable upland aestivation habitat.

2.3.4 Burrowing Owl

The burrowing owl, a California Species of Special Concern, is a small owl occurring in grassland habitats of the Central Valley that support California ground squirrels. This owl seeks shelter in ground squirrel burrows throughout the year and breeds in these burrows from February through August. Owl populations have declined sharply in some portions of California during the past two decades (i.e. the San Francisco Bay Area, Sacramento County, San Joaquin County, etc.), but they have increased greatly in some agricultural counties (particularly Imperial). In Fresno and Madera Counties, these owls most commonly occur on the valley floor. They are not as common in foothill habitats.

Grasslands of the site provide suitable foraging and nesting habitat for the burrowing owl. However, evidence of burrowing owl use of the site was not observed during LOA's field survey. Observation data in the CNDDB and eBird is also lacking in this area of Madera County; the nearest CNDDB occurrence is approximately 5 miles east of the site in grassland habitats along State Route 145. Nonetheless, the irregular migratory movements of this owl afford the possibility that this species could move onto the site prior to construction.

2.4 JURISDICTIONAL WATERS

As will be discussed in greater detail in Section 3.2.8, the U.S. Army Corps of Engineers (USACE) has regulatory authority over certain rivers, creeks, lakes, ponds, reservoirs, wetlands, and in some cases irrigation canals ("waters of the U.S."). The CDFW asserts jurisdiction over waters in California that have a defined bed and bank, including engineered channels that replace, and/or connect to, natural drainages. The State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCBs) assert jurisdiction over California's oceans, lakes, and rivers, and some, but not all, of California's wetland features.

Waters of the United States and other possible jurisdictional waters (i.e. those subject to the jurisdiction of the state of California) are present on the site in the form of Madera Lake. An onsite ephemeral drainage within the orchard (see Figure 2) and the onsite ruderal pool do not appear to meet the current definition of a water of the U.S.; however, they may be considered waters of the State.

2.5 SENSITIVE NATURAL COMMUNITIES

Sensitive Natural Communities are those that are of limited distribution, distinguished by significant biological diversity, home to special status plant and animal species, of importance in maintaining water quality or sustaining flows, etc. Examples of sensitive natural communities include various types of wetlands, riparian habitat, and valley scrub habitats. CDFW has assigned State Ranks to California's natural communities that reflect the condition and imperilment of that community throughout its range within the state. State Ranks are represented with a letter and number score. Older ranks, which need to be updated in the CNDDB, may still contain a decimal "threat" rank of .1, .2, or .3, where .1 indicates very threatened status, .2 indicates moderate threat, and .3 indicates few or no current known threats.

The APE supports no sensitive natural communities.

2.6 WILDLIFE MOVEMENT CORRIDORS

Wildlife movement corridors are routes that animals regularly and predictably follow during seasonal migration, dispersal from native ranges, daily travel within home ranges, and inter-population movements. Movement corridors in California are typically associated with valleys, rivers and creeks supporting riparian vegetation, and ridgelines.

The APE does not contain features that would function as a wildlife movement corridor.

2.7 DESIGNATED CRITICAL HABITAT

The USFWS often designates areas of "critical habitat" when it lists species as threatened or endangered. Critical habitat is a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection.

Designated critical habitat is absent from the APE and immediately surrounding lands. The nearest critical habitat, for San Joaquin Valley Orcutt grass (*Orcuttia inaequalis*) and Green's tuctoria (*Tuctoria greenei*), is approximately 1.5 miles to the north of the Project, consisting of mostly developed land.

3.0 REGULATORY SETTING

In California, any project carried out or approved by a public agency that will result in a direct or reasonably foreseeable indirect physical change in the environment must comply with CEQA. The purpose of CEQA is to ensure that a project's potential impacts on the environment are evaluated, and methods for avoiding or reducing these impacts are considered, before the project is allowed to move forward. A secondary aim of CEQA is to provide justification to the public for the approval of any projects involving significant impacts on the environment.

According to Section 15382 of the CEQA Guidelines, a significant effect on the environment means a "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic interest." Although the lead agency may set its own CEQA significance thresholds, project impacts to biological resources are generally considered to be significant if they would meet any of the following criteria established in Appendix G of the CEQA Guidelines:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by CDFW or USFWS.

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by CDFW or USFWS.

- Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery site.

- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Furthermore, CEQA Guidelines Section 15065(a) requires the lead agency to make "mandatory findings of significance" if there is substantial evidence that a project may:

- Substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, or substantially reduce the number or restrict the range of an endangered, rare or threatened species.

- Achieve short-term environmental goals to the detriment of long-term environmental goals.

- Produce environmental effects that are individually limited but cumulatively considerable, meaning that the incremental effects of the project are significant when viewed in connection with the effects of past projects, other current projects, and probable future projects.

3.1 RELEVANT GOALS, POLICIES, AND LAWS

3.1.1 Madera County General Plan Policies

In compliance with CEQA, the lead agency must consider project conformance with applicable goals and policies of the General Plan of Madera County. The Madera County General Plan includes goals and policies designed to protect significant biotic resources of the Planning Area. Resource elements addressed by this plan include: (1) wetland and riparian areas, (2) fish and wildlife habitat, (3) vegetation, and (4) open space for the preservation of natural resources. Madera County General Plan policies related to natural resources can be found in Appendix D.

3.1.2 Habitat Conservation Plans and Natural Community Conservation Plans

Section 10 of the federal Endangered Species Act establishes a process by which non-federal projects can obtain authorization to incidentally take listed species, provided take is minimized and thoroughly mitigated. A Habitat Conservation Plan (HCP) developed by the project applicant in collaboration with the USFWS and/or NMFS, ensures that such minimization and mitigation will occur, and is a prerequisite to the issuance of a federal incidental take permit. Similarly, a Natural Community Conservation Plan (NCCP) developed by the project applicant in collaboration with CDFW, provides for the conservation of biodiversity within a project area, and permits limited incidental take of state-listed species.

3.1.3 Threatened and Endangered Species

In California, imperiled plants and animals may be afforded special legal protections under the California Endangered Species Act (CESA) and/or Federal Endangered Species Act (FESA). Species may be listed as "threatened" or "endangered" under one or both Acts, and/or as "rare" under CESA. Under both Acts, "endangered" means a species is in danger of extinction throughout all or a significant portion of its range, and "threatened" means a species is likely to become endangered within the foreseeable future. Under CESA, "rare" means a species may become endangered if their present environment worsens. Both Acts prohibit "take" of listed species, defined under CESA as "to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill" (California Fish and Game Code, Section 86), and more broadly defined under FESA to include "harm" (16 USC, Section 1532(19), 50 CFR, Section 17.3).

When state and federally listed species have the potential to be impacted by a project, the USFWS and CDFW must be included in the CEQA process. These agencies review the environmental document to determine the adequacy of its treatment of endangered species issues and to make project-specific recommendations for the protection of listed species. Projects that may result in the "take" of listed species must generally enter into consultation with the USFWS and/or CDFW pursuant to FESA and CESA, respectively. In some cases, incidental take authorization(s) from these agencies may be required before the project can be implemented.

3.1.4 California Fully Protected Species

The classification of certain animal species as "fully protected" was the State of California's initial effort in the 1960s, prior to the passage of the California Endangered Species Act, to identify and provide additional protection to those species that were rare or faced possible extinction. Following CESA enactment in 1970, many fully protected species were also listed as California threatened or endangered. The list of fully protected species are identified, and their protections stipulated, in California Fish and Game Code Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and fish (5515). Fully protected species may not be taken or possessed at any time and no licenses or permits may be issued for their take, except in conjunction with necessary scientific research and protection of livestock.

3.1.5 Migratory Birds

The Federal Migratory Bird Treaty Act (FMBTA: 16 USC 703-712) prohibits killing, possessing, or trading in any bird species covered in one of four international conventions to which the United States is a party, except in accordance with regulations prescribed by the Secretary of the Interior. The name of the act is misleading, as it actually covers almost all birds native to the United States, even those that are non-migratory. The FMBTA encompasses whole birds, parts of birds, and bird nests and eggs.

Native birds are also protected under California state law. The California Fish and Game Code makes it unlawful to take or possess any non-game bird covered by the FMBTA (Section 3513), as well as any other native non-game bird (Section 3800), even if incidental to lawful activities. Moreover, the California Migratory Bird Protection Act, enacted in September 2019, clarifies native bird protection and increases protections where California law previously deferred to federal law.

3.1.6 Birds of Prey

Birds of prey are protected in California under provisions of the Fish and Game Code (Section 3503.5), which states that it is unlawful to take, possess, or destroy any birds in the order Falconiformes (hawks and eagles) or Strigiformes (owls), as well as their nests and eggs. The bald eagle and golden eagle are afforded additional protection under the federal Bald and Golden Eagle Protection Act (16 USC 668), which makes it unlawful to kill birds or their eggs.

3.1.7 Nesting Birds

In California, protection is afforded to the nests and eggs of all birds. California Fish and Game Code (Section 3503) states that it is "unlawful to take, possess, or needlessly destroy the nest or eggs of any bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Breeding-season disturbance that causes nest abandonment and/or loss of reproductive effort is considered a form of "take" by the CDFW.

3.1.8 Wetlands and Other Jurisdictional Waters

The USACE regulates the filling or grading of waters of the U.S. under the authority of Section 404 of the Clean Water Act (CWA). Drainage channels and adjacent wetlands may be considered "waters of the United States" or "jurisdictional waters" subject to the jurisdiction of the USACE.

Waters of the U.S. are defined by the Navigable Waters Protection Rule. The new rule was published in the Federal Register on April 21, 2020, and took effect on June 22, 2020.

The Navigable Waters Protection Rule (33 CFR Part 328) identifies four categories of Waters of the U.S.: (1) territorial seas and traditional navigable waters, (2) tributaries, (3) lakes, ponds, and impoundments of jurisdictional waters, and (4) adjacent wetlands. These categories are defined as follows:

<u>Territorial Seas and Traditional Navigable Waters (TNWs)</u>

- The territorial seas and traditional navigable waters include large rivers and lakes and tidally-influenced waterbodies used in interstate or foreign commerce.

<u>Tributaries</u>

- Tributaries include perennial and intermittent rivers and streams that contribute surface flow to traditional navigable waters in a typical year. These naturally occurring surface water channels must flow more often than just after a single precipitation event—that is, tributaries must be perennial or intermittent.
- Tributaries can connect to a traditional navigable water or territorial sea in a typical year either directly or through other "waters of the United States," through channelized non-

jurisdictional surface waters, through artificial features (including culverts and spillways), or through natural features (including debris piles and boulder fields).

- Ditches are to be considered tributaries only where they satisfy the flow conditions of the perennial and intermittent tributary definition and either were constructed in or relocate a tributary or were constructed in an adjacent wetland and contribute perennial or intermittent flow to a traditional navigable water in a typical year.

Lakes, Ponds, and Impoundments of Jurisdictional Waters

- Lakes, ponds, and impoundments of jurisdictional waters are jurisdictional where they contribute surface water flow to a traditional navigable water or territorial sea in a typical year either directly or through other "waters of the United States," through channelized non-jurisdictional surface waters, through artificial features (including culverts and spillways), or through natural features (including debris piles and boulder fields).
- Lakes, ponds, and impoundments of jurisdictional waters are also jurisdictional where they are flooded by a "water of the United States" in a typical year, such as certain oxbow lakes that lie along the Mississippi River.

Adjacent Wetlands

- Wetlands that physically touch other jurisdictional waters are "adjacent wetlands,"
- Wetlands separated from a "water of the United States" by only a natural berm, bank or dune are also "adjacent."
- Wetlands inundated by flooding from a "water of the United States" in a typical year are "adjacent."
- Wetlands that are physically separated from a jurisdictional water by an artificial dike, barrier, or similar artificial structure are "adjacent" so long as that structure allows for a direct hydrologic surface connection between the wetlands and the jurisdictional water in a typical year, such as through a culvert, flood or tide gate, pump, or similar artificial feature.

- An adjacent wetland is jurisdictional in its entirety when a road or similar artificial structure divides the wetland, as long as the structure allows for a direct hydrologic surface connection through or over that structure in a typical year.

The final rule also outlines what are not "waters of the United States." The following waters/features are not jurisdictional under the rule:

- Waterbodies that are not included in the four categories of "waters of the United States" listed above.

- Groundwater, including groundwater drained through subsurface drainage systems, such as drains in agricultural lands.

- Ephemeral features, including ephemeral streams, swales, gullies, rills, and pools.

- Diffuse stormwater run-off and directional sheet flow over upland.

- Many farm and roadside ditches.

- Prior converted cropland retains its longstanding exclusion, but is defined for the first time in the final rule. The agencies are clarifying that this exclusion will cease to apply when cropland is abandoned (i.e., not used for, or in support of, agricultural purposes in the immediately preceding five years) and has reverted to wetlands.

- Artificially irrigated areas, including fields flooded for agricultural production, that would revert to upland should application of irrigation water to that area cease.

- Artificial lakes and ponds, including water storage reservoirs and farm, irrigation, stock watering, and log cleaning ponds, constructed or excavated in upland or in non-jurisdictional waters.

- Water-filled depressions constructed or excavated in upland or in non-jurisdictional waters incidental to mining or construction activity, and pits excavated in upland or in non-jurisdictional waters for the purpose of obtaining fill, sand, or gravel.

- Stormwater control features excavated or constructed in upland or in non-jurisdictional waters to convey, treat, infiltrate, or store stormwater run-off.

- Groundwater recharge, water reuse, and wastewater recycling structures, including detention, retention and infiltration basins and ponds, that are constructed in upland or in non-jurisdictional waters.

- Waste treatment systems have been excluded from the definition of “waters of the United States” since 1979 and will continue to be excluded under the final rule. Waste treatment systems include all components, including lagoons and treatment ponds (such as settling or cooling ponds), designed to either convey or retain, concentrate, settle, reduce, or remove pollutants, either actively or passively, from wastewater or stormwater prior to discharge (or eliminating any such discharge).

All activities that involve the discharge of dredge or fill material into waters of the U.S. are subject to the permit requirements of the USACE. Such permits are typically issued on the condition that the applicant agrees to provide mitigation that result in no net loss of wetland functions or values. No permit can be issued until the RWQCB issues a Section 401 Water Quality Certification (or waiver of such certification) verifying that the proposed activity will meet state water quality standards.

Under the Porter-Cologne Water Quality Control Act of 1969, the State Water Resources Control Board has regulatory authority to protect the water quality of all surface water and groundwater in the State of California (“Waters of the State”). Nine RWQCBs oversee water quality at the local and regional level. The RWQCB for a given region regulates discharges of fill or pollutants into waters of the State through the issuance of various permits and orders. Discharges into waters of the State that are also waters of the U.S. require a Section 401 Water Quality Certification from the RWQCB as a prerequisite to obtaining certain federal permits, such as a Section 404 Clean Water Act permit. Discharges into all Waters of the State, even those that are not also waters of the U.S., require Waste Discharge Requirements (WDRs), or waivers of WDRs, from the RWQCB. The RWQCB also administers the Construction Storm Water Program and the federal National Pollution Discharge Elimination System (NPDES) program. Projects that disturb one or more acres of soil must obtain a Construction General

Permit under the Construction Storm Water Program. A prerequisite for this permit is the development of a Storm Water Pollution Prevention Plan (SWPPP) by a certified Qualified SWPPP Developer. Projects that discharge wastewater, storm water, or other pollutants into a water of the U.S. may require a NPDES permit.

CDFW has jurisdiction over the bed and bank of natural drainages and lakes according to provisions of Section 1601 and 1602 of the California Fish and Game Code. Activities that may substantially modify such waters through the diversion or obstruction of their natural flow, change or use of any material from their bed or bank, or the deposition of debris require a Notification of Lake or Streambed Alteration. If CDFW determines that the activity may adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement will be prepared. Such an agreement typically stipulates that certain measures will be implemented to protect the habitat values of the lake or drainage in question.

4.0 IMPACT ANALYSIS

The following analysis is based upon all Project elements described in Section 1.1, including measures designed to avoid and minimize impacts to CTS. Nearly all impacts would be temporary impacts resulting from trenching within ruderal areas of the site, or equipment staging and vehicle movements. Less than one tenth of an acre of permanent impacts are expected in the form of the inlet channel, pipe supports, and concrete equipment pads. Nearly all of the permanent impacts would occur on the lakebed and within ruderal areas of the orchard land.

4.1 POTENTIALLY SIGNIFICANT PROJECT IMPACTS/MITIGATION

4.1.1 California Tiger Salamander

As discussed in Section 2.2.1, California tiger salamanders have the potential to aestivate in onsite grassland habitat. Suitable breeding habitat occurs immediately adjacent to the APE and marginal breeding habitat occurs on the APE.

As described in the Project description in Section 1.1 of this document, the Project has been designed to minimize impacts to CTS. These minimization measures are as follows. The Project will: (1) Obtain an Incidental Take Permit (ITP) from the CDFW, take authorization from the USFWS if needed, and comply with all avoidance, minimization, and mitigation measures required by the ITP and USFWS take authorization; (2) Minimize potential CTS burrow impacts in grassland habitat by installing the pipeline above ground on concrete saddles per Project design; (3) Prohibit ground disturbance in all potential CTS breeding habitat; and (4) Avoid an onsite ruderal pool as well as avoid work in grassland habitat after the first significant rainfall and until the onsite ruderal pool and two adjacent vernal pools are completely dry.

The Project would temporarily utilize an area of the orchard occupied by a ruderal pool that is marginally suitable for CTS. Although no ground disturbance would occur within the pool, the pool, when dry, may be used for the storage of equipment and materials during construction. Because Project use of the area occupied by the ruderal pool would be limited to dry periods outside of the CTS breeding season, temporary Project related use of the area occupied by the pool does not have the potential to result in take of CTS individuals. After Project construction, the pool would return to pre-Project conditions and former level of suitability for this species. Therefore, loss of breeding habitat for the CTS is not considered to be a significant impact of the Project under CEQA.

Project impacts to potential CTS aestivation habitat would be almost entirely temporary. Only 5 square feet of permanent loss of potential aestivation habitat is expected from placement of a concrete saddle under the pipeline; however, this small impact area would not prohibit CTS from utilizing burrows potentially running beneath these areas. Temporary impacts would consist of trenching through 125 square feet of roadway and grassland at the upper banks of the dam embankment. With the exception of the 5 square feet of pipe saddle, following construction, surface habitats are expected to return to pre-Project conditions and their former level of suitability for this species. Therefore, loss of aestivation habitat for the CTS is also not considered to be a significant impact of the Project under CEQA.

Ground-disturbing activities within grassland habitat of the APE that would only occur during the dry season could result in the injury or mortality of one or more aestivating CTS. In addition, work in ruderal areas adjacent to potential CTS breeding habitat (i.e. the two offsite vernal pools and the onsite ruderal pool) during the winter and spring could result in Project related injury or mortality of individual CTS that may be dispersing to or from these potential breeding pools. Such an impact on CTS is considered potentially significant under CEQA.

Implementation of the following measures would reduce impacts to CTS to a less then significant level.

Mitigation. The following measures will be implemented for the protection of the CTS:

> ***Mitigation Measure 4.1.1a* (*Take Authorization*).** Take authorization from CDFW must be obtained and the USFWS must be consulted. Required mitigations presented in take permits issued from these agencies must be adhered to. While such mitigations are project-specific, typical mitigation requirements of these permits include potential compensatory mitigation, as well as avoidance and minimization measures such as burrow excavation, construction monitoring by an approved biologist, mandatory capping of pipes, covering trenches, and maintaining escape ramps in trenches.
>
> ***Mitigation Measure 4.1.1b (Environmental Awareness Training).*** Prior to the start of construction, a qualified biologist will provide training on the CTS to all construction personnel. This training will include a description of the CTS and its habitat needs; a

report of the occurrence of the species in the Project vicinity; an explanation of the status of the species and its protection under the state and federal Endangered Species Acts; and a list of the measures being taken to reduce impacts to CTS during Project implementation. Attendance will be documented on a sign-in sheet. Attendees will be provided a handout that summarizes all of the training information. The applicant will use this handout to train any construction personnel that were not in attendance at the first meeting, prior to those personnel starting work on the site.

Implementation of the above measures will reduce any potential Project-related impacts to CTS to a less than significant level under CEQA.

4.1.2 Western Spadefoot Toad

As discussed in Section 2.2.3, this species has similar habitat requirements and behavior patterns as the CTS. Therefore, potential Project impacts presented for CTS are applicable to spadefoots toads. The spadefoot toad is not a listed species like the CTS but a California Species of Special Concern and much more common than CTS. Project avoidance and minimization measures for the CTS described in the Project description section are pertinent for western spadefoot toads, as well. Impacts to western spadefoot aestivation habitat would be temporary. Following construction, surface habitats are expected to return to pre-Project conditions and their former level of suitability for this species. No ground-disturbing activities would be permitted within the area occupied by the ruderal pool, with Project disturbance of this pool limited to temporarily staging material and equipment after the pool has dried down. As a result, the disturbance of the site occupied by this pool would be similar to existing farming practices with no loss of habitat for the western spadefoot and no chance of mortality to larva that would be present here when the pool is inundated. As a result, the loss of habitat for the western spadefoot is also not considered to be a significant impact of the Project under CEQA. The small area of proposed ground disturbance in grassland habitat may injure or kill one or more individual western spadefoot toads. In addition, work in ruderal areas immediately surrounding the ruderal pool during winter and spring months could result in the injury or mortality of western spadefoot dispersing to or from the pool. Such impacts to this species are considered potentially significant under CEQA.

Mitigation. The following measures will be implemented for the protection of the western spadefoot:

Mitigation Measure 4.1.2a. The project will comply with provisions of *Mitigation Measure 4.1.1a*, which, while designed for CTS, will offer protection measures relevant to western spadefoot.

Mitigation Measure 4.1.2b (Environmental Awareness Training). Prior to the start of construction, a qualified biologist will provide training on the western spadefoot to all construction personnel. This training will include a description of the western spadefoot and its habitat needs; a report of the occurrence of the species in the Project vicinity; an explanation of the status of the species; and a list of the measures being taken to reduce impacts to western spadefoot during Project implementation. Attendance will be documented on a sign-in sheet. Attendees will be provided a handout that summarizes all of the training information. The applicant will use this handout to train any construction personnel that were not in attendance at the first meeting, prior to those personnel starting work on the site.

Implementation of the above measures will reduce any potential Project-related impacts to western spadefoot to a less than significant level under CEQA.

4.1.3 Swainson's Hawk

Potential Impacts. Swainson's hawks are occasionally sighted in the Project vicinity. In fact, an individual was observed during LOA's May 2020 field survey. However, there are no known nesting occurrences within 10 miles of the APE. Although nesting habitat is absent from the APE, Swainson's hawks could potentially nest in eucalyptus trees within 0.5 miles, and could forage in the site's grasslands from time to time. Construction activities do not have the potential to injure or kill foraging Swainson's hawks because the Swainson's hawk is highly mobile while foraging and would be expected to simply fly away from construction disturbance. The Project will result in the permanent loss of approximately 5 square feet of foraging habitat for this species. Therefore, impacts to Swainson's hawks due to the loss of foraging habitat are considered less than significant under CEQA. However, if Swainson's hawks are nesting adjacent to work areas at the time of construction, hawks could be disturbed and their nesting success could potentially be impacted. Project-related disturbance of nesting Swainson's hawks is considered a potentially significant impact of the Project under CEQA.

Mitigation. The applicant will implement the following measures to avoid and minimize the potential for Project-related disturbance of nesting Swainson's hawks.

> ***Mitigation Measure 4.1.3a* (*Construction Timing*).** If feasible, construction activities will occur entirely outside the Swainson's hawk nesting season, typically defined as March 1-September 15.
>
> ***Mitigation Measure 4.1.3b* (*Preconstruction Surveys*).** If construction activities must occur between March 1 and September 15, then within 10 days prior to the start of work, a qualified biologist will conduct a preconstruction survey for Swainson's hawk nests on and within ½ mile of the APE.
>
> ***Mitigation Measure 4.1.3c* (*Avoidance*).** Should any active nests be identified, the biologist will establish a suitable disturbance-free buffer around the nest. This buffer will be identified on the ground with flagging or fencing, and will be maintained until the biologist has determined that the young have fledged.

Implementation of these measures will reduce potential impacts to the Swainson's hawk from Project-related disturbance to a less than significant level under CEQA and ensure compliance with state and federal laws protecting this species.

4.1.4 Burrowing Owl

Potential Impacts. Nearly the entire site is unsuitable for burrowing owl occupation. The small area of grassland habitat within the APE provides potential habitat for this species. Burrowing owls have not been documented in the Project vicinity. However, it is possible that this species could migrate onto the site prior to construction. Burrowing owls are highly mobile while foraging and it is anticipated that any burrowing owls attempting to forage on site at the time of construction would simply fly away from construction disturbance. The Project would result in the permanent loss of approximately 5 square feet of potential habitat for this species. Therefore, impacts to burrowing owls due to the loss of habitat are considered less than significant under CEQA. However, if burrowing owls are occupying burrows on site at the time of construction or ground-disturbing operations and maintenance activities, owls could be vulnerable to Project-related injury or mortality. If construction or ground-disturbing operations and maintenance activities occur during the nesting season, burrowing owls could be disturbed by such activities such that they would abandon their young. Project-related injury, mortality, or disturbance of burrowing owls is considered a potentially significant impact under CEQA.

Mitigation. In order to minimize construction-related impacts to burrowing owls, the applicant will implement the following measures:

Mitigation Measure 4.1.4a (Take Avoidance Surveys). Take avoidance surveys for burrowing owls will be conducted by a qualified biologist within 30 days prior to the start of construction within grassland habitat of the site. The surveys will be conducted according to methods described in the *Staff Report on Burrowing Owl Mitigation* (CDFG 2012). The survey will cover grassland work areas and adjacent lands within 200 meters, where potential nesting or roosting habitat is present ("survey area").

Mitigation Measure 4.1.4b (Avoidance of Nest Burrows). If construction activities within grassland habitats are to occur during the breeding season (February 1-August 31) and active nest burrows are identified within the survey area, a 200-meter disturbance-free buffer will be established around each burrow. The buffers will be enclosed with temporary fencing to prevent encroachment by construction equipment and workers. Buffers will remain in place for the duration of the breeding season, unless otherwise arranged with CDFW. After the breeding season, passive relocation of any remaining owls may take place as described below.

Mitigation Measure 4.1.4c (Avoidance or Passive Relocation of Resident Owls). During the non-breeding season (September 1-January 31), resident owls occupying burrows in work areas may either be avoided, or passively relocated to alternative habitat. If the applicant chooses to avoid active owl burrows within the work area during the non-breeding season, a 50-meter disturbance-free buffer will be established around these burrows. If a 50-meter disturbance-free buffer is not feasible, then a qualified biologist will determine a minimum buffer distance based on site conditions and the biologist will be on site to monitor the owls during all activities conducted within 50 meters to ensure that the owls are not harmed. Buffers will be enclosed with temporary fencing, and will remain in place until a qualified biologist determines that the burrows are no longer active. If the applicant chooses to passively relocate owls during the non-breeding season, this activity will be conducted in accordance with a relocation plan prepared by a qualified biologist.

Compliance with the above mitigation measures will reduce potential impacts to the burrowing owl from Project-related injury, mortality, or disturbance to a less than significant level under CEQA, and will ensure that the Project is in compliance with state and federal laws protecting this species.

4.1.5 Project-Related Mortality/Disturbance of Other Nesting Birds and Raptors Including the Loggerhead Shrike

Potential Impacts. The APE has the potential to be used for nesting by a number of avian species protected by state and federal laws. Orchard trees have the potential to support nesting birds such as the loggerhead shrike, American robin, or mourning dove. Ruderal areas have the potential to support the disturbance-tolerant killdeer. Grasslands could support ground nesting birds such as the horned lark and western meadowlark. If any birds were to be nesting on or adjacent to work areas at the time of construction they could be injured, killed, or disturbed such that they would abandon their nests. Project-related injury or mortality of nesting birds or disturbance leading to nest abandonment would violate state and federal laws and be considered a significant impact of the Project under CEQA.

Mitigation. The applicant will implement the following measures to avoid and minimize the potential for Project-related mortality/disturbance of nesting birds and raptors, as necessary.

> ***Mitigation Measure 4.1.5a* (*Construction Timing*).** If feasible, construction activities and/or vegetation removal will take place entirely outside of the avian nesting season, typically defined as February 1 to August 31.
>
> ***Mitigation Measure 4.1.5b* (*Preconstruction Surveys*).** If construction activities and/or vegetation removal must occur between February 1 and August 31, then within 10 days prior to the start of work, a qualified biologist will conduct preconstruction surveys for active bird nests on and within 500 feet of the APE.
>
> ***Mitigation Measure 4.1.5c* (*Avoidance*).** Should any active nests be identified, the biologist will establish suitable disturbance-free buffers around the nests. Buffers will be identified on the ground with flagging or fencing, and will be maintained until the biologist has determined that the young have fledged and the nests are no longer active.

Compliance with the above mitigation measures would reduce impacts to nesting birds and raptors, including the loggerhead shrike, to a less than significant level under CEQA and ensure compliance with state and federal laws protecting these species.

