Appendix H Preliminary Water Quality Management Plan

Appendix

This page intentionally left blank.

PRELIMINARY WATER QUALITY MANAGEMENT PLAN

"THE INVITATION"

PERMIT NO. OTH2019-01205

Project Address:

1122 N. Anaheim Boulevard

Anaheim, CA

Prepared for:

RENAISSANCE CITY NORTH ANAHEIM LLC RPP EQUITIES LLC

4675 MacArthur Court, Suite 550

Newport Beach, CA 92660

(714) 658-6299

Prepared by:

Hunsaker & Associates Irvine, Inc.

3 Hughes

Irvine, CA 92618

(949) 583-1010

WQMP Preparation Date:

October 1, 2019

Revision Date: December 20, 2019, March 31, 2020 and April 23, 2020

PRELIMINARY
WATER QUALITY
MANAGEMENT PLAN (WQMP)

"THE INVITATION"
DEV2019-00087
PERMIT NO. OTH2019-01205

Project Address:
1122 N. Anaheim Boulevard
Anaheim, CA

Prepared for:

RENAISSANCE CITY NORTH ANAHEIM LLC RPP EQUITIES LLC
4675 MacArthur Court, Suite 550
Newport Beach, CA 92660
(714) 658-6299

Prepared by:

Hunsaker & Associates, Irvine, Inc.

Engineer: Ed Mandich PE Registration No. 59089

3 Hughes
Irvine, CA 92618
(949) 583-1010

Prepared: October 1, 2019
Revised: December 20, 2019, March 31, 2020 & April 23, 2020

4260-

Project Owner's Certification			
Permit/Application No.	OTH2019-01205	Grading Permit No.	N/A
Tract/Parcel Map No.		Building Permit No.	N/A
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			APN 035-010-51

This Water Quality Management Plan (WQMP) has been prepared for Renaissance City North Anaheim LLC RPP Equities LLC by Hunsaker and Associates Irvine, Inc. The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: Renaissance City North Anaheim LLC RPP Equities LLC			
Name/Title	Robert Kim		
Company	Renaissance City North Anaheim LLC RPP Equities LLC		
Address	4675 MacArthur Court, Suite 550, Newport Beach, CA 92660		
Email	rhkim@renpacdev.com		
Telephone #	(714) 658-6299		
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.			
Signature		Date	4/23/20

Preparer (Engineer): Ed Mandich			
Title	Project Manager	PE Registration #	59089
Company	Hunsaker and Associates Irvine, Inc.		
Address	3 Hughes, Irvine, CA 92618		
Email	emandich@hunsaker.com		
Telephone #	(949) 583-1010		

I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board.

Preparer Signature		Date	4/23/2020
Place Stamp Here			

Table of Contents

Page No.

Section I Discretionary Permit(s) and Water Quality Conditions

The project's discretionary permit and water quality information are provided in the following:

Project Infomation			
Permit/Application No. (If applicable)	OTH2019-01205	Grading or Building Permit No. (If applicable)	N/A
Address of Project Site (or Tract Map and Lot Number if no address and APN)	Address: 1122 N. Anaheim Boulevard APN: 035-010-51		
Water Quality Conditions of Approval or Issuance			
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim)	Per City of Anaheim Municipal Code Title 10, Chapter 09, Section 030.010, project is subject to the requirements of New Development and Significant Redevelopment projects to control urban runoff, in accordance County of Orange Drainage Area Management Plan. Project specific conditions of approval are not available at his time and will be provided upon discretionary approval.		
Conceptual WQMP			
Was a Conceptual Water Quality Management Plan previously approved for this project?	No. A conceptual WQMP was not previously approved for this project.		
Watershed-Based Plan Conditions			
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	The project is located within the San Gabriel-Coyote Creek Watershed. Currently, there is no approved WIHMP for the San Gabriel-Coyote Creek Watershed. Although the project's receiving waters are considered impaired under Section 303(d) of the Clean Water Act, there are currently no TMDL's established for these waterbodies.		

Section II Project Description

II.1 Project Description

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td>Development Category (Verbatim from WQMP):</td><td colspan="4">Priority Project, Category 1 – New development projects that create 10,000 square feet or more of impervious surface. This category includes commercial, industrial, residential housing subdivisions, mixed-use, and public projects on private or public property that falls under the planning and building authority or the Permittees.

Priority Project, Category 6 – Parking lots 5,000 square feet or more including associated drive aisle, and potentially exposed to urban storm water runoff. A parking lot is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.

Priority Project, Category 7 – Streets, roads, highways and freeways. This category includes any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles and other vehicles.</td></tr>
<tr><td>Project Area (ft^2): 211,467 ft^2 (4.86 acres - Gross area to centerline of Anaheim Boulevard)

Disturbed Project Area (On-Site Improvements and Street Widening of Anaheim Boulevard Right-of-Way): 201,733 ft^2 (4.63 acres)

Refer to Area Take-offs Exhibit (Section IV) for Project Area Summary</td><td colspan="2">Number of Dwelling Units: 269</td><td colspan="2">SIC Code: N/A for residential development</td></tr>
<tr><td rowspan="2">Project Area (Gross area to centerline of Anaheim Boulevard)</td><td colspan="2">Pervious</td><td colspan="2">Impervious</td></tr>
<tr><td>Area (acres or sq ft)</td><td>Percentage</td><td>Area (acres or sq ft)</td><td>Percentage</td></tr>
<tr><td>Pre-Project Conditions</td><td>0 acres</td><td>0%</td><td>4.86 acres</td><td>100%</td></tr>
<tr><td>Post-Project Conditions</td><td>0.81 acres</td><td>17%</td><td>4.05 acres</td><td>83%</td></tr>
</table>

<table>
<tr><th colspan="2">Description of Proposed Project</th></tr>
<tr><td>Drainage Patterns/Connections</td><td>The pre-project site consists of an industrial site. In general, runoff flows across the site from the northeast to southwest towards Anaheim Boulevard, with any overflows discharging to the existing storm drain system in Anaheim Boulevard and conveyed approximately 0.10 mile south to the existing OCFCD Facility, Carbon Creek Channel (B01), flows will continue westerly and confluence with Coyote Creek (LACFDC, A01), then southerly towards San Gabriel River and ultimately discharge into the Pacific Ocean.</td></tr>
<tr><td>Narrative Project Description:</td><td>The proposed project, "The Invitation", an approximate 4.86 acre (gross area to centerline of Anaheim Boulevard) rectangular parcel of land located just northeast of the intersection of Anaheim Boulevard and West La Palma Avenue in the City of Anaheim, California. The disturbed project area will consist of approximately 4.63 acres (on-site improvements and street widening/improvements for Anaheim Boulevard right-of-way). A portion of Anaheim Boulevard's roadway, 0.23 acres, within the property's boundary, will not be impacted by the project and remain as it exists today.

Summarized below is a breakdown of the project area.

<table>
<tr><th colspan="2">Project Area Summary</th></tr>
<tr><td>Gross Area</td><td>4.86 acres</td></tr>
<tr><td>Net Area (excludes Anaheim Blvd Right of Way)</td><td>4.49 acres</td></tr>
<tr><td>Anaheim Boulevard Right-of-Way</td><td>0.37 acres</td></tr>
<tr><td>Disturbed Area (site improvements and Anaheim Blvd. widening)</td><td>4.63 acres</td></tr>
</table>

The Area Take-offs Exhibit in Section IV also illustrates the project's overall area and the impacted areas as part of the site's redevelopment.

Specifically, the project site is bound to the north by an existing recycling plant; to the east by an existing trucking yard; to the south by La Palma Village; and to the west by Anaheim Boulevard. Entrance to the project is provided via a single entrance from Anaheim Boulevard at the northwest corner of the site.

The project proposes 269 apartments, wet and dry utilities, drive-aisle, parking structure, storm drain improvements, walkways and parkway improvements.</td></tr>
</table>

Description of Proposed Project

Proposed residential units consist of studio, 1-bedroom and 2-bedroom apartments:

Plan	Living Area (ft^2)	No. of Units
Studio	594	49
1-Bed	718-735	119
2-Bed	1,117-1,144	101

Parking is provided via 527 private garage parking spaces within the 6-level parking structure. Project parking is consistent with the City's parking requirements.

Proposed communal improvements include a main clubroom and fitness center, main pool/spa area with cabanas and lounge areas and four separate courtyards that are connected via breezeways with resident amenities that include; outdoor kitchen, fire pit with lounge seating, sit-up bar, group dining area, social activities, game lawn, dog park, and rooftop terrace with a game zone, wet bar, sit-up bar and lounge area.

Proposed open space/landscaping will consist of parkway and walkway landscaping, common landscaping located in the large courtyard areas and perimeter landscaping. Total landscaping is anticipated to consist of approximately 17% of the project site, or 0.81 acres.

Paved and other impervious areas of the site include the project's drive aisle, walkways, parkway, drive approaches and gutter improvements, building structures, amenity courtyards and other exposed paved surfaces.

Total impervious area is anticipated to consist of approximately 83% of the project site, or 4.04 acres.

Activities typical of residential developments are anticipated for the project. These include day-to-day activities such as recreation, lounging, commuting, exercising and other residential related activities.

Typical wastes from apartments are anticipated to be generated daily from the project. These include food wastes, paper products and recyclable materials.

Designated trash bins are located at the west and east ends of the parking garage. For residents, there will be designated trash rooms for each building. Trash shall be removed on a weekly basis, or as needed, by the local waste management company.

The project does not propose any outdoor storage areas, car wash areas

Description of Proposed Project	
	or other commercial activities. All proposed improvements are shown on the WQMP Site Plan in Section VI of this WQMP. Site improvements will include the residential apartment building, access drive, parking structure, interior courtyards, walkway and perimeter landscaping. The limits of the proposed improvements are depicted on the site plan, reference DMA 1. Street and parkway improvements, within Anaheim Boulevard's ultimate right-of-way, will include a 3' widening of the roadway with a 5' landscape parkway (curb adjacent) and 5' sidewalk to provide ultimate improvements along the project's frontage per the Anaheim General Plan Circulation Element. The limits of the proposed improvements are depicted on the site plan, reference DMA's 2 and 3. RCP plans will be submitted during Final Engineering for improvements within Anaheim Boulevard Right-of-Way.

II.2 Potential Stormwater Pollutants

Table 2.1, Anticipated and Potential Pollutants Generated by Land Use Type from the Technical Guidance Document (December 2013) lists the following Pollutants of Concern (POC's) associated with the project:

Pollutants of Concern			
Pollutant	E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E		Potential sources of sediment include landscaping areas and disturbed earth surfaces.
Nutrients	E		Potential sources of nutrients include fertilizers, sediment and trash/debris.
Heavy Metals	E		Potential sources include vehicles and automotive fluids.
Pathogens (Bacteria/Virus)	E		Potential sources of pathogens include landscaping areas and food wastes.
Pesticides	E		Potential sources of pesticides include landscaping areas.
Oil and Grease	E		Potential source includes automobiles.
Toxic Organic Compounds	E		Potential source includes automobiles.

Trash and Debris	E		Potential sources include common litter and trash from residents.

II.3 Hydrologic Conditions of Concern

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2013 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

In the North Orange County permit area, HCOCs are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts and either of the following conditions exists:

- Post-development runoff volume for the 2-yr, 24-hr storm exceeds the pre-development runoff volume for the 2-yr, 24-hr storm by more than 5 percent.

or

- Time of concentration (Tc) of post-development runoff for the 2-yr, 24-hr storm event is less than the time of concentration of the pre-development condition for the 2-yr, 24-hr storm event by more than 5 percent.

If these conditions do not exist or streams are not potentially susceptible to hydromodification impacts, an HCOC does not exist and hydromodification does not need to be considered further. In the North Orange County permit area, downstream channels are considered not susceptible to hydromodification, and therefore do not have the potential for a HCOC, if all downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive habitat areas will be affected.

Is the proposed project potentially susceptible to hydromodification impacts?

☐ No – Show map

☒ Yes - Describe applicable hydrology conditions of concern below.

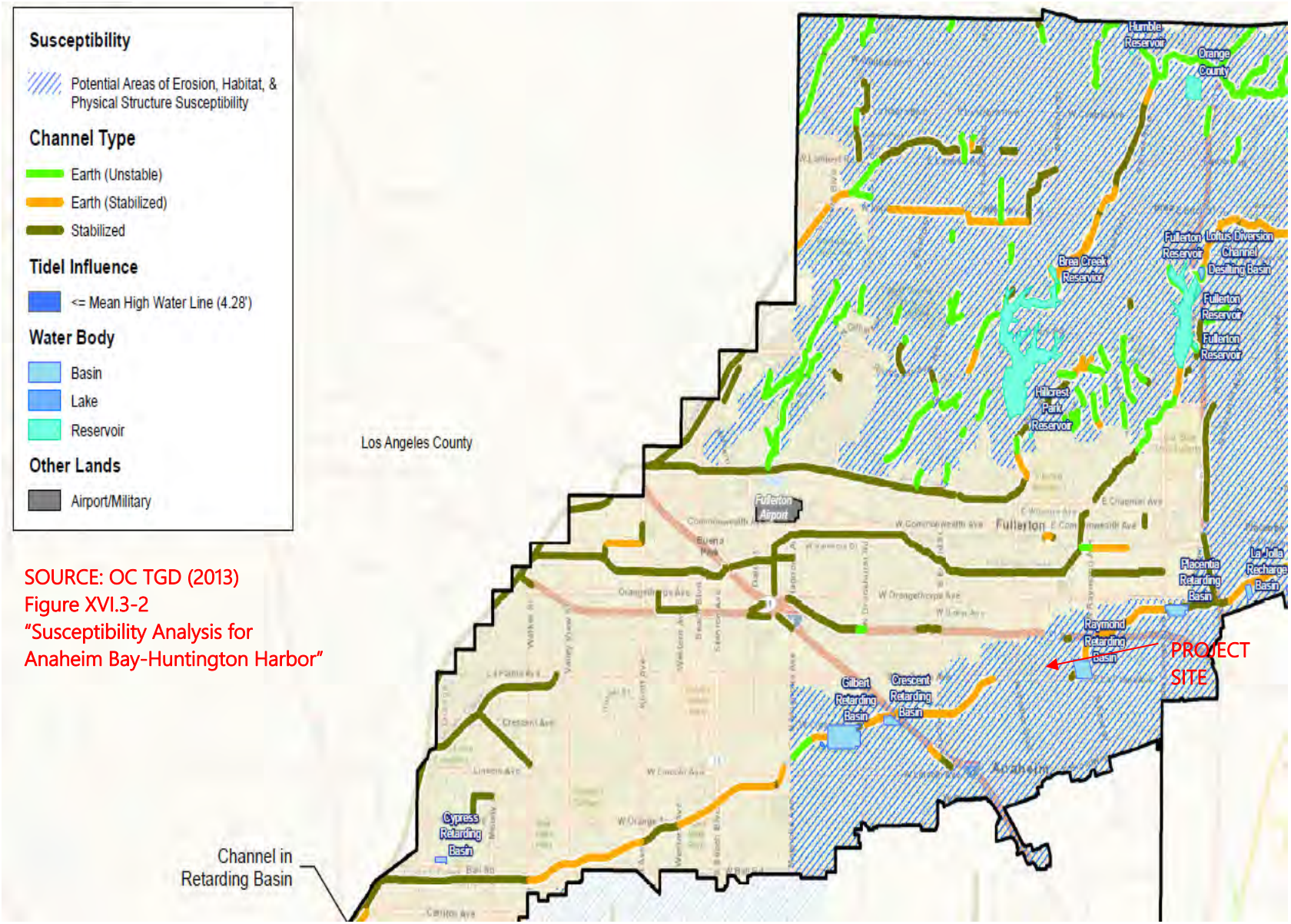
Based on the County's current hydromodification susceptibility map (provided on the following page), the project is subject to the specific 2-year criteria previously noted. However, the project's Q2 Tc is greater in the post-development condition than in the pre-development condition, demonstrating hydromodification will not occur as a result of the project's development. In addition, the Q2 (cfs) and Q2 (volume, ac-ft) are less in the post development condition than in the pre-development condition, also demonstrating hydromodification will not occur as a result of the project's development. Therefore, even though the project site is with in an area with the potential for hydromodification, the project's hydrology for the 2-year event demonstrates hydromodification will not occur as a result of the project's development.

The table below provides a summary comparison of the project's 2-year Tc, Q2 (cfs) and Q2 (volume, ac-ft) in the pre-development and post-development conditions to demonstrate why the project is exempt from HCOC.

Condition	Q2 (Tc, minutes)	Q2 (cfs)	Q2 (volume, ac-ft)
Pre-Development	11.42	6.0	0.62
Post-Development	12.8	5.8	0.59

Please note for the Q2 flows, the post-development condition includes two on-site drainage areas, the north drainage area (with northwest discharge) and south drainage area (with southwest discharge), as well as the street flows (offsite) from Anaheim Boulevard. The north drainage area and south drainage area Q2 flows both ultimately confluence in the 66" RCP in Anaheim Boulevard at the project's southwest corner. The pre-development condition has only one on-site drainage area, which also ultimately discharges into the 66" RCP in Anaheim Boulevard at the project's southwest corner, as well as the street flows (offsite) from Anaheim Boulevard. Therefore, the figures in the table above for the pre-development condition account for the one on-site drainage area and the Anaheim Boulevard street flows. Whereas, for the figures in the post- development condition, the Q2 Tc is for the lowest Tc of the two on-site drainage areas, which happens to be the same Tc (12.8 minutes) for both on-site drainage areas, with the Q2 flow (cfs) and Q2 volume (ac-ft) for the post-development condition accounting for combined overall drainage areas (north, south and Anaheim Boulevard) to make an accurate comparison with the pre-development condition.

Please refer to the pre-development (existing) and post-development (proposed) hydrology maps and pre-development and post-development hydrology calculations for the 2-year storm condition included in Attachment G.


Susceptibility
Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility
Channel Type
Earth (Unstable)
Earth (Stabilized)
Stabilized
Tidel Influence
<= Mean High Water Line (4.28')
Water Body
Basin
Lake
Reservoir
Other Lands
Airport/Military
Los Angeles County
Humble Reservoir
Orange County
Brea Creek Reservoir
Fullerton Reservoir
Loftus Diversion Channel Desilting Basin
Hillcrest Park Reservoir
Fullerton Airport
Fullerton
Placentia Retarding Basin
La Jolla Recharge Basin
Raymond Retarding Basin
Gilbert Retarding Basin
Crescent Retarding Basin
Cypress Retarding Basin
Anaheim
PROJECT SITE
Channel in Retarding Basin
SOURCE: OC TGD (2013)
Figure XVI.3-2
"Susceptibility Analysis for
Anaheim Bay-Huntington Harbor"

II.4 Post Development Drainage Characteristics

In general, post-development drainage area and flow direction will be consistent with pre-project conditions. Runoff is conveyed as surface flow to project gutters and discharged to catch basins and the project's main storm drain system.

Low Impact Development

To satisfy the project requirements for Low Impact Development (LID) and addressing runoff pollutants of concern, the project proposes to retain water quality flows (non-storm water flows and the Design Capture Volume) onsite for each of the project's Drainage Management Area (DMA). DMA's 1-3 total 4.63 acres and the total project boundary is 4.86 acres, the remaining 0.23 acres consist of Anaheim Boulevard right-of-way (within the project's boundary) that will not be improved as part of the project.

Pursuant to new guidance from Orange County Sanitation District (OCSD) regarding parking structure drainage, LID BMPs will need to account for wind driven rain and associated runoff, if the parking structure will have open sides/windows. The proposed parking structure will have exposure on the north elevation and limited exposure on the east elevation. Consequently, LID BMPs have been sized accordingly to ensure that this extra runoff is accounted for and treated. For this Preliminary WQMP, an additional 20% has been added to the LID BMP's to account for the parking structure drainage for wind driven rain into covered levels, refer to the supporting calculations in Worksheet C. For the Final WQMP, precise calculations for the parking garage will be performed and the LID BMP's will be updated accordingly, if necessary.

DMA 1 (On-site: 4.49 acres) – Consists of the project's on-site areas. Runoff generated from the roof areas, the project's exposed areas (courtyards, parking garage, drive aisle, walkways, etc.) is conveyed to a treatment control BMP for pre-treatment (Modular Wetland System or equivalent), then to an underground infiltration vault, located in the northwest corner of the site. Specifically, low flows from the easterly drive aisle will be surface flow southerly to a proposed catch basin and will be directed via a low flow storm drain line to the Modular Wetland System and underground infiltration system located at the northwest corner of the site. Low flows from the northerly drive aisle will surface flow westerly towards the catch basin at the northwest corner and to the Modular Wetland System and underground infiltration system.

DMA 2 (Offsite: 0.08 acres) – Consists of 3' roadway widening and parkway improvements within the right-of-way of Anaheim Boulevard. Storm flows from this area will surface flow and enter the bioretention with no underdrain BMP via curb inlets. Runoff from this area is addressed via a bioretention with no underdrain BMP, that has been sized to accommodate, at minimum, total tributary area of 0.88 acres, to account for a portion of DMA 3 (0.008 acres) that cannot be treated due to utility constraints

DMA 3 (Offsite: 0.06 acres) – Consists of 3' roadway widening and parkway improvements within the right-of-way of Anaheim Boulevard. Storm flows from this area will surface flow and enter the bioretention with no underdrain BMP via curb inlets. Due to utility constraints, 0.008 acres of runoff could not be completely addressed within this DMA. DMA 2 has been designed to accommodate

additional runoff.

DMA 2 and DMA 3 consists of work that will be performed within the Anaheim Boulevard public right-of-way (3' roadway widening and parkway improvements). The Owner will be responsible for the maintenance of the bioretention with no underdrain area until the formation of a POA, then the POA will be the maintenance entity. Grading and storm drain improvement plans will be provided during final engineering.

To meet the trash capture requirements of the Ocean Plan, each of the project's catch basins (onsite and offsite) will be equipped with an approved full trash capture BMP (BioClean's Curb Inlet Filter Model No. BIO-CURB-FULL, or equivalent).

The locations of the project's proposed BMPs are provided in the WQMP Site Plan in Section VI of this WQMP.

II.5 Property Ownership/Management

The property owner, Renaissance City North Anaheim LLC RPP Equities LLC, shall assume all BMP maintenance and inspection responsibilities for the project site until all site responsibilities have been transferred to the POA. Thereafter, the POA shall assume all BMP maintenance and inspection responsibilities, including long-term funding for implementation of the project's onsite BMPs.

Inspection and maintenance activities are provided in Section V of this WQMP.

Section III Site Description

III.1 Physical Setting

General descriptions of the project area are provided below:

<table>
<tr><td>Name of Planned Community/Planning Area (if applicable)</td><td>Community Name: The Renaissance
Planning Area: N/A</td></tr>
<tr><td>Location/Address</td><td>1122 N. Anaheim Boulevard</td></tr>
<tr><td>Project Area Description</td><td>The proposed project, "The Invitation", an approximate 4.86 acre (gross area to centerline of Anaheim Boulevard) rectangular parcel of land located just northeast of the intersection of Anaheim Boulevard and West La Palma Avenue in the City of Anaheim, California. The disturbed project area will consist of approximately 4.63 acres (on-site improvements and street widening/improvements for Anaheim Boulevard right-of-way). A portion of Anaheim Boulevard's roadway, 0.23 acres, within the property's boundary, will not be impacted by the project and remain as it exists today.

Summarized below is a breakdown of the project area.
<table>
<tr><th colspan="2">Project Area Summary</th></tr>
<tr><td>Gross Area</td><td>4.86 acres</td></tr>
<tr><td>Net Area (excludes Anaheim Blvd Right of Way)</td><td>4.49 acres</td></tr>
<tr><td>Anaheim Boulevard Right-of-Way</td><td>0.37 acres</td></tr>
<tr><td>Disturbed Area (site improvements and Anaheim Blvd. widening)</td><td>4.63 acres</td></tr>
</table>
The Area Take-offs Exhibit in Section IV also illustrates the project's overall area and the impacted areas as part of the site's redevelopment.

Specifically, the project site is bound to the north by an existing recycling plant; to the east by an existing trucking yard; to the south by La Palma Village; and to the west by Anaheim Boulevard. Entrance to the project is provided via a single entrance from Anaheim Boulevard at the northwest corner of the site.</td></tr>
<tr><td>General Plan Land Use Designation</td><td>Existing: Mixed-Use High
Proposed: Mixed-Use High</td></tr>
<tr><td>Zoning</td><td>Existing: Industrial (I)
Proposed: Mixed Use (MU) Overlay (36-60 DU/AC)</td></tr>
<tr><td>Acreage of Project Site</td><td>
<table>
<tr><td>Gross Area</td><td>4.86 acres</td></tr>
<tr><td>Net Area (excludes Anaheim Blvd Right of Way)</td><td>4.49 acres</td></tr>
</table>
</td></tr>
</table>

	Anaheim Boulevard Right-of-Way	0.37 acres
	Disturbed Area (site improvements and Anaheim Blvd. widening)	4.63 acres
Predominant Soil Type	Based on the soils report, the subsurface soils contain a mixture of sand and silty sand approximately 15 to 20 feet beneath the site. HSG A.	

III.2 Site Characteristics

The following table summarizes general characteristics of the project site:

Precipitation Zone	0.90 in
Topography	The pre-project site is very flat, with a gentle gradient to the west.
Drainage Patterns/Connections	The pre-project site consists of an industrial site. In general, runoff flows across the site from the northeast to southwest towards Anaheim Boulevard, with any overflows discharging to the existing storm drain system in Anaheim Boulevard and conveyed approximately 0.10 mile south to the existing OCFCD Facility Carbon Creek Channel (B01), flows will continue westerly and confluence with Coyote Creek (LACFDC, A01), then southerly towards San Gabriel River and ultimately discharge into the Pacific Ocean.
Soil Type, Geology, and Infiltration Properties	The project site resides on the lowers reach of the Santa Ana River Basin within the Peninsular Ranges geomorphic province. The Pennisular Ranges geomorphic province extends southward from the Los Angeles Basin to the tip of Baja California and is characterized by elongated northwest trending mountain ranges separated by sediment-floored valleys. The area south and west of the Santa Ana Mountains is generally characterized as a broad, complex, alluvial fan which receives sediments from the Santa Ana River and its tributaries draining the Santa Ana and San Bernardino Mountains. The project site is located approximately 3 miles west of the Santa Ana River. Regional geologic mapping of the project site consist of Quaternary age young alluvial fan deposits comprised of varying proportions of sand, silt and clay. Infiltration testing was conducted at four locations, with measured infiltration rates ranging from 0.81 inches per hour to 179.5 inches per hour. [1] The project is located with Hydrologic Soil Group A per OC TG Figure XVI-2a.