4.1.6 American Badger

Potential Impacts. The American badger, a California Species of Special Concern, is a wide-ranging animal with some potential to forage and/or den within grasslands of the site. The Project would result in the permanent loss of approximately 5 square feet of habitat for this species. Therefore, impacts to American badger due to the loss of habitat are considered less than significant under CEQA. However, any individuals of this species present on site at the time of construction may be at risk of construction-related injury or mortality, particularly if they are raising young on the site. Construction-related mortality of American badgers would be considered a significant impact of the Project under CEQA.

Mitigation. The following measures will be implemented for the protection of the American badger:

> ***Mitigation Measure 4.1.6a (Pre-disturbance Surveys).*** A pre-disturbance survey for American badgers will be conducted by a qualified biologist within 30 days prior to the start of construction. The survey area will include grassland areas within the APE and surrounding lands within 250 feet.
>
> ***Mitigation Measure 4.1.6b (Avoidance).*** Any non-maternity dens identified during the pre-disturbance survey shall be flagged and avoided with a minimum 50-foot no-disturbance buffer until a qualified biologist has determined that the den is no longer in use. Any maternity dens identified during pre-disturbance surveys shall be flagged and avoided, if feasible, with a minimum 200-foot no-disturbance buffer for the duration of the pup-rearing season, typically February 15 to July 1.
>
> ***Mitigation Measure 4.1.6c (Minimization).*** If a maternity den cannot feasibly be avoided, CDFW must be contacted to identify appropriate minimization measures prior to initiating any disturbance that would affect the den, including potential passive relocation by excavation before or after the rearing season.

Implementation of these measures will reduce potential Project impacts to the American badger to a less than significant level under CEQA.

4.2 LESS THAN SIGNIFICANT PROJECT IMPACTS

4.2.1 Special Status Plants

Potential Impacts. Seventeen special status vascular plant species are known to occur in the region (see Table 1). Due to the absence of suitable habitat and/or the site's being situated outside of the species' known distribution, none of these species are expected to occur on site. Therefore, the Project would not adversely affect any of these species and impacts would be less than significant as defined by CEQA.

Mitigation. Mitigation is not warranted.

4.2.2 Project Impacts to Special Status Animal Species Absent from or Unlikely to Occur on the APE

Potential Impacts. Of the 22 special status animal species that potentially occur in the Project vicinity, nine are considered absent or unlikely to occur on site due to past and ongoing disturbance of the site and surrounding lands, the absence of suitable habitat, and/or the site's being situated outside of the species' known distribution. These species include the vernal pool tadpole shrimp, valley elderberry longhorn beetle, foothill yellow-legged frog, blunt-nosed leopard lizard. Fresno kangaroo rat, San Joaquin kit fox, hardhead, western pond turtle, and coast horned lizard (see Table 1). The Project does not have the potential to impact these species through Project-related mortality or loss of habitat because there is little or no likelihood that they are present.

Mitigation. Mitigation is not warranted.

4.2.3 Project-Related Mortality of Special Status Animal Species that May Occur on the APE as Occasional or Regular Foragers but Breed Elsewhere

Potential Impacts. Six special status animals; the bald eagle, tricolored blackbird, golden eagle, white-tailed kite, northern harrier, and pallid bat; have the potential to forage on the site from time to time but would not breed on-site or close enough to the site that they would be vulnerable to Project-related disturbance at their nest or roost sites (see Table 1). Foraging individuals of these species would not be vulnerable to construction-related injury or mortality because they are highly mobile and would be expected to simply avoid active work areas. Furthermore, the Project will not result in any meaningful loss of foraging habitat for these species.

Mitigation. Mitigation is not warranted.

4.2.4 Vernal Pool Fairy Shrimp

Potential Impacts. As discussed in Section 2.2.1, this species could potentially inhabit the onsite ruderal pool. This pool is within the operational footprint of an existing orchard, experiences regular disturbance in the form of farm equipment traffic and material storage when the area is dry, and is barren of vegetation. Project avoidance and minimization measures for the CTS described in the Project description section are pertinent for the vernal pool fairy shrimp as well. No ground-disturbing activities would be permitted within the area occupied by the ruderal pool, with Project disturbance of this pool limited to temporarily staging material and equipment after the pool has dried down. As a result, the disturbance of the site would be similar to existing farming practices in this area with no loss of habitat for the vernal pool fairy shrimp. At most the Project may directly impact dormant eggs within the soil at the location of the pool, an impact that would already occur regularly during existing farming practices, but such an impact is not expected to significantly impact vernal pool fairy shrimp, should they occur there. Such an impact to this species is considered less than significant under CEQA. Given the federal listing status of this species, Project impacts would also be addressed during the anticipated Section 7 consultation between the USACE and the USFWS.

Mitigation. Mitigation is not warranted.

4.2.5 Project Impacts to Wildlife Movement Corridors

Potential Impacts. The APE does not contain features likely to function as a wildlife movement corridor. Potential Project impacts to wildlife movement and wildlife movement corridors are considered less than significant under CEQA.

Mitigation. No mitigation is warranted.

4.2.6 Waters of the United States and California

Potential Impacts. As noted in Section 2.4 of this report, the areas within ordinary high water of Madera Lake would be considered waters of the U.S. and state, the onsite ruderal pool and the ephemeral channel intersecting the pipeline alignment may be considered a water of the State but would not meet the requirements of a water of the U.S. Impacts to these features would be minimal and the function and value of these aquatic features would not be substantially altered; as a result, impacts are considered less than significant under CEQA. However, activities that would result in dredging or the placement of fill material in waters of the U.S. would require a Clean Water Act Section 404 permit and Section 401 California Water Quality Certification (WQC). Impacts to the ephemeral channel could be covered in the WQC. It is anticipated that a Nationwide 12 permit would be required for Project activities that would impact Madera Lake. Furthermore, CDFW would consider Madera Lake a body of water that could not be disturbed without entering into a Streambed Alteration Agreement (SAA).

Mitigation. No mitigation is warranted.

4.2.7 Project Impacts to Designated Critical Habitat and Sensitive Natural Communities

Potential Impacts. Designated critical habitat, sensitive natural communities, and other sensitive habitats are absent from the APE and adjacent lands. The Project would have no impact on such habitats.

Mitigation. No mitigation is warranted.

4.2.8 Local Policies or Habitat Conservation Plans

Potential Impacts. The Project appears to be consistent with the goals and policies of the Madera County General Plan, and would not conflict with any other local policies or ordinances protecting biological resources. The Project is not subject to any Habitat Conservation Plans or Natural Community Conservation Plans.

Mitigation. No mitigation is warranted.

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APPENDIX A: VASCULAR PLANT LIST

APPENDIX A
VASCULAR PLANTS OF THE SITE

The plants species listed below were observed on the Madera Lake Pump and Pipeline APE and two adjacent offsite vernal pools during a field survey conducted by Live Oak Associates, Inc. on May 1, 2020. The U.S. Fish and Wildlife Service wetland indicator status of each plant has been shown following its common name.

OBL - Obligate
FACW - Facultative Wetland
FAC - Facultative
FACU - Facultative Upland
UPL - Upland

AMARANTHACEAE – Amaranth Family		
Amaranthus albus	White Amaranth	FACU
APIACEAE – Carrot Family		
Eryngium vaseyi	Coyote Thistle	FACW
ARACEAE – Duckweed Family		
Lemna sp.	Duckweed	OBL
ASTERACEAE - Sunflower Family		
Centaurea melitensis	Tocalote	UPL
Erigeron bonariensis	Flax-leaved Horseweed	FACU
Erigeron canadensis	Canada Horseweed	FACU
Holocarpha heermannii	Heermann's Tarweed	UPL
Hypochaeris glabra	Smooth Cat's-ear	UPL
Hypochaeris radicata	Cats Ear	UPL
Lactuca serriola	Prickly Lettuce	FACU
Lasthenia fremontii	Fremont's Goldfields	OBL
Matricaria matricarioides	Pineappleweed	UPL
Pseudognaphalium luteoalbum	Jersey Cudweed	FAC
Psilocarphus tenellus ssp. *tenellus*	Slender Woolly Heads	OBL
Sonchus oleraceus	Sow Thistle	UPL
BORAGINACEAE – Borage Family		
Amsinckia menziesii	Small Flowered Fiddleneck	UPL
Heliotropium curassavicum	Salt Heliotrope	FACU
BRASSICACEAE – Mustard Family		
Hirschfeldia incana	Mustard	UPL
Capsella bursa-pastoris	Shepherd's Purse	FACU
Lepidium latifolium	Broadleaved Pepperweed	FAC
Lepidium nitidum	Shining Pepperwort	FAC
Raphanus sativus	Wild Radish	UPL
Rorippa palustris	Bog Yellowcress	OBL
Spergularia rubra	Red Sandspurrey	FAC
CUCURBITACEAE - Cucumber Family		
Cucurbita foetidissima	Calabazilla	UPL

FABACEAE - Legume Family		
Lupinus bicolor	Bicolored Lupine	UPL
Lupinus microcarpus var. *densiflorus*	Chick Lupine	UPL
Medicago lupulina	Black Medic	FAC
Medicago polymorpha	Burclover	FACU
Trifolium albopurpureum	Indian Clover	FACU
Trifolium depauperatum	Balloon Clover	FAC
Trifolium dubium	Shamrock Clover	UPL
Trifolium hirtum	Rose Clover	UPL
GERANIACEAE - Geranium Family		
Erodium cicutarium	Red-stem Filaree	UPL
JUNCACEAE – Rush Family		
Eleocharis macrostachya	Creeping Spikerush	OBL
Juncus bufonius	Toad Rush	FACW
LILIACEAE – Lily Family		
Brodiaea elegans	Elegant Brodiaea	FACU
LYTHRACEAE – Loosestrife Family		
Lythrum hyssopifolium	Hyssop's Loosestrife	OBL
MALVACEAE – Mallow Family		
Malva parviflora	Small Flowered Mallow	UPL
MARSILEACEAE – Water Fern Family		
Marsilea vestita	Hairy Water Fern	OBL
ONAGRACEAE – Fuschia Family		
Epilobium brachycarpum	Annual Fireweed	FACW
PHRYMACEAE – Monkey Flower Family		
Veronica anagallis-aquatica	Water Speedwell	OBL
POACEAE - Grass Family		
Aira caryophyllea	Silver Hair Grass	FACU
Avena sp.	Wild Oats	UPL
Bromus catharticus	Rescue Grass	UPL
Bromus hordeaceus	Soft Chess	FACU
Bromus diandrus	Ripgut Brome	UPL
Bromus madritensis ssp. *rubens*	Red Brome	FACU
Cynodon dactylon	Bermuda Grass	FACU
Hordeum marinum ssp.*gusonneanum*	Mediterranean Barley	FAC
Hordeum murinum ssp. *leporinum*	Barnyard Barley	FACU
Festuca bromoides	Six-weeks Brome Grass	FACU
Festuca myuros	Rattail Fescue	FACU
Festuca perennis	Perennial Ryegrass	FAC
Poa annua	Annual Bluegrass	FAC
Polypogon monspeliensis	Rabbits Foot Grass	FACW
POLYGONACEAE - Buckwheat Family		
Rumex crispus	Curley Dock	FAC
Polygonum aviculare	Prostrate Knotweed	FAC
VERBENACEAE- Verbena Family		
Phyla nodiflora	Common Lippia	FACW

APPENDIX B: TERRESTRIAL VERTEBRATE SPECIES THAT POTENTIALLY OCCUR WITHIN THE APE

APPENDIX B: TERRESTRIAL VERTEBRATE SPECIES THAT POTENTIALLY OCCUR WITHIN THE APE

The species listed below are those that may reasonably be expected to use the APE routinely or from time to time. The list was not intended to include birds that are vagrants or occasional transients. Terrestrial vertebrate species observed on or adjacent to the APE during a survey conducted by Live Oak Associates, Inc. on May 1, 2020 have been noted with an asterisk.

CLASS: AMPHIBIA
ORDER: CAUDATA (Salamanders)
FAMILY: AMBYSTOMATIDAE (Mole Salamanders)
California Tiger Salamander *Ambystoma californiense*)
ORDER: SALIENTIA (Frogs and Toads)
FAMILY: BUFONIDAE (True Toads)
Western Toad (*Bufo boreas*)
FAMILY PELOBATIDAE Spadefoot Toads and Relatives
*Western Spadefoot (*Spea hammondii*)
FAMILY: HYLIDAE (Treefrogs and Relatives)
Sierran Treefrog (*Pseudacris sierra*)
FAMILY: RANIDAE (True Frogs)
*American Bullfrog (*Lithobates catesbeianus*)

CLASS: REPTILIA
ORDER: SQUAMATA (Lizards and Snakes)
SUBORDER: SAURIA (Lizards)
FAMILY: IGUANIDAE (Iguanids)
*Western Fence Lizard (*Sceloporus occidentalis*)
Side-Blotched Lizard (*Uta stansburiana*)
SUBORDER: SERPENTES (Snakes)
Gopher Snake (*Pituophis melanoleucus*)
Common Kingsnake (*Lampropeltis getulus*)
Common Garter Snake (*Thamnophis sirtalis*)
FAMILY: VIPERIDAE
Northern Pacific Rattlesnake (*Crotalus oreganus oreganus*)

CLASS: AVES
ORDER: ANSERIFORMES (Screamers, Ducks and Relatives)
FAMILY: ANATIDAE (Swans, Geese and Ducks)
Canada Goose (*Branta canadensis*)
Cinnamon Teal (*Spatula cynoptera*)
*Mallard (*Anas platyrhynchos*)
ORDER: FALCONIFORMES (Vultures, Hawks, and Falcons)
FAMILY: CATHARTIDAE (American Vultures)
*Turkey Vulture (*Cathartes aura*)
FAMILY: ACCIPITRIDAE (Hawks, Old World Vultures, and Harriers)
Sharp-shinned Hawk (*Accipiter striatus*)

Cooper’s Hawk (*Accipiter cooperi*)
*Red-tailed Hawk (*Buteo jamaicensis*)
*Swainson’s Hawk (*Buteo swainsoni*)
Northern Harrier (*Circus cyaneus*)
Golden Eagle (*Aquila chrysaetos*)
Bald Eagle (*Haliaeetus leucocephalus*)
FAMILY: FALCONIDAE (Caracaras and Falcons)
*American Kestrel (*Falco sparverius*)
ORDER: GALLIFORMES (Megapodes, Currassows, Pheasants, and Relatives)
FAMILY: PHASIANIDAE (Quails, Pheasants, and Relatives)
California Quail (*Callipepla californica*)
ORDER: COLUMBIFORMES (Pigeons and Doves)
FAMILY: COLUMBIDAE (Pigeons and Doves)
Eurasian Collared-Dove (*Streptopelia decaocto*)
*Mourning Dove (*Zenaida macroura*)
ORDER: STRIGIFORMES (Owls)
FAMILY: TYTONIDAE (Barn Owls)
Common Barn Owl (*Tyto alba*)
FAMILY: STRIGIDAE (Typical Owls)
Great Horned Owl (*Bubo virginianus*)
ORDER: CAPRIMULGIFORMES (Goatsuckers and Relatives)
FAMILY: CAPRIMULGIDAE (Goatsuckers)
*Lesser Nighthawk (*Chordeiles acutipennis*)
ORDER: APODIFORMES (Swifts and Hummingbirds)
FAMILY: TROCHILIDAE (Hummingbirds)
Black-chinned Hummingbird (*Archilochus alexandri*)
Anna's Hummingbird (*Calypte anna*)
Rufous Hummingbird (*Selasphorus rufus*)
ORDER: GRUIFORMES (Cranes, Rails, and Allies)
FAMILY: RALLIDAE (Rails, Gallinules, and Coots)
American Coot (*Fulica americana*)
ORDER: CHARADRIIFORMES (Shorebirds, Gulls, and Relatives)
FAMILY: CHARADRIIDAE (Plovers and Lapwings)
*Killdeer (*Charadrius vociferus*)
FAMILY: COLOPACIDAE (Sandpipers and Relatives)
*Greater Yellowlegs (*Tringa melanoleuca*)
Least Sandpiper (*Calidris minutilla*)
FAMILY: LARIDAE (Skuas, Gulls, Terns and Skimmers)
Ring-billed Gull (*Larus delawarensis*)
California Gull (*Larus californicus*)
ORDER: PELICANIFORMES (Wading Birds)
FAMILY: ARDEIDAE (Herons and Bitterns)
*Great Blue Heron (*Ardea herodias*)
Great Egret (*Ardea alba*)
Snowy Egret (*Egretta thula*)
Cattle Egret (*Bubulcus ibis*)

FAMILY: THRESKIORNITHIDAE (Ibises and Spoonbills)
*White-Faced Ibis (*Plegadis chihi*)
ORDER: PICIFORMES (Woodpeckers and Relatives)
FAMILY: PICIDAE (Woodpeckers and Wrynecks)
Nuttall's Woodpecker (*Picoides nuttallii*)
Northern Flicker (*Colaptes auratus*)
ORDER: PASSERIFORMES (Perching Birds)
FAMILY: TYRANNIDAE (Tyrant Flycatchers)
*Black Phoebe (*Sayornis nigricans*)
Say's Phoebe (*Sayornis saya*)
*Western Kingbird (*Tyrannus verticalis*)
FAMILY: HIRUNDINIDAE (Swallows)
Tree Swallow (*Tachycineta bicolor*)
Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)
Cliff Swallow (*Hirundo pyrrhonota*)
Barn Swallow (*Hirundo rustica*)
FAMILY: CORVIDAE (Jays, Magpies, and Crows)
*California Scrub Jay (*Aphelocoma calfornica*)
*American Crow (*Corvus brachyrhynchos*)
*Common Raven (*Corvus corax*)
FAMILY: ALAUDIDAE (Larks)
Horned Lark (*Eremophila alpestris*)
FAMILY: AEGITHALIDAE (Bushtit)
Bushtit (*Psaltriparus minimus*)
FAMILY: TROGLODYTIDAE (Wrens)
Rock Wren (*Salpinctes obsoletus*)
House Wren (*Troglodytes aedon*)
FAMILY: REGULIDAE (Kinglets)
Ruby-crowned Kinglet (*Regulus calendula*)
FAMILY: TURDIDAE (Thrushes)
Mountain Bluebird (*Sialia currucoides*)
Hermit Thrush (*Catharus guttatus*)
*American Robin (*Turdus migratorius*)
FAMILY: MIMIDAE (Mockingbirds and Thrashers)
*Northern Mockingbird (*Mimus polyglottos*)
FAMILY: BOMBYCILLIDAE (Waxwings)
Cedar Waxwing (*Bombycilla cedrorum*)
FAMILY: STURNIDAE (Starlings)
*European Starling (*Sturnus vulgaris*)
FAMILY: MOTACILLIDAE (Wagtails and Pipits)
American Pipit (*Anthus rubescens*)
FAMILY: PARULIDAE (Wood Warblers and Relatives)
Yellow-rumped Warbler (*Dendroica coronata*)
FAMILY: EMBERIZIDAE (Emberizines)
Vesper Sparrow (*Pooecetes gramineus*)
Lark Sparrow (*Chondestes grammacus*)

Savannah Sparrow (*Passerculus sandwichensis*)
White-crowned Sparrow (*Zonotrichia leucophrys*)
Dark-eyed Junco (*Junco hyemalis*)
FAMILY: ICTERIDAE (Blackbirds, Orioles and Allies)
*Red-Winged Blackbird (*Agelaius phoeniceus*)
Western Meadowlark (*Sturnella neglecta*)
Great-Tailed Grackle (*Quiscalus mexicanus*)
Brewer's Blackbird (*Euphagus cyanocephalus*)
Brown-headed Cowbird (*Molothrus ater*)
*Bullock's Oriole (*Icterus bullockii*)
FAMILY: CARDINALIDAE (Cardinals and Relatives)
Black-headed Grosbeak (*Pheucticus melanocephalus*)
FAMILY: FRINGILLIDAE (Finches)
*House Finch (*Carpodacus mexicanus*)
Lesser Goldfinch (*Carduelis psaltria*)
FAMILY: PASSERIDAE (Old World Sparrows)
House Sparrow (*Passer domesticus*)

CLASS: MAMMALIA (Mammals)
ORDER: DIDELPHIMORPHIA (Marsupials)
FAMILY: DIDELPHIDAE (Opossums)
Virginia Opossum (*Didelphis virginiana*)
ORDER: INSECTIVORA (Insectivores)
Ornate Shrew (*Sorex ornatus*)
FAMILY: TALPIDAE (Moles)
Broad-Footed Mole (*Scapanus latimanus*)
ORDER: CHIROPTERA (Bats)
FAMILY: PHYLLOSTOMIDAE (Leaf-nosed Bats)
Southern Long-nosed Bat (*Leptonycteris curasoae*)
FAMILY: VESPERTILIONIDAE (Evening Bats)
Yuma Myotis (*Myotis yumanensis*)
California Myotis (*Myotis californicus*)
Western Pipistrelle (*Pipistrellus hesperus*)
Big Brown Bat (*Eptesicus fuscus*)
Hoary Bat (*Lasiurus cinereus*)
Pallid Bat (*Antrozous pallidus*)
FAMILY: MOLOSSIDAE (Free-tailed Bat)
Brazilian Free-Tailed Bat (*Tadarida brasiliensis*)
ORDER: LAGOMORPHA (Rabbits, Hares, and Pikas)
FAMILY: LEPORIDAE (Rabbits and Hares)
Audubon Cottontail Rabbit (*Sylvilagus audubonii*)
ORDER: RODENTIA (Rodents)
FAMILY: SCIURIDAE (Squirrels, Chipmunks, and Marmots)
California Ground Squirrel (*Otospermophilus beecheyi*)
FAMILY: GEOMYIDAE (Pocket Gophers)
Botta's Pocket Gopher (*Thomomys bottae*)

FAMILY: MURIDAE (Old World Rats and Mice)
Western Harvest Mouse (*Reithrodontomys megalotis*)
Deer Mouse (*Peromyscus maniculatus*)
Norway Rat (*Rattus norvegicus*)
House Mouse (*Mus musculus*)
California Vole (*Microtus californicus*)
ORDER: CARNIVORA (Carnivores)
FAMILY: CANIDAE (Foxes, Wolves, and relatives)
Coyote (*Canis latrans*)
Feral Dog (*Canis lupus familiaris*)
Red Fox (*Vulpes vulpes*)
Gray fox (*Urocyon cinereoargenteus*)
FAMILY: PROCYONIDAE (Raccoons and relatives)
Raccoon (*Procyon lotor*)
FAMILY: MEPHITIDAE (Skunks)
Striped Skunk (*Mephitis mephitis*)
FAMILY: FELIDAE (Cats)
Feral Cat (*Felis domesticus*)
Bobcat (*Lynx rufus*)

APPENDIX C: PHOTOS

Photo 1: Location of outlet pipe within dried arm of Madera Lake.

Photo 2: Proposed pipeline alignment through short section of grasslands between two vernal pools. Siphon pump station to be located at the edge of orchard beyond hedgerow. Pipeline would continue between orchard rows in background.

Photo 3: Proposed pipeline alignment to cut through the top of the Madera Lake Dam.

Photo 4: Proposed siphon pump station location.

Photo 5: Pipeline alignment through orchard. A few gopher mounds apparent in foreground.

Photo 6: Ruderal pool near proposed pump station and site of staging area.


Photo 7: Pipeline crossing of an ephemeral channel. Proposed staging area in background.


Photo 8: Pipeline alignment through orchard road.

Photo 9: Terminus of pipeline at MWD Pump 3.

APPENDIX D: MADERA COUNTY GENERAL PLAN POLICIES

SECTION 5

AGRICULTURAL AND NATURAL RESOURCES

A. AGRICULTURE

Goal 5.A: To designate adequate agricultural land and promote development of agricultural uses to support the continued viability of Madera County's agricultural economy.

Agricultural Land Use Policies

5.A.1. The County shall maintain agriculturally-designated areas for agricultural uses and direct urban uses to designated new growth areas, existing communities, and/or cities.

5.A.2. The County shall discourage the conversion of prime agricultural land to urban uses unless an immediate and clear need can be demonstrated that indicates a lack of land for non-agricultural uses.

5.A.3. The County shall seek to ensure that new development and public works projects do not encourage further expansion of urban uses into designated agricultural areas.

5.A.4. The County will maintain large-parcel agricultural zoning and prohibit the subdivision of agricultural lands into parcels smaller than permitted by the zoning.

5.A.5. The County shall allow the conversion of existing agricultural land to urban uses only within designated urban and rural residential areas, new growth areas, and within city spheres of influence where designated for urban development on the General Plan *Land Use Diagram*.

5.A.6. The County shall encourage continued and, where possible, increased agricultural activities on lands designated for agricultural uses.

5.A.7. The County shall encourage agricultural soil conservation practices such as crop rotation, cover crops, and coordinated disking times to reduce wind erosion. The County shall also encourage farmers and ranchers to develop farm or ranch plans with the appropriate U.S. Soil Conservation Service district office.

5.A.8. The County shall encourage land improvement programs to increase soil productivity in those agriculturally-designated areas containing lesser quality soils.

5.A.9. The County shall encourage infill development in urban areas as an alternative to expanding urban boundaries into agriculturally-designated areas.

5.A.10. The County shall support merging or reversion to acreage of substandard lots in "paper subdivisions" in agriculturally-designated areas under the same ownership and not being used as separate parcels.

5.A.11. The County shall facilitate agricultural production by allowing agricultural service uses (i.e., commercial and industrial uses) to locate in agriculturally-designated areas if they relate to the primary agricultural activity in the area. The County shall use the following guidelines to analyze the suitability of a proposed agricultural service use:

a. The use will not adversely affect agricultural production in the area;
b. The use supports local agricultural production; and
c. It is compatible with existing agricultural activities and residential uses in the area.

5.A.12. The County shall actively encourage enrollments of agricultural lands in its Williamson Act program, particularly on the edges of new growth areas.

Land Use Conflict Policies

5.A.13. The County shall require development within or adjacent to designated agricultural areas to incorporate design, construction, and maintenance techniques that protect agriculture and minimize conflicts with adjacent agricultural uses.

5.A.14. The County shall continue to enforce the provisions of its *Right-to-Farm Ordinance* and of the existing state nuisance law.

5.A.15. The County shall encourage educational programs to inform Madera County residents of the importance of protecting farmland.

Economic Viability of Agriculture Policies

5.A.16. The County shall support opportunities to promote and market agricultural products grown or processed within Madera County (such as farmers' markets) as a part of the economic development activities of local agencies.

5.A.17. The County shall permit a wide variety of promotional and marketing activities for county-grown products in all agricultural zone districts.

5.A.18. The County shall permit on-farm product handling and selling. The County shall permit stands for the sale of agricultural products in any agricultural land use designation to promote and market those agricultural products grown or processed in Madera County. Secondary and incidental sales of agricultural products grown elsewhere may be permitted subject to appropriate approvals.

5.A.19. The County shall ensure that land use regulations do not arbitrarily restrict potential agricultural-related enterprises which could provide supplemental sources of income for farm operators.

B. FOREST RESOURCES

Goal 5.B: To conserve Madera County's forest resources, enhance the quality and diversity of forest ecosystems, reduce conflicts between forestry and other uses, and encourage a sustained yield of forest products.

Policies

5.B.1. The County shall encourage the sustained productive use of forest land as a means of providing open space and conserving other natural resources.

5.B.2. The County shall discourage development that conflicts with timberland management.

5.B.3. The County shall work closely and coordinate with agencies involved in the regulation of timber harvest operations to ensure that County conservation goals are achieved.

5.B.4. The County shall encourage qualified landowners to enroll in the Timberland Production Zone (TPZ) program.

5.B.5. The County shall encourage and promote the productive use of wood waste generated in the county.

5.B.6. The County shall encourage and support conservation programs to reforest private timberlands.

C. WATER RESOURCES

Goal 5.C: To protect and enhance the natural qualities of Madera County's streams, creeks and groundwater.

Policies

5.C.1. The County shall protect preserve areas with prime percolation capabilities and minimize placement of potential sources of pollution in such areas.

5.C.2. The County shall minimize sedimentation and erosion through control of grading, cutting of trees, removal of vegetation, placement of roads and bridges, and use of off-road vehicles. The County shall discourage grading activities during the rainy season, unless adequately mitigated, to avoid sedimentation of creeks and damage to riparian habitat.

5.C.3. The County shall require new development of facilities near rivers, creeks, reservoirs, or substantial aquifer recharge areas to mitigate any potential impacts of release of pollutants in flood waters, flowing river, stream, creek, or reservoir waters.

5.C.4. The County shall require the use of feasible and practical best management practices (BMPs) to protect streams from the adverse effects of construction activities, and shall encourage the urban storm drainage systems and agricultural activities to use BMPs.

5.C.5. The County shall approve only wastewater disposal facilities that will not contaminate groundwater or surface water.

5.C.6. The County shall require that natural watercourses are integrated into new development in such a way that they are accessible to the public and provide a positive visual element.

5.C.7. The County shall protect groundwater resources from contamination and further overdraft by encouraging water conservation efforts and supporting the use of surface water for urban and agricultural uses wherever feasible.

5.C.8. The County shall support the policies of the San Joaquin River Parkway Plan to protect the San Joaquin River as an aquatic habitat and a water source.