[1] *Geotechnical Exploration Proposed Multi-Family Residential Development Project, 1122 N. Anaheim Boulevard, prepared by Leighton and Associates, Inc. dated September 24, 2019*

LEGEND

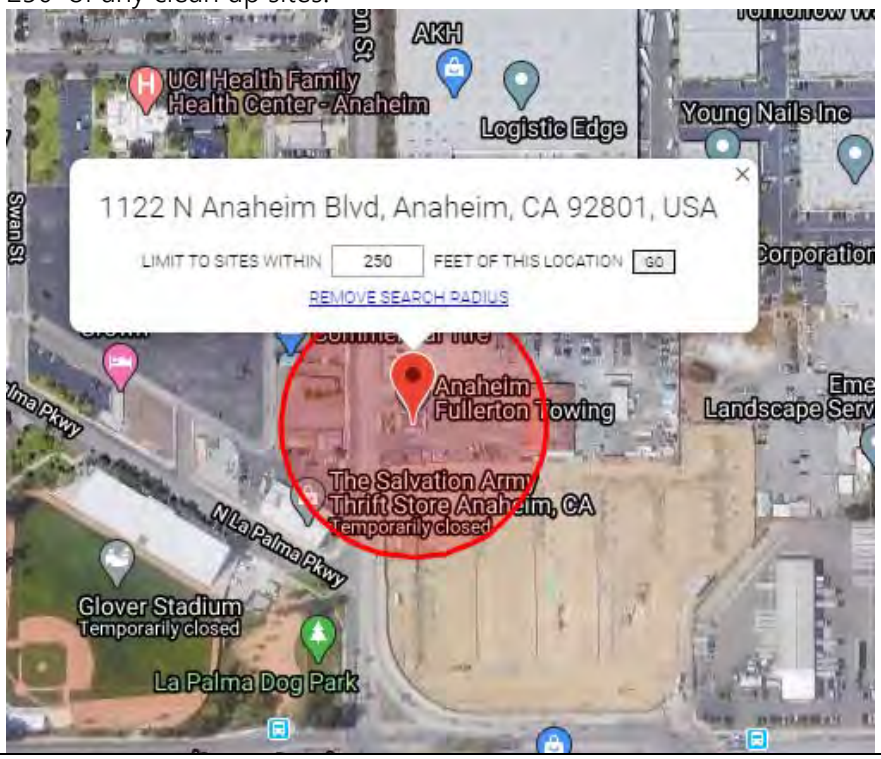
City Boundaries

Hydrologic Soil Groups

A Soils
B Soils
C Soils
D Soils

Source:
Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

Hydrogeologic (Groundwater) Conditions	Groundwater was not encountered during site exploration to a maximum depth of 50 feet. Based on historical data, groundwater in the vicinity is greater than 50 bgs. Additionally, based on review of available groundwater information from the California of Water Resources Date Library for a nearby groundwater monitoring well located near the eastern project boundary, the shallowest groundwater level measured for a monitoring period between February 1971 and August 2003 was approximately 89 feet bgs. Based on the project's Phase 2 ESA, the site has been used as an automobile and freight truck storage/tow yard, maintenance and repair facility, and fueling site since 1947. The site formerly operated underground storage tanks and associated fueling dispenser pumps. Refer to Attachment F for an excerpt of the Phase 2 ESA. Results of the Phase II ESA indicate the following: • Three areas (20,000-gallon underground diesel tank - SB9, TPH impacted soil from former UST dispenser area – SB7, and TPH impacted soil from oil/water separator – SB6) will require remediation and are all located in the southeast quadrant of the property and will impact soils approximately 10 feet beneath existing surface grade. Despite the required remediation, the proposed water quality infiltration BMP will not be an issue as it is located in northwest quadrant of the property within the proposed access drive along the northerly property line, near the project's entry to Anaheim Blvd. (refer to attached BMP Site Plan in Section IV). Additionally, the proposed infiltration BMP (underground vault) will be designed with an approximate 15-foot depth from finished grade providing both distance and grade separation from the remediation sites. Lastly, the project site is located on the fringe of the North Basin Plume Boundary. Infiltration feasibility will be provided by the Orange County Water District (OCWD) for the project pursuant to an official request by the City of Anaheim. If OCWD doesn't approve infiltration, other BMPs will be provided as part of the Final WQMP. 
Geotechnical	Based on infiltration testing conducted on site, measure infiltration rates ranged from

Conditions (relevant to infiltration)	0.81 to 179.5 inches per hour. Based on the State of California's Geotracker database, the site is not located within 250' of any clean up sites. 
Off-Site Drainage	The project does not receive offsite run-on from adjacent properties.
Utility and Infrastructure Information	Wet and dry utilities are proposed for the project and will connect to existing facilities located in Anaheim Boulevard.

III.3 Watershed Description

The following table includes descriptions of the project's receiving waters:

Receiving Waters	Carbon Canyon Creek Coyote Creek San Gabriel River San Pedro Bay Near/Off Shore Zones Pacific Ocean
303(d) Listed Impairments	Carbon Canyon Creek – none Coyote Creek – Dissolved copper, Indicator bacteria, pH, Malathion, Iron, Toxicity San Gabriel River Reach 1 (Estuary to Firestone) – pH, temperature San Gabriel River Estuary – Copper, Dioxin, Nickel, Oxygen, Dissolved Oxygen, Indicator bacteria San Pedro Bay Near/Off Shore Zones – Chlordane, DDT, PCBs, Sediment Toxicity,
Applicable TMDLs	Coyote Creek – Dissolved copper, indicator bacteria San Gabriel River Estuary – Copper, Indicator Bacteria
Pollutants of Concern for the Project	*Pollutants of Concern*: Suspended Solids/Sediment, Nutrients, Pathogens, Pesticides, Oil & Grease, Toxic Organic Compounds, Trash & Debris. *Primary Pollutants of Concern*: Nutrients, Pathogens and Pesticides.
Environmentally Sensitive and Special Biological Significant Areas	There are no Areas of Special Biological Significance (ASBS) or ESA's within 200' of the project site.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

Project Performance Criteria		
(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?	YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	A WIHMP has not been approved for the watershed.	
If HCOC exists, list applicable Hydromodification control performance criteria	Based on the County's most recent HCOC Susceptibility Map, HCOC do exist for the project (Refer to Section II.3). See Attachment G for 2-year, 24-hour calculations and hydrology map.	
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	The applicable LID performance criteria are as follows (the project's selected LID performance criteria is provided in bold below): • **Retain, onsite (infiltrate, harvest and use, or evapotranspire) stormwater runoff as feasible up to the Design Capture Volume, and** • **If the proposed project is a street, road, highway or freeway with 5,000 square feet or more of paved surface, the project shall incorporate USEPA guidance, "Managing Wet Weather with Green Infrastructure: Green Streets" in a manner consistent with the MEP standard.** • Recover (i.e.) drawdown the storage volume as soon as possible after a storm event, and, if necessary • Biotreat, onsite, additional runoff, as feasible, up to 80 percent average annual capture efficiency, and, if necessary • NOC Permit Area only – Retain or biotreat, in a regional facility, the remaining runoff up to 80 percent average annual capture efficiency, and, if necessary • Fulfill alternative compliance obligations for runoff volume not retained or biotreated up to 80 percent average annual capture efficiency using treatment controls or other alternative approaches as described in Section 7.II-3.	

Project Performance Criteria	
List applicable treatment control BMP performance criteria	Ocean Plan Trash Amendments – Full Capture System to trap particles 5mm or greater, and has a design treatment capacity that is either (the project's selected performance criteria is provided in bold): • **Equal to or greater than peak flow rate for the one-year, one-hour storm in the sub-drainage area; or** • Appropriately sized to, and designed to carry at least the same flows as, the corresponding storm drain.
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	Project's LID DCV has been determined using the following equation: DCV = C x D x A x 43560 sf/ac x 1ft/12in, where: DCV = design storm capture volume, cu-ft = 12,226 cu-ft C = runoff coefficient = (0.75 x imp + 0.15) = 0.77 Imp = impervious fraction of drainage area (ranges from 0 to 1) = 0.83 D = storm depth (inches) = 0.90" A = tributary area (acres) = 4.86 acres*

*Property limits is 4.86 acres. For DCV based on DMA limits (Disturbed Area), see Section IV. 2.2.

IV.2 Site Design and Drainage Plan

The primary goal of site design principles and techniques is to reduce land development impacts on water quality and downstream hydrologic conditions. Benefits of site design include reductions in the size of downstream BMPs, conveyance systems, pollutant loading and hydromodification impacts.

IV.2.1 Site Design BMPs

The following section describes the site design BMPs that have been incorporated into this project.

Minimize Impervious Area

The project will minimize impervious area by providing all multi-level structures and incorporating landscaping within the project's opens space areas, parkways, areas between residential buildings and other suitable landscaping areas to minimize the project's impervious footprint, thereby reducing runoff generated during rain events.

Maximize Natural Infiltration Capacity

The project will take advantage of the unconsolidated sand and gravel soils onsite and employ the use of infiltration BMPs to address the project's DCV.

Preserve Existing Drainage Patterns and Time of Concentration

The proposed drainage pattern is consistent with existing drainage patterns, with all flows conveyed west to Anaheim Boulevard.

Disconnect Impervious Areas

Landscaping will be provided adjacent to walkways and parkways to break up the project's impervious areas.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

The pre-project site consists of an industrial site. There are no vegetation and sensitive areas to preserve. All disturbed areas will be paved or landscaped.

Xeriscape Landscaping

Native and/or tolerant landscaping will be incorporated into the site design consistent with City guidelines.

IV.2.2 Drainage Management Areas

Per the TGD, the project site has been divided into Drainage Management Areas (DMAs) to be utilized for defining drainage areas tributary to the project's BMPs. DMA limits have been delineated based on the tributary drainage area for each BMP. The DMA limits is the proposed disturbed area for the project site.

The design capture volume (DCV) and design flow rate utilizing the "Simple Method" and the "Capture Efficiency Method" described in the TGD Section III.3.1 and III.3.3 are provided below. Locations of DMAs and associated treatment BMPs are provided on the exhibits in Section VI. Additional calculations and TGD Worksheets are provided in Attachment C of this WQMP.

DMA	Tributary Drainage Area (Ac.)	Imp.	C-value	Design Storm Depth (in.)	$DCV_{SIMPLE.}$ (ft^3)	Tc (Min)	Design Intensity (in/hr)	Q_{BMP} (cfs)
1	4.49	0.83	0.77	0.90	11,295	12.8	0.22	0.76
2	0.08	0.67	0.652	0.90	176	5	0.27	0.014
3	0.06	0.67	0.652	0.90	127	5	0.27	0.007

IV.3 LID BMP Selection and Project Conformance Analysis

Per the 4th Term MS4 Storm Water Permit (Order No. R8-2009-0030, as amended by Order No. R8-2010-0062), Low Impact Development (LID) BMPs must be incorporated into design features and source controls to reduce project related storm water pollutants. The incorporation of LID BMPs into project design requires evaluation of LID measures in the following BMP hierarchy: infiltration, evapotranspiration, harvest/reuse and biotreatment.

The project proposes the use of infiltration BMPs to address the projects runoff pollutants.

IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic source controls (HSCs) can be considered to be an integration of site design practices and LID BMPs. The goal of HSCs is to reduce runoff volume for a given drainage area without reducing the site's true impervious area.

Name	Included?
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☐
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐

IV.3.2 Infiltration BMPs

Infiltration BMPs are LID BMPs that capture, store and infiltrate storm water runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Examples of infiltration BMPs include infiltration trenches, bioretention without underdrains, Infiltration Wells, permeable pavement, and underground infiltration galleries.

Based on the project's predominant soil type (Type "A") and favorable infiltration rates, the project proposes the use of an underground infiltration system (INF-7) onsite and two parkway bioretention with no underdrain areas (INF-3). The underground infiltration system will treat runoff created by onsite improvements and the two parkway bioretention with no underdrain areas will treat runoff created by the proposed street widening/improvements located within Anaheim Boulevard right-of-way.

The storage volume provided for the proposed infiltration system will consist of an underground vault with open bottom over a gravel bed. Runoff will receive pre-treatment via a proprietary biofiltration unit (MWS or approved equal) sized for the water quality flow. DMA 2 and 3 will propose bioretention with no underdrain systems, located within the Anaheim Boulevard public right-of-way, consistent with the project directly south of the site (RCP 2016-12078).

As discussed in Section II.4, DMA 3, due to utility constraints, 0.008 acres could not flow to the BMP. Therefore, the DMA 2 has been upsized to offset the additional area needed.

BMP Sizing:

INFILTRATION BMP SUMMARY							
DMA	BMP System	$DCV_{SIMPLE.}$ (ft^3)	K_{DESIGN} (in/hr)	DD (hrs)	DCV_{80} (ft^3)	Storage System Size	Lat/Long
1	Modular Wetland System (Pre-treatment) to Underground Infiltration System	12,226	29.99[1]	3.29	3,451	8'W x 63'L x 8'D over 0.5' gravel	33.849680, -117.919422
2	Bioretention with No Underdrain	176	10.8[2]	1.6	N/A (Using Simple DCV Sizing Method)	Minimum Area Required: 117 SF Area Provided: 5'x40; 200 SF (Includes 70 SF from DMA3)	33.849596, -117.919740

INFILTRATION BMP SUMMARY							
DMA	BMP System	$DCV_{SIMPLE.}$ (ft^3)	K_{DESIGN} (in/hr)	DD (hrs)	DCV_{80} (ft^3)	Storage System Size	Lat/Long
3	Bioretention with No Underdrain	127	10.8[2]	1.6	N/A (Using Simple DCV Sizing Method)	Minimum Area Required: 84 SF Area Provided: 5x20; 100 SF	33.848850, -117.919737

[1.] *Design rate obtained from infiltration testing with FS of 6 per soils engineer recommendation. See Attachment E.*
[2.] *Design rate obtained from average of 4 infiltration tests conducted onsite; 65.3 in/hr (average of 4 tests conducted)/6 (FS) = 10.8" in/hr (design rate). During final engineering, infiltration test will be conducted at these BMP locations.*

Name	Included?
Bioretention without underdrains	☒
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☒
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐
Other:	☐

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Name	Included?
EVAPOTRANSPIRATION	
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☐
HARVEST & REUSE/ RAINWATER HARVESTING	
Above-ground cisterns and basins	☐
Underground detention	☐
Other:	☐

Evapotranspiration

Evapotranspiration BMPs are a class of retention BMPs that discharges stored volume predominately to ET, through some infiltration may occur. ET includes both evaporation and transpiration, and ET BMPs may incorporate one or more of these processes. BMPs must be designed to achieve the maximum feasible ET, where required to demonstrate that the maximum amount of water has been retained on-site. Since ET is not the sole process in the proposed BMPs, specific design and sizing criteria have not been developed for ET-based BMPs.

Harvest and Reuse

Harvest and Reuse (aka. Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes and other non-potable uses.

The project does not propose the use of harvesting BMPs, as the project has selected the use of infiltration BMPs to meet the project's onsite LID requirements.

IV.3.4 Biotreatment BMPs

Biotreatment BMPs are a class of structural LID BMPs that treat suspended solids and dissolved pollutants in storm water using mechanisms characteristic of biologically active systems. These BMPs are considered treat and release facilities and include treatment mechanisms that employ soil microbes and plants. Additional benefits of these BMPs may include aesthetic enjoyment, recreational use, wildlife habitat and reduction in storm water volume.

The project does not propose the use of biotreatment BMPs, as the project has selected the use of infiltration BMPs to meet the project's onsite LID requirements.

BIOTREATMENT		
ID	Name	Included?
BIO-1	Bioretention with underdrains	☐
	Stormwater planter boxes with underdrains	☐
	Rain gardens with underdrains	☐
BIO-5	Constructed wetlands	☐
BIO-2	Vegetated swales	☐
BIO-3	Vegetated filter strips	☐
BIO-7	Proprietary vegetated biotreatment systems	☐
BIO-4	Wet extended detention basin	☐
BIO-6	Dry extended detention basins	☐

IV.3.5 Hydromodification Control BMPs

Not applicable. Per discussion in Section II.3 of this WQMP, the project does not have hydrologic conditions of concern.

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable. The project is able to meet LID requirements onsite.

IV.3.7 Treatment Control BMPs

The project is able to meet LID requirements onsite. Treatment control BMPs for this project applies to pre-treatment of runoff prior to infiltration and the treatment BMP employed to meet current full trash capture requirements per the Ocean Plan.

To address pre-treatment of the project's DCV, the project proposes the use of Modular Wetland System media-based filtration BMP that is upstream of each the project's underground infiltration system. Sizing of the unit is as follows:

TREATMENT BMP SUMMARY – PRE-TREATMENT						
DMA	BMP	Tributary Drainage Area (ac)	Design Intensity (in/hr)	Design Flow Rate (cfs) [1]	Model/Capacity	Lat/Long
1	MWS Unit	4.49	0.22	0.76	MWS-L-8-24 (0.89 cfs)	33.849989, -117.919587

[1] *A site-specific MWS detail is provided to treat 0.76 cfs. A typical MWS detail has an operating head of 3.4' and this site-specific detail has an operating head of 4.4', the additional 1' of operating head increases the surface area and provides additional treatment area. Refer to Attachment C.*

To address full trash capture requirements, the project proposes the use of approved full trash capture BMP at the project's catch basins, meeting the "Full Capture" design criteria. Sizing for the devices are based off the 1-year, 1-hour storm as follows:

BMP Sizing

TREATMENT BMP SUMMARY – FULL CAPTURE						
Catch Basin	BMP	Tributary Drainage Area (ac)	C-value	1-Year, 1-Hour Intensity (in/hr)	Design Flow Rate (cfs)	Model/ Capacity
DMA 1	Bioclean Curb Inlet Filter	4.49	0.77	0.439	1.51	BIO-GRATE-FULL-12-12-12/1.55CFS
DMA 2	Bioclean Curb Inlet Filter	0.08	0.735	0.439	0.02	BIO-GRATE-FULL-12-12-12/1.55CFS
DMA 3	Bioclean Curb Inlet Filter	0.06	0.735	0.439	0.01	BIO-GRATE-FULL-12-12-12/1.55CFS

IV.3.8 Non-structural Source Control BMPs

The Table below indicates all Non-Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Proposed facility will not generate waste subject to Title 22 CCR Compliance.
N6	Local Industrial Permit Compliance	☐	☒	Project is not industrial.

Non-Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N7	Spill Contingency Plan	☐	☒	Proposed facilities will not generate waste or store materials subject to the requirements of Chapter 6.95 of the CA Health and Safety Code.
N8	Underground Storage Tank Compliance	☐	☒	None proposed.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Proposed project will not store or generate hazardous materials subject to agency requirements.
N10	Uniform Fire Code Implementation	☐	☒	Proposed facility does not propose to store toxic or highly toxic compressed gases.
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	None proposed for project.
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	Not in project scope.

A discussion of each selected Non-Structural Source Control BMP is provided in the following section. The implementation of each BMP is described in the Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP as well as the Operation and Maintenance Plan provided in Attachment B.

N1 Education for Property Owners, Tenants and Occupants – Educational materials will be provided to tenants at close of escrow by the owner and periodically thereafter by the POA to inform them of their potential impacts to downstream water quality. Materials include those described in Section VII of this WQMP and provided in the Final WQMP.

N2 Activity Restrictions – Activity restrictions to minimize potential impacts to water quality and with the purpose of protecting water quality will be prescribed by the project's Covenant, Conditions and Restrictions (CC&Rs), or other equally effective measure.

N3 Common Area Landscape Management – Maintenance activities for landscape areas shall be consistent with City, County and manufacturer guidelines for fertilizer and pesticide use (OC DAMP Section 5.5). Maintenance includes trimming, weeding and debris removal and vegetation planting and replacement. Stockpiled materials during maintenance activities shall be placed away from drain inlets and runoff conveyance devices. Wastes shall be properly disposed of or recycled.

N4 BMP Maintenance – Responsibility for implementation, inspection and maintenance of all BMPs (structural and non-structural) shall be consistent with the BMP Inspection and Maintenance Responsibilities Matrix provided in Section V of this WQMP, with documented records of inspections and maintenance activities completed.

N11 Common Area Litter Control – Litter control onsite will include the use of POA litter patrols, violation reporting and clean up during landscaping maintenance activities and as needed to ensure good housekeeping of the project's common areas.

N12 Employee Training – All employees, contractors and subcontractors of the POA shall be trained on the proper use and staging of landscaping and other materials with the potential to impact runoff and proper clean up of spills and materials.

N14 Common Area Catch Basin – As required by the TGD, at least 80% of the project's private drainage facilities shall be inspected, cleaned/maintained annually, with 100% of facilities inspected and maintained within a two-year period. Cleaning should take place in the late summer/early fall, prior to the start of the wet season. Records shall be kept to document annual compliance.

N15 Street Sweeping Private Streets and Parking Lots – The project's private streets shall be swept, at minimum, on a weekly basis.

IV.3.9 Structural Source Control BMPs

The Table below indicates all Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in text following the table below and in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	

Structural Source Control BMPs				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No outdoor material storage areas proposed for project use.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	Not applicable. No large slopes (hillside landscaping) proposed.
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☐	☒	Not applicable. Project resides in SARWQCB.
S6	Dock areas	☐	☒	None proposed.
S7	Maintenance bays	☐	☒	None proposed.
S8	Vehicle wash areas	☐	☒	None proposed.
S9	Outdoor processing areas	☐	☒	None proposed.
S10	Equipment wash areas	☐	☒	None proposed.
S11	Fueling areas	☐	☒	None proposed.
S12	Hillside landscaping	☐	☒	None proposed.
S13	Wash water control for food preparation areas	☐	☒	
S14	Community car wash racks	☐	☒	None proposed.

A discussion of each selected Structural Source Control BMP is provided in the following section. The implementation of each BMP and the responsible party are described in the Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP as well as the Operation and Maintenance Plan provided in Attachment B.

S1 Storm Drain Stenciling – Storm drain stencils or signage prohibiting dumping and discharge of materials ("No Dumping – Drains to Ocean") shall be provided adjacent to each of the project's proposed inlets. The stencils shall be inspected and restenciled as needed to maintain legibility.

S3 Designated Trash Enclosure – Designated trash enclosure areas shall be covered and designed to preclude trash and pad area from run-on, run-off and wind. Any drains within area shall be connected to the sanitary sewer system, with proper approval from the sewer company. Site shall be inspected with use to ensure all materials are disposed of properly.

S4 (SD-10, SD-12) Use Efficient Irrigation Systems and Landscape Design – In conjunction with routine landscaping maintenance activities, inspect irrigation for signs of leaks, overspray and repair or adjust accordingly. Adjust system cycle to accommodate seasonal fluctuations in water demand and temperatures. Ensure use of native or drought tolerant/non-invasive plant species to minimize water consumption.

IV.4 Alternative Compliance Plan (If Applicable)

IV.4.1 Water Quality Credits

The project does not propose the use of water quality credits as it is able to meet LID requirements onsite.

Description of Proposed Project		
Project Types that Qualify for Water Quality Credits (Select all that apply):		
☐ Redevelopment projects that reduce the overall impervious footprint of the project site.	☐ Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.	☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).
☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced	☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects	☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City

vehicle trip traffic with the potential to reduce sources of water or air pollution).		would not be able to take credit for both categories, but may have greater credit assigned		Center areas (to be defined through mapping).
☐ Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.	☐ Developments in a city center area.	☐ Developments in historic districts or historic preservation areas.	☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.	☐ In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.
Calculation of Water Quality Credits (if applicable)	Not applicable to project.			

IV.4.2 Alternative Compliance Plan Information

Not applicable. The project is able to meet LID BMP requirements onsite to address pollutants in project related storm water runoff.

Section V Inspection/Maintenance Responsibility for BMPs

Refer to the BMP inspection and maintenance responsibility matrix below. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies.

A property owners' association (POA) shall be established for this project. The POA shall be responsible the long-term funding, inspection and maintenance of all BMPs prescribed in this WQMP.

Until the project's POA has been established, all responsibilities pertaining to this WQMP shall be that of the project developer, Renaissance City North Anaheim LLC RPP Equities LLC. Contact for the interim responsible party is as follows:

Responsible Party: Renaissance City North Anaheim LLC RPP Equities LLC
Contact Name: Robert Kim

Address: 4675 MacArthur Court, Suite 550
Phone: (714) 658-6299
Email: rhkim@renpacdev.com

Inspection and maintenance activities, frequencies and responsibilities for the project's selected BMPs are provided in the following BMP matrix. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies.