[See also policies/programs under 3.C. Water Supply and Delivery, starting on page 39; 3.E. Stormwater Drainage and Flood Control, starting on page 41; and 6.B. Flood Hazards, starting on page 66]

Implementation Programs

5.1. The County shall inform the public and prospective developers about those sections of the *California Fish and Game Code* that apply to diversion or obstruction of stream channels and pollution of waterways with detrimental material. This shall be done through distribution of educational materials with building permits and as a part of project review.

Responsibility:	Engineering Department, Building Division
Time Frame:	Ongoing
Funding:	Permit fees

D. WETLAND AND RIPARIAN AREAS

Goal 5.D: To protect wetland communities and related riparian areas throughout Madera County as valuable resources.

Policies

5.D.1. The County shall comply with the wetlands policies of the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game. Coordination with these agencies at all levels of project review shall continue to ensure that appropriate mitigation measures and the concerns of these agencies are adequately addressed.

5.D.2. The County shall require new development to mitigate wetland loss in both regulated and non-regulated wetlands through any combination of avoidance, minimization, or compensation. The County shall support mitigation banking programs that can provide the opportunity to mitigate impacts to rare, threatened, and endangered species and/or the habitat which supports these species in wetland and riparian areas.

5.D.3. Development should be designed in such a manner that pollutants and siltation will not significantly adversely affect the value or function of wetlands.

5.D.4. The County shall require riparian protection zones around natural watercourses. Riparian protection zones shall include the bed and bank of both low and high flow channels and associated riparian vegetation, the band of riparian vegetation outside the high flow channel, and buffers of 100 feet in width as measured from the top of bank of unvegetated channels and 50 feet in width as measured from the outer edge for the canopy of riparian vegetation. Exceptions may be made in existing developed areas where existing development and lots are located within the setback areas.

5.D.5. The County shall strive to identify and conserve remaining upland habitat areas adjacent to wetlands and riparian areas that are critical to the feeding or nesting of wildlife species associated with these wetland and riparian areas.

5.D.6. The County shall require new private or public developments to preserve and enhance existing native riparian habitat unless public safety concerns require removal of habitat for flood control or other public purposes. In cases where new private or public development results in modification or destruction of riparian habitat for purposes of flood control, the developers shall be responsible for creating new riparian habitats within or near the project area at a ratio of three acres of new habitat for every acre destroyed.

5.D.7. The County shall support the management of wetland and riparian plant communities for passive recreation, groundwater recharge, nutrient catchment, and wildlife habitats. Such communities shall be restored, where possible.

5.D.8. The County shall support the goals and policies of the San Joaquin River Parkway Plan to preserve existing habitat and maintain, enhance, or restore native vegetation to provide essentially continuous riparian and upland habitat for wildlife along the river between Friant Dam and the Highway 145 crossing.

Implementation Programs

5.2. The County shall work toward the acquisition by public or private, non-profit conservation organizations of creek corridors, wetlands, and areas rich in wildlife or of a fragile ecological nature as public open space where such areas cannot be effectively preserved through the regulatory process. Such protection may take the form of fee acquisition or protective easements and may be carried out in cooperation with other local, state, and federal agencies and private entities. Acquisition should include provisions for maintenance and management in perpetuity.

Responsibility:	Engineering Department Planning Department Board of Supervisors
Time Frame:	Ongoing
Funding:	Mitigation fees State and federal grants

5.3. The County shall adopt an ordinance for riparian protection zones identifying allowable activities in riparian protection zones and allowable mitigation techniques.

Responsibility:	Planning Department
Time Frame:	FY 97-98
Funding:	General Fund

E. FISH AND WILDLIFE HABITAT

Goal 5.E: To protect, restore, and enhance habitats that support fish and wildlife species so as to maintain populations at viable levels.

Policies

5.E.1. The County shall identify and protect critical nesting and foraging areas, important spawning grounds, migratory routes, waterfowl resting areas, oak woodlands, wildlife movement corridors, and other unique wildlife habitats critical to protecting and sustaining wildlife populations.

5.E.2. The County shall require development in areas known to have particular value for wildlife to be carefully planned and, where possible, located so that the reasonable value of the habitat for wildlife is maintained.

5.E.3. The County shall encourage private landowners to adopt sound wildlife habitat management practices, as recommended by the California Department of Fish and Game officials and the U.S. Fish and Wildlife Service.

5.E.4. The County shall support preservation of the habitats of rare, threatened, endangered, and/or other special status species. The County shall consider developing a formal habitat conservation plan in consultation with federal and state agencies, as well as other resource conservation organizations. Such a plan would provide a mechanism for the acquisition and management of lands supported by threatened and endangered species.

5.E.5. The County shall support the maintenance of suitable habitats for all indigenous species of wildlife through maintenance of habitat diversity.

5.E.6. The County shall ensure the conservation of sufficiently large, continuous expanses of native vegetation to provide suitable habitat for maintaining abundant and diverse wildlife, if this preservation does not threaten the economic well-being of the county.

5.E.7. The County shall support the preservation or reestablishment of fisheries in the rivers and streams within the county, whenever possible.

5.E.8. The County shall ensure close monitoring of pesticide use in areas adjacent to habitats of special status plants and animals.

5.E.9. The County shall promote effective methods of ground squirrel control on croplands bordering sensitive habitat that do not place kit foxes and other special-status species at risk.

5.E.10. Prior to approval of discretionary development permits involving parcels within a significant ecological resource area, the County shall require, as part of the environmental review process, a biotic resources evaluation of the sites by a qualified biologist. The evaluation shall be based upon field reconnaissance performed at the appropriate time of year to determine the presence or absence of rare, threatened, or endangered species of plants or animals. Such evaluation will consider the potential for significant impact on these resources and will either identify feasible measures to mitigate such impacts or indicate why mitigation is not feasible.

5.E.11. The County shall provide for a minimum 200 foot wildlife corridor along the San Joaquin River between Friant Dam and the Highway 145 crossing, consistent with the San Joaquin River Parkway Plan. The County shall require a buffer with a minimum width of 150 feet between existing or planned urban or suburban uses. Exceptions may be necessary where the minimum width is infeasible due to topography or other physical constraints. In these instances, an offsetting expansion on the opposite side of the river should be provided.

Implementation Programs

5.4. The County shall initiate detailed inventories of ecologically significant resource areas, including unique natural areas, wetland areas, riparian areas, habitats of rare, threatened, endangered, and other uncommon and special-status species. The inventory should be conducted as area plans, specific plans, planned unit developments (PUDs), or other planning projects are considered by the County. The inventory should be based on the California Wildlife Habitats Relationships (WHR) system and shall identify appropriate buffer zones around the identified resource areas in order to account for periodic, seasonal, or ecological changes. The maps should be revised on a regular basis to reflect the availability of new information from other agencies, changes in definition, or any other changes.

Responsibility:	Planning Department
Time Frame:	FY 96-97; ongoing
Funding:	General Fund

5.5. The County shall maintain current maps that indicate the extent of critical habitat for important fish and game species, as these maps are made available by the California Department of Fish and Game (CDFG). The relative importance of these game species shall be determined by the County, in consultation with CDFG, based on relevant ecological, recreational, and economic considerations. These maps shall be used by the County to evaluate proposed *area plans, specific plans*, and any project development proposals to determine compatibility of development with maintenance and enhancement of important fish and game species.

Responsibility:	Planning Department
Time Frame:	Ongoing
Funding:	General Fund

5.6 The County shall investigate costs and possible funding sources for development of a habitat conservation plan.

Responsibility:	Planning Department
Time Frame:	FY 96-97
Funding:	General Fund

F. VEGETATION

Goal 5.F: To preserve and protect the valuable vegetation resources of Madera County.

Policies

5.F.1. The County shall encourage landowners and developers to preserve the integrity of existing terrain and natural vegetation in visually-sensitive areas such as hillsides, ridges, and along important transportation corridors.

5.F.2. The County shall require developers to use native and compatible non-native species, especially drought-resistant species, to the extent possible in fulfilling landscaping requirements imposed as conditions of discretionary permit approval or for project mitigation.

5.F.3. The County shall support the preservation of outstanding areas of natural vegetation, including, but not limited to, oak woodlands, riparian areas, and vernal pools.

5.F.4. The County shall ensure that landmark trees are preserved and protected.

5.F.5. The County shall establish procedures for identifying and preserving rare, threatened, and endangered plant species that may be adversely affected by public or private development projects. The County shall consider developing a formal habitat conservation plan in consultation with federal and state agencies, as well as other resources conservation organizations. Such a plan would provide a mechanism for the acquisition and management of land supporting threatened and endangered species

5.F.6. The County shall require that new development preserve natural woodlands to the maximum extent possible.

5.F.7. The County shall require that development on hillsides be limited to maintain valuable natural vegetation, especially forests and open grasslands, and to control erosion.

5.F.8. The County shall support the continued use of prescribed burning to mimic the effects of natural fires to reduce fuel volumes and associated fire hazard to human residents and to enhance the health of biotic communities.

Implementation Programs

5.7. The County shall prepare and maintain an updated list of state and federal rare, threatened, and endangered plant species known or suspected to occur in the county. The following other uncommon or special-status species which occur or may occur in the county should also be included on the list: 1) plant species included in the California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California; 2) species of special concern as designated by California Department of Fish and Game; and 3) California Fully Protected animals as defined by *California Fish and Game Code*. In addition to updating the list as new information becomes available, the list should be reviewed and amended at least once every two years.

Responsibility:	Planning Department
Time Frame:	FY 96-97; every two years thereafter
Funding:	General Fund

G. GEOLOGIC RESOURCES

Goal 5.G: To preserve and enhance unique geologic sites within Madera County.

Policies

5.G.1. The County shall protect unique geologic resources from incompatible development.

5.G.2. The County shall support the nomination of unique geologic sites in the county for inclusion in the National Register of Geologic Landmarks.

Implementation Programs

5.8. The County shall conduct an inventory of unique geologic resources in Madera County and nominate or assist in their nomination for inclusion in the National Register of Geologic Landmarks.

Responsibility:	Planning Department
Time Frame:	FY 97-98
Funding:	General Fund

H. OPEN SPACE FOR THE PRESERVATION OF NATURAL RESOURCES

Goal 5.H: To preserve and enhance open space lands to maintain the natural resources of the county.

Policies

5.H.1. The County shall support the preservation and enhancement of natural land forms, natural vegetation, and natural resources as open space. To the extent feasible, the County shall permanently protect as open space areas of natural resource value, including wetlands preserves, riparian corridors, woodlands, and floodplains.

5.H.2. The County shall require that new development be designed and constructed to preserve the following types of areas and features as open space to the maximum extent feasible:

a. High erosion hazard areas;
b. Scenic and trail corridors;
c. Streams and streamside vegetation;
d. Wetlands;
e. Other significant stands of vegetation;
f. Wildlife corridors; and
g. Any areas of special ecological significance.

5.H.3. The County shall support the maintenance of open space and natural areas that are interconnected and of sufficient size to protect biodiversity, accommodate wildlife movement, and sustain ecosystems.

5.H.4. Recognizing the importance of both public and privately-owned open space, the County shall encourage both private and public ownership and maintenance of open space.

5.H.5. The County shall require that significant natural, open space, and cultural resources be identified in advance of development and incorporated into site-specific development project design.

Implementation Programs

5.9. The County will review and revise the planned zoning districts of the *Zoning Ordinance* to add provisions for the protection of significant natural, open space, and cultural resources.

Responsibility:	Planning Department
Time Frame:	FY 96-97
Funding:	General Fund

Appendix C

CLASS III INVENTORY/PHASE I SURVEY

CLASS III INVENTORY/PHASE I SURVEY, MADERA LAKE PUMP & PIPELINE PROJECT, MADERA COUNTY, CALIFORNIA

Prepared for:

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October 2020

PN 34790

TABLE OF CONTENTS

LIST OF FIGURES

Page

LIST OF TABLES

Page

MANAGEMENT SUMMARY

An intensive Class III cultural resources inventory/Phase I survey was conducted for the Madera Water District (MWD) Madera Lake Pump & Pipeline Project (Project), Madera County, California. The Project is located in Section 28, 33, and 34 (T10S/R18E; MDBM), west and northwest of Madera Lake. ASM Affiliates, Inc., conducted this study, with David S. Whitley, Ph.D., RPA, serving as principal investigator. The study was undertaken to assist the U.S. Army Corps of Engineers (ACOE) with compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, to be completed at a later date, and to assist with compliance with the California Environmental Quality Act (CEQA). The purpose of the Project is to provide MWD access to surface water from Madera Lake, which is owned by the Madera Irrigation District (MID), through a siphon in the lake to a pump station southwest of an existing levee, through approximately 5,700-feet (ft) of pipeline. The area surveyed included the 9.1-acres (ac) Project area of potential effect (APE) encompassing all areas of potential ground disturbance, as defined by Provost & Pritchard in the Initial Study/Mitigated Negative Declaration, plus a 15-meter (m) buffer pursuant to ACOE guidelines, for a total survey area of about 13-ac.

A records search of site files and maps was conducted at the Southern San Joaquin Valley Archaeological Information Center (IC), California State University, Bakersfield. A Sacred Lands File Request was also submitted to the Native American Heritage Commission (NAHC). These investigations determined that Project Area of Potential effect (APE) had not been previously surveyed, though one previous report had included a geoarchaeological description of it, and that no archaeological sites/tribal cultural resources were known to exist within it. Outreach letters and follow-up emails were sent to tribal organizations on the NAHC contact list and two tribes responded.

The Class III inventory/Phase I survey fieldwork was conducted in April and August 2020 with parallel transects spaced at 15-meter (m) intervals walked across the Project. One cultural resource, Madera Lake, constructed for recreational activities by the Madera County Recreation Commission in 1958, was identified and recorded.

Madera Lake meets the National Register of Historic Places (NRHP) and California Register of Historical Resources (CRHR) age criterion for listing. Originally created as a recreational facility and subsequently acquired by the MID as part of their water conveyance system, it is not associated with an important historical event (Criterion A/1) or individual (Criterion B/2). Built with an earthen embankment across a natural valley forming a reservoir, it is a common property type that is not notable for engineering, craftsmanship or style, and is not eligible under Criterion C/3. As a recently created structure, it does not have research potential that is not better provided by written documents (Criterion D/4). Madera Lake accordingly is recommended as not NRHP/CRHR eligible, and does not constitute a historic property under NHPA Section 106 or a significant or unique historical resource under CEQA. A determination of No Historic Properties Affected and No Significant Adverse Impact is therefore recommended for the proposed Project.

1. INTRODUCTION AND REGULATORY CONTEXT

ASM Affiliates, Inc., was retained by Provost & Pritchard Consulting Group to conduct an intensive Class III inventory/Phase I cultural resources survey for the MWD Madera Lake Pump & Pipeline Project in Madera County, California. This Project is intended to create access to surface water from Madera Lake, when available. The study was undertaken to assist the U.S. Army Corps of Engineers in compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, to be completed at a later date, and assist with compliance with the California Environmental Protection Act (CEQA).

This current study included:

- A background records search and literature review to determine if any known cultural resources were present in the project zone and/or whether the area had been previously and systematically studied by archaeologists;
- An on-foot, intensive inventory of the study area to identify and record previously undiscovered cultural resources and to examine known sites; and
- A preliminary assessment of any such resources found within the subject property.

David S. Whitley, Ph.D., RPA, served as principal investigator and ASM Associate Archaeologist Robert Azpitarte, B.A., conducted the fieldwork for this study.

This document constitutes a report on the Class III inventory/Phase I survey. Subsequent chapters provide background to the investigation, including historic context studies; the findings of the archival records search; Native American outreach; a summary of the field surveying techniques employed; and the results of the fieldwork. We conclude with management recommendations for the Project area.

1.1 PROJECT LOCATION, DESCRIPTION AND AREA OF POTENTIAL EFFECT

The MWD Madera Lake Pump & Pipeline Project is located west and northwest of Madera Lake in Sections 28, 33, and 34 (T10S/R18E; MDBM), Madera County, California (Figure 1). The elevation within the Project APE, which is low rolling hills, ranges from approximately 320-ft above mean sea level (amsl) at Madera Lake, to approximately 335-ft amsl at its highest point along a north-south trending dirt agricultural road. The Project is located a short distance north of the Fresno River.

MWD proposes to develop a project that would allow water from Madera Irrigation District (MID) or other sources to be brought into MWD from Madera Lake. Madera Lake is supplied by an existing turnout off the Fresno River which is fed by the upstream watershed regulated by Hidden Dam on Hensley Lake and from water from the Madera Canal. Water supplies could be from the Central Valley Project Friant Division, Fresno River, or pre-1914 supplies.

The proposed project involves the installation of a siphon in Madera Lake, booster pumps and pipeline to obtain a flowrate of up to 8,000 gpm from Madera Lake, with up to 6,000 gpm delivered into MWD and up to 2,000 gpm delivered to the neighboring property from outside water supplies.

A 26 to 30-inch steel siphon pipe would be installed directly on top of the lakebed below the normal water surface, then the steel pipeline would be installed on concrete saddles on the dam embankment side slopes, and buried through the top of the existing dam embankment/roadway. Once reaching the existing dirt farm road west of Madera Lake, the siphon pipe would be buried three to four feet and then terminate at a sump with booster pump(s).

The booster pump(s) will discharge into a 27-inch buried plastic pipeline that goes through the orchard west of Madera Lake for about ½ mile and an internal existing farm road on the Road 29 ½ alignment for about 5,700 feet until terminating at a new booster pump station discharging into the existing MWD distribution system near existing Well#3 and reservoir north of the Avenue 19 ½ alignment. A landowner turnout will be installed to serve the orchard along the north/south portion of the pipeline alignment and after the landowner turnout, the pipeline will transition to a 24-inch buried plastic pipe.

The horizontal Project APE, as defined by Provost & Pritchard in the Initial Study/Mitigated Negative Declaration, consists of all areas of ground surface disturbance, including work, staging and laydown areas. These comprise the pump stations and approximately 5,700-ft of pipeline, yielding an APE that is 9.1-ac in size. The archaeological survey area for this project was expanded to include a 15-m survey buffer surrounding these components, to comply with ACOE guidelines. With the buffer, this results in an approximately 100-ft wide corridor for the pipeline and a total survey area of approximately 13-ac. The vertical APE, consisting of the maximum depth of excavation, is 6-ft.

1.2 REGULATORY CONTEXT

1.2.1 CEQA

CEQA is applicable to discretionary actions by state or local lead agencies. Under CEQA, lead agencies must analyze impacts to cultural resources. Significant impacts under CEQA occur when “historically significant” or “unique” cultural resources are adversely affected, which occurs when such resources could be altered or destroyed through project implementation. Historically significant cultural resources are defined by eligibility for or by listing in the California Register of Historical Resources (CRHR). In practice, the federal NRHP criteria (below) for significance applied under Section 106 are generally (although not entirely) consistent with CRHR criteria (see PRC § 5024.1, Title 14 CCR, Section 4852 and § 15064.5(a)(3)).

Significant cultural resources are those archaeological resources and historical properties that:

(A) Are associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage;

(B) Are associated with the lives of persons important in our past;

(C) Embody the distinctive characteristics of a type, period, region, or method of construction, or represent the work of an important creative individual, or possess high artistic values; or

(D) Have yielded, or may be likely to yield, information important in prehistory or history.

Unique resources under CEQA, in slight contrast, are those that represent:

> An archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:
>
> (1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
>
> (2) Has a special and particular quality such as being the oldest of its type or the best available example of its type.
>
> (3) Is directly associated with a scientifically recognized important prehistoric or historic event or person (PRC § 21083.2(g)).

Preservation in place is the preferred approach under CEQA to mitigating adverse impacts to significant or unique cultural resources.

1.2.2 NHPA Section 106

NHPA Section 106 is applicable to federal undertakings, including projects financed or permitted by federal agencies regardless of whether the activities occur on federally managed or privately-owned land. Its purpose is to determine whether adverse effects will occur to significant cultural resources, defined as “historical properties” that are listed in or determined eligible for listing in the National Register of Historic Places (NRHP). The U.S. Army Corps of Engineers will serve as federal lead agency for this Project and will use the information contained in this report at a later date to assist with fulfilling its NHPA Section 106 compliance responsibilities.

The criteria for NRHP eligibility are defined at 36 CFR § 60.4 as follows:

> The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that:
>
> (A) are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (B) are associated with the lives of persons significant in our past; or
>
> (C) embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(D) have yielded or may be likely to yield, information important in prehistory or history.

There are, however, restrictions on the kinds of historical properties that can be NRHP listed. These have been identified by the Advisory Council on Historic Preservation (ACHP), as follows:

> Ordinarily cemeteries, birthplaces, or graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years shall not be considered eligible for the National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:
>
> (a) A religious property deriving primary significance from architectural or artistic distinction or historical importance; or
>
> (b) A building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or
>
> (c) A birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building directly associated with his productive life.
>
> (d) A cemetery which derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events; or
>
> (e) A reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived; or
>
> (f) A property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or
>
> (g) A property achieving significance within the past 50 years if it is of exceptional importance. (ACHP n.d.)

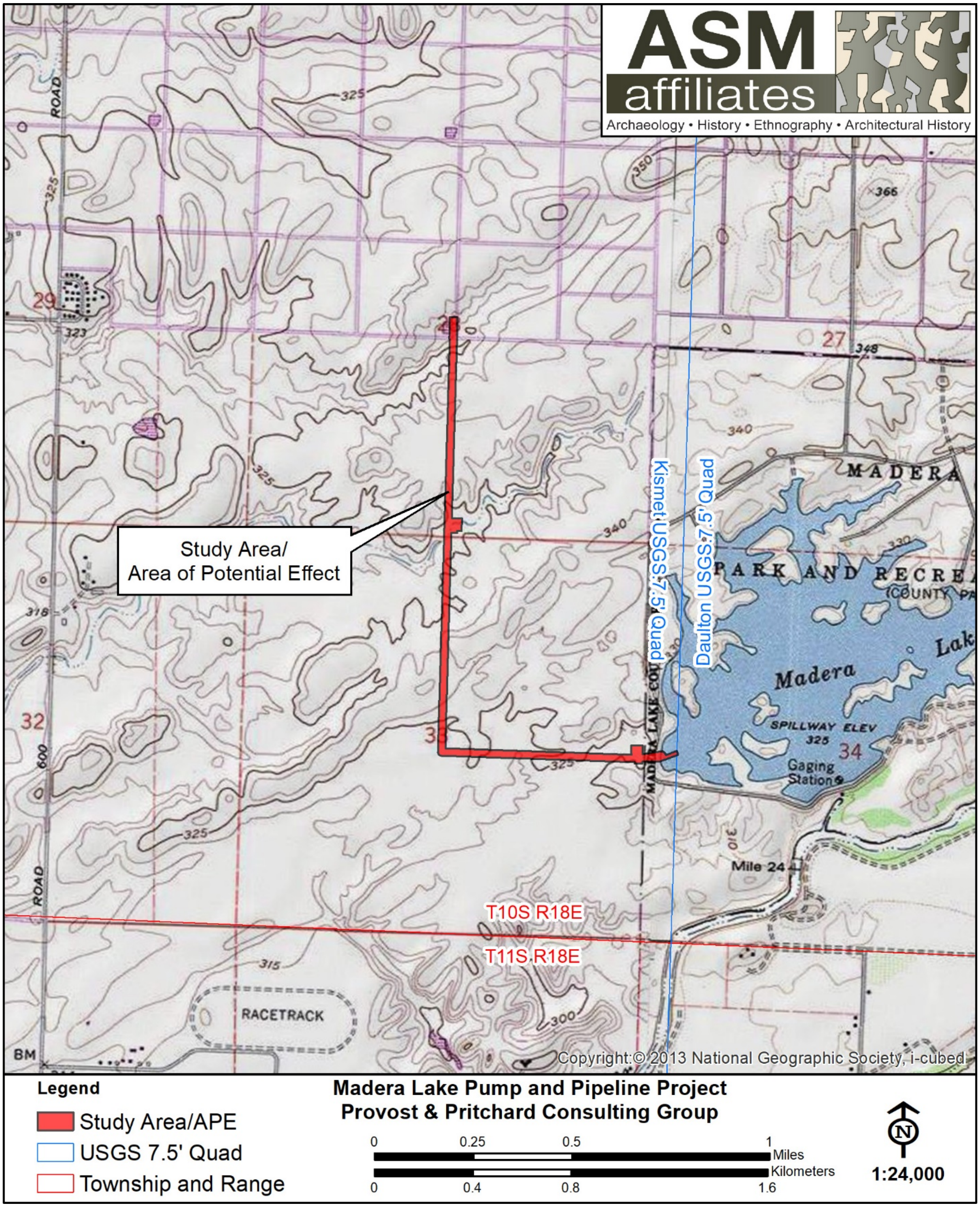

Figure 1. Location of the Madera Lake Pump & Pipeline Project, Madera County, California.

2. ENVIRONMENTAL AND CULTURAL BACKGROUND

2.1 ENVIRONMENTAL BACKGROUND AND GEOARCHAEOLOGICAL SENSITIVITY

The Project APE is located on the eastern side of the San Joaquin Valley approximately 4-mi west of the base of the western foothills of the Sierra Nevada, approximately 400-ft north of the Fresno River, itself a tributary of the San Joaquin River. The area is low rolling hills currently covered by fig and pistachio orchards. The eastern terminus of the APE is within Madera Lake, an artificial reservoir created through diversion of the Fresno River and contained by topography and a series of earthen levees. Prior to the formation of Madera Lake in 1958, the area consisted of mostly flat to gradually rolling hills. Historically, and likely prehistorically, much of the APE would have been within a valley oak tree woodland environment, with riparian environments present along the Fresno River and its sloughs (Preston 1981).

Madera Lake specifically lies in a former side-slough of the Fresno River and would have been periodically inundated, both seasonally and during “mega-floods”. These have been geologically documented back to AD 212 and they occur, on average, every 200 years. The last such flood occurred in 1861 – 1862. Although this is considered one of the milder examples of these events, which are caused by “atmospheric rivers” (Dettinger and Ingram 2013), as much of 6-ft of rain fell in some locations. A period account describes this event as follows:

> “The great central valley of the state is under water—the Sacramento and San Joaquin valleys—a region 250 to 300 miles long and an average of at least twenty miles wide, a district of five thousand or six thousand square miles, or probably three to three and a half millions of acres! Although much of it is not cultivated, yet a part is the garden of the state. Thousands of farms are entirely under water—cattle starving and drowning” (Brewer 2003:242).

This major flood emphasizes that the San Joaquin Valley historically was swampy land, a fact having significant implications for the locations of prehistoric and historic Native American villages, and the archaeological sensitivity of the Project area.

According to the geoarchaeological model developed by Meyer et al. (2010), the APE has a Very Low to Low potential for buried archaeological deposits. Meyer et al.’s study involved first determining the location and ages of late Pleistocene (>25,000 years old) landforms in the southern San Joaquin Valley. These were identified by combining a synthesis of 2,400 published paleontological, soils and archaeological chronometric dates with geoarchaeological field testing. The ages of surface landforms were then mapped to provide an assessment for the potential for buried archaeological deposits. These ages were derived primarily from the Soil Survey Geographic Database (SSURGO) and the State Soils Geographic (STATSGO) database. A series of maps were created from this information that ranked locations in seven ordinal classes for sensitivity for buried soils, from Very Low to Very High. Buried sites and cultural resources are therefore considered to be unlikely within the Project APE. This conclusion is supported by the known distributions of historic Native American villages in the region (below).

2.2 ETHNOGRAPHIC BACKGROUND

Penutian-speaking Yokuts tribal groups occupied the southern San Joaquin Valley region and much of the nearby Sierra Nevada, with Numic-speaking Mono (or Monachi) higher up in the foothills. Ethnographic information about the Yokuts and Mono was collected primarily by Powers (1971, 1976 [originally 1877]), Kroeber (1925), Gayton (1930, 1948), Driver (1937), Latta (1977) and Harrington (n.d.). For a variety of historical reasons, existing research information emphasizes the central Yokuts tribes who occupied both the valley and particularly the foothills of the Sierra, along with the Mono at higher elevation in the central foothills. The northernmost tribes suffered from the influx of Euro-Americans during the Gold Rush and their populations were in substantial decline by the time ethnographic studies began in the early twentieth century. In contrast, the southernmost tribes were partially removed by the Spanish to missions and eventually absorbed into multi-tribal communities on the Sebastian Indian Reservation (on Tejon Ranch), and later the Tule River Reservation and Santa Rosa Rancheria to the north. The result is an unfortunate scarcity of ethnographic detail on southern and northern Valley tribes, especially in relation to the rich information collected from the central foothills tribes where native speakers of the Yokuts and Mono dialects are still found. Regardless, the general details of indigenous life-ways were similar across the broad expanse of this territory, particularly in terms of environmentally influenced subsistence and adaptation and with regard to religion and belief, which were similar everywhere.

Following Kroeber (1925: Plate 47), the APE is potentially within either Heuchi Yokuts and Chauchila (Chowchilla) Yokuts territory. The historic Huechi village of *Ch'ekayu* is described as located about 4-mi west of Madera on the north side of the Fresno River, placing it approximately 8.5-mi southwest of the Project APE. The historic village of *Halau*, which may have been either Heuchi or Chauchila, is located approximately 8-mi northwest of the Project APE near the present town of Berenda.

The Yokuts settlement pattern was largely consistent, regardless of specific tribe involved. Winter villages were typically located along lakeshores and major stream courses (as these existed circa AD 1800), with dispersal phase family camps located at elevated spots on the valley floor and near gathering areas in the foothills. Because of seasonal inundation, winter villages were almost invariably constrained to elevated locations on the landscape.