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
INFILTRATION BMPs				
INF-3	Bioretention with no underdrains	Remove trash and debris, inspect and resolve areas of standing water, remove minor sediment as needed, provide vector control if needed. Irrigate as recommended by a landscape professional, remove undesirable vegetation, reseed or replant areas of thin or missing vegetation. Replace media as needed.	Annually	Owner/POA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
INF-7	Subsurface Infiltration	Inspect for standing water and that water infiltrates into underlying soil completely. Inspect and remove accumulated sediment and debris in pre-treatment chamber as needed.	After significant storm events, semi-annual and as needed.	Owner/POA
TREATMENT BMP (PRE-TREATMENT)				
BIO-7	Proprietary Biotreatment (Modular Wetland System or approved equivalent)	Inspect unit for accumulated debris and sediment and plant health; remove trash from screening device and separation chamber; trim vegetation. Remove sediment from pre-chamber, replace pre-filter cartridge media and drain down filter media. Replace wetland media.	Annually 20 years	Owner/ POA
GROSS SOLIDS REMOVAL BMPs				
PRE-2	Catch Basin Insert (BioClean's Curb Inlet Filter, Model No. BIO-CURB-FULL)	Inspect unit for accumulated debris and sediment. Remove when accumulated material reaches ½ height of screen.	After significant storm events, annual and as needed.	Owner/ POA
NON-STRUCTURAL SOURCE CONTROL BMPs				
N1	Education for Property Owners, Tenants and Occupants	Educational materials will be provided to the owner at close of escrow and thereafter on an annual basis. Materials shall include those provided in Attachment A of this WQMP and any updated materials.	Annually	Owner/ POA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
N2	Activity Restrictions	The Owner will prescribe activity restrictions to protect surface water quality, through a Covenant, Conditions and Restrictions (CC&Rs) agreement, or other equally effective measure, for the property. Upon takeover of site responsibilities by the Homeowners Association (HOA), the HOA shall be responsible for ensuring residents compliance.	Ongoing	Owner/ POA
N3	Common Area Landscape Management	Maintenance shall be consistent with County requirements, plus fertilizer and/or pesticide usages shall be consistent with City, County and manufacturer guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a monthly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Monthly	Owner/ POA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
N4	BMP Maintenance	Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the responsible party and documented with the WQMP, and shall be available for review upon request.	Ongoing	Owner/ POA
N11	Common Area Litter control	Litter patrol, violations investigation, reporting and other litter control activities shall be performed by the HOA in conjunction with routine patrols and with landscaping maintenance activities. Litter collection and removal shall be performed as needed and monthly with landscaping maintenance.	Ongoing patrols and as needed	Owner/POA
N12	Employee Training	All staff and employees of the HOA shall receive initial training upon hire and annually thereafter on the importance of their actions on storm water quality. Training shall include educational materials provided by the County as well as other permitting agencies.	Upon hire and annually	Owner/POA

BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
N14	Common Area Catch Basin Inspection	Catch basin inlets, area drains, swales, curb-and-gutter systems and other drainage systems shall be inspected prior to October 1st of each year and after large storm events. If necessary, drains shall be cleaned prior to any succeeding rain events. 80% of facilities shall be inspected and cleaned annually, with 100% of facilities inspected and maintained	Annually	Owner/POA
N15	Street Sweeping Private Streets and Parking Lots	Streets and parking lots shall be vacuum swept on a weekly basis, at minimum.	Weekly	Owner/POA
STRUCTURAL SOURCE CONTROL BMPs				
S1 SD-13	Provide storm drain system stencilling and signage	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually	Owner/POA
S3 SD-32	Designated Trash Enclosure	Designated trash enclosure areas shall be covered and designed to preclude trash and pad area from run-on, run-off and wind. Any drains within area shall be connected to the sanitary sewer system, with proper approval from the sewer company. Site shall be inspected with use to ensure all materials are disposed of properly.	Daily with Use	Owner/POA

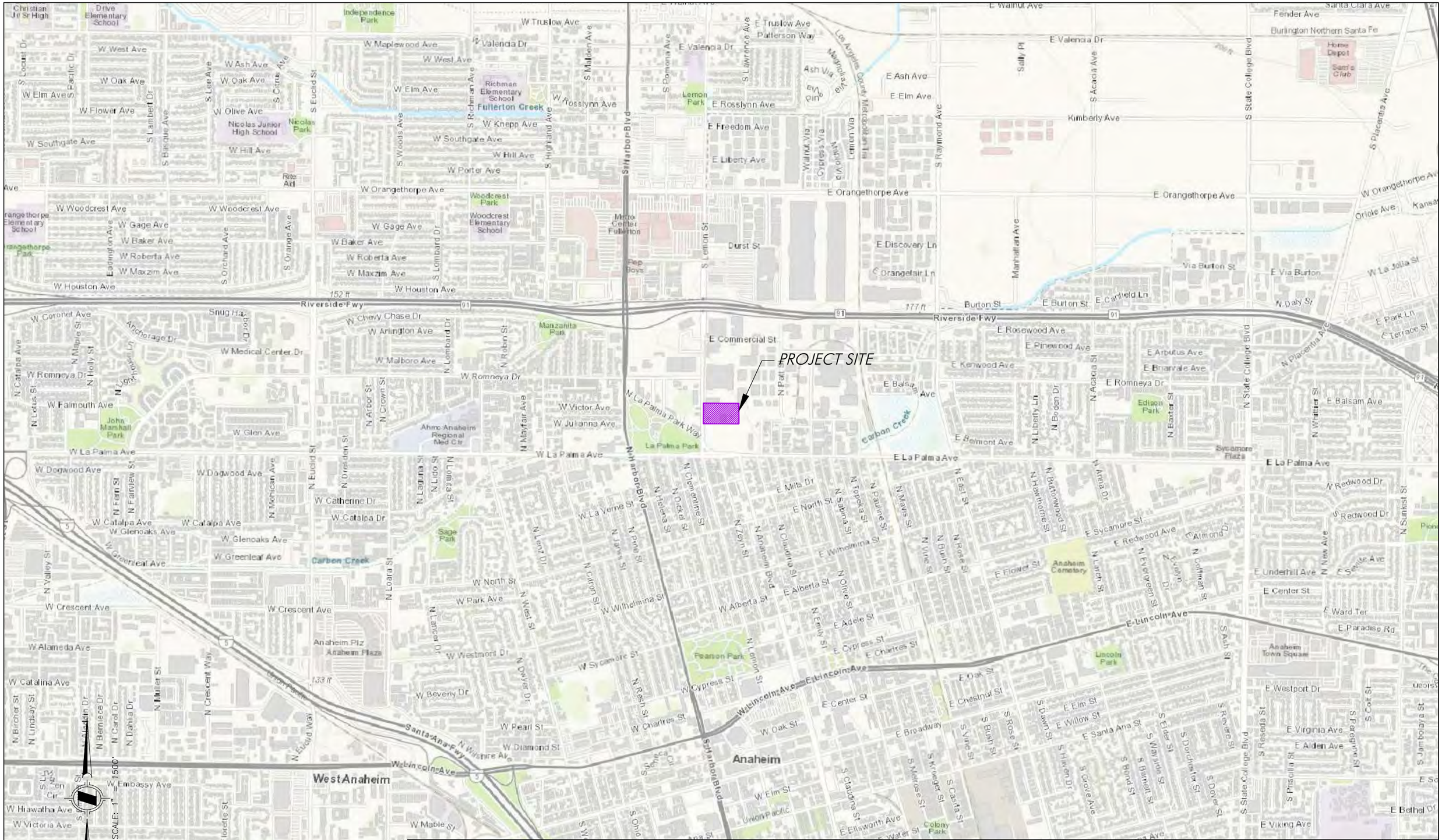
BMP INSPECTION & MAINTENANCE RESPONSIBILITIES MATRIX				
BMP		Inspection/ Maintenance Activities Required	Minimum Frequency	Reponsible Party(s)
S4 SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, day or night time temperatures based on system specifications and local climate patterns.	Monthly	Owner/POA

Section VI Site Plan and Drainage Plan

The exhibits provided in this section are to illustrate the post construction BMPs prescribed within this WQMP. Drainage flow information of the proposed project, such as general surface flow lines, concrete or other surface drainage conveyances, and storm drain facilities are also depicted. All structural source control and treatment control BMPs are shown as well.

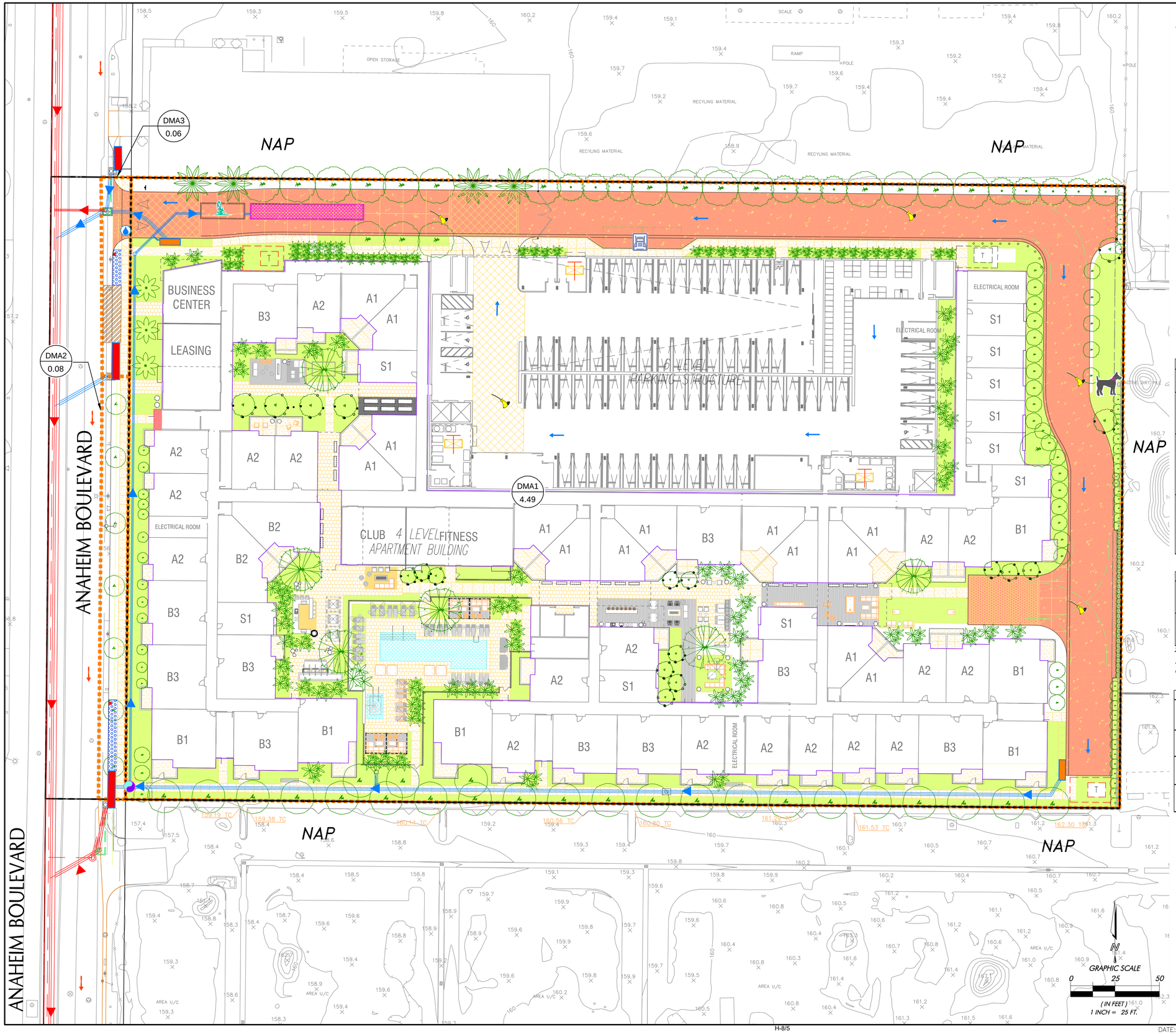
Exhibits

- Vicinity Map
- WQMP Site Plan



DRAWN BY: TIH DATE: 04/23/2020 W.O.: 4260-3	PREPARED BY: HUNSAKER & ASSOCIATES IRVINE, INC. PLANNING ■ ENGINEERING ■ SURVEYING Three Hughes, Irvine, CA 92618 ■ PH: (949) 583-1010 ■ FX: (949) 583-0759	PREPARED FOR: *RENAISSANCE CITY NORTH ANAHEIM LLC* *RPP EQUITIES LLC* 4575 MACARTHUR COURT, SUITE 550 NEWPORT BEACH, CA 92660 (714) 658-6229	*"THE INVITATION"* *1122 NORTH ANAHEIM BOULEVARD* *NORTHEAST OF ANAHEIM BLVD & LA PALMA PKWY* *CITY OF ANAHEIM, CA*	*PWQMP VICINITY MAP*

DATE: Apr. 23, 2020 03:55:12 PM FILE: F:\1027\Planning\SY_WQ\WQMP\Exhibits\PWQMP_VIC Renaissance.dwg



LEGEND

- PROJECT LIMITS (GROSS AREA)
- PROJECT LIMITS (NET AREA)
- NAP — NOT A PART
- DRAINAGE MANAGEMENT AREA (DMA) LIMITS
- DMA / ACRE — DMA DESIGNATION AND ACRES
- ONSITE FLOW DIRECTION
- OFFSITE FLOW DIRECTION
- PROPOSED STORM DRAIN SYSTEM
- EXISTING OFFSITE STORM DRAIN SYSTEM
- PROJECT CATCH BASIN INLET WITH BMPS. S1 STORM DRAIN SYSTEM STENCILING/SIGNAGE. FULL TRASH CAPTURE BMP (TYPE TBD).
- OFFSITE CATCH BASIN INLET (PROPOSED) (STANDARD 307-2). S1 STORM DRAIN SYSTEM STENCILING/SIGNAGE. FULL TRASH CAPTURE BMP (TYPE TBD).
- WATER QUALITY DIVERSION STRUCTURE
- COMMON AREA LANDSCAPING WITH BMPS. S4 EFFICIENT IRRIGATION SYSTEM AND LANDSCAPE DESIGN.
- WALKWAY AND PAVEMENT AREAS
- DRIVES
- BUILDING FOOTPRINT
- BIO-7 PROPRIETARY BIOFILTRATION (MWS OR EQUIVALENT). PRETREATMENT FOR SUBSURFACE INFILTRATION FACILITY.
- S3 TRASH ENCLOSURE
- DISCHARGE POINT
- LOADING AREA
- N15 STREET SWEEPING PRIVATE STREETS/PARKING LOTS
- PET WASTE STATION
- 0.008 ACRES THAT CANNOT BE TREATED DUE TO UTILITY CONSTRAINTS, DMA 3 HAS BEEN SIZED TO TREAT THIS AREA.
- CURB INLET
- SWIMMING POOL/ SPA FACILITY
- INF-7 SUBSURFACE INFILTRATION FACILITY (8'W x 63'L x 8'D)
- INF-3 BIORETENTION WITH NO UNDERDRAIN

INFILTRATION BMP SUMMARY

DMA	BMP System	DCV_{SIMPLE} (ft^3)	K_{DESIGN} (in/hr)	DD (hrs)	DCV_{80} (ft^3)	Storage System Size	Lat/Long
1	Modular Wetland System (Pre-treatment) to Underground Infiltration System	12,226	29.991	3.29	3,451	8'W x 63'L x 8'D over 0.5' gravel	33.849680, -117.919422
2	Bioretention with No Underdrain	176	10.82	1.6	N/A (Using Simple DCV Sizing Method)	Minimum Area Required: 117 SF Area Provided: 5'x40; 200 SF (Includes 70 SF from DMA3)	33.849596, -117.91974
3	Bioretention with No Underdrain	127	10.82	1.6	N/A (Using Simple DCV Sizing Method)	Minimum Area Required: 84 SF Area Provided: 5x20; 100 SF	33.848850, -117.919737

TREATMENT BMP SUMMARY – PRE-TREATMENT

DMA	BMP	Tributary Drainage Area (ac)	Design Intensity (in/hr)	Design Flow Rate (cfs) [1]	Model/Capacity	Lat/Long
1	MWS Unit	4.49	0.22	0.76	MWS-L-8-24 (0.89 cfs)	33.849989, -117.91959

1. A SITE-SPECIFIC MWS DETAIL IS PROVIDED TO TREAT 0.76 CFS. A TYPICAL MWS DETAIL HAS AN OPERATING HEAD OF 3.4' AND THIS SITE-SPECIFIC DETAIL HAS AN OPERATING HEAD OF 4.4', THE ADDITIONAL 1' OF OPERATING HEAD INCREASES THE SURFACE AREA AND PROVIDES ADDITIONAL TREATMENT AREA. REFER TO ATTACHMENT C.

TREATMENT BMP SUMMARY – FULL CAPTURE

Catch Basin	BMP	Tributary Drainage Area (ac)	C-value	1-Year, 1-Hour Intensity (in/hr)	Design Flow Rate (cfs)	Model/Capacity
DMA 1	Bioclean Curb Inlet Filter	4.49	0.77	0.439	1.51	BIO-GRATE-FULL-12-12-12/1.55CFS
DMA 2	Bioclean Curb Inlet Filter	0.08	0.735	0.439	0.02	BIO-GRATE-FULL-12-12-12/1.55CFS
DMA 3	Bioclean Curb Inlet Filter	0.06	0.735	0.439	0.01	BIO-GRATE-FULL-12-12-12/1.55CFS

PRELIMINARY
WATER QUALITY MANAGEMENT PLAN
SITE PLAN

APPLICANT:
RENAISSANCE CITY NORTH ANAHEIM LLC.
RPP EQUITITIES LLC.
4575 MACARTHUR COURT, SUITE 550
NEWPORT BEACH, CA 92660
(714) 656-6229

PREPARED BY:
HUNSAKER & ASSOCIATES IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

"THE INVITATION"
1122 NORTH ANAHEIM BOULEVARD
SOUTHEAST OF ANAHEIM BLVD & LA PALMA PKWY
CITY OF ANAHEIM, ORANGE COUNTY, CA

DRAFTED BY: LP | DATE: 05/06/2020 | W.O. NO: 4260-3 | SHEET NO: 1 OF 1

DATE: May. 06, 2020 01:15:52 PM FILE: F:\1027\Planning\SY_WQ\WQMP\Exhibits\PWQMP_SP The Invitation.dwg

EAST HALF QUARTER OF THE SW QUARTER
SECTION 3
T. 4S., R. 10 W., RANCHO SAN JUAN DE CAJON DE SANTA ANA

OWNER: SUNWEST METALS INC
APN: 035-010-73

N89°29'44"W 604.01'

FIRE/EVA LANE

N00°31'27"E 350.00'

FIRE/EVA LANE

5' CITY OF ANAHEIM ELECTRICAL EASEMENT

PARCEL MAP NO. 2007-232
PARCEL 2

OWNER: WEST CROWTHER LLC
APN: 035-010-83

N00°27'50"E 350.00'

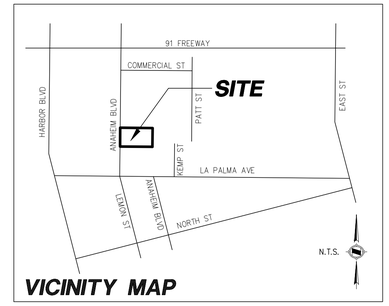
N89°29'44"W 604.37'

OWNER: LENNAR HOMES OF CALIFORNIA INC
APN: 267-151-01

EAST HALF OF SW QUARTER
SECTION 3
T. 4S., R. 10 W., RANCHO SAN JUAN DE CAJON DE SANTA ANA

OWNER: LENNAR HOMES OF CALIFORNIA INC
APN: 267-151-02

PARCEL 1



VICINITY MAP

ACREAGE SUMMARY:

GROSS AREA	4.86 AC
ANAHEIM BLVD ROW	-0.37 AC
NET AREA	4.49 AC

LEGEND

- RIGHT OF WAY
- LOT LINE
- TRACT BOUNDARY
- EASEMENT
- EXISTING CONTOUR
- PROPOSED CURB
- EXISTING CURB
- PARKWAY INFILTRATION SWALE

AREA SUMMARY:

- APARTMENT BUILDING
- PARKING STRUCTURE
- NON-PARKING ASPHALT TO BE PAVED
- HARDSCAPE TO BE LAID
- LANDSCAPE
- ANAHEIM BLVD. IMPACTED AREA
- ANAHEIM BLVD. NON-IMPACTED AREA

	S.F.
Apartment Building Footprint	78,388
Parking Structure Footprint	37,758
Non-Parking Asphalt To Be Paved	25,301
Total Hardscape To Be Laid	22,485
Total Landscape	35,285
Sub-Total	**199,217**
Anaheim Blvd. Impacted Area	2,516
Anaheim Blvd. Non-Impacted Area	9,734
Sub-Total	**12,250**
Total Site Area	**211,467**

0 15 30 60 90 120
SCALE: 1" = 30'

DATE: MARCH 10, 2020

NO.	DATE	REVISIONS	APPROVED

DRAWN BY: TN
DESIGNED BY: AO
CHECKED BY: AO/TF

PREPARED FOR:
RENAISSANCE CITY NORTH ANAHEIM LLC
RPP EQUITIES LLC
4675 MacArthur Court, Suite 550
Newport Beach, CA 92660
Contact: Robert Kim
Phone: (714) 658-6299

PREPARED BY:
HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

1122 N. ANAHEIM BLVD
"THE INVITATION"
AREA TAKE-OFFS
City of Anaheim

SHEET 1

THE RENAISSANCE SITE PLAN
W.O.: 4260-3

H-8/5
P
F:\1027\Engineering\Exhibit\Area Take-Offs Exhibit.dwg

EAST HALF QUARTER OF THE SW QUARTER
SECTION 3
T. 4S., R. 10 W., RANCHO SAN JUAN DE CAJON DE SANTA ANA

OWNER: SUNWEST METALS INC
APN: 035-010-73

EAST HALF OF SW QUARTER
SECTION 3
T. 4S., R. 10 W., RANCHO SAN JUAN DE CAJON DE SANTA ANA

OWNER: LENNAR HOMES OF CALIFORNIA INC
APN: 267-151-01

OWNER: LENNAR HOMES OF CALIFORNIA INC
APN: 267-151-02

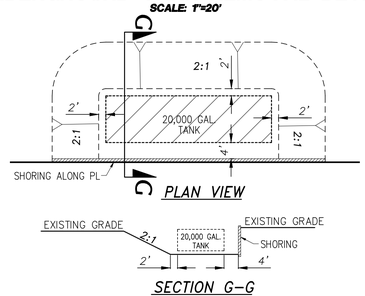
PARCEL 1

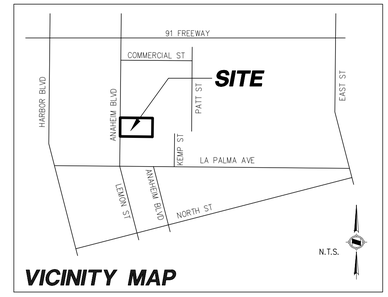
PARCEL MAP NO. 2007-232
PARCEL 2

OWNER: WEST CROWTHER LLC
APN: 035-010-83

UNDERGROUND TANK REMOVAL DETAIL

SCALE: 1"=20'





LEGAL DESCRIPTION

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE CITY OF ANAHEIM, COUNTY OF ORANGE, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

THAT PORTION OF THE EAST HALF OF THE SOUTHWEST QUARTER OF SECTION 3, TOWNSHIP 4 SOUTH, RANGE 10 WEST, IN THE RANCHO SAN JUAN CAJON DE SANTA ANA, AS PER MAP RECORDED IN BOOK 51, PAGE 10 OF MISCELLANEOUS MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHWEST CORNER OF THE SOUTH HALF OF THE NORTHEAST QUARTER, OF SAID SOUTHWEST QUARTER; THENCE EASTERLY ALONG THE NORTHERLY LINE OF SAID SOUTH HALF TO THE NORTHERLY PROLONGATION OF THE WESTERLY LINE OF THE LAND DESCRIBED AS PARCEL 2 IN THE DEED TO U.S. INDUSTRIAL ALCOHOL CO., RECORDED NOVEMBER 15, 1926 IN BOOK 689, PAGE 83 OF DEEDS; THENCE SOUTH 0° 02' 15" EAST ALONG SAID PROLONGATION AND ALONG SAID WESTERLY LINE TO A POINT NORTH 0° 02' 15" WEST 907.00 FEET FROM THE SOUTHERLY LINE OF SAID SECTION 3, SAID POINT BEING THE TRUE POINT OF BEGINNING; THENCE SOUTH 0° 02' 15" EAST 350.00 FEET; THENCE PARALLEL WITH THE SOUTHERLY LINE OF SAID SECTION 3, WEST 604.33 FEET TO THE WESTERLY LINE OF SAID EAST HALF, BEING THE CENTER OF NORTH LEMON STREET, 60.00 FEET IN WIDTH, THENCE ALONG SAID WESTERLY LINE AND THE CENTER LINE OF NORTH LEMON STREET, NORTH 0° 01' 50" EAST 350.00 FEET; THENCE EAST 603.99 FEET TO THE TRUE POINT OF BEGINNING.

APN: 035-010-51

BENCHMARK

CITY OF ANAHEIM BENCHMARK NO. 2A-40
ELEVATION: 157.59
DATUM: NAVD 88
DESCRIPTION: BRASS CAP MKD C OF A BM, IN THE TOP OF CURB AT THE NE BCR

CITY OF ANAHEIM BENCHMARK NO. 2A-38A
ELEVATION: 156.41
DATUM: NAVD 88

DESCRIPTION: BRASS CAP MKD C OF A BM IN THE TOP OF CURB AT THE NW BCR

DATUM STATEMENT

COORDINATES SHOWN ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM (CCS83), ZONE VI, 1983 NAD, (2007.00 EPOCH OCS GPS ADJUSTMENT).

ALL DISTANCES SHOWN ARE GROUND, UNLESS OTHERWISE NOTED. TO OBTAIN GRID DISTANCE MULTIPLY GROUND DISTANCE BY 0.99999100. (PROJECT SPECIFIC COMBINATION FACTOR)

BASIS OF BEARINGS

THE BEARINGS SHOWN HEREON ARE BASED ON THE BEARING BETWEEN O.C.S. HORIZONTAL CONTROL STATION GPS NO. SACY AND STATION GPS NO. CCCS BEING N38°31'17"W PER RECORDS ON FILE IN THE OFFICE OF THE ORANGE COUNTY SURVEYOR.