Most Yokuts groups, again regardless of specific tribal affiliation, were organized as a recognized and distinct tribelet; a circumstance that almost certainly pertained to the tribal groups noted above. Tribelets were land-owning groups organized around a central village and linked by shared territory and descent from a common ancestor. The population of most tribelets ranged from about 150 to 500 peoples (Kroeber 1925).

Each tribelet was headed by a chief who was assisted by a variety of assistants, the most important of whom was the *winatum*, a herald or messenger and assistant chief. A shaman also served as religious officer. While shamans did not have any direct political authority, as Gayton (1930) has illustrated, they maintained substantial influence within their tribelet.

Shamanism is a religious system common to most Native American tribes. It involves a direct and personal relationship between the individual and the supernatural world enacted by entering a trance or hallucinatory state (usually based on the ingestion of psychotropic plants, such as jimsonweed or more typically native tobacco). Shamans were considered individuals with an unusual degree of supernatural power, serving as healers or curers, diviners, and controllers of natural phenomena (such as rain or thunder). Shamans also produced the rock art of this region, depicting the visions they experienced in vision quests believed to represent their spirit helpers and events in the supernatural realm (Whitley 1992, 2000).

The centrality of shamanism to the religious and spiritual life of the Yokuts was demonstrated by the role of shamans in the yearly ceremonial round. The ritual round, performed the same each year, started in the spring with the jimsonweed ceremony, followed by rattlesnake dance and (where appropriate) first salmon ceremony. After returning from seed camps, fall rituals began in the late summer with the mourning ceremony, followed by first seed and acorn rites and then bear dance (Gayton 1930:379). In each case, shamans served as ceremonial officials responsible for specific dances involving a display of their supernatural powers (Kroeber 1925).

Subsistence practices varied from tribelet to tribelet based on the environment of residence. Throughout Native California, and Yokuts territory in general, the acorn was a primary dietary component, along with a variety of gathered seeds. Valley tribes augmented this resource with lacustrine and riverine foods, especially fish and wildfowl. As with many Native California tribes, the settlement and subsistence rounds included the winter aggregation into a few large villages, where stored resources (like acorns) served as staples, followed by dispersal into smaller camps, often occupied by extended families, where seasonally available resources would be gathered and consumed.

Although population estimates vary and population size was greatly affected by the introduction of Euro-American diseases and social disruption, the Yokuts were one of the largest, most successful groups in Native California. Cook (1978) estimates that the Yokuts region contained 27 percent of the aboriginal population in the state at the time of contact; other estimates are even higher. Many Yokuts people continue to reside in the San Joaquin Valley today.

2.3 PRE-CONTACT ARCHAEOLOGICAL BACKGROUND

The southern San Joaquin Valley region has received minimal archaeological attention compared to other areas of the state. In part, this is because the majority of California archaeological work has concentrated in the Sacramento Delta, Santa Barbara Channel, and central Mojave Desert areas (see Moratto 1984). Although knowledge of the region's prehistory is limited, enough is known to determine that the archaeological record is broadly similar to south-central California as a whole (see Gifford and Schenk 1926; Hewes 1941; Wedel 1941; Fenenga 1952; Elsasser 1962; Fredrickson and Grossman 1977; Schiffman and Garfinkel 1981). Based on these sources, the general prehistory of the region can be outlined as follows.

Initial occupation of the region occurred at least as early as the *Paleoindian Period*, or prior to about 10,000 years before present (YBP). Evidence of early use of the region is indicated by characteristic fluted and stemmed points found around the margin of Tulare Lake, in the foothills of the Sierra, and in the Mojave Desert proper.

Both fluted and stemmed points are particularly common around lake margins, suggesting a terminal Pleistocene/early Holocene lakeshore adaptation similar to that found throughout the far west at the same time; little else is known about these earliest peoples. Over 250 fluted points have been recovered from the Witt Site (CA-KIN-32), located along the western shoreline of ancient Tulare Lake west of the study area, demonstrating the importance of this early occupation in the San Joaquin Valley specifically (see Fenenga 1993). Additional finds consist of a Clovis-like projectile point discovered in a flash-flood cut-bank near White Oak Lodge in 1953 on Tejon Ranch (Glennan 1987a, 1987b). More recently, a similar fluted point was found near Bakersfield (Zimmerman et al. 1989), and a number are known from the Edwards Air Force Base and Boron area of the western Mojave Desert. Although human occupation of the state is well-established during the Late Pleistocene, relatively little can be inferred about the nature and distribution of this occupation with a few exceptions. First, little evidence exists to support the idea that people at that time were big-game hunters, similar to those found on the Great Plains. Second, the western Mojave Desert evidence suggests small, very mobile populations that left a minimal archaeological signature. The evidence from the ancient Tulare Lake shore, in contrast, suggests much more substantial population and settlements which, instead of relying on big game hunting, were tied to the lacustrine lake edge. Variability in subsistence and settlement patterns is thus apparent in California, in contrast to the Great Plains.

Substantial evidence for human occupation across California, however, first occurs during the middle Holocene, roughly 7,500 to 4,000 YBP. This period is known as the *Early Horizon*, or alternatively as the Early Millingstone along the Santa Barbara Channel. In the south, populations concentrated along the coast with minimal visible use of inland areas. Adaptation emphasized hard seeds and nuts with tool-kits dominated by mullers and grindstones (manos and metates). Additionally, little evidence for Early Horizon occupation exists in most inland portions of the state, partly due to a severe cold and dry paleoclimatic period occurring at this time, although a site deposit dating to this age has been identified along the ancient Buena Vista shoreline in Kern County to the south (Rosenthal et al. 2007). Regardless of specifics, Early Horizon population density was low with a subsistence adaptation more likely tied to plant food gathering than hunting.

Environmental conditions improved dramatically after about 4,000 YBP during the *Middle Horizon* (or Intermediate Period). This period is known climatically as the Holocene Maximum (circa 3,800 YBP) and was characterized by significantly warmer and wetter conditions than previously experienced. It was marked archaeologically by large population increase and radiation into new environments along coastal and interior south-central California and the Mojave Desert (Whitley 2000). In the Delta region to the north, this same period of favorable environmental conditions was characterized by the appearance of the Windmiller culture which exhibited a high degree of ritual elaboration (especially in burial practices) and perhaps even a rudimentary mound-building tradition (Meighan, personal communication, 1985). Along with ritual elaboration, Middle Horizon times experienced increasing subsistence specialization, perhaps correlating with the appearance of acorn processing technology. Penutian speaking peoples (including the Yokuts) are also posited to have entered the state roughly at the beginning of this period and, perhaps to have brought this technology with them (cf. Moratto 1984). Likewise, it appears the so-called

"Shoshonean Wedge" in southern California, the Takic speaking groups that include the Gabrielino/Fernandeño, Tataviam and Kitanemuk, may have moved into the region at that time (Sutton 2009, rather than at about 1,500 YBP as first suggested by Kroeber (1925).

Evidence for Middle Horizon occupation of interior south-central California is substantial. For example, in northern Los Angeles County along the upper Santa Clara River, to the south of the San Joaquin Valley, the Agua Dulce village complex indicates occupation extending back to the Intermediate Period, when the population of the village may have been 50 or more people (King et al n.d.). Similarly, inhabitation of the Hathaway Ranch region near Lake Piru, and the Newhall Ranch near Valencia, appears to date to the Intermediate Period (W & S Consultants 1994). To the west, little or no evidence exists for pre-Middle Horizon occupation in the upper Sisquoc and Cuyama River drainages; populations first appear there at roughly 3,500 YBP (Horne 1981). The Carrizo Plain, the valley immediately west of the San Joaquin, experienced a major population expansion during the Middle Horizon (W & S Consultants 2004; Whitley et al. 2007), and recently collected data indicates the Tehachapi Mountains region was first significantly occupied during the Middle Horizon (W & S Consultants 2006). A parallel can be drawn to the inland Ventura County region where a similar pattern has been identified (Whitley and Beaudry 1991), as well as the western Mojave Desert (Sutton 1988a, 1988b), the southern Sierra Nevada (W & S Consultants 1999), and the Coso Range region (Whitley et al. 1988). In all of these areas a major expansion in settlement, the establishment of large site complexes and an increase in the range of environments exploited appear to have occurred sometime roughly around 4,000 years ago. Although most efforts to explain this expansion have focused on local circumstances and events, it is increasingly apparent this was a major southern California-wide occurrence and any explanation must be sought at a larger level of analysis (Whitley 2000). Additionally, evidence from the Carrizo Plain suggests the origins of the tribelet level of political organization developed during this period (W & S Consultants 2004; Whitley et al. 2007). Whether this same demographic process holds for the southern San Joaquin Valley, including the study area, is yet to be determined.

The beginning of the *Late Horizon* is set variously at 1,500 and 800 YBP, with a growing archaeological consensus for the shorter chronology. Increasing evidence suggests the importance of the Middle-Late Horizons transition (AD 800 to 1200) in the understanding of south-central California prehistory. This corresponds to the so-called Medieval Climatic Anomaly, followed by the Little Ice Age, and this general period of climatic instability extended to about A.D. 1860. It included major droughts matched by intermittent “mega-floods,” and resulted in demographic disturbances across much of the west (Jones et al. 1999). It is believed to have resulted in major population decline and abandonments across south-central California, involving as much as 90% of the interior populations in some regions, including the Carrizo Plain (Whitley et al. 2007). It is not clear whether site abandonment was accompanied by a true reduction in population or an agglomeration of the same numbers of peoples into fewer but larger villages in more favorable locations. Population along the Santa Barbara coast appears to have spiked at about the same time that it collapsed on the Carrizo Plain (ibid). Along Buena Vista Lake, in Kern County to the south, population appears to have been increasingly concentrated towards the later end of the Medieval Climatic Anomaly (Culleton 2006), and population intensification also appears to have occurred in the well-watered Tehachapi Mountains during this same period (W & S Consultants 2006).

What is then clear is that Middle Period villages and settlements were widely dispersed across the south-central California landscape, including in the Sierras and the Mojave Desert. Many of these sites are found at locations that lack existing or known historical fresh water sources. Late Horizon sites, in contrast, are typically concentrated in areas where fresh water was available during the historical period, if not currently.

One extensively studied site that shows evidence of intensive occupation during the Middle-Late Horizons transition (~1,500 – 500 YBP) is the Redtfeldt Mound (CA-KIN-66/H), located west of the current study area, near the north shore of ancient Tulare Lake and Lemoore. There, Siefkin (1999) reported on human burials and a host of artifacts and ecofacts excavated from a modest-sized mound. He found that both Middle Horizon and Middle-Late Horizons transition occupations were more intensive than Late Horizon occupations, which were sporadic and less intensive (Siefkin 1999:110-111).

The Late Horizon can then be understood as a period of recovery from a major demographic collapse. One result is the development of regional archaeological cultures as the precursors to ethnographic Native California; suggesting that ethnographic life-ways recorded by anthropologists extend roughly 800 years into the past.

The position of San Joaquin Valley prehistory relative to patterns seen in surrounding areas is still somewhat unknown. The presence of large lake systems in the valley bottoms appears to have mediated some of the desiccation seen elsewhere. But, as the reconstruction of Soda Lake in the nearby Carrizo Plain demonstrates (see Whitley et al. 2007) environmental perturbations had serious impacts on lake systems too. Identifying certain of the prehistoric demographic trends for the San Joaquin Valley, and determining how these trends (if present) correlate with those seen elsewhere, is a current important research objective.

2.4 HISTORICAL BACKGROUND

Spanish explorers first visited the San Joaquin Valley in 1772, but its lengthy distance from the missions and presidios along the Pacific Coast delayed permanent settlement for many years, including during the Mexican period of control over the Californian region. In the 1840s, Mexican rancho owners along the Pacific Coast allowed their cattle to wander and graze in the San Joaquin Valley (JRP Historical Consulting 2009). The Mexican government granted the first ranchos in the southern part of the San Joaquin Valley in the early 1840s, but these did not result in permanent settlement. It was not until the annexation of California in 1848 that the exploitation of the southern San Joaquin Valley began (Pacific Legacy 2006).

The discovery of gold in northern California in 1848 resulted in a dramatic increase of population, consisting in good part of fortune seekers and gold miners, who began to scour other parts of the state. After 1851, when gold was discovered in the Sierra Nevada Mountains in eastern Kern County, the population of the area grew rapidly. Some new immigrants began ranching in the San Joaquin Valley to supply the miners and mining towns. Ranchers grazed cattle and sheep, and farmers dry-farmed or used limited irrigation to grow grain crops, leading to the creation of small agricultural communities throughout the valley (JRP Historical Consulting 2009).

After the American annexation of California, the southern San Joaquin Valley became significant as a center of food production for this new influx of people in California. The expansive unfenced and principally public foothill spaces were well suited for grazing both sheep and cattle (Boyd 1997). As the Sierra Nevada gold rush presented extensive financial opportunities, ranchers introduced new breeds of livestock, consisting of cattle, sheep and pig (Boyd 1997).

With the increase of ranching in the southern San Joaquin came the dramatic change in the landscape, as non-native grasses more beneficial for grazing and pasture replaced native flora (Preston 1981). After the passing of the Arkansas Act in 1850, efforts were made to reclaim small tracts of land in order to create more usable spaces for ranching. Eventually, as farming supplanted ranching as a more profitable enterprise, large tracts of land began to be reclaimed for agricultural use, aided in part by the extension of the railroad in the 1870s (Pacific Legacy 2006).

Following the passage of state-wide ‘No-Fence’ laws in 1874, ranching practices began to decline, while farming expanded in the San Joaquin Valley in both large land holdings and smaller, subdivided properties. As the farming population grew, so did the demand for irrigation. Settlers began reclamation of swampland in 1866, building small dams across the rivers to divert water for agricultural purposes. During this period of reclaiming unproductive land in the San Joaquin Valley, grants were given to individuals who had both the resources and the finances to undertake the operation alone. But three competing partnerships developed during this period which had a great impact on control of water, land reclamation and ultimately agricultural development in the San Joaquin Valley: Livermore and Chester, Haggin and Carr, and Miller and Lux, perhaps the most famous of the enterprises. Livermore and Chester were responsible, among other things, for developing the large Hollister plow (three feet wide by two feet deep), pulled by a 40-mule team, which was used for ditch digging. Haggin and Carr were largely responsible for reclaiming the beds of the Buena Vista and Kern lakes, and for creating the Calloway Canal, which drained through the Rosedale area in Bakersfield to Goose Lake (Morgan 1914). Miller and Lux ultimately became one of the biggest private property holders in the country, controlling the rights to over 22,000 square miles. They recognized early-on that control of water would have important economic implications, and they played a major role in the water development of the state. They controlled, for example, over 100 miles of the San Joaquin River with the San Joaquin and Kings River Canal and Irrigation System. They were also embroiled for many years in litigation against Haggin and Carr over control of the water rights to the Kern River. Descendants of Henry Miller continue to play a major role in California water rights, with his great grandson, George Nickel, Jr., the first to develop the concept of water banking, thus creating a system to buy and sell water (http://exiledonline.com/california-class-war-history-meet-the-oligarch-family-thats-been-scamming-taxpayers-for-150-years-and-counting/).

Millerton, now inundated by Millerton Lake, was the original historical focus of settlement in the region, initially serving as the capital of Fresno County. After its inundation in the great San Joaquin River flood of 1867, the focus of settlement shifted to what is now Fresno, especially after 1872 when the Southern Pacific Railroad created a station in this then-small town. Madera County was formed from the northern portion of Fresno County in 1893, but the metropolitan Fresno area remains the greatest population center in the region.

The San Joaquin Valley was dominated by agricultural pursuits until the oil boom of the early 1900s, which saw a shift in the region, as some reclaimed lands previously used for farming were leased to oil companies. Nonetheless, the shift of the San Joaquin Valley towards oil production did not halt the continued growth of agriculture (Pacific Legacy 2006). The Great Depression of the 1930s brought with it the arrival of great number of migrants from the drought-affected Dust Bowl region, looking for agricultural labor. These migrants established temporary camps in the valley, staying on long past the end of the drought and the Great Depression, eventually settling in towns such as Bakersfield and Fresno where their descendants live today (Boyd 1997).

The City of Madera, the nearest population center to the Project APE, had its beginning as a logging town in 1876. A 63-mi water flume carried lumber from the Sierra Nevada to Madera to be shipped by train to buyers. The first post office opened in 1877, and Madera was incorporated on March 27, 1907 (Durham 1998). Agriculture makes up over 17 percent of industry in Madera, with almost 14 percent of Madera's population employed in agricultural work (http://www.city-data.com/city/Madera-California.html).

2.5 RESEARCH DESIGN

2.5.1 Pre-Contact Archaeology

Previous research and the nature of the pre-contact archaeological record suggest two significant NRHP themes, both of which fall under the general Pre-Contact Archaeology area of significance. These are the Expansion of Pre-Contact Populations and Their Adaptation to New Environments; and Adaptation to Changing Environmental Conditions.

The Expansion of Pre-Contact Populations and Their Adaptation to New Environments theme primarily concerns the Middle Horizon/Holocene Maximum. Its period of significance runs from about 4,000 to 1,500 YBP. It involves a period during which the prehistoric population appears to have expanded into a variety of new regions, developing new adaptive strategies in the process.

The Adaptation to Changing Environmental Conditions theme is partly related to the Holocene Maximum, but especially to the Medieval Climatic Anomaly. The period of significance for this theme, accordingly, extends from about 4,000 to 800 YBP. This theme involves the apparent collapse of many inland populations, presumably with population movements to better environments such as the coast. It is not yet known whether the southern San Joaquin Valley, with its system of lakes, sloughs and swamps, experienced population decline or, more likely, population increase due to the relatively favorable conditions of this region during this period of environmental stress.

The range of site types that are present in this region include:

- Villages, primarily located on or near permanent water sources, occupied by large groups during the winter aggregation season;
- Seasonal camps, again typically located at water sources, occupied during other parts of the year tied to locally and seasonally available food sources;

- Special activity areas, especially plant processing locations containing bedrock mortars (BRMs), commonly (though not exclusively) near existing oak woodlands, and invariably at bedrock outcrops or exposed boulders;
- Stone quarries and tool workshops, occurring in two general contexts: at or below naturally occurring chert exposures on the eastern front of the Temblor Range; and at quartzite cobble exposures, often on hills or ridges;
- Ritual sites, most commonly pictographs (rock art) found at rockshelters or large exposed boulders, and cemeteries, both commonly associated with villages; and
- A variety of small lithic scatters (low density surface scatters of stone tools).

The first requisites in any research design are the definition of site age/chronology and site function. The ability to determine either of these basic kinds of information may vary between survey and test excavation projects, and due to the nature of the sites themselves. BRM sites without associated artifacts, for example, may not be datable beyond the assumption that they post-date the Early Horizon and are thus less than roughly 4,000 years old.

A second fundamental issue involves the place of site in the settlement system, especially with respect to water sources. Because the locations of the water sources have sometimes changed over time, villages and camps are not exclusively associated with existing (or known historical) water sources (W&S Consultants 2006). The size and locations of the region’s lakes, sloughs and delta channels, to cite the most obvious example, changed significantly during the last 12,000 years due to major paleoclimatic shifts. This altered the area’s hydrology and thus prehistoric settlement patterns. The western shoreline of Tulare Lake was relatively stable, because it abutted the Kettleman Hills. But the northern, southern and eastern shorelines comprised the near-flat valley floor. Relatively minor fluctuations up or down in the lake level resulted in very significant changes in the areal expression of the lake on these three sides, and therefore the locations of villages and camps. Although perhaps not as systematic, similar changes occurred with respect to stream channels and sloughs, and potential site locations associated with them. This circumstance has implications for predicting site locations and archaeological sensitivity. Site sensitivity is then hardest to predict in the open valley floor, where changes in stream courses and lake levels occurred on numerous occasions.

Nonetheless, the position of San Joaquin Valley prehistory relative to the changing settlement and demographic patterns seen in surrounding areas is still somewhat unknown (cf. Siefkin 1999), including to the two NRHP themes identified above. The presence of large lake systems in the valley bottoms can be expected to have mediated some of the effects of desiccation seen elsewhere. But, as the reconstruction of Soda Lake in the nearby Carrizo Plain demonstrates (see Whitley et al. 2007), environmental perturbations had serious impacts on lake systems too. Identifying certain of the prehistoric demographic trends for the San Joaquin Valley, and determining how these trends (if present) correlate with those seen elsewhere, is another primary regional research objective.

Archaeological sites would primarily be evaluated for NRHP eligibility under Criterion D, research potential.

2.5.2 Historical Archaeology: Native American

Less research has been conducted on the regional historical archaeological record, both Native American and Euro-American. For Native American historical sites, the ethnographic and ethnohistoric periods in the southern San Joaquin Valley extended from first Euro-American contact, in AD 1772, to circa 1900, when tribal populations were first consolidated on reservations. The major significant historic NRHP themes during this period of significance involve the related topics of Historic-Aboriginal Archaeology, and Native American Ethnic Heritage. More specifically, these concern the Adaptation of the Indigenous Population to Euro-American Encroachment and Settlement, and their Acculturation to Western Society. These processes included the impact of missionization on the San Joaquin Valley (circa 1800 to about 1845); the introduction of the horse and the development of a San Joaquin Valley “horse culture,” including raiding onto the coast and Los Angeles Basin (after about 1810); the use of the region as a refuge for mission neophyte escapees (after 1820); responses to epidemics from introduced diseases (especially in the 1830s); armed resistance to Euro-American encroachment (in the 1840s and early 1850s); the origins of the reservation system and the development of new tribal organizations and ethnic identities; and, ultimately, the adoption of the Euro-American society’s economic system and subsistence practices, and acculturation into that society.

Site types that have been identified in the region dating to the ethnographic/ethnohistoric period of significance primarily include villages and habitations, some of which contain cemeteries and rock art (including pictographs and cupules). Dispersed farmsteads, dating specifically from the reservation period or post-1853, would also be expected. The different social processes associated with this historical theme may be manifest in the material cultural record in terms of changing settlement patterns and village organization (from traditional nucleated villages to single family dispersed farmsteads); the breakdown of traditional trading networks with their replacement by new economic relationships; changing subsistence practices, especially the introduction of agriculture initially via escaped mission neophytes; the use of Euro-American artifacts and materials rather than traditional tools and materials; and, possibly, changing mortuary practices.

Inasmuch as culture change is a primary intellectual interest in archaeology, ethnographic villages and habitations may be NRHP eligible under Criterion D, research potential. Rock art sites, especially pictographs, may be eligible under Criterion C as examples of artistic mastery. They may also be eligible under Criterion A, association with events contributing to broad patterns of history. Ethnographic sites, further, may be NRHP eligible as Traditional Cultural Properties due to potential continued connections to tribal descendants, and their resulting importance in traditional practices and beliefs, including their significance for historical memory, tribal- and self-identity formation, and tribal education.

For Criteria A, C and D, eligibility requires site integrity (including the ability to convey historical association for Criterion A). These may include intact archaeological deposits for Criterion D, as well as setting and feel for Criteria C and A. Historical properties may lack physical integrity, as normally understood in heritage management, but still retain their significance to Native American tribes as Traditional Cultural Properties if they retain their tribal associations and uses.

2.5.3 Historical Archaeology: Euro-American

Approaches to historical Euro-American archaeological research relevant to the region have been summarized by Caltrans (1999, 2000, 2007, 2008). These concern the general topics of historical landscapes, agriculture and farming, irrigation (water conveyance systems), and mining. Caltrans has also identified an evaluation matrix to aid in determinations of eligibility. The identified research issues include site structure and land-use (lay-out, land use, feature function); economics (self-sufficiency, consumer behavior, wealth indicators); technology and science (innovations, methods); ethnicity and cultural diversity (religion, race); household composition and lifeways (gender, children); and labor relations. Principles useful for determining the research potential of an individual site or feature are conceptualized in terms of the mnemonic AIMS-R, as follows:

1. *Association* refers to the ability to link an assemblage of artifacts, ecofacts, and other cultural remains with an individual household, an ethnic or socioeconomic group, or a specific activity or property use.

2. *Integrit*y addresses the physical condition of the deposit, referring to the intact nature of the archaeological remains. In order for a feature to be most useful, it should be in much the same state as when it was deposited. However, even disturbed deposits can yield important information (e.g., a tightly dated deposit with an unequivocal association).

3. *Materials* refers to the number and variety of artifacts present. Large assemblages provide more secure interpretations as there are more datable items to determine when the deposit was made, and the collection will be more representative of the household, or activity. Likewise, the interpretive potential of a deposit is generally increased with the diversity of its contents, although the lack of diversity in certain assemblages also may signal important behavioral or consumer patterns.

4. *Stratigraphy* refers to the vertically or horizontally discrete depositional units that are distinguishable. Remains from an archaeological feature with a complex stratigraphic sequence representative of several events over time can have the added advantage of providing an independent chronological check on artifact diagnosis and the interpretation of the sequence of environmental or sociocultural events.

5. *Rarity* refers to remains linked to household types or activities that are uncommon. Because they are scarce, they may have importance even in cases where they otherwise fail to meet other thresholds of importance (Caltrans 2007:209).

For agricultural sites, Caltrans (2007) has identified six themes to guide research: Site Structure and Land Use Pattern; Economic Strategies; Ethnicity and Cultural Adaptation; Agricultural Technology and Science; Household Composition and Lifeways; and Labor History. Expected site types would include farm and ranch homesteads and facilities, line camps, and refuse dumps. In general terms, historical Euro-American archaeological sites would be evaluated for NRHP eligibility under Criterion D, research potential. However, they also potentially could be eligible under Criteria A and B for their associate values with major historical trends or individuals. Historical landscapes might also be considered. Historical structures are typically evaluated for

NRHP eligibility under Criteria A and/or B, for their associative values with major historical trends or individuals, and C for potential design or engineering importance.

3. ARCHIVAL RECORDS SEARCH

3.1 ARCHIVAL RECORDS SEARCH

In order to determine whether the APE and buffer survey area had been previously surveyed for cultural resources, and/or whether any such resources were known to exist within it, an archival records search was conducted by the staff of the Southern San Joaquin Valley Information Center (IC). The records search was completed to determine: (i) if prehistoric or historical archaeological sites had previously been recorded within the APE; (ii) if the Project area had been systematically surveyed by archaeologists prior to the initiation of this field study; and/or (iii) whether the region of the Project was known to contain archaeological sites and to thereby be archaeologically sensitive. Records examined included archaeological site files and maps, the NRHP, Historic Property Data File, California Inventory of Historic Resources, and the California Points of Historic Interest.

According to the IC record search (Confidential Appendix A), no previous studies are known to have been conducted within the APE and buffer, though one large geoarchaeological study of Caltrans Districts 6 and 9 had covered the APE (Table 1). No cultural resources of any kind are known to exist within it. No previous surveys had been conducted within 0.5-mi of the APE and buffer, and no previously recorded cultural resources were known to exist in that same radius.

Table 1. Survey Reports within the 0.5-mi of the Study Area

Report No.	Year	Author (s)/Affiliation	Title
MA-01201	2010	Meyer, Jack, Young, D. Craig, and Rosenthal, Jeffrey/ Far Western Anthropological Research Group, Inc.	Volume I: A Geoarchaeological Overview and Assessment of Caltrans Districts 6 and 9 - Cultural Resources Inventory of Caltrans District 6/9 Rural Conventional Highways - EA 06-0A7408 TEA Grant
MA-01201A	2010	Meyer, Jack, Young, D. Craig, and Rosenthal, Jeffrey/ Far Western Anthropological Research Group, Inc.	Volume II: Appendices A Geoarchaeological Overview and Assessment of Caltrans District 6 and 9 - Cultural Resources Inventory of Caltrans District 6/9 Rural Conventional Highways - EA 06-0A7408 TEA Grant

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File was also completed for the Project. The results were negative (Confidential Appendix A). Outreach letters and follow-up emails were sent to the tribal organizations on the NAHC contact list (Confidential Appendix A). Two written response was received: one from the North Valley Yokuts in which they requested an on-site visit, and another from the Dumna Wo-Wah Tribal Government who responded in writing and requested monitoring during ground disturbing activities.

Given the absence of previously recorded resources and the location of the Project APE in an area with very low potential for buried archaeological deposits, the study area appeared to have low potential for archaeological resources.

4. METHODS AND RESULTS

4.1 FIELD METHODS

An intensive Class III inventory/Phase I survey of the MWD Madera Lake Pump & Pipeline Project APE and survey area was conducted by ASM Associate Archaeologist Robert Azpitarte, B.A., in April and August 2020. The field methods employed included intensive pedestrian examination of the ground surface for evidence of archaeological sites in the form of artifacts, surface features (such as bedrock mortars, historical mining equipment), and archaeological indicators (e.g., organically enriched midden soil, burnt animal bone); the identification and location of any discovered sites, should they be present; tabulation and recording of surface diagnostic artifacts; site sketch mapping; preliminary evaluation of site integrity; and site recording, following the California Office of Historic Preservation Instructions for Recording Historic Resources, using DPR 523 forms.

The survey employed parallel transects spaced at a minimum of 15-m along the entirety of the Project APE and survey buffer area. Where ground surface visibility was impeded, special attention paid to rodent back-dirt piles and other cleared spaces to provide adequate survey coverage.