NOTES

1. EXISTING STRUCTURES AND SURFACE PARKING AREAS WILL BE DEMOLISHED PRIOR TO CONSTRUCTION PURSUANT TO AN APPROVED DEMOLITION PERMIT.
2. NO GRADING SHALL COMMENCE WITHOUT FIRST OBTAINING A GRADING PERMIT ISSUED BY THE CITY OF ANAHEIM PUBLIC WORKS DEPARTMENT, UNLESS IT IS EXEMPT PER THE CITY OF ANAHEIM MUNICIPAL CODE.
3. ALL PROPOSED GRADING, EROSION CONTROL AND DRAINAGE SHALL BE CONSISTENT WITH THE REQUIREMENTS SET FORTH IN TITLE 17 OF THE CITY OF ANAHEIM MUNICIPAL CODE, THE STATE CONSTRUCTION SAFETY ORDERS, AND ANY SPECIAL REQUIREMENTS OF THE PERMIT.
4. ALL IMPROVEMENTS WITHIN THE PUBLIC RIGHT-OF-WAY SHALL REQUIRE A RIGHT-OF-WAY CONSTRUCTION PERMIT.
5. ALL IMPROVEMENTS TO BE CONSTRUCTED PER CITY OF ANAHEIM STANDARD DETAILS, UNLESS OTHERWISE APPROVED BY CITY ENGINEER.
6. CONSTRUCTION AND GRADING MAY BE DONE IN PHASES.
7. THE R100B(CA) SIGN, INDICATING TOW AWAY ZONE, SHOULD BE INSTALLED AT THE ENTRANCE. AS WELL AS, THE PRIVATE PROPERTY SIGN CONSISTENT WITH ANAHEIM MUNICIPAL CODE SECTION 4.75.090 FOR THE PURPOSES OF TOW-AWAY OUTSIDE OF DISABLED PARKING STALLS.
8. FINAL FINISH FLOOR ELEVATIONS SHALL BE 1-FT. MINIMUM ABOVE WATER SURFACE ELEVATION OF THE 100-YEAR EVENT.
9. EXISTING ANAHEIM BOULEVARD CATCH BASINS ARE TO BE RELOCATED AND THE NEW CATCH BASINS SHALL HAVE FULL CAPTURE SCREENS AND AUTOMATIC SCREENS ON THE CURB SURFACE.
10. LA PALMA VILLAGE DRIVEWAY APPROACH WILL NEED TO BE REBUILT DURING STREET WIDENING AS WELL AS GUTTER. COORDINATION FOR THESE IMPROVEMENTS WITH LA PALMA VILLAGE WILL BE MADE.
11. RIGHT-OF-WAY BMP'S SHALL BE PRIVATELY MAINTAINED BY PROPERTY OWNER.
12. REMOVE AND DISPOSE EXISTING UNDERGROUND TANK AND PIPELINES, AS SHOWN ON DETAIL, AND BACKFILL PER CITY STANDARDS AND SOIL ENGINEER RECOMMENDATIONS.
13. DURING THE CONSTRUCTION PHASE OF THIS PROJECT, THE INFILTRATION SYSTEM SHALL BE PHYSICALLY SEPARATED/PROTECTED FROM RUNOFF AND/OR ANY OTHER MATERIAL/LIQUID/DEBRIS.

ACREAGE SUMMARY:

GROSS AREA	4.86 AC
ANAHEIM BLVD ROW	-0.37 AC
NET AREA	4.49 AC

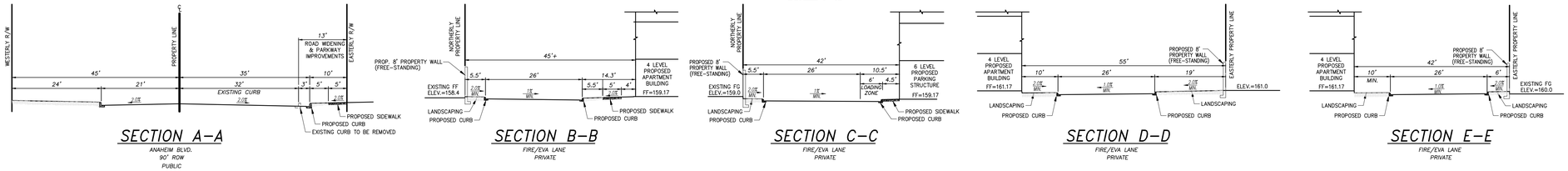
LEGEND

- RIGHT OF WAY
- LOT LINE
- TRACT BOUNDARY
- EASEMENT
- EXISTING CONTOUR
- PROPOSED CURB
- EXISTING CURB
- ACCESSIBLE PATH OF TRAVEL
- BIORETENTION WITH NO UNDERDRAIN
- MWS — MODULAR WETLAND SYSTEM
- CURB INLET

SCALE: 1" = 30'

SECTIONS

SCALE: 1"=16'



NO.	DATE	REVISIONS	APPROVED

DRAWN BY: TN
DESIGNED BY: AO
CHECKED BY: AO/TF

PREPARED FOR:
RENAISSANCE CITY NORTH ANAHEIM LLC
RPP EQUITIES LLC
4675 MacArthur Court, Suite 550
Newport Beach, CA 92660
Contact: Robert Kim
Phone: (714) 658-6299

PREPARED BY:
HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

1122 N. ANAHEIM BLVD
"THE INVITATION"
CONCEPTUAL GRADING PLAN
City of Anaheim

SHEET C-2

DATE: MAY 4, 2020

W.O.: 4260-3 THE RENAISSANCE SITE PLAN

H-8/5

PLOTTED BY: Luis Pina DATE: May. 06, 2020 01:13:11 PM FILE: F:\1027\Engineering\Site Plan\C-2 GRADING.dwg

Section VII Educational Materials

Education Materials			
Residential Material (http://www.ocwatersheds.com)	Check If Applicable	Business Material (http://www.ocwatersheds.com)	Check If Applicable
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☒	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☒	Proper Maintenance Practices for Your Business	☐
Household Tips	☒	Other Material	Check If Attached
Proper Disposal of Household Hazardous Waste	☒		
Recycle at Your Local Used Oil Collection Center (North County)	☐		☐
Recycle at Your Local Used Oil Collection Center (Central County)	☒		☐
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☒		☐
Sewer Spill	☒		☐
Tips for the Home Improvement Projects	☐		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☒		☐
Tips for Pool Maintenance	☒		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☒		☐
Tips for Projects Using Paint	☒		☐

Attachment A

Educational Materials

(Educational materials to be provided in Final WQMP)

Attachment B

O & M Plan

OPERATIONS AND MAINTENANCE (O&M) PLAN

WATER QUALITY MANAGEMENT PLAN

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Non-Structural Source Control BMPs			
Yes	**N1. Education for Property Owners, Tenants and Occupants** Educational materials will be provided at close of escrow by the owner and thereafter on an annual basis by the POA. Materials shall include those provided in Attachment A of the Final WQMP and any updated materials.	At close of escrow, lease and annually thereafter.	Owner/POA
Yes	**N2. Activity Restrictions** The Owner will prescribe activity restrictions to protect surface water quality, through a Covenant, Conditions and Restrictions (CC&Rs) agreement, lease agreements or other equally effective measure, for the property. Upon takeover of site responsibilities by the POA, the POA shall be responsible for ensuring residents and tenant compliance.	Ongoing	Owner/POA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	**N3. Common Area Landscape Management** Maintenance shall be consistent with County requirements, plus fertilizer and/or pesticide usages shall be consistent with County guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Monthly	Owner/POA
Yes	**N4. BMP Maintenance** Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the responsible party and documented with the WQMP, and shall be available for review upon request.	Ongoing, as prescribed per WQMP.	Owner/POA
No	**N5. Title 22 CCR Compliance** Not applicable to residential projects.		
No	**N6. Local Water Quality Permit Compliance** Not applicable. No local water quality permits are required for the operation of the project.		

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	**N7. Spill Contingency Plan** Not applicable to residential projects.		
No	**N8. Underground Storage Tank Compliance** Not applicable. None onsite.		
No	**N9. Hazardous Materials Disclosure Compliance** Not applicable to residential projects.		
No	**N10. Uniform Fire Code Implementation** Not applicable to residential projects.		
Yes	**N11. Common Area Litter Control** Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with landscape maintenance activities.	Ongoing patrols. Weekly (minimum) pick up and removal. Monthly inspections with landscaping maintenance.	Owner/POA
Yes	**N12. Employee Training** All employees, contractors and subcontractors of the POA shall receive training regarding the potential impacts of their actions on downstream water quality, proper material use and staging (for landscaping and other materials) and proper clean up material	Annually and as needed	Owner/POA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	**N13. Housekeeping of Loading Docks** The proposed loading docks and loading areas shall be inspected with use, with area kept in an orderly manner, following good housekeeping practices. Pills, debris and other waste materials shall be cleaned up and property disposed. Area shall be precluded from run-on and runoff as necessary.	Daily with use	Owner/POA
Yes	**N14. Common Area Catch Basin Inspection** Catch basin inlets, area drains, curb-and-gutter systems and other drainage systems shall be inspected prior to October 1st of each year and after large storm events. If necessary, drains shall be cleaned prior to any succeeding rain events. 80% of facilities shall be inspected and cleaned annually, with 100% of facilities inspected and maintained	Annually	Owner/POA
Yes	**N15. Street Sweeping Private Streets and Parking Lots** Streets must be swept at minimum, on a weekly and as needed basis.	Weekly and as needed	Owner/POA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Structural Source Control BMPs			
Yes	**S1. Provide Storm Drain System Stenciling and Signage** Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually	Owner/POA
No	**S2. Design Outdoor Hazardous Material Storage Areas to Reduce Pollutant Introduction** Not applicable. No outdoor storage of hazardous materials onsite.		
Yes	**S3. Design Trash Enclosures to Reduce Pollutant Introduction** Designated trash enclosure areas shall be covered and designed to preclude trash and pad area from run-on, run-off and wind. Any drains within area shall be connected to the sanitary sewer system, with proper approval from the sewer company. Site shall be inspected with use to ensure all materials are disposed of properly.	Daily with use	Owner/POA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	**S4. Use Efficient Irrigation Systems and Landscape Design** In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, day or night time temperatures based on system specifications and local climate patterns.	Monthly	Owner/POA
No	**S5. Protect Slopes and Channels** Not applicable. Site is flat.		
No	**S6. Loading Dock Areas** Not applicable. None proposed		
No	**S7. Maintenance Bays and Docks** Not applicable. None proposed.		
No	**S8. Vehicle Wash Areas** Not applicable. None proposed.		
No	**S9. Outdoor Processing Areas** Not applicable. No outdoor processing onsite.		
No	**S10. Equipment Wash Areas** Not applicable. No wash areas onsite.		
No	**S11. Fueling Areas** Not applicable. No fueling areas onsite.		

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	**S12. Site Design and Landscape Planning (Hillside Landscaping)** Not applicable. Project is not hillside development.		
No	**S13. Wash Water Controls for Food Preparation Areas** Not applicable. None proposed.		
No	**S14. Community Car Wash Racks** Not applicable. No community car wash areas onsite.		
Low Impact Development BMPs			
INF-3 Bioretention with No Underdrain Remove trash and debris, inspect and resolve areas of standing water, remove minor sediment as needed, provide vector control if needed. Irrigate as recommended by a landscape professional, remove undesirable vegetation, reseed or replant areas of thin or missing vegetation. Replace media as needed.		Annually	Owner/POA
INF-7 Subsurface Infiltration Gallery– Inspect for standing water after storm events. Clean out pre-treatment area as needed for sediment and trash/debris.		After significant storm events, semi-annual and as needed.	Owner/POA

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
	BIO-7 Proprietary Biotreatment (Modular Wetland System or approved equivalent) – Inspect unit for accumulated debris and sediment and plant health; remove trash from screening device and separation chamber; trim vegetation. Remove sediment from pre-chamber, replace pre-filter cartridge media and drain down filter media. Replace wetland media.	Annually	Owner/POA
	Gross Solids Removal Device		
	GSRD BMP #1 **PRE-2 Catch Basin Insert Device (BioClean Curb Inlet Filter) -** Inspect unit for accumulated debris and sediment. Remove when accumulated material reaches ½ height of screen.	After significant storm events, annual and as needed.	Owner/POA

Required Permits

No additional permits are necessary for the operation and maintenane of the proposed BMPs.

Forms to Record BMP Implementation, Maintenance, and Inspection

The form that will be used to record implementation, maintenance, and inspection of BMPs is attached.

Recordkeeping

All records must be maintained for at least five (5) years and must be made available for review upon request.

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

MAINTENANCE AGREEMENT – TO BE PROVIDED IN FINAL WQMP

Attachment C

BMP Calculations and Details

BMP Calculations

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	TBD	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=		inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	See table	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=		
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=		
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=		cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=		In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=		In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	See Worksheet C	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=		sq-ft
Calculations:				

DMA	Tributary Drainage Area (Ac)	Imp.	C-value	Design Storm Depth (in.)	Simple Method DCV (cu-ft)
1	4.49	0.83	0.77	0.9	11,295
2	0.08	0.67	0.652	0.9	176
3	0.06	0.67	0.652	0.9	127

DMA 1 - Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours)	T=	3.29	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.28	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
5	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency (Y_2), X_2	X_2=	0	
7	Calculate the fraction of design volume that must be provided by BMP, $fraction = X_1 - X_2$	fraction=	0.28	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction} = fraction \times d$	$d_{fraction}$=	0.275	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	4.49	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.83	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.77	
4	Calculate runoff volume, $V_{design} = (C \times d_{rfraction} \times A \times 43560 \times (1/12))$	V_{design}=	3,451	cu-ft
Supporting Calculations				

DMA 1 - Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

Describe system: Underground Infiltration system consisting of 8'W x 55'L x 8'D vault over 0.5' gravel bed.

Minimum V_{design} required is 3,451 cubic feet. An additional 690 cubic feet (20% added to account for parking structure drainage relative to wind driven rain and associated runoff) has been applied.

Minimum BMP area required is 420 square feet (DCV80 3451/DEFFECT 8.2 ft). An additional 84 square feet (20% added to account for parking structure drainage relative to wind driven rain and associated runoff) has been applied. The total area provided is 504 square feet.

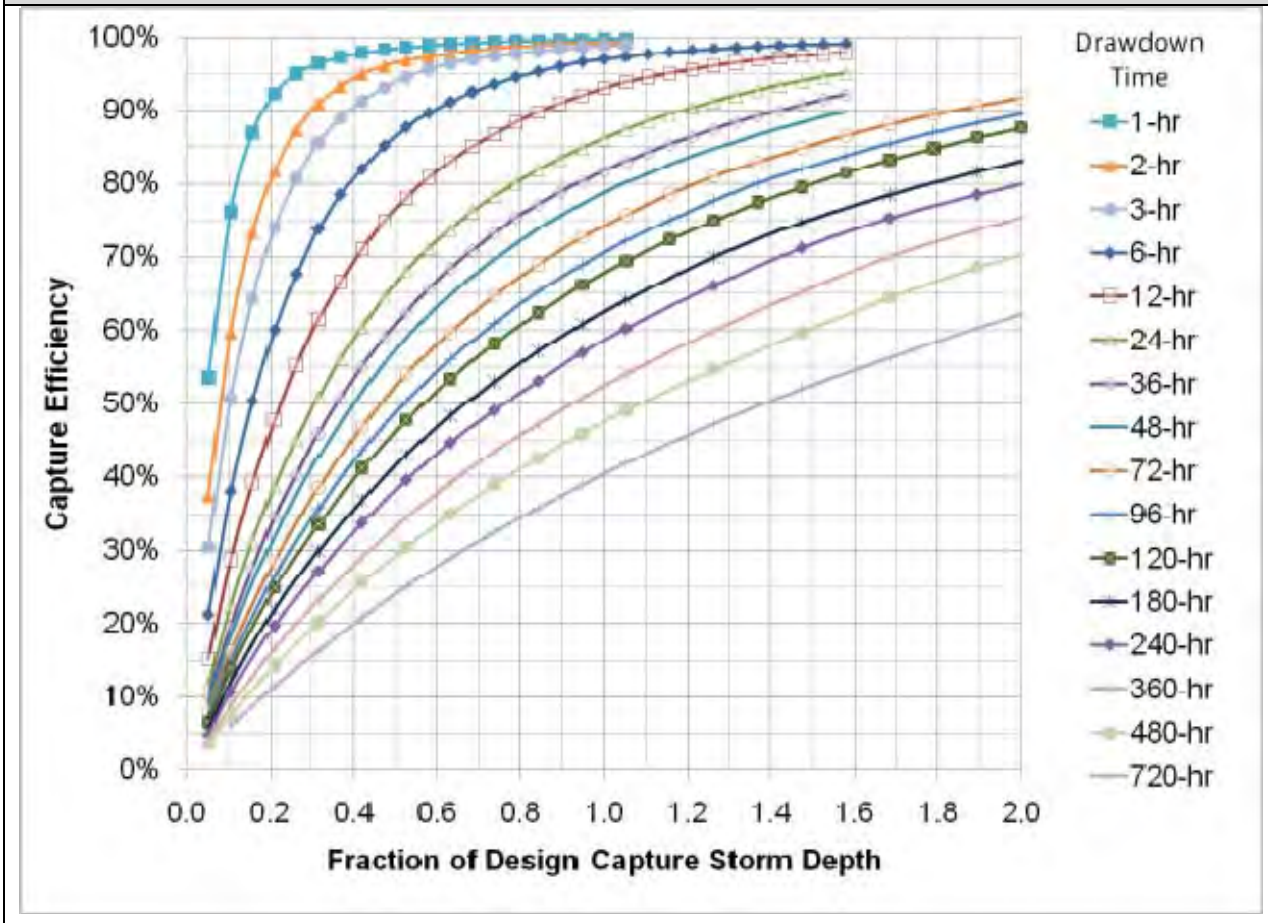
Note: New guidance from OCSD regarding parking structure drainage, the Final WQMP will need to account for wind driven rain and associated runoff if the parking structure will have open sides/windows. LID BMPs will need to be sized accordingly to ensure that this extra runoff is accounted for.

For this Preliminary WQMP, an additional 20% has been added to the DCV and minimum BMP area, calculations are provided above. During the Final WQMP phase, precise DCV calculations will be provided and the project LID BMP's will be updated accordingly.

Provide drawdown time calculations per applicable BMP Fact Sheet:
Effective depth of system: 8.2'
DD= (8.2 ft) x (12in/ft)/29.9 in/hr = 3.29 hours

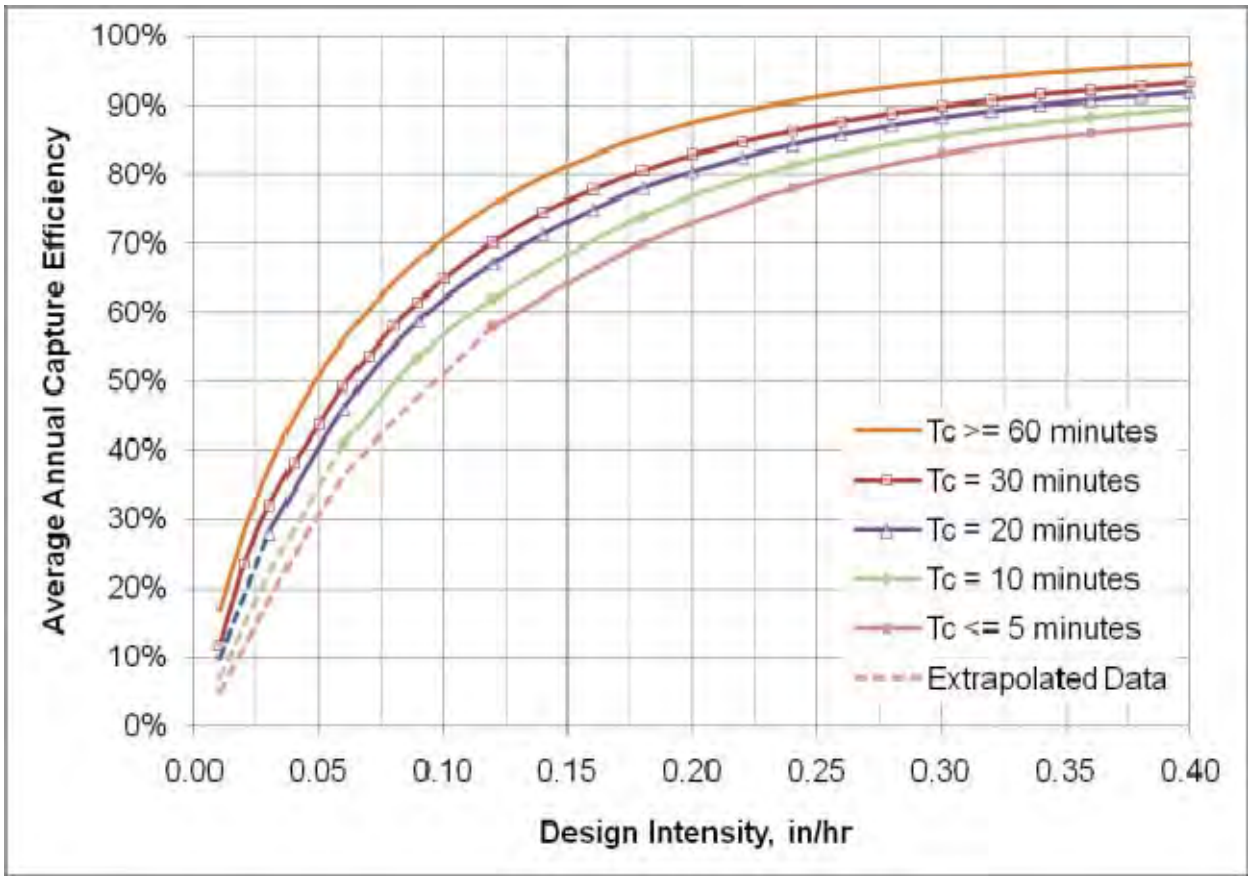
DMA 1 - Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

Graphical Operations



Worksheet D: Capture Efficiency Method for Flow-Based BMPs – DMA 1 (Pre-treatment)

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	15	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.22	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	
6	Determine the design intensity that must be provided by BMP $I_{design}= I_1-I_2$	I_{design}=	0.22	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	4.49	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.83	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.77	
4	Calculate design flow rate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design}=	0.76	cfs
Supporting Calculations				
Describe system: Runoff will be conveyed to a proprietary biotreatment unit for pretreatment prior to conveyance to the underground infiltration system. Modular Wetland System, Model # MWS-L-8-24-HC is proposed as a pretreatment control BMP. The capacity of the unit is 0.89 cfs. The operating head of the unit has been increased by 1.0 feet which increases the unit's treatment capacity.				
Provide time of concentration assumptions: 2-year Tc is approximately 12.8 minutes.				


Average Annual Capture Efficiency
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
Design Intensity, in/hr
Tc >= 60 minutes
Tc = 30 minutes
Tc = 20 minutes
Tc = 10 minutes
Tc <= 5 minutes
Extrapolated Data

DMA 2- *Worksheet B: Simple Design Capture Volume Sizing Method*

Step 1: Determine the design capture storm depth used for calculating volume			
Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0	inches
Step 2: Calculate the DCV			
Enter Project area tributary to BMP (s), *A* (acres)	A=	0.08	acres
Enter Project Imperviousness, *imp* (unitless)	imp=	0.90	
Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.825	
Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	176	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV			
Step 3a: Determine design infiltration rate			
Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	65.3	In/hr
Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	6	
Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	10.8	In/hr
Step 3b: Determine minimum BMP footprint			
Enter drawdown time, *T* (max 48 hours)	T=	1.66	Hours
Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	1.5	feet
Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	117	sq-ft
Supporting Calculations			
DD = 1.5'/10.8 in/hr = 1.66 hours (1.5' is maximum depth for bioretention) A 200' square foot bioretention with no underdrain is provided. $K_{measured}$ of 65.3 in/hr is based on the average of 4 infiltration tests conducted onsite.			

DMA 3 - *Worksheet B: Simple Design Capture Volume Sizing Method*

Step 1: Determine the design capture storm depth used for calculating volume			
Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0	inches
Step 2: Calculate the DCV			
Enter Project area tributary to BMP (s), *A* (acres)	A=	0.06	acres
Enter Project Imperviousness, *imp* (unitless)	imp=	0.90	
Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.825	
Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	127	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV			
Step 3a: Determine design infiltration rate			
Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	65.3	In/hr
Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	6	
Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	10.8	In/hr
Step 3b: Determine minimum BMP footprint			
Enter drawdown time, *T* (max 48 hours)	T=	1.66	Hours
Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	1.5	feet
Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	84	sq-ft
Supporting Calculations			
DD = 1.5'/10.8 in/hr = 1.66 hours (1.5' is maximum depth for bioretention) A 100' square foot bioretention with no underdrain is provided. $K_{measured}$ of 65.3 in/hr is based on the average of 4 infiltration tests conducted onsite.			