4.2 SURVEY RESULTS

As noted above, the study area consisted primarily of dirt roads within orchards and some open land near Madera Lake (Figure 2 and 3). Ground-surface visibility was excellent along the pipeline route, representing the large majority of the APE and survey buffer area. Low-cover grass was present adjacent to Madera Lake, at the south end of the Project. Special attention was directed at cleared areas within this location and the immediately surrounding areas (adjacent to the survey buffer) to insure adequate survey coverage.

One cultural resource was identified and recorded during the inventory: Madera Lake. Madera Lake is an artificial water body that was constructed for recreational purposes in 1958 by the Madera County Recreation Commission. Funding for the project was provided by the State of California Wildlife Conservation Board. This included approximately $96,000 to purchase 1,160-acres from the Carlson Brothers Ranch and about $219,000 for development costs (Anonymous 1958).

The lake is located in a former slough a short distance north of the Fresno River bed, east of the town of Madera. As a natural, narrow water trap, this spot was used as a small livestock reservoir by the Archibald Ranch starting circa 1914. Based on 1940 and 1946 air photos (at historicaerials.com) it still held water into that decade and may have been enlarged in the interim between the two images. The reservoir had been destroyed and abandoned, however, by the mid-1950s. A period description, referencing plans for the future Madera Lake, describes the former ranch reservoir as follows:

> "At the site at present there is [sic] the remains of an old levee 6000 [sic] feet long. This would be enlarged, a 20 foot gap would be closed, a drainage outlet, access roads and service roads would be built and pumps installed" (Anonymous 1956).

Although some early documents refer to the planned water body as "Archibald Lake," the Conservation Board officially changed its name to "Madera Lake" with the approval of funding in 1957 (Anonymous 1957).

The intended purpose of the lake was to promote tourism to enhance the local economy with a warm-water fishery. Initial estimates predicted that it would generate $300,000 per year in business. The project resulted in debate, if not controversy, from its initial conceptualization in the mid-1950s, however. This continued until at least the late-1960s, involving who would operate and control the lake, how it would be engineered and especially the source of its water. The Madera Irrigation District (MID) specifically had promoted the idea of creating the lake as part of their water control and conveyance system. The county ultimately rejected their suggestion and had the lake engineered using two pumps on the nearby Fresno River to supply water. In part this decision was tied to the fact that the MID did not then include the lake location within its service area boundaries and it had no authorization to use its water for recreational purposes (Anonymous 1956).

The lake was officially opened for fishing on Labor Day weekend, 1959 (Anonymous 1959). Although 1700 anglers appeared for the opening, adequate water was already a problem, even for a warm water fishery: there was not enough surplus water in the Fresno River to fully supply the lake (Anonymous 1959b). By 1963 the *Madera Tribune* referred to the lake as a "$400,000 mudhole" and the project as a scandal (Anonymous 1963a). And by 1964, the Chair of the Madera County Recreation Commission suggested that the lake should be abandoned if the Fresno River did not have enough water to fill it (Anonymous 1964a).

The County attempted to resolve the water problem during the 1960s. Recognizing the inadequacy of the two Fresno River pumps, a volunteer citizens group undertook the construction of a weir and canal from the river to the lake (Anonymous 1964b), and new park facilities and water control features were constructed, shown on a 1966 California Department of Fish and Game Dam Safety Application (no. 1-3682). But these actions proved unsuccessful and the planned formal re-opening in 1966 was postponed (Anonymous 1966). A 1968 engineering report identified a major leak through a sand lens equivalent to a 30-inch diameter outlet pipe as one source of continuing difficulty (Anonymous 1968).

The MID had also raised the possibility of acquiring the lake from the County at various times during the 1960s, with a plan of supplying it with water from the Madera Equalization Reservoir, one of its upstream sources, through a canal constructed for that purpose (e.g., Anonymous 1962, 1963b, 1968). A major impediment to this proposal involved the fact that the water in question derived from the Central Valley Project (CVP) and U.S. Bureau of Reclamation authorization was required for such an action. After more than a decade of requests and negotiations, MID eventually acquired Lake Madera from the County, using it for stock-water, storage, groundwater recharge, and downstream regulation using water diverted from the Fresno River.

Figure 2. Pipeline corridor at approximate center, looking south.

Figure 3. Approximate pump location and start of pipeline, looking west.

The segment of the lake levee, Madera Lake Dam (DSOD #682-000-CA00027), within the Project APE was recorded during the inventory (Figure 4; Confidential Appendix B). This is an earthen embankment that, at this location, runs north-south. It is approximately 31-ft high with the recorded segment measuring 30-m long and 25-m wide. A dirt road currently runs along the top of the dam, which impounds about 2,300-acre-feet of water at capacity.

Figure 4. Top of Madera Lake levee at location of proposed pipe crossing, looking south.

No additional cultural resources were identified within the Project APE and survey buffer area.

5. SUMMARY AND RECOMMENDATIONS

An intensive Class III archaeological inventory/Phase I survey was conducted for the MWD Madera Lake Pump & Pipeline Project, Madera County, California. A records search was conducted at the Southern San Joaquin Valley Archaeological Information Center, California State University, Bakersfield. This indicated that the APE and survey buffer area had not been previously surveyed and that no cultural resources of any kind were known to exist within it. The NAHC Sacred Lands Files were also consulted, with negative results. Outreach letters and follow-up emails were sent to tribal organizations on the NAHC contact list. The North Valley Yokuts responded in writing requesting an on-site visit. The Dumna Wo-Wah Tribal Government also responded in writing and requested monitoring during ground disturbing activities.

A geoarchaeological assessment that covered the Project APE and survey buffer indicated that it has Very Low to Low likelihood for buried archaeological resources (Meyer et al. 2010). The distribution of known historical Native American villages supports this conclusion.

The Class III inventory/Phase I survey fieldwork was conducted with parallel transects spaced at 15-meter intervals along the APE and survey buffer. One cultural resource, historical Madera Lake, was identified and recorded. This lake was created in 1958 by the Madera County Recreation Commission to promote tourism with a warm water fishery. It proved impractical to obtain an adequate water supply and the lake was eventually acquired by the MID. It now serves as a storage, regulation and ground water recharge facility. No other archaeological resources or historical structures were identified within the Project APE and survey buffer. Given the geomorphological context of the Project, within a former side-slough of the Fresno River, and the Very Low to Low archaeological sensitivity of this location, it is unlikely that buried archaeological remains would be present.

5.1 RECOMMENDATIONS

A Class III inventory/Phase I survey of the Madera Lake Pump and Pipeline Project APE and survey buffer resulted in the identification and recording of Madera Lake, constructed in 1958. This lake meets the National Register of Historic Places (NRHP) and California Register of Historical Resources (CRHR) age criterion for listing. Originally created as a recreational facility and subsequently acquired by the MID as part of their water conveyance system, it is not associated with an important historical event (Criterion A/1) or individual (Criterion B/2). Built with an earthen embankment across a natural valley forming a reservoir, it is a common property type that is not notable for engineering, craftsmanship or style, and is not eligible under Criterion C/3. As a recently built structure, it does not have research potential that is not better provided by written documents (Criterion D/4). Madera Lake accordingly is recommended as not NRHP/CRHR eligible, and does not constitute a historic property under NHPA Section 106 or a significant or unique historical resource under CEQA. A determination of No Historic Properties Affected and No Significant Adverse Impact is therefore recommended for the proposed Project.

In the unlikely event that cultural resources are discovered during the construction and operation of the Project, however, it is recommended that an archaeologist be contacted to evaluate the find and to assist with the development of a treatment plan, if warranted.

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CONFIDENTIAL APPENDIX A

Appendix D

NRCS Soils Report

United States Department of Agriculture

NRCS

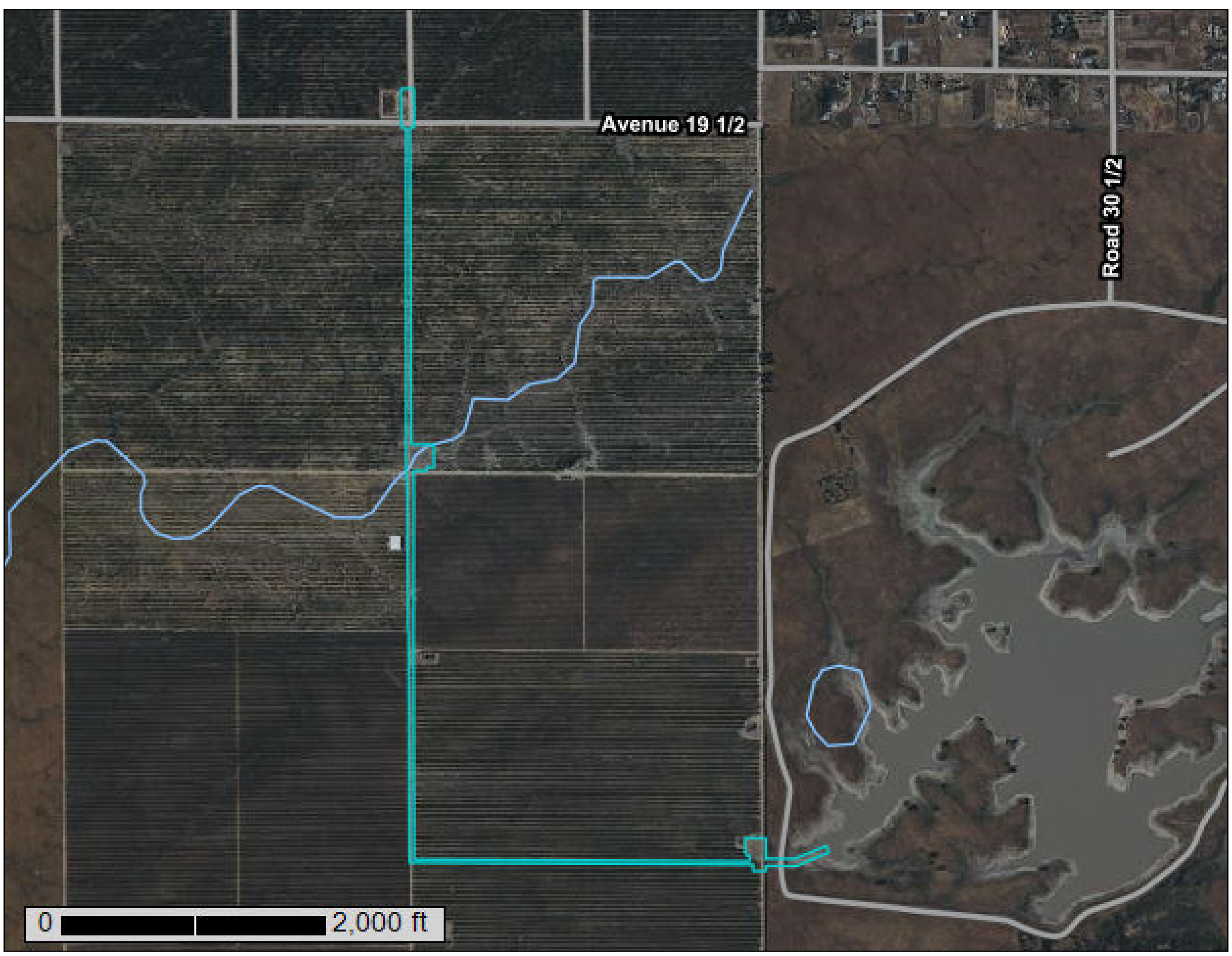
Natural Resources Conservation Service

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

Madera Area, California

Madera Lake Pipeline



July 30, 2020

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 (https://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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

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.

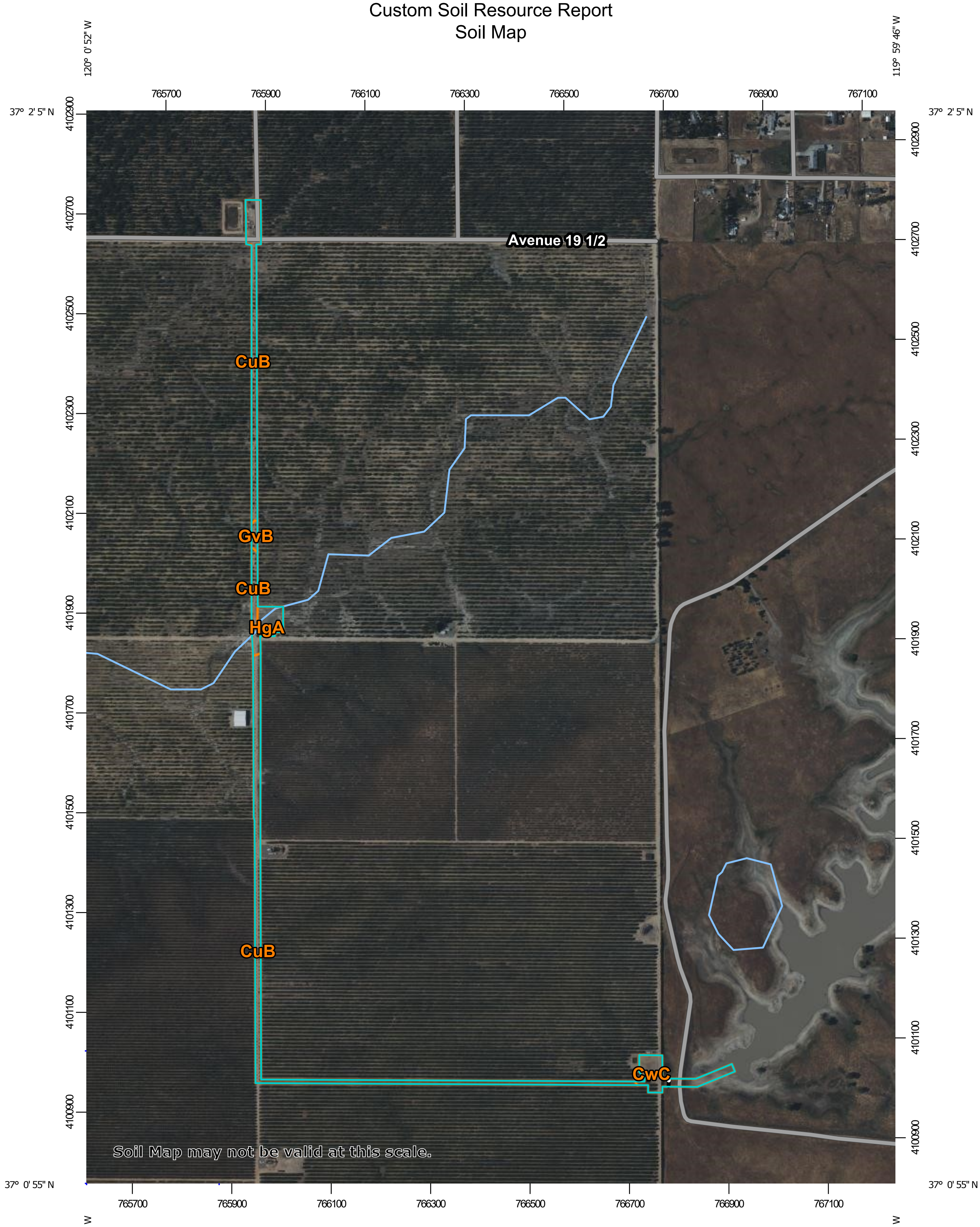
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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



Map Scale: 1:10,500 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 150, 300, 600, 900

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N 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 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Madera Area, California
Survey Area Data: Version 14, Jun 1, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 4, 2019—Jun 19, 2019

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CuB	Cometa sandy loams, 3 to 8 percent slopes	6.6	72.9%
CwC	Cometa-Whitney sandy loams, 8 to 15 percent slopes	1.4	15.0%
GvB	Greenfield sandy loam, moderately deep and deep over hardpan, 3 to 8 percent slopes	0.2	1.8%
HgA	Hanford sandy loam, moderately deep and deep over hardpan, 0 to 3 percent slopes	0.9	10.2%
Totals for Area of Interest		**9.1**	**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.

Madera Area, California

CuB—Cometa sandy loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: hk5j
Elevation: 20 to 400 feet
Mean annual precipitation: 10 to 23 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 260 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Cometa and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cometa

Setting

Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 17 inches: sandy loam
H2 - 17 to 27 inches: sandy clay
H3 - 27 to 60 inches: stratified sandy loam to sandy clay loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 17 inches to abrupt textural change
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

San joaquin

Percent of map unit: 10 percent
Hydric soil rating: No

Whitney

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed, ponded

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

CwC—Cometa-Whitney sandy loams, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: hk5m
Elevation: 20 to 500 feet
Mean annual precipitation: 10 to 23 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Cometa and similar soils: 46 percent
Whitney and similar soils: 44 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cometa

Setting

Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 17 inches: sandy loam
H2 - 17 to 27 inches: sandy clay
H3 - 27 to 60 inches: stratified sandy loam to sandy clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 17 inches to abrupt textural change
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Whitney

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Concave
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 19 inches: sandy loam
H2 - 19 to 28 inches: fine sandy loam
Cr - 28 to 60 inches: weathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 28 to 32 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

San joaquin

Percent of map unit: 8 percent
Hydric soil rating: No

Unnamed, ponded

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

GvB—Greenfield sandy loam, moderately deep and deep over hardpan, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: hk7m
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Greenfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Greenfield

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 23 inches: sandy loam
H2 - 23 to 40 inches: sandy loam
H3 - 40 to 60 inches: cemented

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: 40 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A

Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Ramona

Percent of map unit: 5 percent
Hydric soil rating: No

San joaquin

Percent of map unit: 5 percent
Hydric soil rating: No

HgA—Hanford sandy loam, moderately deep and deep over hardpan, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: hk7v
Elevation: 150 to 900 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 250 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hanford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hanford

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous rock

Typical profile

H1 - 0 to 12 inches: sandy loam
H2 - 12 to 36 inches: fine sandy loam
H3 - 36 to 60 inches: cemented

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 36 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Madera

Percent of map unit: 5 percent
Hydric soil rating: No

San joaquin

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Irrigated Capability Class

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations that show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels-capability class, subclass, and unit. Only class and subclass are included in this data set.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

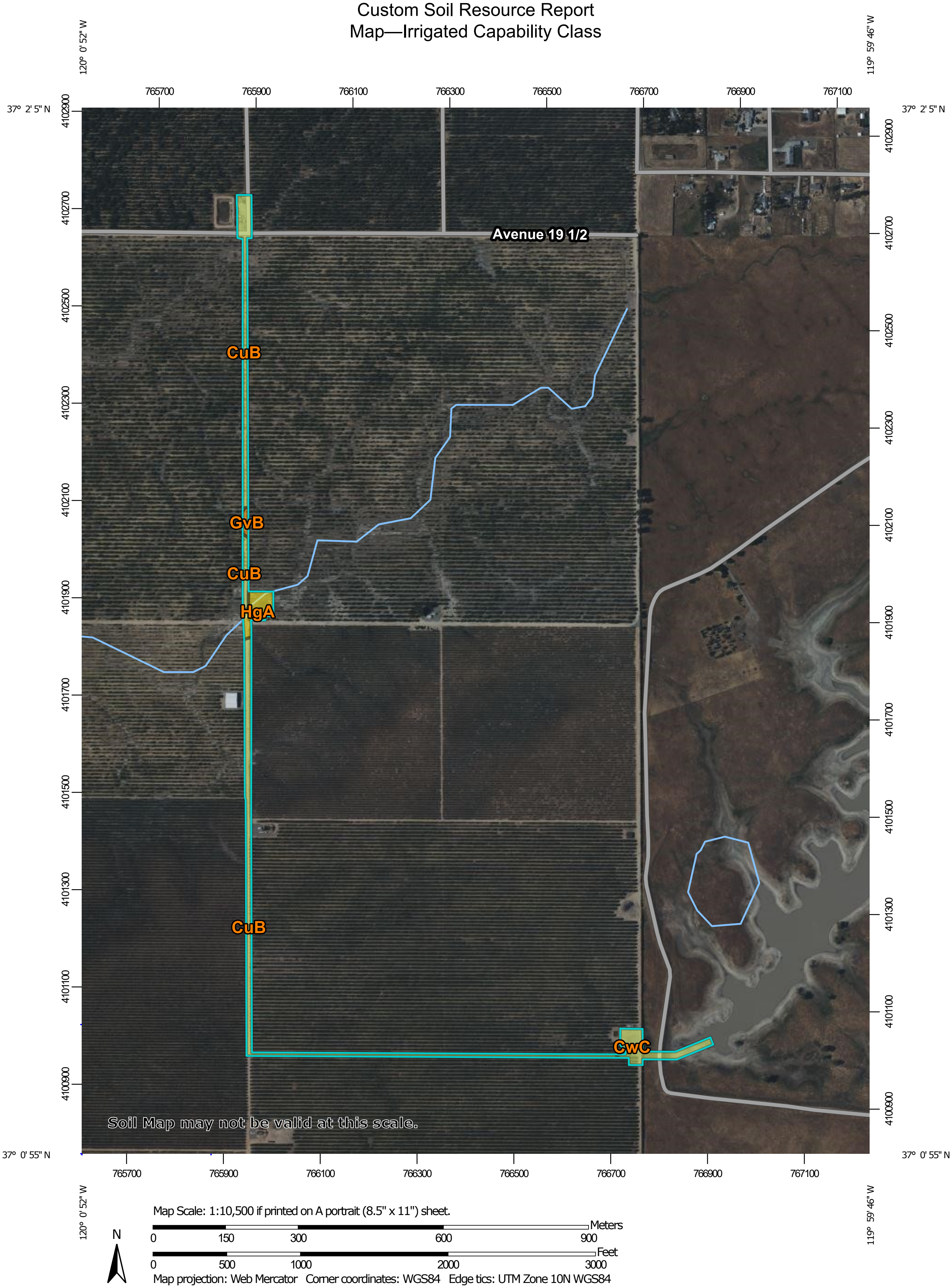
Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Map—Irrigated Capability Class



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Capability Class - I
- Capability Class - II
- Capability Class - III
- Capability Class - IV
- Capability Class - V
- Capability Class - VI
- Capability Class - VII
- Capability Class - VIII
- Not rated or not available

Soil Rating Lines
- Capability Class - I
- Capability Class - II
- Capability Class - III
- Capability Class - IV
- Capability Class - V
- Capability Class - VI
- Capability Class - VII
- Capability Class - VIII
- Not rated or not available

Soil Rating Points
- Capability Class - I
- Capability Class - II
- Capability Class - III
- Capability Class - IV
- Capability Class - V
- Capability Class - VI
- Capability Class - VII
- Capability Class - VIII
- Not rated or not available

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 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Madera Area, California
Survey Area Data: Version 14, Jun 1, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 4, 2019—Jun 19, 2019

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.

Table—Irrigated Capability Class

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CuB	Cometa sandy loams, 3 to 8 percent slopes	4	6.6	72.9%
CwC	Cometa-Whitney sandy loams, 8 to 15 percent slopes	4	1.4	15.0%
GvB	Greenfield sandy loam, moderately deep and deep over hardpan, 3 to 8 percent slopes	2	0.2	1.8%
HgA	Hanford sandy loam, moderately deep and deep over hardpan, 0 to 3 percent slopes	3	0.9	10.2%
Totals for Area of Interest			**9.1**	**100.0%**

Rating Options—Irrigated Capability Class

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

California Revised Storie Index (CA)

The Revised Storie Index is a rating system based on soil properties that govern the potential for soil map unit components to be used for irrigated agriculture in California.

The Revised Storie Index assesses the productivity of a soil from the following four characteristics:

- Factor A: degree of soil profile development

- Factor B: texture of the surface layer

- Factor C: steepness of slope

- Factor X: drainage class, landform, erosion class, flooding and ponding frequency and duration, soil pH, soluble salt content as measured by electrical conductivity, and sodium adsorption ratio

Revised Storie Index numerical ratings have been combined into six classes as follows:

- Grade 1: Excellent (81 to 100)

- Grade 2: Good (61 to 80)

- Grade 3: Fair (41 to 60)

- Grade 4: Poor (21 to 40)

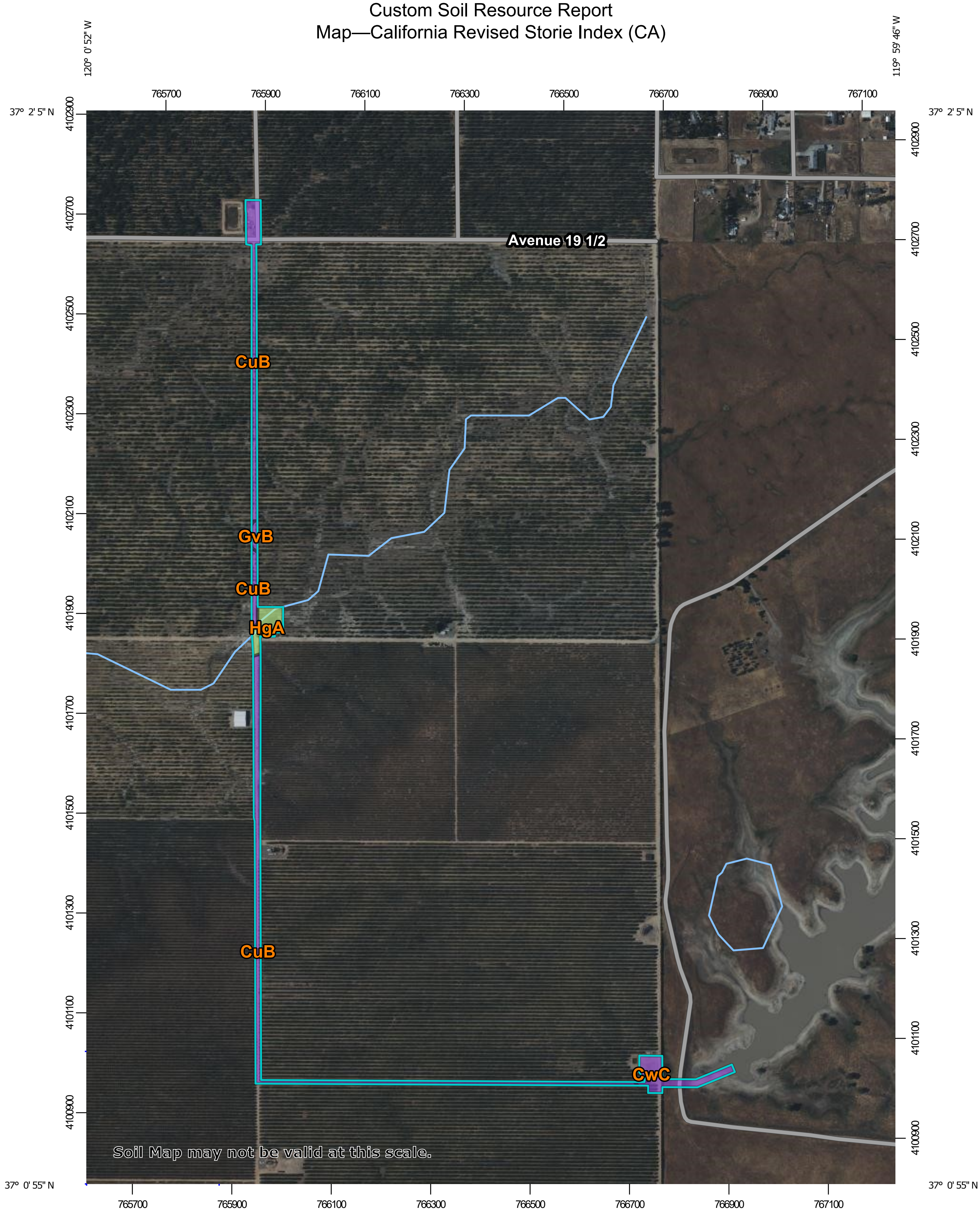
- Grade 5: Very poor (11 to 20)

- Grade 6: Nonagricultural (10 or less)

The components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as the one shown for the map unit. The percent composition of each component in a particular map unit is given to help the user better understand the extent to which the rating applies to the map unit.

Other components with different ratings may occur in each map unit. The ratings for all components, regardless the aggregated rating of the map unit, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map—California Revised Storie Index (CA)



Map Scale: 1:10,500 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 150, 300, 600, 900

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Grade 1 - Excellent

Grade 2 - Good

Grade 3 - Fair

Grade 4 - Poor

Grade 5 - Very Poor

Grade 6 - Nonagricultural

Not rated

Not rated or not available

Soil Rating Lines

Grade 1 - Excellent

Grade 2 - Good

Grade 3 - Fair

Grade 4 - Poor

Grade 5 - Very Poor

Grade 6 - Nonagricultural

Not rated

Not rated or not available

Soil Rating Points

Grade 1 - Excellent

Grade 2 - Good

Grade 3 - Fair

Grade 4 - Poor

Grade 5 - Very Poor

Grade 6 - Nonagricultural

Not rated

Not rated or not available

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 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Madera Area, California
Survey Area Data: Version 14, Jun 1, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 4, 2019—Jun 19, 2019

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.

Table—California Revised Storie Index (CA)

Map unit symbol	Map unit name	Rating	Component name (percent)	Acres in AOI	Percent of AOI
CuB	Cometa sandy loams, 3 to 8 percent slopes	Grade 3 - Fair	Cometa (85%)	6.6	72.9%
CwC	Cometa-Whitney sandy loams, 8 to 15 percent slopes	Grade 3 - Fair	Cometa (46%)	1.4	15.0%
GvB	Greenfield sandy loam, moderately deep and deep over hardpan, 3 to 8 percent slopes	Grade 3 - Fair	Greenfield (85%)	0.2	1.8%
HgA	Hanford sandy loam, moderately deep and deep over hardpan, 0 to 3 percent slopes	Grade 2 - Good	Hanford (85%)	0.9	10.2%
Totals for Area of Interest				**9.1**	**100.0%**

Rating Options—California Revised Storie Index (CA)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the following National Soil Survey Handbook link: "National Soil Survey Handbook."

ABC soil

A soil having an A, a B, and a C horizon.

Ablation till

Loose, relatively permeable earthy material deposited during the downwasting of nearly static glacial ice, either contained within or accumulated on the surface of the glacier.

AC soil

A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil

The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil

Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone

A semiconical type of alluvial fan having very steep slopes. It is higher, narrower, and steeper than a fan and is composed of coarser and thicker layers of material deposited by a combination of alluvial episodes and (to a much lesser degree) landslides (debris flow). The coarsest materials tend to be concentrated at the apex of the cone.

Alluvial fan

A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes. It is shaped like an open fan or a segment of a cone. The material was deposited by a stream at the place where it issues from a narrow mountain valley or upland valley or where a tributary stream is near or at its junction with the main stream. The fan is steepest near its apex, which points upstream, and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

Alluvium

Unconsolidated material, such as gravel, sand, silt, clay, and various mixtures of these, deposited on land by running water.

Alpha,alpha-dipyridyl

A compound that when dissolved in ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction implies reducing conditions and the likely presence of redoximorphic features.

Animal unit month (AUM)

The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions

Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon

A subsoil horizon characterized by an accumulation of illuvial clay.

Arroyo

The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material. It is usually dry but can be transformed into a temporary watercourse or short-lived torrent after heavy rain within the watershed.

Aspect

The direction toward which a slope faces. Also called slope aspect.

Association, soil

A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity)

The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low: 0 to 3
Low: 3 to 6
Moderate: 6 to 9
High: 9 to 12
Very high: More than 12

Backslope

The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Backswamp

A flood-plain landform. Extensive, marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces.

Badland

A landscape that is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes and narrow interfluves. Badlands develop on surfaces that have little or no vegetative cover overlying unconsolidated or poorly cemented materials (clays, silts, or sandstones) with, in some cases, soluble minerals, such as gypsum or halite.

Bajada

A broad, gently inclined alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial fans. Typically, it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins.

Basal area

The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation

The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope (geomorphology)

A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding plane

A planar or nearly planar bedding surface that visibly separates each successive layer of stratified sediment or rock (of the same or different lithology) from the preceding or following layer; a plane of deposition. It commonly marks a change in the circumstances of deposition and may show a parting, a color difference, a change in particle size, or various combinations of these. The term is commonly applied to any bedding surface, even one that is conspicuously bent or deformed by folding.

Bedding system

A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock

The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography

A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace

A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum

Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout (map symbol)

A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand or loose soil or where protective vegetation is disturbed or destroyed. The adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Blowouts are commonly small.

Borrow pit (map symbol)

An open excavation from which soil and underlying material have been removed, usually for construction purposes.

Bottom land

An informal term loosely applied to various portions of a flood plain.

Boulders

Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks

A landscape or tract of steep, rough or broken land dissected by ravines and gullies and marking a sudden change in topography.

Breast height

An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management

Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Butte

An isolated, generally flat-topped hill or mountain with relatively steep slopes and talus or precipitous cliffs and characterized by summit width that is less than the height of bounding escarpments; commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

Cable yarding

A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil

A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche

A general term for a prominent zone of secondary carbonate accumulation in surficial materials in warm, subhumid to arid areas. Caliche is formed by both geologic and pedologic processes. Finely crystalline calcium carbonate forms a nearly continuous surface-coating and void-filling medium in geologic (parent) materials. Cementation ranges from weak in nonindurated forms to very strong in indurated forms. Other minerals (e.g., carbonates, silicate, and sulfate) may occur as accessory cements. Most petrocalcic horizons and some calcic horizons are caliche.

California bearing ratio (CBR)

The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy

The leafy crown of trees or shrubs. (See Crown.)

Canyon

A long, deep, narrow valley with high, precipitous walls in an area of high local relief.

Capillary water

Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena

A sequence, or “chain,” of soils on a landscape that formed in similar kinds of parent material and under similar climatic conditions but that have different characteristics as a result of differences in relief and drainage.

Cation

An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity

The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps

See Terracettes.

Cement rock

Shaly limestone used in the manufacture of cement.

Channery soil material

Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment

Control of unwanted vegetation through the use of chemicals.

Chiseling

Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque

A steep-walled, semicircular or crescent-shaped, half-bowl-like recess or hollow, commonly situated at the head of a glaciated mountain valley or high on the side of a mountain. It was produced by the erosive activity of a mountain glacier. It commonly contains a small round lake (tarn).

Clay

As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions

See Redoximorphic features.

Clay film

A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Clay spot (map symbol)

A spot where the surface texture is silty clay or clay in areas where the surface layer of the soils in the surrounding map unit is sandy loam, loam, silt loam, or coarser.

Claypan

A dense, compact subsoil layer that contains much more clay than the overlying materials, from which it is separated by a sharply defined boundary. The layer restricts the downward movement of water through the soil. A claypan is commonly hard when dry and plastic and sticky when wet.

Climax plant community

The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil

Sand or loamy sand.

Cobble (or cobblestone)

A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material

Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

COLE (coefficient of linear extensibility)

See Linear extensibility.

Colluvium

Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g., direct gravitational action) and by local, unconcentrated runoff.

Complex slope

Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil

A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions

See Redoximorphic features.

Conglomerate

A coarse grained, clastic sedimentary rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system

Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage

A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil

Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Contour stripcropping

Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section

The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat)

A type of limnic layer composed predominantly of fecal material derived from aquatic animals.

Corrosion (geomorphology)

A process of erosion whereby rocks and soil are removed or worn away by natural chemical processes, especially by the solvent action of running water, but also by other reactions, such as hydrolysis, hydration, carbonation, and oxidation.

Corrosion (soil survey interpretations)

Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop

A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management

Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system

Growing crops according to a planned system of rotation and management practices.

Cross-slope farming

Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown

The upper part of a tree or shrub, including the living branches and their foliage.

Cryoturbate

A mass of soil or other unconsolidated earthy material moved or disturbed by frost action. It is typically coarser than the underlying material.

Cuesta

An asymmetric ridge capped by resistant rock layers of slight or moderate dip (commonly less than 15 percent slopes); a type of homocline produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope) that roughly parallels the inclined beds; on the other side, it has a relatively short and steep or clifflike slope (scarp) that cuts through the tilted rocks.

Culmination of the mean annual increment (CMAI)

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave

The walls of excavations tend to cave in or slough.

Decreasers

The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing

Postponing grazing or resting grazing land for a prescribed period.

Delta

A body of alluvium having a surface that is fan shaped and nearly flat; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer

A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depression, closed (map symbol)

A shallow, saucer-shaped area that is slightly lower on the landscape than the surrounding area and that does not have a natural outlet for surface drainage.

Depth, soil

Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Desert pavement

A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments mantling a desert surface. It forms where wind action and sheetwash have removed all smaller particles or where rock fragments have migrated upward through sediments to the surface. It typically protects the finer grained underlying material from further erosion.

Diatomaceous earth

A geologic deposit of fine, grayish siliceous material composed chiefly or entirely of the remains of diatoms.

Dip slope

A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace)

A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming

A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural)

Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the “Soil Survey Manual.”

Drainage, surface

Runoff, or surface flow of water, from an area.

Drainageway

A general term for a course or channel along which water moves in draining an area. A term restricted to relatively small, linear depressions that at some time move concentrated water and either do not have a defined channel or have only a small defined channel.

Draw

A small stream valley that generally is shallower and more open than a ravine or gulch and that has a broader bottom. The present stream channel may appear inadequate to have cut the drainageway that it occupies.

Drift

A general term applied to all mineral material (clay, silt, sand, gravel, and boulders) transported by a glacier and deposited directly by or from the ice or transported by running water emanating from a glacier. Drift includes unstratified material (till) that forms moraines and stratified deposits that form outwash plains, eskers, kames, varves, and glaciofluvial sediments. The term is generally applied to Pleistocene glacial deposits in areas that no longer contain glaciers.

Drumlin

A low, smooth, elongated oval hill, mound, or ridge of compact till that has a core of bedrock or drift. It commonly has a blunt nose facing the direction from which the ice approached and a gentler slope tapering in the other direction. The longer axis is parallel to the general direction of glacier flow. Drumlins are products of streamline (laminar) flow of glaciers, which molded the subglacial floor through a combination of erosion and deposition.

Duff

A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune

A low mound, ridge, bank, or hill of loose, windblown granular material (generally sand), either barren and capable of movement from place to place or covered and stabilized with vegetation but retaining its characteristic shape.

Earthy fill

See Mine spoil.

Ecological site

An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation

The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation

A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposit

Sand-, silt-, or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess.

Ephemeral stream

A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation

A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion

The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (accelerated)

Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion (geologic)

Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion pavement

A surficial lag concentration or layer of gravel and other rock fragments that remains on the soil surface after sheet or rill erosion or wind has removed the finer soil particles and that tends to protect the underlying soil from further erosion.

Erosion surface

A land surface shaped by the action of erosion, especially by running water.

Escarpment

A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Most commonly applied to cliffs produced by differential erosion. Synonym: scarp.

Escarpment, bedrock (map symbol)

A relatively continuous and steep slope or cliff, produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarpment, nonbedrock (map symbol)

A relatively continuous and steep slope or cliff, generally produced by erosion but in some places produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.

Esker

A long, narrow, sinuous, steep-sided ridge of stratified sand and gravel deposited as the bed of a stream flowing in an ice tunnel within or below the ice (subglacial) or between ice walls on top of the ice of a wasting glacier and left behind as high ground when the ice melted. Eskers range in length from less than a kilometer to more than 160 kilometers and in height from 3 to 30 meters.

Extrusive rock

Igneous rock derived from deep-seated molten matter (magma) deposited and cooled on the earth's surface.

Fallow

Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan remnant

A general term for landforms that are the remaining parts of older fan landforms, such as alluvial fans, that have been either dissected or partially buried.

Fertility, soil

The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat)

The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity

The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fill slope

A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil

Sandy clay, silty clay, or clay.

Firebreak

An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom

An obsolete, informal term loosely applied to the lowest flood-plain steps that are subject to regular flooding.

Flaggy soil material

Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone

A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain

The nearly level plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain landforms

A variety of constructional and erosional features produced by stream channel migration and flooding. Examples include backswamps, flood-plain splays, meanders, meander belts, meander scrolls, oxbow lakes, and natural levees.

Flood-plain splay

A fan-shaped deposit or other outspread deposit formed where an overloaded stream breaks through a levee (natural or artificial) and deposits its material (commonly coarse grained) on the flood plain.

Flood-plain step

An essentially flat, terrace-like alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface still actively modified by fluvial scour and/or deposition. May occur individually or as a series of steps.

Fluvial

Of or pertaining to rivers or streams; produced by stream or river action.

Foothills

A region of steeply sloping hills that fringes a mountain range or high-plateau escarpment. The hills have relief of as much as 1,000 feet (300 meters).

Footslope

The concave surface at the base of a hillslope. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb

Any herbaceous plant not a grass or a sedge.

Forest cover

All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type

A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan

A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil

The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai

Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glaciofluvial deposits

Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur in the form of outwash plains, valley trains, deltas, kames, eskers, and kame terraces.

Glaciolacustrine deposits

Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are bedded or laminated.

Gleyed soil

Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping

Growing crops in strips that grade toward a protected waterway.

Grassed waterway

A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel

Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravel pit (map symbol)

An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel.

Gravelly soil material

Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol)

A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area that has less than 15 percent rock fragments.

Green manure crop (agronomy)

A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water

Water filling all the unblocked pores of the material below the water table.

Gully (map symbol)

A small, steep-sided channel caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage whereas a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock

Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hard to reclaim

Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Hardpan

A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope (geomorphology)

A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat)

Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops

Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill

A generic term for an elevated area of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline. Slopes are generally more than 15 percent. The distinction between a hill and a mountain is arbitrary and may depend on local usage.

Hillslope

A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of a hill.

Horizon, soil

A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the “Soil Survey Manual.” The major horizons of mineral soil are as follows:

O horizon: An organic layer of fresh and decaying plant residue.

L horizon: A layer of organic and mineral limnic materials, including coprogenous earth (sedimentary peat), diatomaceous earth, and marl.

A horizon: The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon: The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon: The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon: The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon: Soft, consolidated bedrock beneath the soil.

R layer: Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

M layer: A root-limiting subsoil layer consisting of nearly continuous, horizontally oriented, human-manufactured materials.

W layer: A layer of water within or beneath the soil.

Humus

The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups

Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties include depth to a seasonal high water table, the infiltration rate, and depth to a layer that significantly restricts the downward movement of water. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock

Rock that was formed by cooling and solidification of magma and that has not been changed appreciably by weathering since its formation. Major varieties include plutonic and volcanic rock (e.g., andesite, basalt, and granite).

Illuviation

The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil

A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers

Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration

The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity

The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate

The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate

The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Very low: Less than 0.2
Low: 0.2 to 0.4
Moderately low: 0.4 to 0.75
Moderate: 0.75 to 1.25
Moderately high: 1.25 to 1.75
High: 1.75 to 2.5
Very high: More than 2.5

Interfluve

A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Interfluve (geomorphology)

A geomorphic component of hills consisting of the uppermost, comparatively level or gently sloping area of a hill; shoulders of backwearing hillslopes can narrow the upland or can merge, resulting in a strongly convex shape.

Intermittent stream

A stream, or reach of a stream, that does not flow year-round but that is commonly dry for 3 or more months out of 12 and whose channel is generally below the local water table. It flows only during wet periods or when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders

On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions

See Redoximorphic features.

Irrigation

Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin: Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border: Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding: Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation: Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle): Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow: Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler: Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation: Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding: Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame

A low mound, knob, hummock, or short irregular ridge composed of stratified sand and gravel deposited by a subglacial stream as a fan or delta at the margin of a melting glacier; by a supraglacial stream in a low place or hole on the surface of the glacier; or as a ponded deposit on the surface or at the margin of stagnant ice.

Karst (topography)

A kind of topography that formed in limestone, gypsum, or other soluble rocks by dissolution and that is characterized by closed depressions, sinkholes, caves, and underground drainage.

Knoll

A small, low, rounded hill rising above adjacent landforms.

Ksat

See Saturated hydraulic conductivity.

Lacustrine deposit

Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain

A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lake terrace

A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landfill (map symbol)

An area of accumulated waste products of human habitation, either above or below natural ground level.

Landslide

A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials caused by gravitational forces; the movement may or may not involve saturated materials. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones

Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lava flow (map symbol)

A solidified, commonly lobate body of rock formed through lateral, surface outpouring of molten lava from a vent or fissure.

Leaching

The removal of soluble material from soil or other material by percolating water.

Levee (map symbol)

An embankment that confines or controls water, especially one built along the banks of a river to prevent overflow onto lowlands.

Linear extensibility

Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $^{1}/_{3}$- or $^{1}/_{10}$-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit

The moisture content at which the soil passes from a plastic to a liquid state.

Loam

Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess

Material transported and deposited by wind and consisting dominantly of silt-sized particles.

Low strength

The soil is not strong enough to support loads.

Low-residue crops

Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Marl

An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal proportions; formed primarily under freshwater lacustrine conditions but also formed in more saline environments.

Marsh or swamp (map symbol)

A water-saturated, very poorly drained area that is intermittently or permanently covered by water. Sedges, cattails, and rushes are the dominant vegetation in marshes, and trees or shrubs are the dominant vegetation in swamps. Not used in map units where the named soils are poorly drained or very poorly drained.

Mass movement

A generic term for the dislodgment and downslope transport of soil and rock material as a unit under direct gravitational stress.

Masses

See Redoximorphic features.

Meander belt

The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops.

Meander scar

A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream that impinged upon and undercut the bluff.

Meander scroll

One of a series of long, parallel, close-fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank.

Mechanical treatment

Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil

Very fine sandy loam, loam, silt loam, or silt.

Mesa

A broad, nearly flat topped and commonly isolated landmass bounded by steep slopes or precipitous cliffs and capped by layers of resistant, nearly horizontal rocky material. The summit width is characteristically greater than the height of the bounding escarpments.

Metamorphic rock

Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement at depth in the earth’s crust. Nearly all such rocks are crystalline.

Mine or quarry (map symbol)

An open excavation from which soil and underlying material have been removed and in which bedrock is exposed. Also denotes surface openings to underground mines.

Mine spoil

An accumulation of displaced earthy material, rock, or other waste material removed during mining or excavation. Also called earthy fill.

Mineral soil

Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage

Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area

A kind of map unit that has little or no natural soil and supports little or no vegetation.

Miscellaneous water (map symbol)

Small, constructed bodies of water that are used for industrial, sanitary, or mining applications and that contain water most of the year.

Moderately coarse textured soil

Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil

Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon

A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine

In terms of glacial geology, a mound, ridge, or other topographically distinct accumulation of unsorted, unstratified drift, predominantly till, deposited primarily by the direct action of glacial ice in a variety of landforms. Also, a general term for a landform composed mainly of till (except for kame moraines, which are composed mainly of stratified outwash) that has been deposited by a glacier. Some types of moraines are disintegration, end, ground, kame, lateral, recessional, and terminal.

Morphology, soil

The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil

Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain

A generic term for an elevated area of the land surface, rising more than 1,000 feet (300 meters) above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are formed primarily by tectonic activity and/or volcanic action but can also be formed by differential erosion.

Muck

Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat

See Hemic soil material.

Mudstone

A blocky or massive, fine grained sedimentary rock in which the proportions of clay and silt are approximately equal. Also, a general term for such material as clay, silt, claystone, siltstone, shale, and argillite and that should be used only when the amounts of clay and silt are not known or cannot be precisely identified.

Munsell notation

A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon

A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil

A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules

See Redoximorphic features.

Nose slope (geomorphology)

A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent. Nose slopes consist dominantly of colluvium and slope-wash sediments (for example, slope alluvium).

Nutrient, plant

Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter

Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low: Less than 0.5 percent
Low: 0.5 to 1.0 percent
Moderately low: 1.0 to 2.0 percent
Moderate: 2.0 to 4.0 percent
High: 4.0 to 8.0 percent
Very high: More than 8.0 percent

Outwash

Stratified and sorted sediments (chiefly sand and gravel) removed or “washed out” from a glacier by meltwater streams and deposited in front of or beyond the end moraine or the margin of a glacier. The coarser material is deposited nearer to the ice.

Outwash plain

An extensive lowland area of coarse textured glaciofluvial material. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paleoterrace

An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

Pan

A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material

The unconsolidated organic and mineral material in which soil forms.

Peat

Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped

An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment

A layer of sediment, eroded from the shoulder and backslope of an erosional slope, that lies on and is being (or was) transported across a gently sloping erosional surface at the foot of a receding hill or mountain slope.

Pedon

The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation

The movement of water through the soil.

Perennial water (map symbol)

Small, natural or constructed lakes, ponds, or pits that contain water most of the year.

Permafrost

Ground, soil, or rock that remains at or below 0 degrees C for at least 2 years. It is defined on the basis of temperature and is not necessarily frozen.

pH value

A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil

A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping

Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting

Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plastic limit

The moisture content at which a soil changes from semisolid to plastic.

Plasticity index

The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plateau (geomorphology)

A comparatively flat area of great extent and elevation; specifically, an extensive land region that is considerably elevated (more than 100 meters) above the adjacent lower lying terrain, is commonly limited on at least one side by an abrupt descent, and has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

Playa

The generally dry and nearly level lake plain that occupies the lowest parts of closed depressions, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff. Playa deposits are fine grained and may or may not have a high water table and saline conditions.

Plinthite

The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan

A compacted layer formed in the soil directly below the plowed layer.

Ponding

Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded

Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Pore linings

See Redoximorphic features.

Potential native plant community

See Climax plant community.

Potential rooting depth (effective rooting depth)

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning

Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil

The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil

A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use

Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland

Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil

A measure of acidity or alkalinity of a soil, expressed as pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid: Less than 3.5
Extremely acid: 3.5 to 4.4
Very strongly acid: 4.5 to 5.0
Strongly acid: 5.1 to 5.5
Moderately acid: 5.6 to 6.0
Slightly acid: 6.1 to 6.5
Neutral: 6.6 to 7.3
Slightly alkaline: 7.4 to 7.8
Moderately alkaline: 7.9 to 8.4
Strongly alkaline: 8.5 to 9.0
Very strongly alkaline: 9.1 and higher

Red beds

Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations

See Redoximorphic features.

Redoximorphic depletions

See Redoximorphic features.

Redoximorphic features

Redoximorphic features are associated with wetness and result from alternating periods of reduction and oxidation of iron and manganese compounds in the soil. Reduction occurs during saturation with water, and oxidation occurs when the soil is not saturated. Characteristic color patterns are created by these processes. The reduced iron and manganese ions may be removed from a soil if vertical or lateral fluxes of water occur, in which case there is no iron or manganese precipitation in that soil. Wherever the iron and manganese are oxidized and precipitated, they form either soft masses or hard concretions or nodules. Movement of iron and manganese as a result of redoximorphic processes in a soil may result in redoximorphic features that are defined as follows:

1. Redoximorphic concentrations.—These are zones of apparent accumulation of iron-manganese oxides, including:
   A. Nodules and concretions, which are cemented bodies that can be removed from the soil intact. Concretions are distinguished from nodules on the basis of internal organization. A concretion typically has concentric layers that are visible to the naked eye. Nodules do not have visible organized internal structure; *and*
   B. Masses, which are noncemented concentrations of substances within the soil matrix; *and*
   C. Pore linings, i.e., zones of accumulation along pores that may be either coatings on pore surfaces or impregnations from the matrix adjacent to the pores.
2. Redoximorphic depletions.—These are zones of low chroma (chromas less than those in the matrix) where either iron-manganese oxides alone or both iron-manganese oxides and clay have been stripped out, including:
   A. Iron depletions, i.e., zones that contain low amounts of iron and manganese oxides but have a clay content similar to that of the adjacent matrix; *and*
   B. Clay depletions, i.e., zones that contain low amounts of iron, manganese, and clay (often referred to as silt coatings or skeletans).
3. Reduced matrix.—This is a soil matrix that has low chroma *in situ* but undergoes a change in hue or chroma within 30 minutes after the soil material has been exposed to air.

Reduced matrix

See Redoximorphic features.

Regolith

All unconsolidated earth materials above the solid bedrock. It includes material weathered in place from all kinds of bedrock and alluvial, glacial, eolian, lacustrine, and pyroclastic deposits.

Relief

The relative difference in elevation between the upland summits and the lowlands or valleys of a given region.

Residuum (residual soil material)

Unconsolidated, weathered or partly weathered mineral material that accumulated as bedrock disintegrated in place.

Rill

A very small, steep-sided channel resulting from erosion and cut in unconsolidated materials by concentrated but intermittent flow of water. A rill generally is not an obstacle to wheeled vehicles and is shallow enough to be smoothed over by ordinary tillage.

Riser

The vertical or steep side slope (e.g., escarpment) of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural, steplike landforms, such as successive stream terraces.

Road cut

A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments

Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol)

An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit.

Root zone

The part of the soil that can be penetrated by plant roots.

Runoff

The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil

A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Saline spot (map symbol)

An area where the surface layer has an electrical conductivity of 8 mmhos/cm more than the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has an electrical conductivity of 2 mmhos/cm or less.

Sand

As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone

Sedimentary rock containing dominantly sand-sized particles.

Sandy spot (map symbol)

A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils in the surrounding map unit is very fine sandy loam or finer.

Sapric soil material (muck)

The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturated hydraulic conductivity (Ksat)

The ease with which pores of a saturated soil transmit water. Formally, the proportionality coefficient that expresses the relationship of the rate of water movement to hydraulic gradient in Darcy's Law, a law that describes the rate of water movement through porous media. Commonly abbreviated as "Ksat." Terms describing saturated hydraulic conductivity are:

Very high: 100 or more micrometers per second (14.17 or more inches per hour)

High: 10 to 100 micrometers per second (1.417 to 14.17 inches per hour)

Moderately high: 1 to 10 micrometers per second (0.1417 inch to 1.417 inches per hour)

Moderately low: 0.1 to 1 micrometer per second (0.01417 to 0.1417 inch per hour)

Low: 0.01 to 0.1 micrometer per second (0.001417 to 0.01417 inch per hour)

Very low: Less than 0.01 micrometer per second (less than 0.001417 inch per hour).

To convert inches per hour to micrometers per second, multiply inches per hour by 7.0572. To convert micrometers per second to inches per hour, multiply micrometers per second by 0.1417.

Saturation

Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification

The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock

A consolidated deposit of clastic particles, chemical precipitates, or organic remains accumulated at or near the surface of the earth under normal low temperature and pressure conditions. Sedimentary rocks include consolidated equivalents of alluvium, colluvium, drift, and eolian, lacustrine, and marine deposits. Examples are sandstone, siltstone, mudstone, claystone, shale, conglomerate, limestone, dolomite, and coal.

Sequum

A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil

A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Severely eroded spot (map symbol)

An area where, on the average, 75 percent or more of the original surface layer has been lost because of accelerated erosion. Not used in map units in which “severely eroded,” “very severely eroded,” or “gullied” is part of the map unit name.

Shale

Sedimentary rock that formed by the hardening of a deposit of clay, silty clay, or silty clay loam and that has a tendency to split into thin layers.

Sheet erosion

The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short, steep slope (map symbol)

A narrow area of soil having slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.

Shoulder

The convex, erosional surface near the top of a hillslope. A shoulder is a transition from summit to backslope.

Shrink-swell

The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-coppice dune

A small, streamlined dune that forms around brush and clump vegetation.

Side slope (geomorphology)

A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel. Side slopes are dominantly colluvium and slope-wash sediments.

Silica

A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio

The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt

As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone

An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

Similar soils

Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol)

A closed, circular or elliptical depression, commonly funnel shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock (e.g., limestone, gypsum, or salt) or by collapse of underlying caves within bedrock. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography.

Site index

A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides (pedogenic)

Grooved, striated, and/or glossy (shiny) slip faces on structural peds, such as wedges; produced by shrink-swell processes, most commonly in soils that have a high content of expansive clays.

Slide or slip (map symbol)

A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces.

Slope

The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope alluvium

Sediment gradually transported down the slopes of mountains or hills primarily by nonchannel alluvial processes (i.e., slope-wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of rock fragments and may be separated by stone lines. Burnished peds and sorting of rounded or subrounded pebbles or cobbles distinguish these materials from unsorted colluvial deposits.

Slow refill

The slow filling of ponds, resulting from restricted water transmission in the soil.

Slow water movement

Restricted downward movement of water through the soil. See Saturated hydraulic conductivity.

Sodic (alkali) soil

A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodic spot (map symbol)

An area where the surface layer has a sodium adsorption ratio that is at least 10 more than that of the surface layer of the named soils in the surrounding map unit. The surface layer of the surrounding soils has a sodium adsorption ratio of 5 or less.

Sodicity

The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight: Less than 13:1

Moderate: 13-30:1

Strong: More than 30:1

Sodium adsorption ratio (SAR)

A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock

Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil

A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief and by the passage of time.

Soil separates

Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand: 2.0 to 1.0

Coarse sand: 1.0 to 0.5

Medium sand: 0.5 to 0.25

Fine sand: 0.25 to 0.10

Very fine sand: 0.10 to 0.05

Silt: 0.05 to 0.002

Clay: Less than 0.002

Solum

The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol)

A pile of earthy materials, either smoothed or uneven, resulting from human activity.

Stone line

In a vertical cross section, a line formed by scattered fragments or a discrete layer of angular and subangular rock fragments (commonly a gravel- or cobble-sized lag concentration) that formerly was draped across a topographic surface and was later buried by additional sediments. A stone line generally caps material that was subject to weathering, soil formation, and erosion before burial. Many stone lines seem to be buried erosion pavements, originally formed by sheet and rill erosion across the land surface.

Stones

Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony

Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stony spot (map symbol)

A spot where 0.01 to 0.1 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surrounding soil has no surface stones.

Strath terrace

A type of stream terrace; formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

Stream terrace

One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream; represents the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition.

Stripcropping

Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil

The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

Platy: Flat and laminated
Prismatic: Vertically elongated and having flat tops
Columnar: Vertically elongated and having rounded tops
Angular blocky: Having faces that intersect at sharp angles (planes)
Subangular blocky: Having subrounded and planar faces (no sharp angles)
Granular: Small structural units with curved or very irregular faces

Structureless soil horizons are defined as follows:

Single grained: Entirely noncoherent (each grain by itself), as in loose sand
Massive: Occurring as a coherent mass

Stubble mulch

Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil

Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling

Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum

The part of the soil below the solum.

Subsurface layer

Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow

The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit

The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer

The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil

The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus

Rock fragments of any size or shape (commonly coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts

Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine

An end moraine that marks the farthest advance of a glacier. It typically has the form of a massive arcuate or concentric ridge, or complex of ridges, and is underlain by till and other types of drift.