Feasibility Worksheets

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	*Yes*	*No*
1	Would Infiltration BMPs pose significant risk for groundwater related concerns? Refer to Appendix VII (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria.		x
Provide basis: **Pending review/approval from Orange County Water District.**			
2	Would Infiltration BMPs pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert): The BMP can only be located less than 50 feet away from slopes steeper than 15 percent. The BMP can only be located less than eight feet from building foundations or an alternative setback. A study prepared by a geotechnical professional or an available watershed study substantiates that stormwater infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be mitigated to an acceptable level.		X
Provide basis: **No restrictions placed by geotechnical engineer.**			
3	Would infiltration of the DCV from drainage area violate downstream water rights?		X
Provide basis: **No restrictions on water rights for project site.**			
	Partial Infeasibility Criteria	*Yes*	*No*
4	Is proposed infiltration facility located on HSG D soils or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?		X
Provide basis: **Per OC TGD, site resides on HSG Group A soils, Soil type also confirmed by geotechnical reports.**			
5	Is measured infiltration rate below proposed facility less than 0.3 inches per hour? This calculation shall be based on the methods described in Appendix VII.		X
Provide basis: **Based on infiltration testing, measured infiltration rates were approximately 179.5 inches per hour.**			

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	*Yes*	*No*
6	Would reduction of over pre-developed conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: Project discharges to storm drains and channels that are not ephemeral.			
7	Would an increase in infiltration over pre-developed conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:			
Infiltration Screening Results (check box corresponding to result):			
8	Is there substantial evidence that infiltration from the project would result in a significant increase in I&I to the sanitary sewer that cannot be sufficiently mitigated? (See Appendix XVII) Provide narrative discussion and supporting evidence: Per TGD and County of Orange GIS data, project is not located in an area where increase in I&I to the sanitary sewer is of concern.		X
9	If any answer from row 1-3 is yes: infiltration of any volume is not feasible within the DMA or equivalent. Provide basis:		
10	If any answer from row 4-7 is yes, infiltration is permissible but is not presumed to be feasible for the entire DCV. Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply. Provide basis: Answer to items are "no".		
11	If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable. Provide basis:		

Worksheet I: Summary of Groundwater-related Feasibility Criteria

1	Is project large or small? (as defined by Table VIII.2) circle one	Large		Small
2	What is the tributary area to the BMP?	A	4.49	acres
3	What type of BMP is proposed?	Infiltration		
4	What is the infiltrating surface area of the proposed BMP?	A_{BMP}	440	sq-ft
5	What land use activities are present in the tributary area (list all) - Pavement - Roof tops - Landscaping areas - Uncovered parking areas - Parking Structure			
6	What land use-based risk category is applicable?	L	M	H
7	If M or H, what pretreatment and source isolation BMPs have been considered and are proposed (describe all): **Modular Wetland System**			
8	What minimum separation to mounded seasonally high groundwater applies to the proposed BMP? See Section VIII.2 (circle one)	5 ft		10 ft
9	Provide rationale for selection of applicable minimum separation to seasonally high mounded groundwater:			
10	What is separation from the infiltrating surface to seasonally high groundwater?	SHGWT	greater than 10	ft
11	What is separation from the infiltrating surface to mounded seasonally high groundwater?	Mounded SHGWT	greater than 10	ft
12	Describe assumptions and methods used for mounding analysis:			
13	Is the site within a plume protection boundary (See Figure VIII.2) **Subject to final review/determination from Orange County Water District as part of the project's Final WQMP.**	Y	N	N/A
14	Is the site within a selenium source area or other natural plume area (See Figure VIII.2)?	Y	N	N/A
15	Is the site within 250 feet of a contaminated site?	Y	N	N/A
16	If site-specific study has been prepared, provide citation and briefly summarize relevant findings: Based on the project's Phase 2 ESA, the site has been used as an automobile and freight truck storage/tow yard, maintenance and repair facility, and fueling site since 1947. The site formerly operated underground storage tanks and associated fueling dispenser pumps. Refer to Attachment F for an excerpt of the Phase 2			

Worksheet I: Summary of Groundwater-related Feasibility Criteria

	ESA. Results of the Phase II ESA indicate the following: • Three areas (20,000-gallon underground diesel tank - SB9, TPH impacted soil from former UST dispenser area – SB7, and TPH impacted soil from oil/water separator – SB6) will require remediation and are all located in the southeast quadrant of the property and will impact soils approximately 10 feet beneath existing surface grade. Despite the required remediation, the proposed water quality infiltration BMP will not be an issue as it is located in northwest quadrant of the property within the proposed access drive along the northerly property line, near the project's entry to Anaheim Blvd. (refer to attached BMP Site Plan in Section IV). Additionally, the proposed infiltration BMP (underground vault) will be designed with an approximate 15-foot depth from finished grade providing both distance and grade separation from the remediation sites. Lastly, the project site is located on the fringe of the North Basin Plume Boundary. Infiltration feasibility will be provided by the Orange County Water District (OCWD) for the project pursuant to an official request by the City of Anaheim. If OCWD doesn't approve infiltration, other BMPs will be provided as part of the Final WQMP.	
17	Is the site within 100 feet of a water supply well, spring, septic system?	Y N N/A
18	Is infiltration feasible on the site relative to groundwater-related criteria? **Subject to final review/determination from Orange County Water District as part of the project's Final WQMP.**	Y N
Provide rationale for feasibility determination: For purposes of the Preliminary WQMP, infiltration has been assumed as feasible due to favorable infiltration rates and the separation of the infiltration BMP from the known contaminants onsite. The Infiltration BMP is located in the northwest quadrant of the project site and the known contaminants are located in the southeast quadrant of the site. The final infiltration feasibility determination will be provided by the Orange County Water District (OCWD) for the project, pursuant to an official request by the City of Anaheim as part of the project's Final WQMP.		

BMP Details

INF-3 Bioretention With No Underdrain

INF-3: Bioretention with no Underdrain

Bioretention stormwater treatment facilities are landscaped shallow depressions that capture and filter stormwater runoff. These facilities function as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. The facilities normally consist of a ponding area, mulch layer, planting soils, and plants. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, and biodegraded by the soil and plants. For areas with low permeability native soils or steep slopes, bioretention areas can be designed with an underdrain system that routes the treated runoff to the storm drain system rather than depending entirely on infiltration.

Also known as:

- *Rain gardens*
- *Infiltration planter*

Bioretention
Source: Geosyntec Consultants

Feasibility Screening Considerations

- Bioretention with no underdrains shall pass infiltration infeasibility screening criteria to be considered for use.

Opportunity Criteria

- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Bioretention may also be applied in parking lot islands, cul-de-sacs, traffic circles, road shoulders, and road medians.
- Drainage area is ≤ 5 acres, preferrably ≤ 1 acre.
- Area available for infiltration.
- Soils are adequate for infiltration or can be amended to improve infiltration capacity. Site slope is less than 15 percent.

OC-Specific Design Criteria and Considerations

☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc.)

☐ Depth to mounded seasonally high groundwater shall not be less than 5 feet.

☐ If sheet flow is conveyed to the treatment area over stabilized grassed areas, the site must be graded in such a way that minimizes erosive conditions; sheet flow velocities should not exceed 1 foot per second.

☐ Ponding depth should not exceed 18 inches; fencing may be required if ponding depth exceeds 6 inches to mitigate the risk of drowning.

☐ Planting/storage media shall be based on the recommendations contained in MISC-1: Planting/Storage Media

☐ The minimum amended soil depth is 1.5 feet (3 feet is preferred).

☐ The maximum drawdown time of the planting soil is 48 hours.

- ☐ Infiltration pathways may need to be restricted due to the close proximity of roads, foundations, or other infrastructure. A geomembrane liner, or other equivalent water proofing, may be placed along the vertical walls to reduce lateral flows. This liner should have a minimum thickness of 30 mils.
- ☐ Plant materials should be tolerant of summer drought, ponding fluctuations, and saturated soil conditions for 48 hours; native plant species and/or hardy cultivars that are not invasive and do not require chemical fertilizers or pesticides should be used to the maximum extent feasible.
- ☐ The bioretention area should be covered with 2-4 inches (average 3 inches) of mulch at startup and an additional placement of 1-2 inches of mulch should be added annually.
- ☐ An optional gravel drainage layer may be installed below planting media to augment storage volume.
- ☐ An overflow device is required at the top of the ponding depth.
- ☐ Dispersed flow or energy dissipation (i.e. splash rocks) for piped inlets should be provided at basin inlet to prevent erosion.

Simple Sizing Method for Bioretention with no Underdrain

If the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** is used to size a bioretention area with underdrains, the user calculates the DCV and designs the system with geometry required to draw down the DCV in 48 hours. The sizing steps are as follows:

Step 1: Determine the Bioretention Design Capture Volume

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1**.

Step 2: Determine the 48-hour Ponding Depth

The depth of effective storage depth that can be drawn down in 48 hours can be calculated using the following equation:

$$d_{48} = K_{DESIGN} \times 4$$

Where:

d_{48} = bioretention 48-hour effective depth, ft

K_{DESIGN} = bioretention design infiltration rate, in/hr (See **Appendix VII**)

This is the maximum effective depth of the basin below the overflow device to achieve drawdown in 48 hours. Effective depth includes ponding water and media/aggregate pore space.

Step 3: Design System Geometry to Provide d_{48}

Design system geometry such that

$$d_{48} \geq d_{EFFECTIVE} = (d_P + n_M d_M + n_G d_G)$$

Where:

d_{48} = depth of water that can drain in 48 hours

$d_{EFFECTIVE}$ = total effective depth of water stored in bioretention area, ft

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

n_M = bioretention media porosity

d_M = bioretention media depth, ft

n_G = bioretention gravel layer porosity; 0.35 may be assumed where other information is not available

d_G = bioretention gravel layer depth, ft

Step 4: Calculate the Required Infiltrating Area

The required infiltrating area (i.e. measured at the media surface) can be calculated using the following equation:

$A = DCV / d_{EFFECTIVE}$

Where:

A = required infiltrating area, sq-ft (measured as the media surface area)

DCV = design capture volume, cu-ft (see Step 1)

$d_{EFFECTIVE}$ = total effective depth of water stored in bioretention area, ft (from Step 3)

This does not include the side slopes, access roads, etc. which would increase bioretention footprint.

Capture Efficiency Method for Bioretention with no Underdrain

If BMP geometry has already been defined and deviates from the 48 hour drawdown time, the designer can use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to determine the fraction of the DCV that must be provided to manage 80 percent of average annual runoff volume. This method accounts for drawdown time different than 48 hours.

Step 1: Determine the drawdown time associated with the selected basin geometry

$DD = (d_{EFFECTIVE} / K_{DESIGN}) \times 12$ in/ft

Where:

DD = time to completely drain infiltration basin ponding depth, hours

$d_{EFFECTIVE} \leq (d_P + n_M d_M + n_G d_G)$

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

n_M = bioretention media porosity

d_M = bioretention media depth, ft

n_G = bioretention gravel layer porosity; 0.35 may be assumed where other information is not available

d_G = bioretention gravel layer depth, ft

K_{DESIGN} = basin design infiltration rate, in/hr (See **Appendix VII**)

Step 2: Determine the Required Adjusted DCV for this Drawdown Time

Use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**) to calculate the fraction of the DCV the basin must hold to achieve 80 percent capture of average annual stormwater runoff volume based on the basin drawdown time calculated above.

Step 4: Check that the Bioretention Effective Depth Drains in no Greater than 96 Hours

$DD = (d_{EFFECTIVE} / K_{DESIGN}) \times 12$

Where:

DD = time to completely drain bioretention facility, hours

$d_{EFFECTIVE}$ = total effective depth of water stored in bioretention area, ft (from Step 3)

K_{DESIGN} = basin design infiltration rate, in/hr (See **Appendix VII**)

If DD_{ALL} is greater than 96 hours, adjust bioretention media depth and/or gravel layer depth until DD is less than 96 hours. This duration is based on preventing extended periods of saturation from causing plant mortality.

Step 5: Determine the Basin Infiltrating Area Needed

The required infiltrating area (i.e. the surface area of the top of the media layer) can be calculated using the following equation:

$A = DCV / d_{EFFECTIVE}$

Where:

A = required infiltrating area, sq-ft (measured at the media surface)

DCV = design capture volume, adjusted for drawdown time, cu-ft (see Step 1)

$d_{EFFECTIVE}$ = total effective depth of water stored in bioretention area, ft (from Step 3)

This does not include the side slopes, access roads, etc. which would increase bioretention footprint. If the area required is greater than the selected basin area, adjust surface area or adjust ponding depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

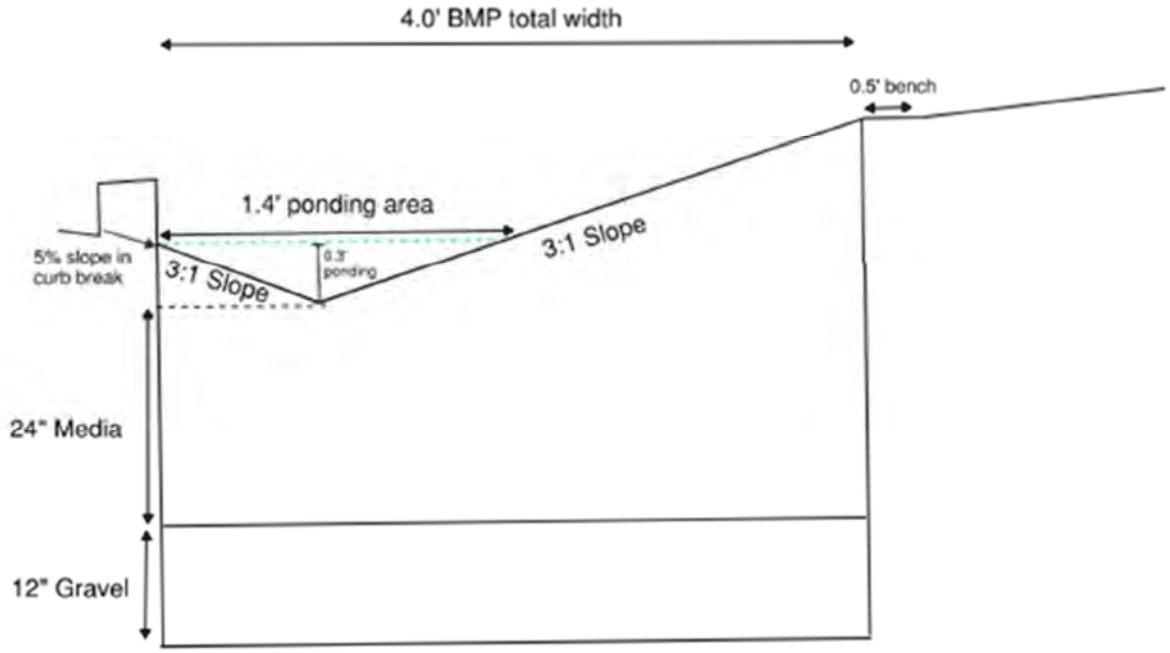
- Bioretention areas may be preceeded in a treatment train by HSCs in the drainage area, which would reduce the required volume of the bioretention cell.
- Bioretention areas can be incorporated in a treatment train to provide enhanced water quality treatment and reductions in runoff volume and rate. For example, runoff can be collected from a roadway in a vegetated swale that then flows to a bioretention area. Similarly, bioretention could be used to manage overflow from a cistern.

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment: http://www.cabmphandbooks.com/Documents/Development/TC-32.pdf
- SMC LID Manual (pp 68): http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 5: http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf
- San Diego County LID Handbook Appendix 4 (Factsheet 7): http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf
- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4. http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850

  County of Los Angeles Low Impact Development Standards Manual, Chapter 5: http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf

Bioretention without Underdrain Draft BMP Cross Section Detail



NTS

INF-7 Subsurface Infiltration

INF-7: Underground Infiltration

Underground infiltration is a vault or chamber with an open bottom that used to store runoff and percolate into the subsurface. A number of vendors offer proprietary infiltration products that allow for similar or enhanced rates of infiltration and subsurface storage while offering durable prefrabricated structures. There are many varieties of proprietary infiltration BMPs that can be used for roads and parking lots, parks and open spaces, single and multi-family residential, or mixed-use and commercial uses.

Also known as:

- *Infiltration vault*
- *Recharge vault*

Underground Infiltration

Source: http://www.contech-cpi.com

Feasibility Screening Considerations

- Infiltration bains shall pass infeasible screening criteria to be considered for use.
- Underground infiltration galleries pose a potential risk of groundwater contamination; pretreatment should be used.

Opportunity Criteria

- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Appropriate for sites with limited surface space.
- Can be placed beneath roads, parking lots, parks, and athletic fields.
- Potential for groundwater contamination can be mitigated through isolation of pollutant sources, pretreatment of inflow, and/or demonstration of adequate treatment capacity of underlying soils.
- Infiltration is into native soil, or depth of engineered fill is ≤ 5 feet from the bottom of the facility to native material and infiltration into fill is approved by a geotechnical professional.
- Tributary area land uses include mixed-use and commercial, sngle-family and multi-family, roads and parking lots, and parks and open spaces. High pollutant land uses should not be tributary to infiltration BMPs.

OC-Specific Design Criteria and Considerations

☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc.)

☐ Minimum separation to mounded seasonally high groundwater of 10 feet shall be observed.

☐ Minimum pretreatment should be provided upstream of the infiltration facility, and water bypassing pretreatment should not be directed to the facility.

☐ Underground infiltration should not be used for drainage areas with high sediment production potential unless preceded by full treatment control with a BMP effective for sediment removal.

☐ Design infiltration rate should be determined as described **in Appendix VII**.

☐ Inspection ports or similar design features shall be provided to verify continued system performance and identify need for major maintenance.

☐ For infiltration facilities beneath roads and parking areas, structural requirements should meet H-20 load requirements.

Computing Underground Infiltration Device Size

Underground infiltration devices vary by design and by proprietary designs. The sizing method selected for use must be based on the BMP type it most strongly resembles.

- For underground infiltration devices with open pore volume (e.g., vaults, crates, pipe sections, etc), sizing will be most similar to infiltration basins.
- For underground infiltration devices with pore space (e.g., aggregate reservoirs), sizing will be most similar to permeable pavement.

Additional References for Design Guidance

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 5: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**

BIO-7 Proprietary Biotreatment

BIO-7: Proprietary Biotreatment

Proprietary biotreatment devices are devices that are manufactured to mimic natural systems such as bioretention areas by incorporating plants, soil, and microbes engineered to provide treatment at higher flow rates or volumes and with smaller footprints than their natural counterparts. Incoming flows are typically filtered through a planting media (mulch, compost, soil, plants, microbes, etc.) and either infiltrated or collected by an underdrain and delivered to the storm water conveyance system. Tree box filters are an increasingly common type of proprietary biotreatment device that are installed at curb level and filled with a bioretention type soil. For low to moderate flows they operate similarly to bioretention systems and are bypassed during high flows. Tree box filters are highly adaptable solutions that can be used in all types of development and in all types of soils but are especially applicable to dense urban parking lots, street, and roadways.

Also known as:

- *Catch basin planter box*
- *Bioretention vault*
- *Tree box filter*

Proprietary biotreatment
Source: http://www.americastusa.com /index.php/filterra/

Feasibility Screening Considerations

- Proprietary biotreatment devices that are unlined may cause incidental infiltration. Therefore, an evaluation of site conditions should be conducted to evaluate whether the BMP should include an impermeable liner to avoid infiltration into the subsurface.

Opportunity Criteria

- Drainage areas of 0.25 to 1.0 acres.
- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Proprietary biotreatment facilities may also be applied in parking lot islands, traffic circles, road shoulders, and road medians.
- Must not adversely affect the level of flood protection provided by the drainage system.

OC-Specific Design Criteria and Considerations

☐ Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.

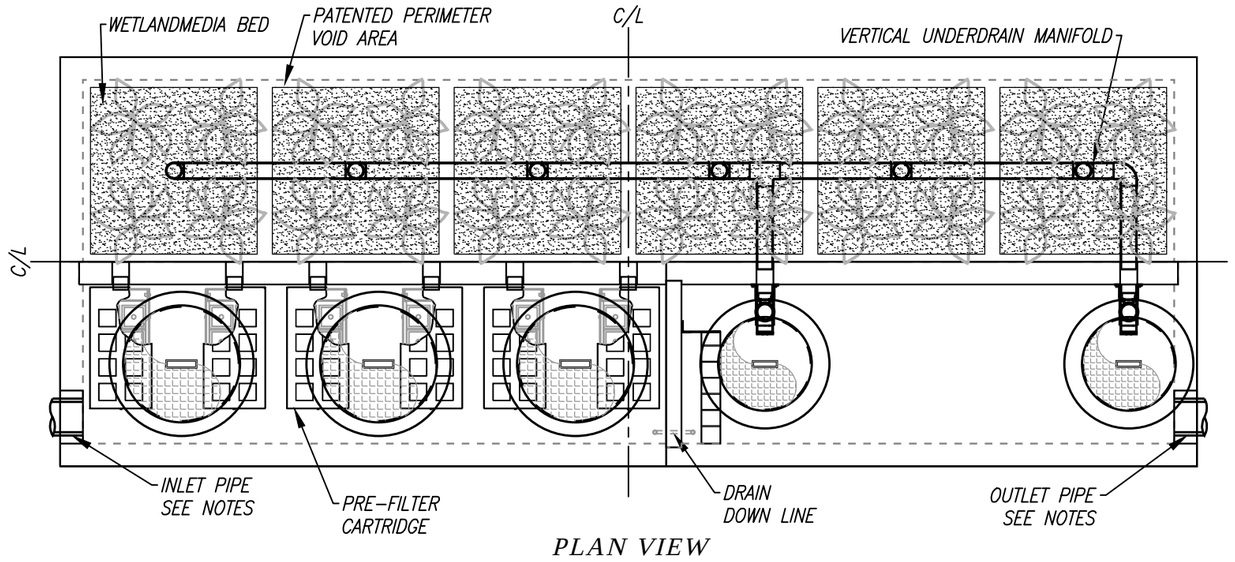
☐ Consult proprietors for specific criteria concerning the design and performance.

☐ Proprietary biotreatment may include specific media to address pollutants of concern. However, for proprietary device to be considered a biotreatment device the media must be capable of supporting rigorous growth of vegetation.

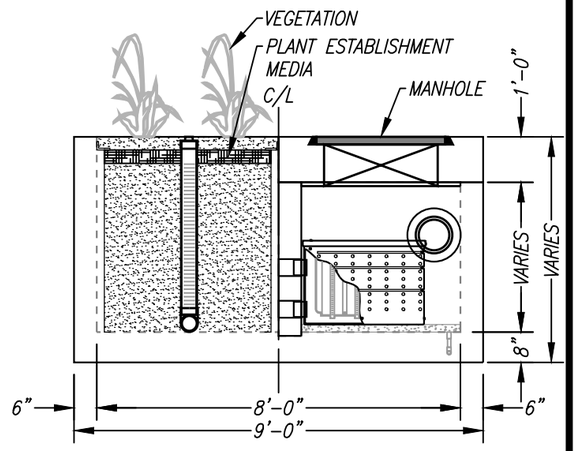
☐ Proprietary systems must be acceptable to the reviewing agency. Reviewing agencies shall have the discretion to request performance information. Reviewing agencies shall have the discretion to deny the use of a proprietary BMP on the grounds of performance, maintenance considerations, or other relevant factors.

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		THE INVIATION APARTMENTS	
PROJECT LOCATION		ANAHEIM, CA	
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.890	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	3EA ø30"	OPEN PLANTER	2EA ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



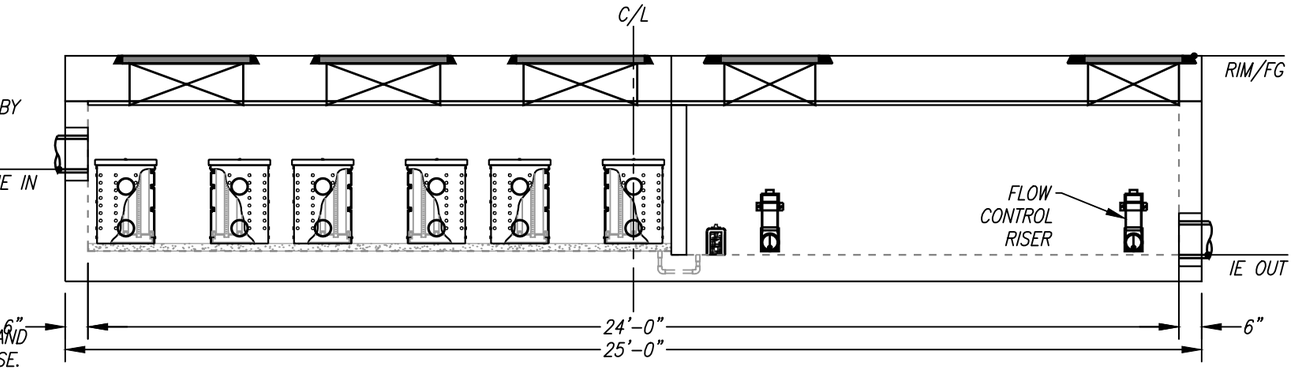
LEFT END VIEW

INSTALLATION NOTES

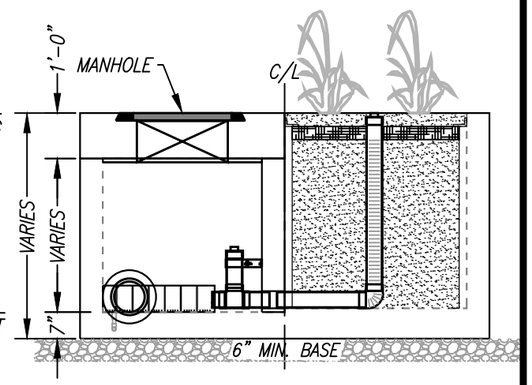
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.89
OPERATING HEAD (FT)	4.4
PRETREATMENT LOADING RATE (GPM/SF)	2.6
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

Bio Clean
A Forterra Company

MWS-L-8-24-V
STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

5/23/19 10:LEF

Bio Clean

A Forterra Company

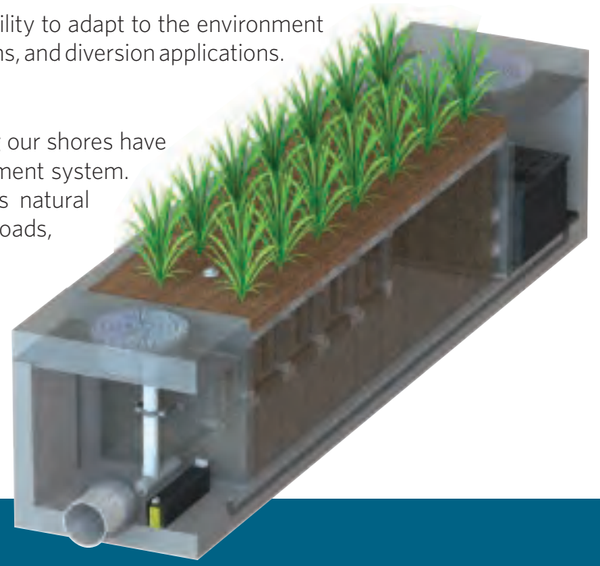
Modular Wetlands® System Linear

A Stormwater Biofiltration Solution

OVERVIEW

The Bio Clean Modular Wetlands® System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint, higher treatment capacity, and a wide range of versatility. While most biofilters use little or no pretreatment, the Modular Wetlands® incorporates an advanced pretreatment chamber that includes separation and pre-filter cartridges. In this chamber, sediment and hydrocarbons are removed from runoff before entering the biofiltration chamber, reducing maintenance costs and improving performance.

Horizontal flow also gives the system the unique ability to adapt to the environment through a variety of configurations, bypass orientations, and diversion applications.



The Urban Impact

For hundreds of years, natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as cities grow and develop, our environment's natural filtration systems are blanketed with impervious roads, rooftops, and parking lots.

Bio Clean understands this loss and has spent years re-establishing nature's presence in urban areas, and rejuvenating waterways with the Modular Wetlands® System Linear.

PERFORMANCE

The Modular Wetlands® continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons, and bacteria. Since 2007 the Modular Wetlands® has been field tested on numerous sites across the country and is proven to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. In fact, the Modular Wetlands® harnesses some of the same biological processes found in natural wetlands in order to collect, transform, and remove even the most harmful pollutants.