Terrace (conservation)

An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geomorphology)

A steplike surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, lake, or seashore. The term is usually applied both to the relatively flat summit surface (tread) that was cut or built by stream or wave action and to the steeper descending slope (scarp or riser) that has graded to a lower base level of erosion.

Terracettes

Small, irregular steplike forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock, such as sheep or cattle.

Texture, soil

The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer

Otherwise suitable soil material that is too thin for the specified use.

Till

Dominantly unsorted and nonstratified drift, generally unconsolidated and deposited directly by a glacier without subsequent reworking by meltwater, and consisting of a heterogeneous mixture of clay, silt, sand, gravel, stones, and boulders; rock fragments of various lithologies are embedded within a finer matrix that can range from clay to sandy loam.

Till plain

An extensive area of level to gently undulating soils underlain predominantly by till and bounded at the distal end by subordinate recessional or end moraines.

Tilth, soil

The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope

The gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil

The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements

Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread

The flat to gently sloping, topmost, laterally extensive slope of terraces, flood-plain steps, or other stepped landforms; commonly a recurring part of a series of natural steplike landforms, such as successive stream terraces.

Tuff

A generic term for any consolidated or cemented deposit that is 50 percent or more volcanic ash.

Upland

An informal, general term for the higher ground of a region, in contrast with a low-lying adjacent area, such as a valley or plain, or for land at a higher elevation than the flood plain or low stream terrace; land above the footslope zone of the hillslope continuum.

Valley fill

The unconsolidated sediment deposited by any agent (water, wind, ice, or mass wasting) so as to fill or partly fill a valley.

Variegation

Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve

A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very stony spot (map symbol)

A spot where 0.1 to 3.0 percent of the soil surface is covered by rock fragments that are more than 10 inches in diameter in areas where the surface of the surrounding soil is covered by less than 0.01 percent stones.

Water bars

Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering

All physical disintegration, chemical decomposition, and biologically induced changes in rocks or other deposits at or near the earth’s surface by atmospheric or biologic agents or by circulating surface waters but involving essentially no transport of the altered material.

Well graded

Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol)

A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit.

Wilting point (or permanent wilting point)

The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow

The uprooting and tipping over of trees by the wind.

Appendix E

Aquatic Resources Delineation

LIVE OAK ASSOCIATES, INC.

an Ecological Consulting Firm

AQUATIC RESOURCES DELINEATION
MADERA LAKE PUMP AND PIPELINE PROJECT
MADERA COUNTY, CALIFORNIA

Live Oak Associates, Inc.

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November 3, 2020 File No. 2194-02

EXECUTIVE SUMMARY

Live Oak Associates, Inc. (LOA) conducted a delineation of aquatic resources on an approximately 9.1-acre site on May 1, 2020. The linear study area is located within an unincorporated area of Madera County at the western side of Madera Lake extending into orchard land west and northwest of the lake.

LOA biologist Jeff Gurule examined the entire study area for aquatic features and gathered vegetation, soils, and hydrology data at five sampling locations within and adjacent to such features. Aquatic resources delineated on the site included Madera Lake, a ruderal pool, and an ephemeral channel. Aquatic resources were delineated based on the boundaries of ordinary high water indicators. Aquatic resource boundaries mapped during LOA's field investigation total approximately 29,525 sq, ft. or 0.677 acres.

TABLE OF CONTENTS

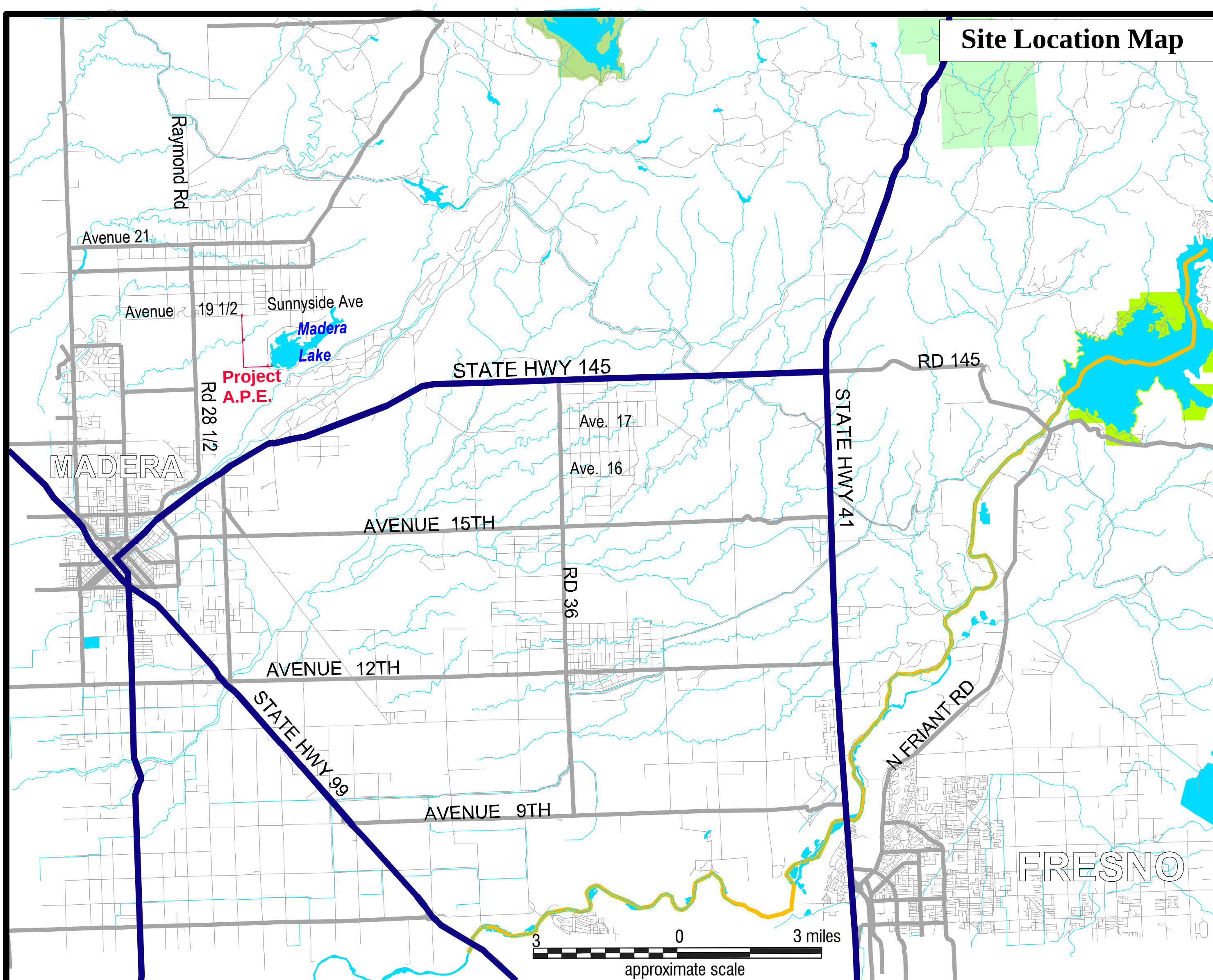
1.0 INTRODUCTION

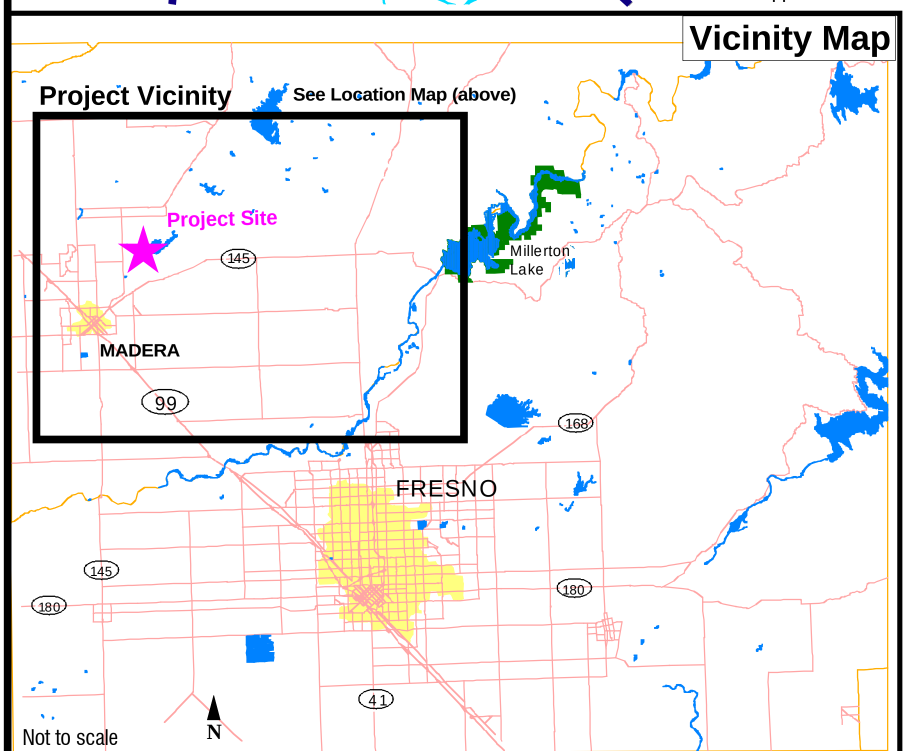
This technical report presents the results of an aquatic resources delineation conducted by Live Oak Associates, Inc. (LOA) within an approximately 9.1-acre area (“study area”) in Madera County, California. The study area corresponds to the Area of Potential Effect (APE) of the Madera Lake Pump and Pipeline Project, a project proposed by the Madera Water District (MWD) to divert water from Madera Lake into the MWD. The linear study area is located within an unincorporated area of Madera County at the western side of Madera Lake extending into orchard land west of the lake (Figure 1). The site can be found primarily in the Kismet U.S. Geological Survey (USGS) 7.5-minute quadrangle, with a small portion in the Daulton quad; Sections 28, 33, and 34 of Township 10 South, Range 18 East, Mount Diablo Base and Meridian (Figure 2).

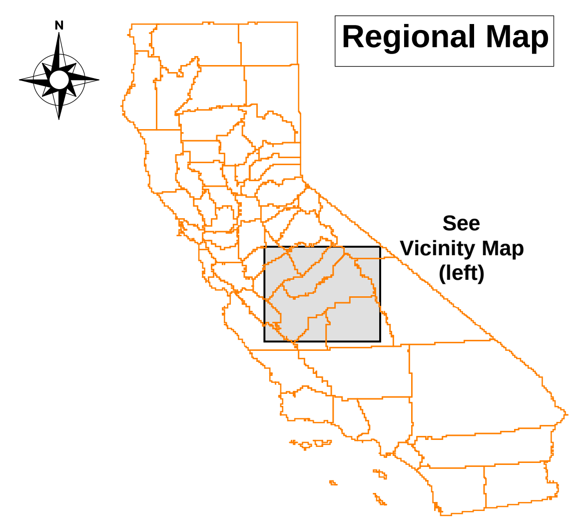
1.1 REGULATORY DEFINITION OF WATERS OF THE U.S.

Section 404 of the federal Clean Water Act (CWA) regulates the discharge of dredged or fill material into “navigable waters” (33 U.S.C. §1344), defined in the CWA as “the waters of the United States, including the territorial seas” (33 U.S.C. §1362(7)). Waters of the U.S. are not explicitly defined in the CWA, but a variety of regulatory definitions have been promulgated by the two federal agencies responsible for implementing the CWA, the Environmental Protection Agency (EPA) and U.S. Army Corps of Engineers (USACE). These definitions have been interpreted, and in some cases, invalidated, by federal courts.

Waters of the U.S. are currently defined by the Navigable Waters Protection Rule (33 CFR Part 328), which took effect on June 22, 2020. The rule identifies four categories of waters of the U.S.: (1) territorial seas and traditional navigable waters, (2) tributaries, (3) lakes, ponds, and impoundments of jurisdictional waters, and (4) adjacent wetlands. These categories are defined as follows:





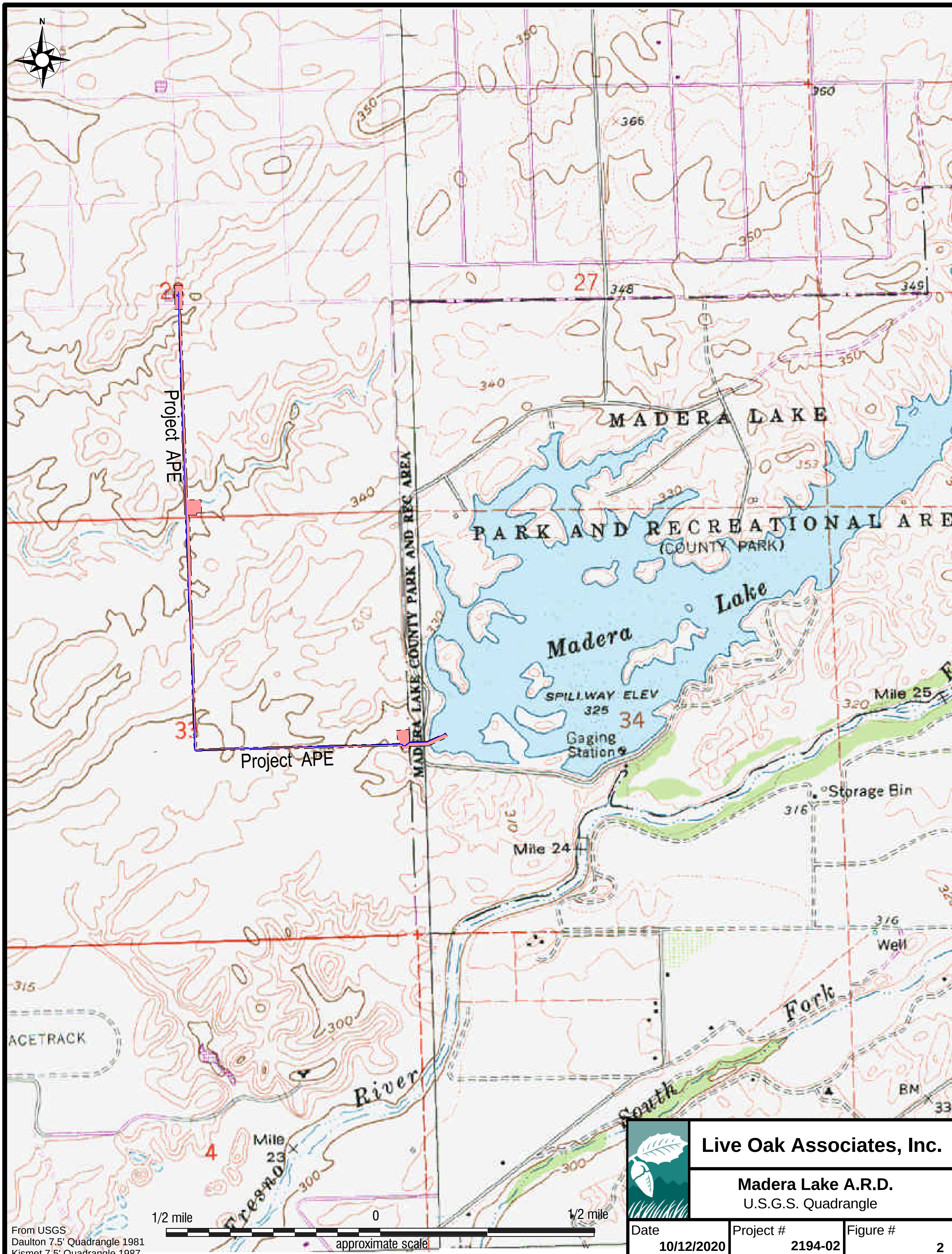


Live Oak Associates, Inc.

Madera Lake A.R.D.

Site / Vicinity Map

Date	Project #	Figure #
10/12/2020	2194-02	1


N
Project APE
Project APE
MADERA LAKE
PARK AND RECREATIONAL AREA
(COUNTY PARK)
MADERA LAKE COUNTY PARK AND REC AREA
Madera Lake
SPILLWAY ELEV 325
Gaging Station
27
28
33
34
4
350
366
348
349
340
330
353
320
316
310
315
300
335
Mile 25
Mile 24
Mile 23
Storage Bin
Well
BM
RACETRACK
Fresno River
South Fork
1/2 mile
0
1/2 mile
approximate scale
From USGS
Daulton 7.5' Quadrangle 1981
Kismet 7.5' Quadrangle 1987
Live Oak Associates, Inc.
Madera Lake A.R.D.
U.S.G.S. Quadrangle
Date
10/12/2020
Project #
2194-02
Figure #
2

Territorial Seas and Traditional Navigable Waters (TNWs)

- The territorial seas and traditional navigable waters include large rivers and lakes and tidally-influenced waterbodies used in interstate or foreign commerce.

Tributaries

- Tributaries include perennial and intermittent rivers and streams that contribute surface flow to traditional navigable waters in a typical year. These naturally occurring surface water channels must flow more often than just after a single precipitation event—that is, tributaries must be perennial or intermittent.
- Tributaries can connect to a traditional navigable water or territorial sea in a typical year either directly or through other "waters of the United States," through channelized non-jurisdictional surface waters, through artificial features (including culverts and spillways), or through natural features (including debris piles and boulder fields).
- Ditches are to be considered tributaries only where they satisfy the flow conditions of the perennial and intermittent tributary definition and either were constructed in or relocate a tributary or were constructed in an adjacent wetland and contribute perennial or intermittent flow to a traditional navigable water in a typical year.

Lakes, Ponds, and Impoundments of Jurisdictional Waters

- Lakes, ponds, and impoundments of jurisdictional waters are jurisdictional where they contribute surface water flow to a traditional navigable water or territorial sea in a typical year either directly or through other "waters of the United States," through channelized non-jurisdictional surface waters, through artificial features (including culverts and spillways), or through natural features (including debris piles and boulder fields).
- Lakes, ponds, and impoundments of jurisdictional waters are also jurisdictional where they are flooded by a "water of the United States" in a typical year, such as certain oxbow lakes that lie along the Mississippi River.

Adjacent Wetlands

- Wetlands that physically touch other jurisdictional waters are “adjacent wetlands,”
- Wetlands separated from a “water of the United States” by only a natural berm, bank or dune are also “adjacent.”
- Wetlands inundated by flooding from a “water of the United States” in a typical year are “adjacent.”
- Wetlands that are physically separated from a jurisdictional water by an artificial dike, barrier, or similar artificial structure are “adjacent” so long as that structure allows for a direct hydrologic surface connection between the wetlands and the jurisdictional water in a typical year, such as through a culvert, flood or tide gate, pump, or similar artificial feature.
- An adjacent wetland is jurisdictional in its entirety when a road or similar artificial structure divides the wetland, as long as the structure allows for a direct hydrologic surface connection through or over that structure in a typical year.

The Navigable Waters Protection Rule also outlines what are not “waters of the United States.” The following waters/features are not jurisdictional under the rule:

- Waterbodies that are not included in the four categories of “waters of the United States” listed above.
- Groundwater, including groundwater drained through subsurface drainage systems, such as drains in agricultural lands.
- Ephemeral features, including ephemeral streams, swales, gullies, rills, and pools.
- Diffuse stormwater run-off and directional sheet flow over upland.
- Many farm and roadside ditches.

- Prior converted cropland retains its longstanding exclusion, but is defined for the first time in the final rule. The agencies are clarifying that this exclusion will cease to apply when cropland is abandoned (i.e., not used for, or in support of, agricultural purposes in the immediately preceding five years) and has reverted to wetlands.

- Artificially irrigated areas, including fields flooded for agricultural production, that would revert to upland should application of irrigation water to that area cease.

- Artificial lakes and ponds, including water storage reservoirs and farm, irrigation, stock watering, and log cleaning ponds, constructed or excavated in upland or in non-jurisdictional waters.

- Water-filled depressions constructed or excavated in upland or in non-jurisdictional waters incidental to mining or construction activity, and pits excavated in upland or in non-jurisdictional waters for the purpose of obtaining fill, sand, or gravel.

- Stormwater control features excavated or constructed in upland or in non-jurisdictional waters to convey, treat, infiltrate, or store stormwater run-off.

- Groundwater recharge, water reuse, and wastewater recycling structures, including detention, retention and infiltration basins and ponds, that are constructed in upland or in non-jurisdictional waters.

- Waste treatment systems have been excluded from the definition of "waters of the United States" since 1979 and will continue to be excluded under the final rule. Waste treatment systems include all components, including lagoons and treatment ponds (such as settling or cooling ponds), designed to either convey or retain, concentrate, settle, reduce, or remove pollutants, either actively or passively, from wastewater or stormwater prior to discharge (or eliminating any such discharge).

All activities that involve the discharge of dredge or fill material into waters of the U.S. are subject to Section 404 permit requirements of the USACE. Such permits are typically issued on the condition that the applicant agrees to provide mitigation that result in no net loss of wetland functions or values. No permit can be issued until the Regional Water Quality Control Board (RWQCB) issues a Section 401 Water Quality Certification (or waiver of such certification) verifying that the proposed activity will meet state water quality standards.

1.2 STATE OF CALIFORNIA JURISDICTION OVER AQUATIC FEATURES

Under the Porter-Cologne Water Quality Control Act of 1969, the State Water Resources Control Board has regulatory authority to protect the water quality of all surface water and groundwater in the State of California ("Waters of the State"). Nine RWQCBs oversee water quality at the local and regional level. The RWQCB for a given region regulates discharges of fill or pollutants into waters of the State through the issuance of various permits and orders. Discharges into waters of the State that are also waters of the U.S. require a Section 401 Water Quality Certification from the RWQCB as a prerequisite to obtaining certain federal permits, such as a Section 404 Clean Water Act permit. Discharges into all Waters of the State, even those that are not also waters of the U.S., require Waste Discharge Requirements (WDRs), or waivers of WDRs, from the RWQCB. The RWQCB also administers the Construction Storm Water Program and the federal National Pollution Discharge Elimination System (NPDES) program. Projects that disturb one or more acres of soil must obtain a Construction General Permit under the Construction Storm Water Program. A prerequisite for this permit is the development of a Storm Water Pollution Prevention Plan (SWPPP) by a certified Qualified SWPPP Developer. Projects that discharge wastewater, storm water, or other pollutants into a water of the U.S. may require a NPDES permit.

CDFW has jurisdiction over the bed and bank of natural drainages and lakes according to provisions of Section 1601 and 1602 of the California Fish and Game Code. Activities that may substantially modify such waters through the diversion or obstruction of their natural flow, change or use of any material from their bed or bank, or the deposition of debris require a Notification of Lake or Streambed Alteration. If CDFW determines that the activity may adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement will be prepared. Such an agreement typically stipulates that certain measures will be implemented to protect the habitat values of the lake or drainage in question.

2.0 METHODS

LOA biologist Jeff Gurule conducted a walking and driving survey of the study area for aquatic resources on May 1, 2020. Mr. Gurule used GIS files of the proposed project APE projected over aerial photography and a USGS topographic map to guide the survey effort. The boundaries of potential jurisdictional waters were mapped using an EOS Arrow 100 GPS receiver paired with a mobile device running the ESRI Collector app.

LOA's survey was consistent with guidelines found in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), *Minimum Standards for Acceptance of Preliminary Wetland Delineations* (USACE 2016), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE 2008). Following the survey, LOA prepared a map depicting likely jurisdictional waters using information collected in the field overlaid on an aerial photo. The map was produced at a scale of 1" = 250'.

Five sample points were selected to record data to determine and support aquatic resource boundaries within the investigation area. LOA's survey methods are described in more detail below.

2.1 SURVEY METHODS FOR DETERMINING AREAS MEETING THE TECHNICAL CRITERIA OF WETLANDS

Wetlands are defined as "those areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas" (Environmental Laboratory 1987). The diagnostic environmental characteristics of wetlands include hydrophytic vegetation, hydric soils and a hydrology characterized by an aquic or peraquic moisture regime. Accordingly, LOA surveyed the site for wetland indicator plants, positive indicators of hydric soils, and wetland hydrology.

Sampling locations were selected within the investigation area to assess and collect vegetation, hydrology and soils information associated with observed hydrologic features and adjacent upland areas. The location of the sample points was selected to best represent the predominant characteristics of the hydrologic feature(s) or upland area(s). This information was entered onto standard data sheets patterned after those used by the USACE for the Arid West Region. The data sheet for each numbered sampling location can be found in Appendix A. The numbered sampling locations have been identified on the map depicting the study area's aquatic resources. Color photographs, presented in Appendix B, were taken at each sampling location.

Plants observed within an appropriate radius of each sampling location were identified to species using *The Jepson Manual: Vascular Higher Plants of California, Second Edition* (Baldwin et al, 2012). The wetland indicator status of each species was obtained from the 2018 National Wetland Plant List (USACE 2018). A plant's wetland indicator status is so designated according to its frequency of occurrence in wetlands, as follows.

OBLIGATE (OBL)	Probability to occur in wetland is >99%
FACULTATIVE WETLAND (FACW)	Probability to occur in wetland is between 67-99%
FACULTATIVE (FAC)	Probability to occur in wetland is between 33 to 67%
FACULTATIVE UPLAND (FACU)	Probability to occur in wetland is between 1 to <33%.
UPLAND (UPL)	Probability to occur in wetland is <1%

Hydrophytic vegetation is considered present when more than 50% of the dominant species at a given location are composed of obligate, facultative wetland and facultative plant species. However, the Arid West Supplemental Guidelines also incorporate an alternate prevalence index to be calculated in determining the presence of wetland vegetation if the dominance test is not met. A complete list of vascular plants identified on the study area during the 2020 survey can be found in Appendix C.

Each sampling location was also examined for positive indicators of wetland hydrology and hydric soils. Evidence of wetland hydrology consisted of primary indicators such as surface water, watermarks, drift lines, sediment deposits, etc. Secondary indicators of wetland hydrology include drainage patterns in wetlands, watermarks (Riverine), drift lines (Riverine), sediment deposits (Riverine), etc. In accordance with USACE guidelines, a soil pit 12 inches in depth was dug at all sampling locations. The soils excavated from each pit were also examined for low chromas, gleying, mottling, concretions, sulfidic odors, etc.

2.2 SURVEY METHODS FOR TRIBUTARY WATERS

In the absence of adjacent wetlands, the limit of jurisdiction for navigable rivers and their tributaries, whether inter- or intrastate, extends to the "ordinary high water" (OHW) line. OHW refers to "that line on the shore established by the fluctuation of water and indicated by physical characteristics such as a clear natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

The term "channel" as used in this report refers to a drainage feature with a bed and defined bank. Where drainage channels are present on a given site, it is customary to walk the channel and take width measurements at a standard interval. Width measurements represent the channel width between OHW marks on opposing banks.

The field investigators visually inspected the site for physical characteristics of OHW in order to determine the extent of possible jurisdiction.

2.3 SURVEY METHODS FOR OTHER WATERS

During the field investigation the LOA surveyor inspected the study area for other aquatic features such as ditches, culverts, and artificial basins. Such features, if encountered, were mapped to their OHW mark, spillway elevation, and/or wetland boundaries, whichever were greater.

3.0 RESULTS

3.1 SETTING

The study area consisted of a reservoir (Madera Lake), ruderal lands within orchards, and an unnamed ephemeral tributary to Schmidt Creek. Water is diverted into Madera Lake from the Fresno River by the Madera Irrigation District (MID) for storage and regulated release via an outlet pipe to downstream agricultural irrigation uses. Local watershed contributions to the reservoir are minimal with the primary natural inlet consisting of an unnamed ephemeral drainage feeding the lake from the northeast. Although flows into the reservoir are tightly regulated by MID, the reservoir contains an emergency overflow spill that also feeds back to the Fresno River.

The study area is situated within a matrix of agricultural, residential, and undeveloped lands at the eastern edge of the San Joaquin Valley, just south and west of the lowest foothills of the Sierra Nevada. The site consists of gently undulating to flat terrain with a median elevation of approximately 320 feet National Geodetic Vertical Datum (NGVD) (see Figure 2).

Climatic and topographic features of the study area are typical of those found in California's San Joaquin Valley. The study area, like most of California west of the Sierra Nevada, experiences a Mediterranean climate, with hot, dry summers and cool, moist winters. Average annual precipitation in the general vicinity of the site is highly variable with an average annual precipitation of approximately 12 inches, most of which falls as rain between the months of October and March.

The soil mapping unit within grasslands of the site is Cometa-Whitney sandy loams, 8 to 15 percent slopes. This soil mapping unit is considered hydric and regularly supports vernal pools, which commonly support a unique flora and fauna endemic to such pools.

Soils within the orchard boundaries include Cometa sandy loams, 3 to 8 percent slopes; Cometa-Whitney sandy loams, 8 to 15 percent slopes; Greenfield sandy loam, moderately deep and deep over hardpan, 3 to 8 percent slopes; and Hanford sandy loam, moderately deep and deep over hardpan, 0 to 3 percent slopes. However, the soils of the orchard no longer maintain their native characteristics due to long-term, soil-disturbing agricultural practices, including deep-ripping, trenching, discing, grading, road-building, harvest activities, and other forms of orchard maintenance.

Soil mapping unit locations within the study area are illustrated in Figure 3 and detailed information pertaining to these soils can be found in Appendix D.

3.2 AQUATIC RESOURCES DELINEATED

Aquatic resources identified within the study area include Madera Lake, a ruderal pool within the operational footprint of the orchard, and an unnamed ephemeral tributary to Schmidt Creek. The linear and areal extent of these features is presented in Table 1 and their locations are depicted in Figure 4.

Table 1. Aquatic Features Identified on the Study Area

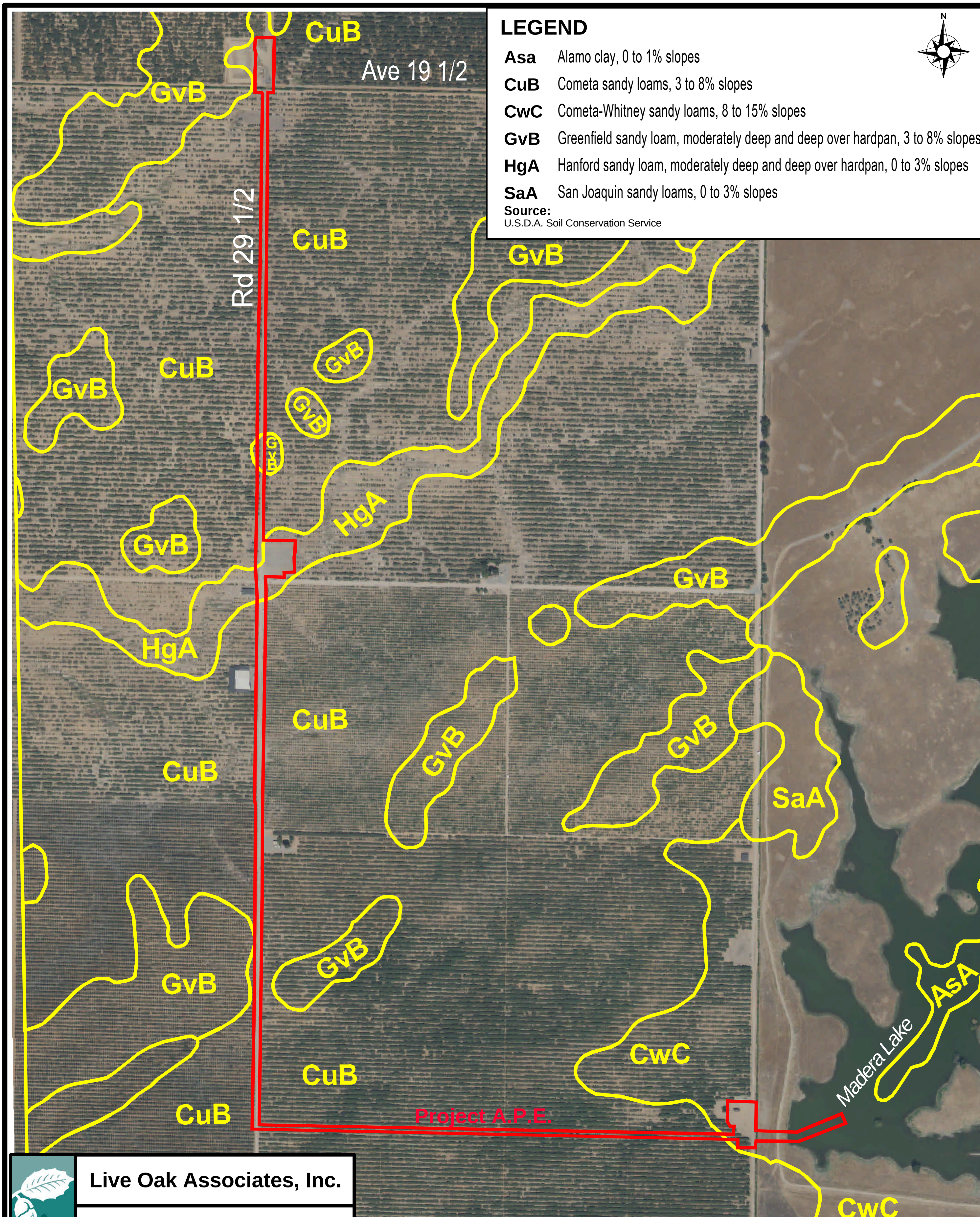
Aquatic Feature	**Approximate length (lf)**	**Approximate Area ($ft.^2$)**	**Approximate Area (acres)**
Unnamed Ephemeral Drainage	46	264	0.006
Ruderal Pool	N/A	11,513	0.264
Madera Lake	336	17,748	0.407
Total	**382**	**29,525**	**0.677**

Vegetation, soil, and hydrology characteristics at sample points taken within each of these features are discussed below.

3.2.1 Madera Lake

Madera Lake is a man-made reservoir that stores water diverted from the Fresno River for regulated release to the Fresno River for agricultural irrigation. The lake was dry at the sampling location (Sample Point 5) during the field investigation.

Vegetation: The dry lakebed at this sample location contained only herbaceous vegetation. Dominant vegetation identified consisted of dwarf sack clover (*Trifolium depauperatum*) (FAC) and broadleaved pepperweed (*Lepidium latifolium*) (FAC). The Dominance Test found that the hydrophytic vegetation criterion was met.



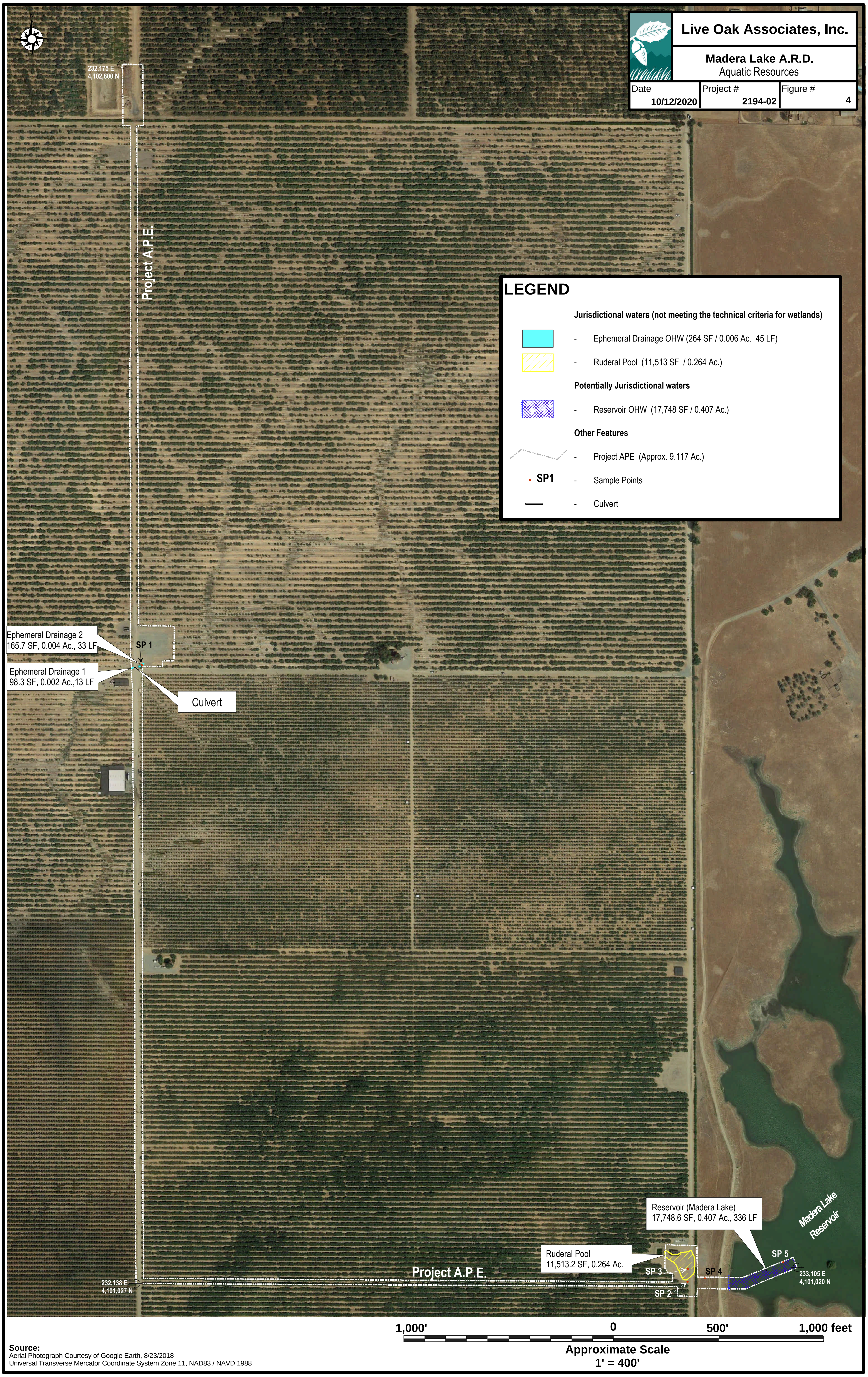
Live Oak Associates, Inc.

Madera Lake A.R.D.
Soils

Date	Project #	Figure #
10/12/2020	2194-02	3

1,000' 0 500' 1,000 feet
approximate scale

Aerial Photo courtesy of
U.S.D.A. National Agriculture Imagery Program (NAIP)
Aerial Photo Field Office 12/17/2018



Source:
Aerial Photograph Courtesy of Google Earth, 8/23/2018
Universal Transverse Mercator Coordinate System Zone 11, NAD83 / NAVD 1988

Soils: Soils at the sample location consisted of a sandy clay loam with a matrix color of 10YR 3/3 and redox features with a color of 5YR 6/4 as concentrations within approximately 15 percent of the soil matrix. The soils here met hydric soils criterion as Redox Depressions (F8).

Hydrology: The lakebed was dry at the sample location during the investigation. Based on Fresno River flows and irrigation needs the lake can be filled from a regulated turnout along the Fresno River. The primary hydrology indicator was inundation visible on a number of aerial photos of the site and observed by the LOA investigator in 2017 during a reconnaissance field survey.

While the dry lakebed meets wetland criteria when dry, the lake would be considered a deep-water aquatic habitat when filled. Therefore, the spillway elevation, which corresponds to the ordinary high water of the lake, was used to delineate the boundary of the lake.

3.2.2 Ruderal Pool

A large ruderal pool was delineated within the study area. This pool is located within a barren open area at the eastern edge of the orchard within the study area. The pool contained a small amount of water at its lowest point at the time of the field investigation. Information pertaining to this feature was collected at (Sample Point 3).

Vegetation: Vegetation was absent from approximately 99% of the pool. Consequently, the entire area of the pool, rather than just the immediate area surrounding Sample Point 3, was incorporated in the vegetation analysis. The dominant species, each with an absolute cover of less than 1%, were Mediterranean barley (*Hordeum marinum*) (FAC), annual bluegrass (*Poa annua*) (FAC), perennial ryegrass (*Festuca perennis*) (FAC), and rabbits foot grass (*Polypogon monspeliensis*) (FACW). Although vegetation was absent from nearly the entire pool, the Dominance Test found that the hydrophytic vegetation criterion was met when accounting for absolute cover across the entire pool.

Soils: Soils of the site consisted of clay sand with a matrix color of 10YR 3/2 and redox features with a color of 7.5YR 3/2 as concentrations within approximately 30 percent of the soil matrix. The soils here met hydric soils criterion as Redox Depressions (F8).

Hydrology: Hydrology indicators that were present at the time of the investigation consisted of surface water, saturation, drift deposits, surface soil cracks, and biotic crust. Inundation of the pool is also visible on aerial photos of the site.

Due to the presence of dominant wetland vegetation (albeit extremely sparse), hydric soil indicators, and wetland hydrology indicators, the ruderal pool appears to meet wetland criteria. Since vegetation was so sparse, the boundaries of the ruderal pool were defined by drift deposits visible around the pool's perimeter.

3.2.3 Ephemeral Drainage

An unnamed ephemeral drainage channel was delineated within the study area. This drainage contained short sections of bed and bank on both sides of a culverted orchard road crossing. Beyond the eastern end of the delineated bed and bank within the study area no trace of a channel was found and vegetation was absent. The drainage flows through areas of the orchard outside the study area and ultimately joins Schmidt Creek. The channel was dry at the sampling location (Sample Point 1) during the site survey.

Vegetation: Vegetation was absent at the sample location.

Soils: The soils at the sample location consisted of a sandy loam with a matrix color of 10YR 3/3. Redox features were absent. As a result the soil did not meet any hydric soil indicator categories.

Hydrology: The creek was dry during the investigation. Aerial photography indicates the drainage is nearly always dry except during and shortly after heavy rain events. Only a portion of the drainage within the study area exhibited a defined bed and bank. Hydrology indicators consist of drainage patterns evident on aerial photos and a blue line on USGS quadrangle maps, as well as soil saturation evident on an aerial photo.

Due to the absence of dominant wetland vegetation and hydric soils, the channel did not meet the criteria of a wetland. Hydrologic indicators of ordinary high water associated with the areas of defined bed and bank were used to map the boundaries of this feature.

3.3 OTHER AREAS

The remaining portions of the study area comprised ruderal areas associated with an existing orchard operation and non-native grassland habitat. These other areas did not contain any drainage features or areas meeting the technical criteria of a wetland.

Vegetation: Vegetation was sparse to absent within ruderal areas and, where present, included foxtail barley (*Hordeum murinum*) (FACU), flax-leaved horseweed (*Erigeron bonariensis*) (FACU), rough cats ear (*Hypochaeris radicata*) (UPL), pigweed amaranth (*Amaranthus albus*) (FACU), and prickly lettuce (*Lactuca serriola*) (FACU), among others. Vegetation with grassland areas consisted of non-native annual grasses and forbs. The dominant grass species in this habitat included soft chess (*Bromus hordeaceus*) (FACU), red brome (*Bromus madritensis*) (FACU), wild oats (*Avena sp.*) (UPL), and rattail fescue (*Vulpia myuros*) (FACU). The dominant forbs were also non-native annuals such as rose clover (*Trifolium hirtum*) (UPL), smooth cat's-ear (*Hypochaeris glabra*) (UPL), and burr clover (*Medicago polymorpha*) (FACU). Native forbs found on the site included Heermann's tarweed (*Holocarpha heermannii*) (UPL), harvest brodiaea (*Brodiaea elegans*) (FACU), common fiddleneck (*Amsinckia menziesii*) (UPL), and bi-color lupine (*Lupinus bicolor*) (UPL).

At Sample Point 2 vegetation was absent. Dominant vegetation at Sample Point 4 consisted of soft chess (FACU), six-weeks brome grass (*Festuca bromoides*) (UPL), and six-weeks brome grass (*Festuca bromoides*) (FACU).

Soils: No indicators of hydric soils were observed at Sample Points 2 or 4. The Munsell soil color notation at Sample Point 2 was 10YR 3/3 and the texture was a very compacted sandy loam with no redox features present. At Sample Point 4 the Munsell soil color notation was 10YR 4/4 and the texture was also a sandy loam with no redox features present.

Hydrology: No indicators of wetland or tributary hydrology were observed at Sample Points 2 or 4.

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APPENDIX A: WETLAND DATA SHEETS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Madera P+P City/County: Madera County Sampling Date: 5-1-20

Applicant/Owner: Madera Water District State: CA Sampling Point: 1

Investigator(s): Jeff Gurule Section, Township, Range: S28, T10S, R18E

Landform (hillslope, terrace, etc.): Drainage Local relief (concave, convex, none): Concave Slope (%): ~2%

Subregion (LRR): C Lat: 37.025378 Long: -120.010756 Datum: NAD 83

Soil Map Unit Name: Hanford sandy loam, moderately deep and deep over hardpan, 0 to 3% 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? No Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (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: Area an ephemeral drainage running through orchard. Area delineated exhibited a bed + bank with the outer edge of bed delineated.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3. None			
4.			
Total Cover:	0		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4. None			
5.			
Total Cover:	0		
Herb Stratum			
1.			
2.			
3.			
4.			
5. None			
6.			
7.			
8.			
Total Cover:	0		
Woody Vine Stratum			
1.			
2. None			
Total Cover:	0		

% Bare Ground in Herb Stratum 100 % 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 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ____

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: No vegetation present.

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 Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/3	100					Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

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[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ___ No ✓

Remarks: Hydric soils criteria not met.

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: Area an ephemeral drainage with area of bed and bank extending to swale with no bed and bank to northeast within study area. Blue line drainage on USGS topo. Drainage visible on aerial photos.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Madera Lake P&P City/County: Madera Sampling Date: 5-1-20

Applicant/Owner: Madera Water District State: CA Sampling Point: 2

Investigator(s): Jeff Gurule Section, Township, Range: S33, T10S, R18E

Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%): ~2%

Subregion (LRR): C Lat: 37.01728361 Long: -120.00174111 Datum: NAD83

Soil Map Unit Name: Cometa-Whitney sandy loams, 8-15% 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? No Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (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: Area not meeting wetland criteria. Ruderal area of fig orchard.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
= Total Cover	0		
Sapling/Shrub Stratum (Plot size: 10ft)			
1. None			
2.			
3.			
4.			
5.			
= Total Cover	0		
Herb Stratum (Plot size: 10ft)			
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	0		
Woody Vine Stratum (Plot size: 10ft)			
1. None			
2.			
= Total Cover	0		

% 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: 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 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ______

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, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No ✓

Remarks: No veg. Area has compacted soils. Ruderal area of orchard.

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 %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/3	100	—				Sandy loam	Very Compacted

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

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[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? Yes ___ No ✓

Remarks: Hydric soil criteria not met. Soils very compacted.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ 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 Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ 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)
___ 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 present.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Madera Lake P+P City/County: Madera Sampling Date: 5-1-20

Applicant/Owner: Madera Water District State: CA Sampling Point: 3

Investigator(s): JG Section, Township, Range: S33, T10S, R18E

Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%): <10%

Subregion (LRR): C Lat: 37.01745237 Long: -120.00172157 Datum: NAD 83

Soil Map Unit Name: Cometa-Whitney sandy loams, 8-15% slopes NWI classification: Lake

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? No Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (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 absent from 99% of this ruderal pool located within the operational footprint of orchard. Pool boundaries defined by drift deposits at edge of pool.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 100 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3. None			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 100 ft)			
1.			
2.			
3. None			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 100 ft)			
1. Hordeum marinum	<1	Y	FAC
2. Poa annua	<1	Y	FAC
3. Festuca perreni	<1	Y	FAC
4. Polygonum aviculare	<1	Y	FAC
5.			
6.			
7.			
8.			
= Total Cover	1		
Woody Vine Stratum (Plot size: 100 ft)			
1. None			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 94% % Cover of Biotic Crust 5%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ____

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, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: Veg absent from ~99% of pool. Biotic Crust Present.

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 %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	70	7.5YR 3/2	30	C	M	Clay Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

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[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ___
Depth (inches): ___

Hydric Soil Present? Yes ✓ No ___

Remarks: Area meeting hydric soils criteria.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ 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 Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ 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)
- ___ 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): 6
Water Table Present? Yes ✓ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 12

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Area Low spot in orchard that regularly collects winter rain runoff. Spadefoot toad larva in small inundated area. Pool mostly dry.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Madera Lake P+P City/County: Madera County Sampling Date: 5-1-20

Applicant/Owner: Madera Water District State: CA Sampling Point: 4

Investigator(s): Jeff Gurule Section, Township, Range: S34, T10S, R18E

Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): concave Slope (%): ~5%

Subregion (LRR): C Lat: 37.01735620 Long: 120.00144953 Datum: NAD83

Soil Map Unit Name: Cometa-Whitney sandy loams, 8-15% 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? No Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? No (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: Area an upland within non-native grassland habitat.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10 ft)			
1. None			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 10 ft)			
1. None			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 10 ft)			
1. Trifolium hirtum	20	Y	UPL
2. Festuca bromoides	50	Y	FACU
3. Holocarpha heermannii	5		UPL
4. Bromus hordeaceus	20	Y	FACU
5. Erodium cicutarium	5		UPL
6.			
7.			
8.			
= Total Cover	100		
Woody Vine Stratum (Plot size: 10 ft)			
1. None			
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: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (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 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ___

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, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No ✓

Remarks: Area contained only upland vegetation.

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 %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/4	100	—	—	—		Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

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[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No ✓

Remarks: Hyrdic soil indicators absent.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ 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 Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ 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)
- ___ 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: Hydrology criteria absent. No indicators.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Madera Lake P+P City/County: Madera County Sampling Date: 5-1-20
Applicant/Owner: Madera Water District State: CA Sampling Point: 5
Investigator(s): Jeff Gurule Section, Township, Range: S34, T10S, R18E
Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): Concave Slope (%): ~2%
Subregion (LRR): C Lat: 37.01754986 Long: -120.0001787 Datum: NAD83
Soil Map Unit Name: Cometa-Whitney sandy loams, 8-15% slopes NWI classification: Lake
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? No Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? No (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: Lakebed of Madera Lake meeting wetland criteria at time of survey. When innundated a deep-water aquatic habitat.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 10Ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
= Total Cover			

Herb Stratum (Plot size: 10Ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Trifolium depauperatum	15	Y	FAC
2. Medicago polymorpha	5		FACU
3. Lepidium latifolium	15	Y	FAC
4. ~~[illegible]~~	~~[illegible]~~		
5. Spergularia rubra	5		FAC
6. Pilularia tenellus	5		OBL
7. Erodium cicutarium	5		UPL
8. Trifolium dubium	5		UPL
= Total Cover	55		

Woody Vine Stratum (Plot size: 10Ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 45 % 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: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

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, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: Area supports a dominance of wetland species.

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	Remarks
0-12	10YR 3/3	85	5YR 6/4	15	C	M	Sandy Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

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[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ No ___

Remarks: Hydric soil indicators present

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ 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 Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ 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)
- ___ 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: Area dried lakebed of Madera Lake

APPENDIX B: SELECTED PHOTOGRAPHS OF THE STUDY AREA

Photo 1: Sample Point 1 location within area of an ephemeral channel exhibiting a modest bed and bank. Bed and bank becoming imperceptible upstream in upper middle of photo.
Photo direction: Northeast.

Photo 2: Sample Point 1 location within area of an ephemeral channel exhibiting a modest bed and bank.
Photo direction: Southwest.

Photo 3: Sample Point 2 at edge of orchard.
Ruderal pool boundary in view at right side of photo.
Photo direction: West.

Photo 4: Sample Point 3 in ruderal pool.
Photo direction: North.

Photo 5: Overview of Sample Point 3 in ruderal pool.
Photo direction: South.

Photo 6: Sample Point 4 non-native grassland. Offsite vernal pool in background.
Photo direction: North.

Photo 7: Overview of grassland associated with Sample Point 4.
Photo direction: West.

Photo 8: Sample Point 5 in Madera Lake lakebed. Madera Lake Dam in background.
Photo direction: Southwest.

Photo 9: Ruderal upland area.
Photo direction: South.

Photo 10: Another ruderal upland area intended for project staging.
Photo direction: West.

APPENDIX C: VASCULAR PLANTS OF THE STUDY AREA

APPENDIX A

VASCULAR PLANTS OF THE SITE

The plants species listed below were observed on the Madera Lake Pump and Pipeline APE during a field survey conducted by Live Oak Associates, Inc. on May 1, 2020. The National Wetland Plant List wetland indicator status of each plant has been shown following its common name.

OBL - Obligate
FACW - Facultative Wetland
FAC - Facultative
FACU - Facultative Upland
UPL - Upland

AMARANTHACEAE – Amaranth Family		
Amaranthus albus	White Amaranth	FACU
ASTERACEAE - Sunflower Family		
Centaurea melitensis	Tocalote	UPL
Erigeron bonariensis	Flax-leaved Horseweed	FACU
Erigeron canadensis	Canada Horseweed	FACU
Holocarpha heermannii	Heermann's Tarweed	UPL
Hypochaeris glabra	Smooth Cat's-ear	UPL
Hypochaeris radicata	Cats Ear	UPL
Lactuca serriola	Prickly Lettuce	FACU
Matricaria matricarioides	Pineappleweed	UPL
Pseudognaphalium luteoalbum	Jersey Cudweed	FAC
Psilocarphus tenellus ssp. *tenellus*	Slender Woolly Heads	OBL
Sonchus oleraceus	Sow Thistle	UPL
BORAGINACEAE – Borage Family		
Amsinckia menziesii	Small Flowered Fiddleneck	UPL
Heliotropium curassavicum	Salt Heliotrope	FACU
BRASSICACEAE – Mustard Family		
Hirschfeldia incana	Mustard	UPL
Capsella bursa-pastoris	Shepherd's Purse	FACU
Lepidium latifolium	Broadleaved Pepperweed	FAC
Lepidium nitidum	Shining Pepperwort	FAC
Raphanus sativus	Wild Radish	UPL
Spergularia rubra	Red Sandspurrey	FAC
CUCURBITACEAE - Cucumber Family		
Cucurbita foetidissima	Calabazilla	UPL
FABACEAE - Legume Family		
Lupinus bicolor	Bicolored Lupine	UPL

Lupinus microcarpus var. *densiflorus*	Chick Lupine	UPL
Medicago lupulina	Black Medic	FAC
Medicago polymorpha	Burclover	FACU
Trifolium albopurpureum	Indian Clover	FACU
Trifolium depauperatum	Balloon Clover	FAC
Trifolium dubium	Shamrock Clover	UPL
Trifolium hirtum	Rose Clover	UPL
GERANIACEAE - Geranium Family		
Erodium cicutarium	Red-stem Filaree	UPL
LILIACEAE – Lily Family		
Brodiaea elegans	Elegant Brodiaea	FACU
MALVACEAE – Mallow Family		
Malva parviflora	Small Flowered Mallow	UPL
ONAGRACEAE – Fuschia Family		
Epilobium brachycarpum	Annual Fireweed	UPL
PHRYMACEAE – Monkey Flower Family		
Veronica anagallis-aquatica	Water Speedwell	OBL
POACEAE - Grass Family		
Aira caryophyllea	Silver Hair Grass	FACU
Avena sp.	Wild Oats	UPL
Bromus catharticus	Rescue Grass	UPL
Bromus hordeaceus	Soft Chess	FACU
Bromus diandrus	Ripgut Brome	UPL
Bromus madritensis ssp. *rubens*	Red Brome	FACU
Cynodon dactylon	Bermuda Grass	FACU
Hordeum marinum ssp.*gusonneanum*	Mediterranean Barley	FAC
Hordeum murinum ssp. *leporinum*	Barnyard Barley	FACU
Festuca bromoides	Six-weeks Brome Grass	FACU
Festuca myuros	Rattail Fescue	FACU
Festuca perennis	Perennial Ryegrass	FAC
Poa annua	Annual Bluegrass	FAC
Polypogon monspeliensis	Rabbits Foot Grass	FACW
POLYGONACEAE - Buckwheat Family		
Rumex crispus	Curly Dock	FAC
Polygonum aviculare	Prostrate Knotweed	FAC
VERBENACEAE- Verbena Family		
Phyla nodiflora	Common Lippia	FACW

APPENDIX D: SOILS INFORMATION

Map Unit Description

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 in this report, 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, soils that are similar to the named components, and some minor components that differ in use and management from the major soils.

Most of the soils similar to the major components 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. Some minor components, however, have properties and behavior 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*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given 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.

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description

Madera Area, California

CuB—Cometa sandy loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: hk5j
Elevation: 20 to 400 feet

Mean annual precipitation: 10 to 23 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 260 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Cometa and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cometa

Setting

Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 17 inches: sandy loam
H2 - 17 to 27 inches: sandy clay
H3 - 27 to 60 inches: stratified sandy loam to sandy clay loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 17 inches to abrupt textural change
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

San joaquin

Percent of map unit: 10 percent
Hydric soil rating: No

Whitney

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed, ponded

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

CwC—Cometa-Whitney sandy loams, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: hk5m
Elevation: 20 to 500 feet
Mean annual precipitation: 10 to 23 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Cometa and similar soils: 46 percent
Whitney and similar soils: 44 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cometa

Setting

Landform: Fan remnants
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 17 inches: sandy loam
H2 - 17 to 27 inches: sandy clay
H3 - 27 to 60 inches: stratified sandy loam to sandy clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 17 inches to abrupt textural change
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: D
Hydric soil rating: No

Description of Whitney

Setting

Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Concave
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 19 inches: sandy loam
H2 - 19 to 28 inches: fine sandy loam
Cr - 28 to 60 inches: weathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 28 to 32 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

San joaquin

Percent of map unit: 8 percent
Hydric soil rating: No

Unnamed, ponded

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

GvB—Greenfield sandy loam, moderately deep and deep over hardpan, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: hk7m
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches

Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Greenfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Greenfield

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 23 inches: sandy loam
H2 - 23 to 40 inches: sandy loam
H3 - 40 to 60 inches: cemented

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: 40 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Ramona

Percent of map unit: 5 percent
Hydric soil rating: No

San joaquin

Percent of map unit: 5 percent
Hydric soil rating: No

HgA—Hanford sandy loam, moderately deep and deep over hardpan, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: hk7v
Elevation: 150 to 900 feet
Mean annual precipitation: 10 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 250 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hanford and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hanford

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous rock

Typical profile

H1 - 0 to 12 inches: sandy loam
H2 - 12 to 36 inches: fine sandy loam
H3 - 36 to 60 inches: cemented

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 36 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: B

Hydric soil rating: No

Minor Components

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Madera

Percent of map unit: 5 percent
Hydric soil rating: No

San joaquin

Percent of map unit: 5 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Madera Area, California
Survey Area Data: Version 14, Jun 1, 2020