66% REMOVAL OF DISSOLVED ZINC	**69%** REMOVAL OF TOTAL ZINC	**38%** REMOVAL OF DISSOLVED COPPER	**64%** REMOVAL OF TOTAL PHOSPHORUS	
45% REMOVAL OF NITROGEN	**50%** REMOVAL OF TOTAL COPPER	**95%** REMOVAL OF MOTOR OIL	**67%** REMOVAL OF ORTHO PHOSPHORUS	**85%** REMOVAL OF TSS

APPROVALS

The Modular Wetlands® System Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation and perhaps the world. Here is a list of some of the most high-profile approvals, certifications, and verifications from around the country.

Washington State Department of Ecology TAPE Approved
The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft² loading rate. The highest performing BMP on the market for all main pollutant categories.

California Water Resources Control Board, Full Capture Certification
The Modular Wetlands® System is the first biofiltration system to receive certification as a full capture trash treatment control device.

Virginia Department of Environmental Quality, Assignment
The Virginia Department of Environmental Quality assigned the MWS Linear the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) regulation technical criteria.

Maryland Department of the Environment, Approved ESD
Granted Environmental Site Design (ESD) status for new construction, redevelopment, and retrofitting when designed in accordance with the design manual.

MASTEP Evaluation
The University of Massachusetts at Amherst – Water Resources Research Center issued a technical evaluation report noting removal rates up to 84% TSS, 70% total phosphorus, 68.5% total zinc, and more.

Rhode Island Department of Environmental Management, Approved BMP
Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% pathogens, 30% total phosphorus, and 30% total nitrogen.

ADVANTAGES

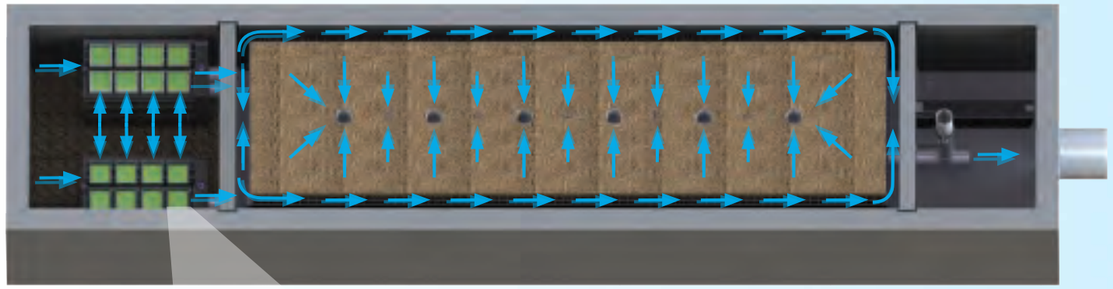
- HORIZONTAL FLOW BIOFILTRATION
- GREATER FILTER SURFACE AREA
- PRETREATMENT CHAMBER
- PATENTED PERIMETER VOID AREA
- FLOW CONTROL
- NO DEPRESSED PLANTER AREA
- AUTO DRAINDOWN MEANS NO MOSQUITO VECTOR

OPERATION

The Modular Wetlands® System Linear is the most efficient and versatile biofiltration system on the market, and it is the only system with horizontal flow which:

- Improves performance
- Reduces footprint
- Minimizes maintenance

Figure 1 & Figure 2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.



2x to 3x more surface area than traditional downward flow bioretention systems.

Figure 2, Top View

1 PRETREATMENT

SEPARATION

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

PRE-FILTER CARTRIDGES

- Over 25 sq. ft. of surface area per cartridge
- Utilizes BioMediaGREEN™ filter material
- Removes over 80% of TSS and 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber

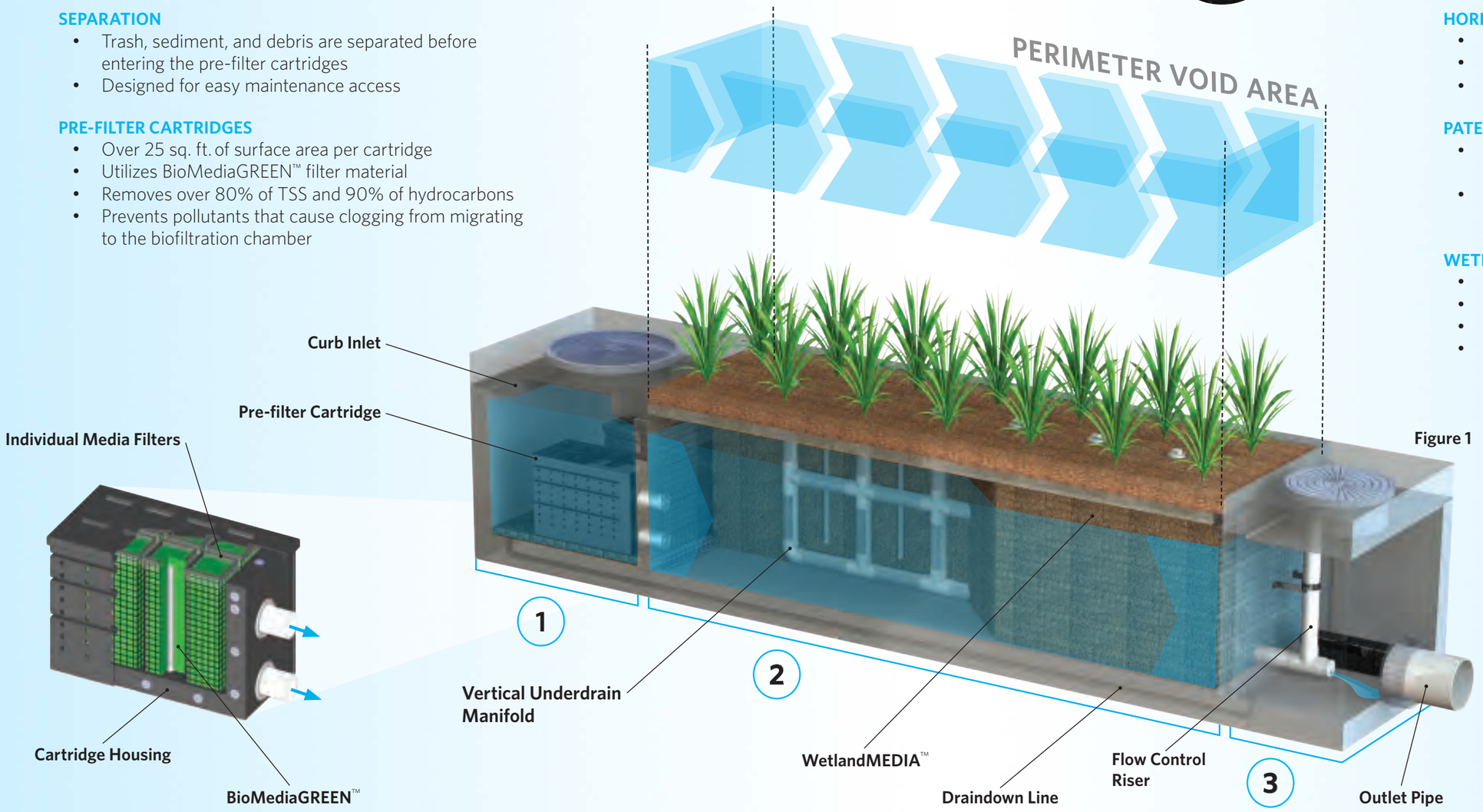


Figure 1

2 BIOFILTRATION

HORIZONTAL FLOW

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

PATENTED PERIMETER VOID AREA

- Vertically extends void area between the walls and the WetlandMEDIA™ on all four sides
- Maximizes surface area of the media for higher treatment capacity

WETLANDMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and lightweight

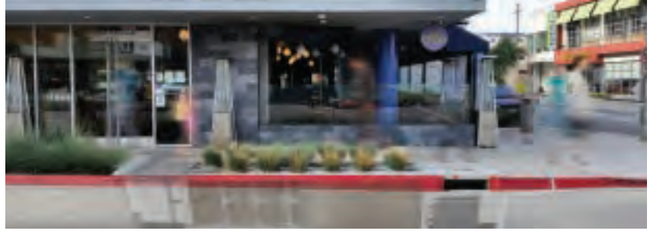
3 DISCHARGE

FLOW CONTROL

- Orifice plate controls flow of water through WetlandMEDIA™ to a level lower than the media's capacity
- Extends the life of the media and improves performance

DRAINDOWN FILTER

- The draindown is an optional feature that completely drains the pretreatment chamber
- Water that drains from the pretreatment chamber between storm events will be treated

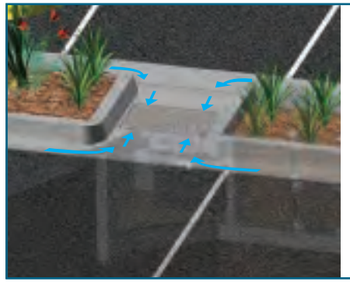


CONFIGURATIONS

The Modular Wetlands® System Linear is the preferred biofiltration system of civil engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your storm drain design.

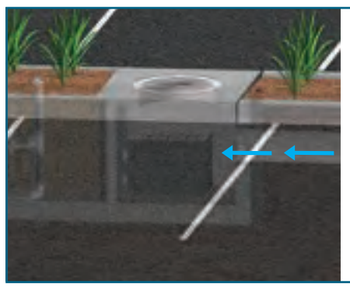
CURB TYPE

The Curb Type configuration accepts sheet flow through a curb opening and is commonly used along roadways and parking lots. It can be used in sump or flow-by conditions. Length of curb opening varies based on model and size.



GRATE TYPE

The Grate Type configuration offers the same features and benefits as the Curb Type but with a grated/drop inlet above the systems pretreatment chamber. It has the added benefit of allowing pedestrian access over the inlet. ADA-compliant grates are available to assure easy and safe access. The Grate Type can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



VAULT TYPE

The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pretreatment chamber, meaning the Modular Wetlands® can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/ bioretention systems. Another benefit of the "pipe-in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.

DOWNSPOUT TYPE

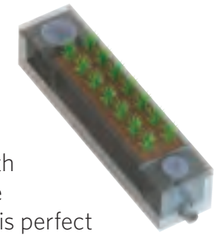
The Downspout Type is a variation of the Vault Type and is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

ORIENTATIONS

SIDE-BY-SIDE

The Side-By-Side orientation places the pretreatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.

END-TO-END



The End-To-End orientation places the pretreatment and discharge chambers on opposite ends of the biofiltration chamber, therefore minimizing the width of the system to 5 ft. (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is that bypass must be external.

BYPASS

INTERNAL BYPASS WEIR (SIDE-BY-SIDE ONLY)

The Side-By-Side orientation places the pretreatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pretreatment chamber directly to the discharge chamber.

EXTERNAL DIVERSION WEIR STRUCTURE

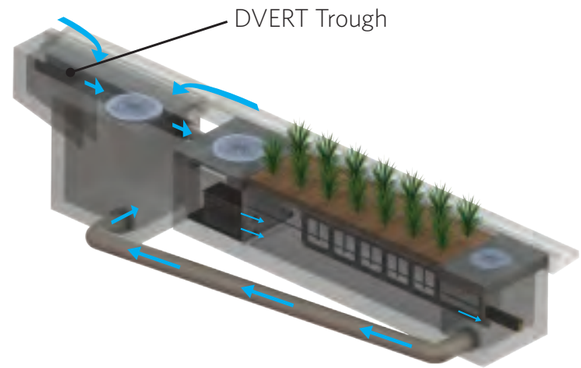
This traditional offline diversion method can be used with the Modular Wetlands® in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the Modular Wetlands® for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

FLOW-BY-DESIGN

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the Modular Wetlands® and into the standard inlet downstream.

DVERT LOW FLOW DIVERSION

This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the Modular Wetlands® via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over



to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allow the Modular Wetlands® to be installed anywhere space is available.

SPECIFICATIONS

FLOW-BASED DESIGNS

The Modular Wetlands® System Linear can be used in stand-alone applications to meet treatment flow requirements. Since the Modular Wetlands® is the only biofiltration system that can accept inflow pipes several feet below the surface, it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

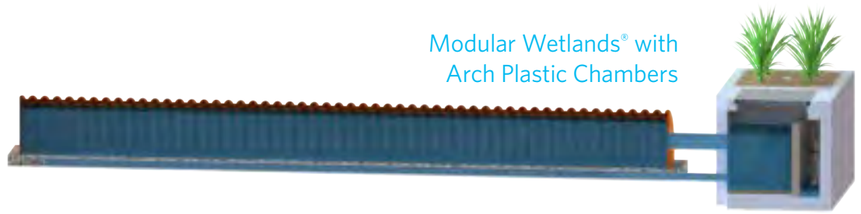
MODEL #	DIMENSIONS	WETLANDMEDIA SURFACE AREA (sq. ft.)	TREATMENT FLOW RATE (cfs)
MWS-L-4-4	4′ x 4′	23	0.052
MWS-L-4-6	4′ x 6′	32	0.073
MWS-L-4-8	4′ x 8′	50	0.115
MWS-L-4-13	4′ x 13′	63	0.144
MWS-L-4-15	4′ x 15′	76	0.175
MWS-L-4-17	4′ x 17′	90	0.206
MWS-L-4-19	4′ x 19′	103	0.237
MWS-L-4-21	4′ x 21′	117	0.268
MWS-L-6-8	7′ x 9′	64	0.147
MWS-L-8-8	8′ x 8′	100	0.230
MWS-L-8-12	8′ x 12′	151	0.346
MWS-L-8-16	8′ x 16′	201	0.462
MWS-L-8-20	9′ x 21′	252	0.577
MWS-L-8-24	9′ x 25′	302	0.693
MWS-L-10-20	10' x 20'	302	0.693

VOLUME-BASED DESIGNS

HORIZONTAL FLOW BIOFILTRATION ADVANTAGE

Modular Wetlands® with Box Culvert Prestorage

The Modular Wetlands® System Linear offers a unique advantage in the world of biofiltration due to its exclusive horizontal flow design: Volume-Based Design. No other biofilter has the ability to be placed downstream of detention ponds, extended dry detention basins, underground storage systems and permeable paver reservoirs. The systems horizontal flow configuration and built-in orifice control allows it to be installed with just 6" of fall between inlet and outlet pipe for a simple connection to projects with shallow downstream tie-in points. In the example above, the Modular Wetlands® is installed downstream of underground box culvert storage. Designed for the water quality volume, the Modular Wetlands® will treat and discharge the required volume within local draindown time requirements.



Modular Wetlands® with Arch Plastic Chambers

DESIGN SUPPORT

Bio Clean engineers are trained to provide you with superior support for all volume sizing configurations throughout the country. Our vast knowledge of state and local regulations allow us to quickly and efficiently size a system to maximize feasibility. Volume control and hydromodification regulations are expanding the need to decrease the cost and size of your biofiltration system. Bio Clean will help you realize these cost savings with the Modular Wetlands®, the only biofilter than can be used downstream of storage BMPs.

ADVANTAGES

- LOWER COST THAN FLOW-BASED DESIGN
- MEETS LID REQUIREMENTS
- BUILT-IN ORIFICE CONTROL STRUCTURE
- WORKS WITH DEEP INSTALLATIONS

APPLICATIONS

The Modular Wetlands® System Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

INDUSTRIAL

Many states enforce strict regulations for discharges from industrial sites. The Modular Wetlands® has helped various sites meet difficult EPA-mandated effluent limits for dissolved metals and other pollutants.

RESIDENTIAL

Low to high density developments can benefit from the versatile design of the Modular Wetlands®. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.

STREETS

Street applications can be challenging due to limited space. The Modular Wetlands® is very adaptable, and it offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.

PARKING LOTS

Parking lots are designed to maximize space and the Modular Wetlands'® 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

COMMERCIAL

Compared to bioretention systems, the Modular Wetlands® can treat far more area in less space, meeting treatment and volume control requirements.

MIXED USE

The Modular Wetlands® can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

More applications include:

• Agriculture • Reuse • Low Impact Development • Waste Water

PLANT SELECTION

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the Modular Wetlands® System Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade, the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the Modular Wetlands®, giving the plants more contact time so that pollutants are more successfully decomposed, volatilized, and incorporated into the biomass of the Modular Wetlands'® micro/macro flora and fauna.

A wide range of plants are suitable for use in the Modular Wetlands®, but selections vary by location and climate. View suitable plants by visiting biocleanenvironmental.com/plants.

INSTALLATION

The Modular Wetlands® is simple, easy to install, and has a space-efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles precast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians is available to supervise installations and provide technical support.

MAINTENANCE

Reduce your maintenance costs, man hours, and materials with the Modular Wetlands®. Unlike other biofiltration systems that provide no pretreatment, the Modular Wetlands® is a self-contained treatment train which incorporates simple and effective pretreatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pretreatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pretreatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long-term operation, and there is absolutely no need to replace expensive biofiltration media.

Bio Clean
A Forterra Company

5796 Armada Drive Suite 250
Carlsbad, CA 92008
855.566.3938
stormwater@forterrabp.com
biocleanenvironmental.com

122018R1A

PRE-2 Catch Basin Insert Fact Sheet

Bio Clean

A Forterra Company

Catch Basin Inlet Filters

A Stormwater Trash Capture Solution

OVERVIEW

The Bio Clean Catch Basin Inlet Filters are insertable systems designed to capture fine to coarse sediments, floatable trash, debris, total suspended solids (TSS), nutrients, metals, and hydrocarbons conveyed in stormwater runoff. The filter system is available in four different model types:

Full Capture Type	Multi-Level Screen Type	Kraken Filter Type	Media Filter Type
			
California Water Board Certified	**Verified by the New Jersey Corporation for Advanced Technology**	**Advanced Pollutant Removal**	**Design for Industrial Applications**
TESTING HIGHLIGHT: **California Water Board** **100% of Trash**	**TESTING HIGHLIGHT:** **NJDEP Testing Protocol** **86.6% of TSS** **(Down to 100 Micron)**	**TESTING HIGHLIGHT:** **Third Party Testing** **85% of TSS & 72% of TP**	**TESTING HIGHLIGHT:** **Port of San Diego Field Testing** **82% of TSS**

The Catch Basin Inlet Filters are an effective and economical solution to help property owners, developers, and municipalities meet local, state, and federal water quality requirements and regulations, as each filter can be custom built to meet specific project needs, and screen size and media type can be modified to remove specific pollutants.

Constructed of 100% high-grade stainless steel, it is built to last longer than any other filter brand, and the non-clogging screens provide higher levels of filtration and water flow. The filter is equipped with unimpeded high flow bypass to prevent backflow during the largest storm events.

ADVANTAGES

- 8-YEAR WARRANTY
- WORKS IN ANY SIZE CATCH BASIN
- NO NETS OR GEOFABRICS
- 15+ YEARS USER LIFE
- EASIEST TO MAINTAIN TROUGH SYSTEM ALLOWS FOR 15-MINUTE OR LESS SERVICE TIME
- MEETS LEED REQUIREMENTS
- STAINLESS STEEL AND FIBERGLASS CONSTRUCTION

APPLICATIONS

The Catch Basin Inlet Filters have been successfully used on numerous new construction and retrofit projects. The system's superior durability and customization make it ideal for a wide range of stormwater applications. Each filter fits within a shallow catch basin, giving them the ability to integrate with versatile curb inlet trough systems.

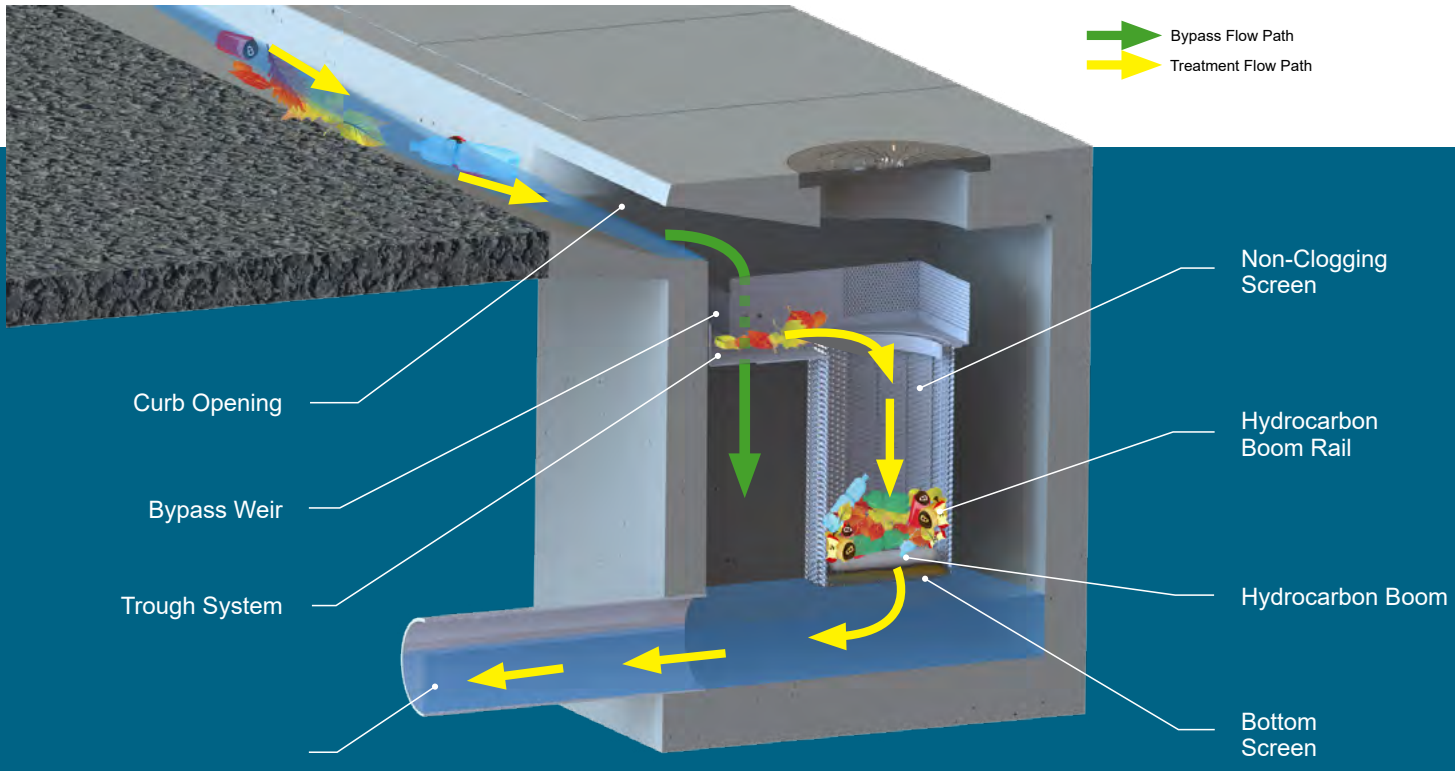
- Parking Lot Curb Inlets
- Parking Lot Grate Inlets
- Roadway Curb Inlets
- Roadway Grate Inlets
- Bioswale Bypass Structures
- Stormwater Pretreatment

CURB INLET APPLICATION

The curb inlet application or shelf system, provides easy access for maintenance from the surface without having to enter the catch basin. Maintenance service takes about 15 minutes and requires no confined space entry.

Each Catch Basin Inlet Filter is designed to be insertable and the expandable trough system is designed to convey water quality design flows through the filter basket while allowing peak flows to bypass over the trough without resuspending captured pollutants. The modular design of the trough system makes it adaptable to any size or type of curb inlet catch basin.

OPERATION



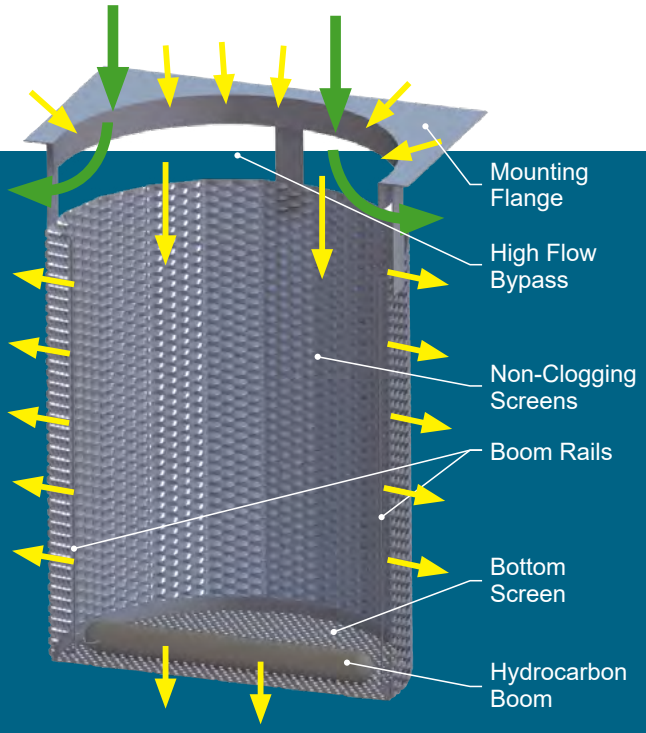
FULL CAPTURE TYPE

The Full Capture type inlet filter is California Full Capture approved and allows for a higher flow of water, making it more applicable for demanding applications. The screen has a specialized design that efficiently caputres all trash, but also makes cleaning more efficient while maintaining its ability to meet demanding flow requirements.

PERFORMANCE

100% REMOVAL OF TRASH

OPERATION



SPECIFICATIONS

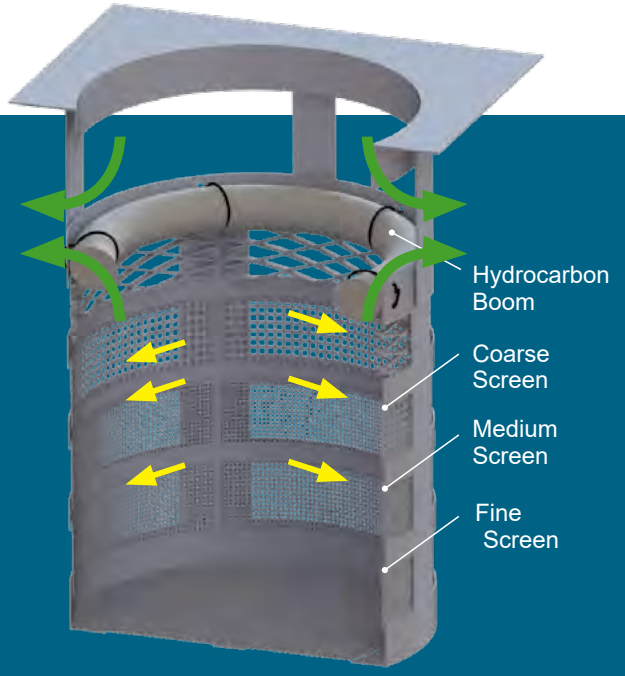
MODEL #	TREATMENT FLOW (cfs)	BYPASS FLOW (cfs)
BIO-CURB-FULL	2.85	UNLIMITED
BIO-GRATE-FULL-12-12-12	1.55	1.55
BIO-GRATE-FULL-18-18-18	4.32	3.68
BIO-GRATE-FULL-24-24-24	7.67	4.83
BIO-GRATE-FULL-30-30-24	12.97	6.21
BIO-GRATE-FULL-25-38-24	13.53	6.59
BIO-GRATE-FULL-36-36-24	19.64	7.60
BIO-GRATE-FULL-48-48-18	25.59	10.13

Note: Curb inlet application teatment flow rate limited to the weir capacity - actual flow rates of the filter basket is greater than 2.85 cfs.
Various depth filter baskets available. Treatment and bypass flow rates include a safety factor of 2.

MULTI-LEVEL SCREEN TYPE

The Bio Clean Multi-Level Screening Grate Inlet Filter is the standard configuration used for more than a decade and provides the best overall performance for all pollutants of concern.

OPERATION



PERFORMANCE

80% REMOVAL OF SEDIMENTS

100% REMOVAL OF TRASH

100% REMOVAL OF FOLIAGE

- MEDIUM LEVEL REMOVAL FOR PARTICULATE METALS AND NUTRIENTS
- INCLUDES HYDROCARBON BOOM FOR REMOVAL OF OILS AND GREASE

SPECIFICATIONS

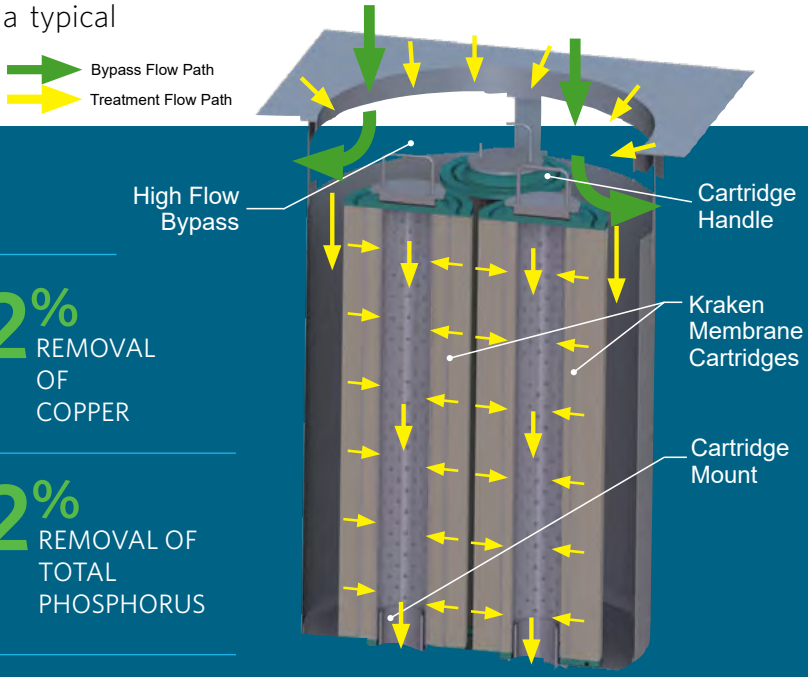
MODEL #	SCREEN TREATMENT FLOW (cfs)	BYPASS FLOW (cfs)
BIO-CURB-MLS	2.85	UNLIMITED
BIO-GRATE-MLS-12-12-12	0.52	0.52
BIO-GRATE-MLS-18-18-18	2.51	2.51
BIO-GRATE-MLS-24-24-24	5.31	5.31
BIO-GRATE-MLS-30-30-24	10.05	10.05
BIO-GRATE-MLS-25-38-24	10.39	10.39
BIO-GRATE-MLS-36-36-24	16.28	12.53
BIO-GRATE-MLS-48-48-18	16.94	17.05

Note: Curb inlet application teatment flow rate limited to the weir capacity - actual flow rates of the filter basket is greater than 2.85 cfs.
Various depth filter baskets available. Treatment and bypass flow rates include a safety factor of 2.

KRAKEN FILTER TYPE

The Bio Clean Grate Inlet Kraken Filter is an advanced-level filtration device designed with Kraken membrane cartridges for increased removal efficiencies. Kraken Filter cartridges are removable and reusable after spray cleaning with a typical garden hose.

OPERATION



PERFORMANCE

85% REMOVAL OF FINE TSS	**81%** REMOVAL OF OILS & GREASE	**52%** REMOVAL OF COPPER
58% REMOVAL OF ZINC	**60%** REMOVAL OF FECAL COLIFORM	**72%** REMOVAL OF TOTAL PHOSPHORUS

SPECIFICATIONS

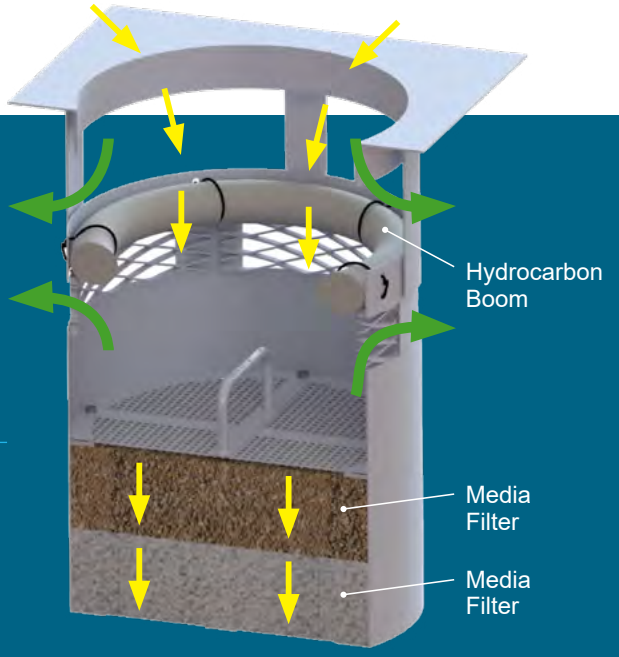
MODEL #	MEDIA TREATMENT FLOW (cfs)	BYPASS FLOW (cfs)
BIO-CURB-KMF-33	0.13	UNLIMITED
BIO-GRATE-KMF-12-12-39	0.04	0.52
BIO-GRATE-KMF-18-18-39	0.04	2.51
BIO-GRATE-KMF-24-24-39	0.17	5.31
BIO-GRATE-KMF-36-36-39	0.50	12.53
BIO-GRATE-KMF-48-48-39	0.88	17.05

Note: Media treatment flow rate based on three 30" tall Kraken filter cartridges. Various filter basket and Kraken Filter Cartridge heights available.

MEDIA FILTER TYPE

The Bio Clean Grate Inlet Media Filter is made of 100% stainless steel and is available in various sizes and depths allowing it to fit in any grated catch basin inlet. The filter's heavy duty construction allows for cleaning with any vacuum truck.

OPERATION



PERFORMANCE

85% REMOVAL OF FINE TSS	**95%** REMOVAL OF OILS & GREASE	**95%** REMOVAL OF COPPER
94% REMOVAL OF ZINC	**83%** REMOVAL OF LEAD	

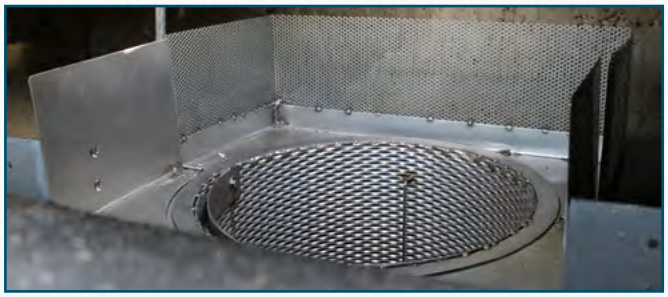
SPECIFICATIONS

MODEL #	MEDIA TREATMENT FLOW (cfs)	BYPASS FLOW (cfs)
BIO-CURB-MF-24	0.11	UNLIMITED
BIO-GRATE-MF-12-12-12	0.08	0.52
BIO-GRATE-MF-18-18-18	0.18	2.51
BIO-GRATE-MF-24-24-24	0.35	5.31
BIO-GRATE-MF-36-36-24	0.86	12.53
BIO-GRATE-MF-48-48-18	1.36	17.05

Note: Media treatment flow rate based on hydraulic conductivity of bulk media pack verified in labratory evalution. Various filter basket heights available.

INSTALLATION

CURB INLET FILTER



Bio Clean's Curb Inlet Filters are easily installed under catch basin access for ease of maintenance.

GRATE INLET FILTER

Grate Inlet Filters can be quickly installed directly under grated inlets with no special equipment.

MAINTENANCE

CURB INLET FILTER

Filters can be lifted out by hand for routine maintenance and inspections.

GRATE INLET FILTER

Bio Clean
A Forterra Company
5796 Armada Drive Suite 250
Carlsbad, CA 92008
855.566.3938
stormwater@forterrabp.com
biocleanenvironmental.com

102919RZC

Section [_____]
Stormwater Catch Basin Filtration Device

PART 1 – GENERAL

01.01.00 Purpose
The purpose of this specification is to establish generally acceptable criteria for devices used for filtration of stormwater runoff captured by catch basins with grates. It is intended to serve as a guide to producers, distributors, architects, engineers, contractors, plumbers, installers, inspectors, agencies and users; to promote understanding regarding materials, manufacture and installation; and to provide for identification of devices complying with this specification.

01.02.00 Description
Stormwater Catch Basin Filtration Devices (SCBFD) are used to filter stormwater runoff captured by catch basins. The SCBFD is a filter system composed of a SCBFD with a media filtration storm boom. SCBFDs are used to remove various pollutants from stormwater by means of screening, separation and media filtration.

01.03.00 Manufacturer
The manufacturer of the SCBFD shall be one that is regularly engaged in the engineering, design and production of systems developed for the treatment of stormwater runoff for at least (10) years, and which have a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the SCBFD(s) shall be a filter device manufactured/distributed by Bio Clean Environmental Services, Inc., or assigned distributors or licensees. Bio Clean Environmental Services, Inc. can be reached at:

Corporate Headquarters:
398 Via El Centro
Oceanside, CA 92058
Phone: (760) 433-7640
Fax: (760) 433-3176
www.biocleanenvironmental.net

01.04.00 Submittals

01.04.01 Submittal drawings will be provided with each order to the contractor and engineer of work.

01.04.02 Submittal drawings are to detail the SCBFD, its components and the sequence for installation, including:
- SCBFD configuration with primary dimensions
- Various SCBFD components
- Any accessory equipment

01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

01.05.01 Specification requirements for installation of SCBFD.

01.05.02 Manufacturer to supply SCBFD(s):
- Filter Basket
- Media Filtration Storm Boom

01.05.03 Media Filtration Boom shall be provided with each Filter Basket housed in nylon netting and securely fastened entrance to the Filtration basket. Each media boom shall contain polymer beads to permanently absorb hydrocarbons.

01.06.00 Reference Standards

ASTM A 240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM F 716	Testing Sorbent Performance of Absorbents
ASTM F 726	Sorbent Performance of Absorbents
ASTM D3787 - 07	Standard Test Method for Bursting Strength of Textiles-Constant-Rate-of-Traverse (CRT) Ball Burst Test
ASTM D2690-98	Standard Test Method for Isophthalic Acid in Alkyd and Polyester Resins
ASTM C 582-02	Standard Specification for Contact-Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion-Resistant Equipment
ASTM D 638	Standard Test Method for Tensile Properties of Plastics
ASTM D 790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D 648	Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
ASTM D 2583	Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM D 4097	Standard Specification for Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Tanks
ASTM D3409	Standard Test Method for Adhesion of Asphalt-Roof Cement to Damp, Wet, or Underwater Surfaces
IFI 114	Break Mandrel Blind Rivets

PART 2 – COMPONENTS

02.01.00 Filter Basket Components

All SCBFD components must be made of stainless steel, per these specifications. SCBFD's containing any fabrics or plastics will not be accepted.

02.01.01 Filter Housing shall be manufactured of 100% stainless steel.

02.02.02 Side Screens shall be manufactured of 100% stainless steel louver expanded metal with openings equal to or less than 4.7 mm in size.

- Screens shall be oriented with openings opposite to the flow of water into the filter and be non-clogging based on perpetual deflective shielding.

02.02.03 Bottom Screens shall be manufactured of 100% stainless steel perforated round openings less than 5 mm in size.

02.02.04 Media Filtration Boom shall be made up of granulated oil absorbing polymers that have been tested in accordance with section 11.2 of ASTM F 716.07 and held within a netting.

- Oil absorbing polymers must be proven to absorb 180% of its weight within a 300 second contact time, and at this absorption percentage the physical increase in the size of the granules is not more that 50%.

- Netting shall be 100% polyester with a number 16 sieve size, and strength tested per ASTM D 3787.
- Filter netting shall be 100% polyester with a number 16 sieve size, and strength tested per ASTM D 3787.

PART 3 – PERFORMANCE

03.01.00 General

03.01.01 Function - The SCBFD has no moving internal components and functions based on gravity flow, unless otherwise specified. Runoff enters the SCBFD from a catch basin with a grate opening and flows downward into the SCBFD. This SCBFD shall be positioned directly under the catch basin grate. After removal of the grate the SCBFD must be able to be removed through the catch basin opening without any further disassembly Stormwater enters the inside of the Filter Basket and flows downward toward the bottom portion of the Basket. The non-clogging screen has openings that are facing upward. As water flows downward the screening continuously removes debris from the screen's surface. Flowing water also makes contact with the Media Filtration Boom which absorbs free floating oils. Stormwater flow up to the peak treatment flow rate is processed through the filtration screens. During the heaviest flows the Basket fills with water and spills out the internal bypass and into the bottom of the catch basin.

03.01.02 Pollutants - The SCBFD will remove and retain debris, sediments, metals, nutrients, oxygen demanding substances and hydrocarbons entering the catch basin during frequent storm events and specified flow rates. For pollutant removal performance see section 03.02.00.

03.01.03 Treatment Flow Rate - The SCBFD operates using gravity flow. The SCBFD treatment flow rate varies by size and is provided on the drawings for each model. Flow rates must be supported by independent lab results.

03.01.04 Bypass Flow Rate – The SCBFD is designed to fit within the catch basin in a way not to affect the existing hydraulics and treat or bypass all flows. The bypass must be sized with a surface area greater then the outlet pipe size, thus the SCBFD shall not be a critical point of flow restriction. Bypass flow rate must be based on the SCBFD's inlet throat or bypass orifice capacity, which ever is less.

03.01.05 Pollutant Load – The SCBFD must be designed to have minimum storage

03.01.06 capacity as documented on the drawing for each particular size and model.

03.01.07 Performance Protocol and Results – All lab testing on filtration media must be performed by an independent third party consultant and testing lab.

03.02.00 Test Performance

At a minimum, the SCBFD shall be tested, according to section 03.01.06, and meet these performance specifications:

03.02.01 Filter Pollutant Removal Table

POLLUTANT	REMOVAL EFFICIENCY
Trash and Debris - (down to 5 mm)	100%

PART 4 - EXECUTION

04.01.00 General

The installation and use of the SCBFD shall conform to all applicable national, state, municipal and local specifications.

04.02.00 Installation

The contractor shall furnish all labor, equipment, materials and incidentals required to install the (SCBFD) device(s) and appurtenances in accordance with the drawings, installation manual, and these specifications, and be inspected and approved by the local governing agency. Installation contractor should possess a Confined Space Entry Certification Permit, pursuant to OSHA standards. Any damage to catch basin and surrounding infrastructure caused by the installation of the SCBFD is the responsibility of the installation contractor.

04.02.01 Filter Basket and all components or accessories shall be inserted through the catch basin and properly secured per manufactures installation manual and these specifications.

04.03.00 Shipping, Storage and Handling

04.03.01 Shipping – SCBFD shall be shipped to the contractor's address and is the responsibility of the contractor to transport the unit(s) to the exact site of installation.

04.03.02 Storage and Handling– The contractor shall exercise care in the storage and handling of the SCBFD(s) and its components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted, and unloading has commenced shall be born by the contractor. The SCBFD(s) and its components shall always be stored indoors and transported inside the original shipping container(s) until the SCBFD(s) are ready to be installed. The SCBFD shall always be handled with care and lifted according to OSHA and NIOSA lifting recommendations and/or contractor's workplace safety professional recommendations.

04.04.00 Maintenance and Inspection

04.04.01 Inspection – After installation, the contractor shall demonstrate that the SCBFD has been properly installed at the correct location(s), elevations, and with appropriate supports and fasteners. All components associated with the SCBFD and its installation shall be subject to inspection by the engineer of work, governing agency, and the manufacture at the place of installation. In addition, the contractor shall demonstrate that the SCBFD has been installed per the manufacturer's specifications and recommendations. SCBFD(s) shall be physically inspected regularly in accordance to owner's Stormwater Pollution Prevention Plans (SWPPP) and manufacture's recommendations. An inspection record shall be kept by the inspection operator. The record shall include the condition of the SCBFD and its appurtenances. The most current copy of the inspection record shall always be copied and placed in the owner's SWPPP.

04.04.02 Maintenance – The manufacturer recommends cleaning and debris removal and replacement of the Media Filtration Boom as needed. The maintenance shall be preformed by someone qualified. A Maintenance Manual is available upon request from the manufacturer. The manual has detailed information

regarding the maintenance of the SCBFD(s). A detailed Maintenance Record shall be kept by the maintenance operator. The Maintenance Record shall include any maintenance activities preformed, amount and description of debris collected, and the condition of the filter. The most current copy of the Maintenance Record shall always be copied and placed in the owner's Stormwater Pollution Prevention Plan (SWPPP) per governing agency.

04.04.03 Material Disposal - All debris, trash, organics, and sediments captured and removed from the SCBFD shall be transported and disposed of at an approved facility for disposal in accordance with local and state regulations. Please refer to state and local regulations for the proper disposal of toxic and non-toxic material.

PART 5 – QUALITY ASSURANCE

05.01.00 Warranty

The manufacturer shall guarantee the SCBFD against all manufacturing defects in materials and workmanship for a period of (5) years from the date of delivery to the contractor. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The SCBFD is limited to recommended application for which it was designed.

[End of This Section]

Certified Full Capture System List of Trash Treatment Control Devices

In accordance with the Trash Amendments,[1] all trash treatment control devices (Devices) installed after December 2, 2015 shall meet the Full Capture System definition[2] and be certified by the State Water Resources Control Board (State Water Board) Executive Director, or designee, prior to installation. The Devices listed below meet the Full Capture System definition and are certified for installation by the State Water Board Executive Director designee, provided that upon installation, the Devices:

1) Are appropriately sized to treat not less than the peak flowrate resulting from a 1-year, 1-hour storm event (design storm) or at least the same peak flows from the corresponding storm drain;
2) Do not bypass trash below the design storm under maximum operational loading conditions;
3) Trap all particles that are 5 mm or greater up to the design flow[3] or at least the same peak flows from the corresponding storm drain; and
4) Do not have a diversion structure present upstream such that a portion of the peak flow is not treated to trap all particles 5 mm or greater.

Municipalities shall incorporate an operation and maintenance plan sufficient to ensure that the captured trash does *not* migrate into the storm sewer system.

The Executive Director reserves the right to de-certify and remove any Device from this list. Listing of any Device does not constitute an endorsement by the State Water Board. Applicants seeking to add a new Device to this list shall submit an application to the Executive Director Designee for approval. The Trash Treatment Control Device Application Requirements are located on the Trash Amendments Implementation webpage at:

https://www.waterboards.ca.gov/ water_issues/programs/stormwater/trash_implementation.shtml.

[1] Amendment to the Water Quality Control Plan for Ocean Waters of California to Control Trash (Ocean Plan) and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, And Estuaries of California (ISWEBE Plan) adopted by the State Water Board.

[2] Full Capture System is a treatment control, or series of treatment controls, including but not limited to, a multi-benefit project or a low-impact development control that traps all particles that are 5 mm or greater, and has a design treatment capacity that is either: a) of not less than the peak flow rate, Q, resulting from a one-year, one-hour storm in the subdrainage area, or b) appropriately sized to, and designed to carry at least the same flows as, the corresponding storm drain.

[3] The region specific one-year, one-hour storm (or design flow) may be obtained from the National Oceanic and Atmospheric Precipitation Estimates at https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html

CATCH BASIN INSERTS and Other DEVICES

According to the **California Health and Safety Code**, Landowners in California are legally responsible to abate (eliminate the source of) a public nuisance arising from their property, including mosquitoes. Mosquito vector control agencies have substantial authority to access public and private property, inspect known or suspected sources of mosquitoes, and abate the source of a mosquito problem, and charge the landowner for work performed and/or charge fees if a landowner is unwilling or unable to address a mosquito problem arising from their property. [H&S Code Sections 2001 - 4(d); 2002; 2060 (b)] and [H&S Code sections 2060-2067, 100170, and 100175].

Depending on the Device, certain Devices may create a habitat for mosquitos; moreover, impede the pest control operator's ability to both visually inspect the Device for mosquito breeding and apply the appropriate chemical treatment. The State Water Board is providing vector control accessibility information below. Please contact the **Mosquito Vector Control Association of California Review Team** (MVCAC <Trashtreatment@mvcac.org>) or the **local mosquito vector control agency** prior to selection of any of the following **Devices** to ensure inspection and treatment is not impeded, and to minimize the potential of nuisances and public health impacts resulting from vector breeding.

Manufacture/ Website	Device Name	Fact Sheet	Vector Control Accessibility			Municipality Contacts Experienced with Device
			Inspection	Treatment	Verification Letter	
Advanced Drainage Systems, Inc. - FLEXSTORM Division http://www.inletfilters.com/	**FLEXSTORM Full Trash Capture (FTC) Inserts**	**APPLICATION 2**				Refer to Application
	FLEXSTORM Connector Pipe Screen	**ADS-1**				No Contacts
Bio Clean® Environmental Services, Inc. http://www.biocleanenvironmental.com/products/	**Catchbasin Connector Pipe Trash Screen (Trash Guard)**	**BC-4**				No Contacts
	Curb Inlet and Grate Inlet Filters	**APPLICATION 4**				Refer to Application
	Modular Connector Pipe Trash Screen	**BC-3**				No Contacts
CleanWay® Environmental Partners, Inc. http://Cleanwayusa.com	**CleanWay Curb Inlet Filtration System**	**APPLICATION 7**				Refer to Application
	CleanWay 'Drop inlet Filtration Insert	**APPLICATION 8**				Refer to Application
Coanda Inc. http://www.coanda.com/	**Coanda Trash Screen and Debris Fence**	**COA-1**				No Contacts
Ecology Control Industries http://www.ecologycontrol.com	**Debris Dam - Connector Pipe Trash Screen**	**ECI**				No Contacts
Filtrexx Sustainable Technologies https://www.filtrexx.com/en/products/stormexx	**StormExx® Clean**	**APPLICATION 16**				Refer to Application

CATCH BASIN INSERTS and Other DEVICES

According to the **California Health and Safety Code**, Landowners in California are legally responsible to abate (eliminate the source of) a public nuisance arising from their property, including mosquitoes. Mosquito vector control agencies have substantial authority to access public and private property, inspect known or suspected sources of mosquitoes, and abate the source of a mosquito problem, and charge the landowner for work performed and/or charge fees if a landowner is unwilling or unable to address a mosquito problem arising from their property. [H&S Code Sections 2001 - 4(d); 2002; 2060 (b)] and [H&S Code sections 2060-2067, 100170, and 100175].

Depending on the Device, certain Devices may create a habitat for mosquitos; moreover, impede the pest control operator's ability to both visually inspect the Device for mosquito breeding and apply the appropriate chemical treatment. The State Water Board is providing vector control accessibility information below. Please contact the **Mosquito Vector Control Association of California Review Team** (MVCAC <Trashtreatment@mvcac.org>) or the **local mosquito vector control agency** prior to selection of any of the following **Devices** to ensure inspection and treatment is not impeded, and to minimize the potential of nuisances and public health impacts resulting from vector breeding.

Manufacture/ Website	Device Name	Fact Sheet	Vector Control Accessibility			Municipality Contacts Experienced with Device
			Inspection	Treatment	Verification Letter	
G2 Construction, Inc. http://www.g2construction.com/products/	**Collector Pipe Trash Screen & Removable Collector Pipe Trash Screen**	**G2-1 G2-1R**				No Contacts
Hydro International® https://www.hydro-int.com/en/products/flo-filter	**Hydro Up-Flo Filter®**	**APPLICATION 11**				Refer to Application
Inventive Resources, Inc. http://www.IRIproducts.com	**Water Decontaminator**	**APPLICATION 3**				Refer to Application
Oldcastle Precast® Stormwater Solutions https://oldcastleprecast.com/stormwater/ **(formerly KriStar Enterprises Inc.)**	**Flo Guard +Plus Catchbasin Trash Screen Insert, Combination Inlet Style - Drop in Basket**	**KS-1**				Locations and Contacts
	Flo Guard Catchbasin Trash Screen Insert, Flat Grated Inlet Style-Drop in Basket	**KS-2**				Locations and Contacts
	Flo Guard Catchbasin Outlet Trash Screen Insert - Connector Pipe Screen	**KS-3**				Locations and Contacts
Revel Environmental Manufacturing, Inc. http://www.remfilters.com	**Triton™ Bioflex Inlet Trash Guard – Catchbasin Polyester Fiber Mesh Trash Filter Insert**	**REM-1**				Locations and Contacts
	Triton™ CPS-FTC (Crescent Pipe Screen)	**APPLICATION 12**				Refer to Application
	Triton Perf-FTC Insert	**APPLICATION 13**				Refer to Application

CATCH BASIN INSERTS and Other DEVICES

According to the **California Health and Safety Code**, Landowners in California are legally responsible to abate (eliminate the source of) a public nuisance arising from their property, including mosquitoes. Mosquito vector control agencies have substantial authority to access public and private property, inspect known or suspected sources of mosquitoes, and abate the source of a mosquito problem, and charge the landowner for work performed and/or charge fees if a landowner is unwilling or unable to address a mosquito problem arising from their property. [H&S Code Sections 2001 - 4(d); 2002; 2060 (b)] and [H&S Code sections 2060-2067, 100170, and 100175].

Depending on the Device, certain Devices may create a habitat for mosquitos; moreover, impede the pest control operator's ability to both visually inspect the Device for mosquito breeding and apply the appropriate chemical treatment. The State Water Board is providing vector control accessibility information below. Please contact the **Mosquito Vector Control Association of California Review Team** (MVCAC <Trashtreatment@mvcac.org>) or the **local mosquito vector control agency** prior to selection of any of the following **Devices** to ensure inspection and treatment is not impeded, and to minimize the potential of nuisances and public health impacts resulting from vector breeding.

Manufacture/ Website	Device Name	Fact Sheet	Vector Control Accessibility			Municipality Contacts Experienced with Device
			Inspection	Treatment	Verification Letter	
Stormtek (formerly Advanced Solutions) http://www.stormtekcps.com	**Stormtek ST3 & ST3G – Catchbasin Connector Pipe**	**AS-1, AS-2**				Locations and Contacts
United Stormwater, Inc. http://www.unitedstormwater.com	**Connector Pipe Trash Screen**	**USW-1**				Locations and Contacts
	Drop-in-Grate Inlet - Catchbasin Trash Screen	**USW-5**				Locations and Contacts

High Flow Capacity Trash Devices

According to the **California Health and Safety Code**, Landowners in California are legally responsible to abate (eliminate the source of) a public nuisance arising from their property, including mosquitoes. Mosquito vector control agencies have substantial authority to access public and private property, inspect known or suspected sources of mosquitoes, and abate the source of a mosquito problem, and charge the landowner for work performed and/or charge fees if a landowner is unwilling or unable to address a mosquito problem arising from their property. [H&S Code Sections 2001 - 4(d); 2002; 2060 (b)] and [H&S Code sections 2060-2067, 100170, and 100175].

Depending on the Device, certain Devices may create a habitat for mosquitos; moreover, impede the pest control operator's ability to both visually inspect the Device for mosquito breeding and apply the appropriate chemical treatment. The State Water Board is providing vector control accessibility information below. Please contact the **Mosquito Vector Control Association of California Review Team** (MVCAC <Trashtreatment@mvcac.org>) or the **local mosquito vector control agency** prior to selection of any of the following **Devices** to ensure inspection and treatment is not impeded, and to minimize the potential of nuisances and public health impacts resulting from vector breeding.

Manufacture/ Website	Device Name	Fact Sheet	Vector Control Accessibility			Municipalities Contacts Experienced with Device
			Inspection	Treatment	Verification Letter	
AquaShield,™ Inc. http://www.aquashieldinc.com/--aqua-swirl.html	**Aqua-Swirl® Stormwater Treatment System**	**APPLICATION 1**				Refer to Application
Bio Clean® Environmental Services, Inc. http://www.biocleanenvironmental.com/products/	**Debris Separating Baffle Box (DSBB)**	**APPLICATION 6**				Refer to Application
	Modular Wetland System® (MWS)	**APPLICATION 15**				Refer to Application
Contech® Construction Products http://www.conteches.com/products/stormwater-management/treatment/cds	**Continuous Deflective Separator (CDS) – Hydrodynamic Separator**	**CCP-1HF**				Locations and Contacts
Jensen® Stormwater Systems http://www.jensenengineeredsystems.com/ about/stormwater/	**Jensen® Deflective Separators (JDS)**	**APPLICATION 5**				Refer to Application
Hydro International® (Stormwater) www.hydro-int.com	**Downstream Defender (In-Line & Off-Line Configurations)**	**APPLICATION 14**				Refer to Application
	Hydro DryScreen®	**APPLICATION 10**				Refer to Application

High Flow Capacity Trash Devices

According to the **California Health and Safety Code**, Landowners in California are legally responsible to abate (eliminate the source of) a public nuisance arising from their property, including mosquitoes. Mosquito vector control agencies have substantial authority to access public and private property, inspect known or suspected sources of mosquitoes, and abate the source of a mosquito problem, and charge the landowner for work performed and/or charge fees if a landowner is unwilling or unable to address a mosquito problem arising from their property. [H&S Code Sections 2001 - 4(d); 2002; 2060 (b)] and [H&S Code sections 2060-2067, 100170, and 100175].

Depending on the Device, certain Devices may create a habitat for mosquitos; moreover, impede the pest control operator's ability to both visually inspect the Device for mosquito breeding and apply the appropriate chemical treatment. The State Water Board is providing vector control accessibility information below. Please contact the **Mosquito Vector Control Association of California Review Team** (MVCAC <Trashtreatment@mvcac.org>) or the **local mosquito vector control agency** prior to selection of any of the following **Devices** to ensure inspection and treatment is not impeded, and to minimize the potential of nuisances and public health impacts resulting from vector breeding.

Manufacture/ Website	Device Name	Fact Sheet	Vector Control Accessibility			Municipalities Contacts Experienced with Device
			Inspection	Treatment	Verification Letter	
Oldcastle Precast® Stormwater Solutions www.oldcastlestormwater.com **(formerly KriStar Enterprises Inc.** http://www.kristar.com**)**	**Dual Vortex Separator – Hydrodynamic Separator with Trash Screen**	**KS-7HF**				Locations and Contacts
	FloGard Perk Filter – Radial Cartridge Filter with Trash Screen	**KS-8HF**				No Contacts
	Nettech Gross Pollutant Trap, In Line – Trash Screen and Net	**KS-10HF**				No Contacts
	***Nettech Gross Pollutant Trap, End of Line – Trash Screen and Net**	**KS-11HF**				No Contacts
Roscoe Moss Company https://roscoemoss.com/products/gross-solids-removal%20device/	**Storm Flo® Trash Screen – Linear Radial Gross Solids Removal Device**	**RMC-1HF**				Locations and Contacts
StormTrap® Modular Concrete Stormwater Management http://stormtrap.com	**Inline Netting Trash Trap – Inline Pipe Net with Trash Screen** (formerly Fresh Creek Technology Product**)**	**FCT-IHF**				No Contacts
	***End of Pipe Netting Trash Trap – End of Pipe Net with Trash Screen** (formerly Fresh Creek Technology Product**)**	**FCT-2HF**				Locations and Contacts
	SiteSaver®	**APPLICATION 9**				Refer to Application
Suntree Technologies Inc.® www.suntreetech.com	**Nutrient Separating Baffle Box®**	**APPLICATION 17**				Refer to Application

* Nets and any associated containment structures are often placed at the outlets of storm drain pipes, which can be in receiving waters such as rivers, creeks, and wetlands. Under these circumstances, a Clean Water Act Section 404 permit may be required from the Army Corps of Engineers, a Clean Water Act Section 401 water quality certification may be required by the Regional Water Board, and a Section 1600 Streambed Alteration Agreement may be required by the CA Dept. of Fish and Wildlife. Before installing a net within a receiving water, municipalities are instructed to submit the design to the Regional Water Board for review and further instruction.

NOAA Atlas 14, Volume 6, Version 2
Location name: Anaheim, California, USA*
Latitude: 33.8493°, Longitude: -117.9185°
Elevation: 158.59 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.57** (1.32-1.90)	**2.02** (1.68-2.44)	**2.59** (2.16-3.14)	**3.07** (2.54-3.76)	**3.72** (2.98-4.72)	**4.24** (3.30-5.48)	**4.75** (3.61-6.31)	**5.29** (3.90-7.24)	**6.02** (4.26-8.62)	**6.60** (4.50-9.79)
10-min	**1.13** (0.948-1.36)	**1.45** (1.21-1.74)	**1.86** (1.55-2.25)	**2.20** (1.82-2.69)	**2.67** (2.13-3.38)	**3.04** (2.37-3.92)	**3.41** (2.59-4.52)	**3.79** (2.80-5.19)	**4.32** (3.05-6.18)	**4.73** (3.22-7.02)
15-min	**0.912** (0.764-1.10)	**1.16** (0.976-1.40)	**1.50** (1.25-1.82)	**1.78** (1.47-2.17)	**2.15** (1.72-2.72)	**2.45** (1.91-3.16)	**2.75** (2.09-3.65)	**3.06** (2.26-4.18)	**3.48** (2.46-4.98)	**3.82** (2.60-5.66)
30-min	**0.624** (0.524-0.752)	**0.798** (0.668-0.964)	**1.03** (0.858-1.25)	**1.22** (1.01-1.49)	**1.48** (1.18-1.87)	**1.68** (1.31-2.17)	**1.88** (1.43-2.50)	**2.10** (1.55-2.87)	**2.39** (1.69-3.42)	**2.62** (1.78-3.88)
60-min	**0.439** (0.368-0.530)	**0.561** (0.470-0.678)	**0.723** (0.603-0.876)	**0.856** (0.708-1.05)	**1.04** (0.829-1.31)	**1.18** (0.921-1.53)	**1.33** (1.01-1.76)	**1.48** (1.09-2.02)	**1.68** (1.19-2.40)	**1.84** (1.25-2.73)
2-hr	**0.318** (0.266-0.382)	**0.406** (0.340-0.490)	**0.522** (0.436-0.632)	**0.617** (0.510-0.754)	**0.746** (0.595-0.944)	**0.844** (0.659-1.09)	**0.944** (0.718-1.25)	**1.05** (0.773-1.43)	**1.19** (0.838-1.70)	**1.30** (0.882-1.92)
3-hr	**0.265** (0.222-0.320)	**0.339** (0.284-0.409)	**0.436** (0.363-0.527)	**0.514** (0.425-0.628)	**0.620** (0.495-0.785)	**0.701** (0.547-0.907)	**0.784** (0.596-1.04)	**0.868** (0.641-1.19)	**0.982** (0.693-1.41)	**1.07** (0.729-1.59)
6-hr	**0.188** (0.157-0.226)	**0.240** (0.201-0.289)	**0.308** (0.257-0.373)	**0.363** (0.300-0.443)	**0.438** (0.349-0.554)	**0.495** (0.386-0.640)	**0.552** (0.420-0.734)	**0.612** (0.451-0.837)	**0.691** (0.488-0.989)	**0.753** (0.513-1.12)
12-hr	**0.121** (0.101-0.146)	**0.155** (0.130-0.187)	**0.200** (0.166-0.242)	**0.236** (0.195-0.288)	**0.286** (0.228-0.362)	**0.324** (0.253-0.420)	**0.364** (0.276-0.483)	**0.404** (0.298-0.553)	**0.459** (0.324-0.656)	**0.501** (0.341-0.744)
24-hr	**0.083** (0.073-0.095)	**0.107** (0.094-0.123)	**0.139** (0.122-0.161)	**0.165** (0.144-0.193)	**0.201** (0.170-0.242)	**0.229** (0.190-0.282)	**0.258** (0.208-0.325)	**0.287** (0.226-0.372)	**0.328** (0.248-0.442)	**0.360** (0.263-0.501)
2-day	**0.049** (0.044-0.057)	**0.065** (0.057-0.075)	**0.085** (0.075-0.099)	**0.102** (0.089-0.119)	**0.125** (0.105-0.150)	**0.142** (0.118-0.175)	**0.160** (0.129-0.201)	**0.178** (0.140-0.230)	**0.202** (0.153-0.273)	**0.221** (0.162-0.309)
3-day	**0.037** (0.033-0.042)	**0.049** (0.043-0.057)	**0.065** (0.057-0.075)	**0.078** (0.068-0.091)	**0.095** (0.081-0.115)	**0.109** (0.090-0.134)	**0.122** (0.099-0.154)	**0.136** (0.107-0.176)	**0.155** (0.117-0.209)	**0.169** (0.124-0.236)
4-day	**0.029** (0.026-0.034)	**0.040** (0.035-0.046)	**0.053** (0.046-0.061)	**0.063** (0.055-0.074)	**0.078** (0.066-0.094)	**0.089** (0.074-0.109)	**0.100** (0.081-0.126)	**0.111** (0.088-0.144)	**0.127** (0.096-0.171)	**0.138** (0.101-0.193)
7-day	**0.019** (0.017-0.022)	**0.026** (0.023-0.030)	**0.034** (0.030-0.040)	**0.041** (0.036-0.048)	**0.051** (0.043-0.062)	**0.059** (0.049-0.072)	**0.066** (0.054-0.083)	**0.074** (0.058-0.096)	**0.085** (0.064-0.114)	**0.093** (0.068-0.129)
10-day	**0.014** (0.013-0.017)	**0.019** (0.017-0.022)	**0.026** (0.023-0.030)	**0.031** (0.027-0.037)	**0.039** (0.033-0.047)	**0.045** (0.037-0.055)	**0.051** (0.041-0.064)	**0.057** (0.045-0.074)	**0.065** (0.049-0.088)	**0.072** (0.053-0.100)
20-day	**0.009** (0.008-0.010)	**0.012** (0.010-0.013)	**0.016** (0.014-0.018)	**0.019** (0.017-0.022)	**0.024** (0.020-0.029)	**0.028** (0.023-0.034)	**0.031** (0.025-0.040)	**0.036** (0.028-0.046)	**0.041** (0.031-0.056)	**0.046** (0.034-0.064)
30-day	**0.007** (0.006-0.008)	**0.009** (0.008-0.011)	**0.012** (0.011-0.014)	**0.015** (0.013-0.018)	**0.019** (0.016-0.023)	**0.022** (0.018-0.027)	**0.025** (0.020-0.032)	**0.029** (0.023-0.037)	**0.034** (0.025-0.045)	**0.037** (0.027-0.052)
45-day	**0.005** (0.005-0.006)	**0.007** (0.006-0.008)	**0.010** (0.009-0.011)	**0.012** (0.010-0.014)	**0.015** (0.013-0.018)	**0.018** (0.015-0.022)	**0.020** (0.016-0.025)	**0.023** (0.018-0.030)	**0.027** (0.020-0.036)	**0.030** (0.022-0.042)
60-day	**0.005** (0.004-0.005)	**0.006** (0.005-0.007)	**0.008** (0.007-0.010)	**0.010** (0.009-0.012)	**0.013** (0.011-0.016)	**0.015** (0.013-0.019)	**0.017** (0.014-0.022)	**0.020** (0.016-0.026)	**0.023** (0.018-0.032)	**0.026** (0.019-0.037)

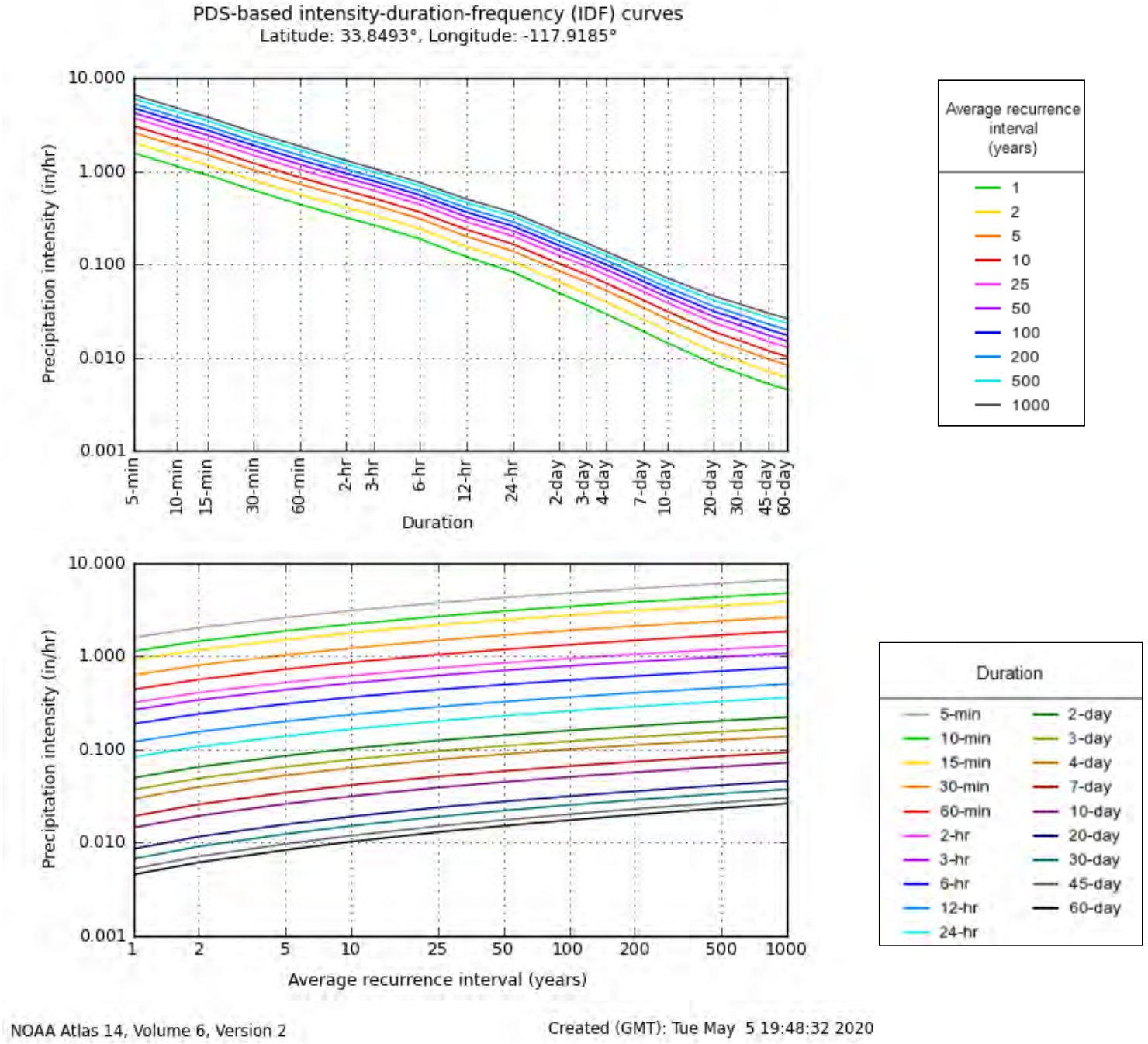
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



NOAA Atlas 14, Volume 6, Version 2

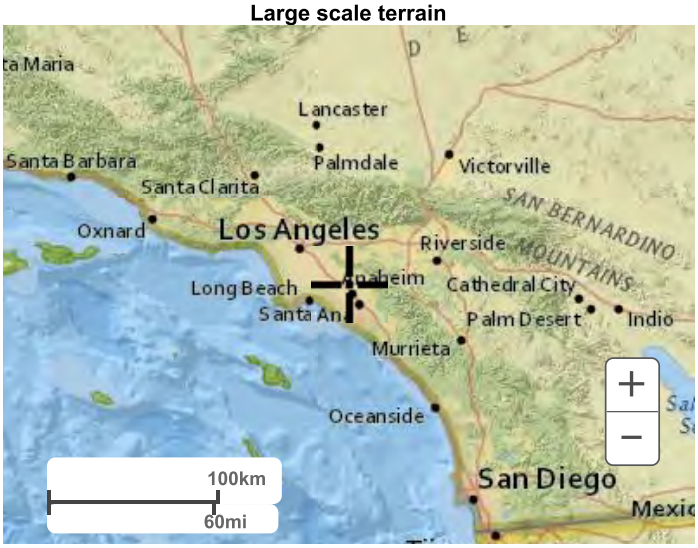
Created (GMT): Tue May 5 19:48:32 2020

Back to Top

Maps & aerials

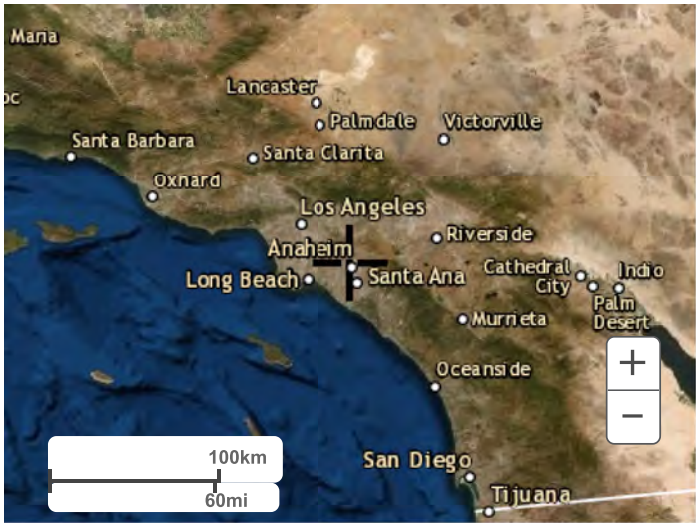
Small scale terrain

Large scale terrain



Large scale map

Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Attachment D

WQMP Notice of Transfer of Responsibility

Water Quality Management Plan

Notice of Transfer of Responsibility

Tracking No. Assigned by the City of Anaheim: _____

Submission of this Notice of Transfer of Responsibility constitutes notice to the City of Anaheim that responsibility for the Water Quality Management Plan ("WQMP") for the subject property identified below, and implementation of that plan, is being transferred from the Previous Owner (and his/her agent) of the site (or a portion thereof) to the New Owner, as further discussed.

I. Previous Owner/Previous Responsible Party Information

Company/Individual Name:		Contact Person:	
Title:			
Street Address:			
City:	State:	City:	State:

II. Information about Site Transferred

Name of Project (if applicable):		Contact Person:	
Title of WQMP applicable to Site:			
Planning Area (PA) and/or Tract Number(s) for Site Lot Numbers (if Site is a portion of a tract):			
Date WQMP Prepared (and revised if applicable):			
Street Address of Site:			
City:	State:	Zip:	Phone:

III. New Owner/New Responsible Party Information

Company/Individual Name:		Contact Person:	
Title:			
Street Address:			
City:	State:	Zip:	Phone:

IV. Ownership Transfer Information

General Description of Site Transferred to New Owner:	General Description of Portion of Project/Parcel Subject to WQMP Retained by Owner (if any):
Lot/Tract Numbers of Site Transferred to New Owner:	
Remaining Lot/Tract Numbers Subject to WQMP Still Held by Owner (if any):	
Date of Ownership Transfer:	

Note: When the Previous Owner is transferring a site that is a portion of a larger project/parcel addressed by the WQMP, as opposed to the entire project/parcel addressed by the WQMP, the General Description of the Site transferred and the remainder of the project/parcel not transferred shall be set forth as maps attached to this notice. These maps shall show those portions of a project/parcel addressed by the WQMP that are transferred to the New Owner (the Transferred Site), those portions retained by the Previous Owner, and those portions previously transferred by Previous Owner. Those portions retained by Previous Owner shall be labeled "Previous Owner," and those portions previously transferred by Previous Owner shall be labeled as "Previously Transferred."

V. Purpose of Transfer

The purpose of this Notice of Transfer of Responsibility are: 1) to track transfer of responsibility for implementation and amendment of the WQMP when property to which the WQMP is transferred from the Previous Owner to the New Owner, and 2) to facilitate notification to a transferee of property subject to a WQMP that such New Owner is now the Responsible Party of record for the WQMP for those portions of the site that it owns.

VI. Certifications

A. Previous Owner

I Certify under penalty of law that I am no longer the owner of the Transferred Site as described in Section II above. I have provided the New Owner with a copy of the WQMP applicable to the Transferred Site that the New Owner is acquiring from the Previous Owner.

Printed Name of Previous Owner Representative:	Title:
Signature of Previous Owner Representative:	Date:

B. New Owner

I Certify under penalty of law that I am the owner of the Transferred Site, as described in Section II above, that I have been provided a copy of the WQMP, and that I have informed myself and understand the New Owner's responsibilities related to the WQMP, its implementation, and Best Management Practices associated with it. I understand that by signing this notice, the New Owner is accepting all ongoing responsibilities for implementation and amendment of the WQMP for the Transferred Site, which the New Owner has acquired from the Previous Owner.

Printed Name of New Owner Representative:	Title:
Signature of New Owner Representative:	Date:

Attachment E

Geotechnical Reference

GEOTECHNICAL EXPLORATION
PROPOSED MULTI-FAMILY RESIDENTIAL DEVELOPMENT PROJECT
1122 N. ANAHEIM BOULEVARD
ANAHEIM, CALIFORNIA

Prepared for:

Renaissance City North Anaheim LLC

4675 MacArthur Court, Suite 550
Newport Beach, California 92660

Project No. 11862.003

September 24, 2019

Leighton and Associates, Inc.

A LEIGHTON GROUP COMPANY

Leighton and Associates, Inc.
A LEIGHTON GROUP COMPANY

September 24, 2019

Project No. 11862.003

Renaissance City North Anaheim LLC
4675 MacArthur Court, Suite 550
Newport Beach, California 92660

Attention: Mr. Robert Kim

Subject: Geotechnical Exploration Report
Proposed Multi-Family Residential Development Project
1122 N. Anaheim Boulevard
Anaheim, California

In accordance with our proposal, dated August 7, 2019, Leighton and Associates, Inc. (Leighton) has performed a geotechnical exploration for the subject project. We understand the proposed development plan is to construct a 4-story, multi-family residential apartment building surrounding a 6-level parking structure. In addition, two underground detention/infiltration facilities are proposed at the site, one in the northwestern portion of the site and one in the southeastern portion of the site. Ancillary improvements such as utility infrastructure, pavement, flatwork, and landscaping are also proposed. The purpose of our geotechnical exploration was to evaluate subsurface conditions at the site, identify potential geologic and seismic hazards that may affect the project, and provide preliminary geotechnical recommendations for design and construction of the proposed improvements as currently planned.

The project is considered feasible from a geotechnical standpoint. The results of our exploration, conclusions and preliminary recommendations are presented in this report.

17781 Cowan ▪ Irvine, CA 92614-6009
949.250.1421 ▪ 949.250.1114 Fax

We appreciate the opportunity to be of service to you on this project. If you have any questions or concerns, please contact us at your convenience. The undersigned can be reached at **(866) *LEIGHTON***, specifically at the phone extension and e-mail address listed below.

Respectfully submitted,

LEIGHTON AND ASSOCIATES, INC.

Jeffrey Pflueger, PG, CEG 2499
Associate Geologist
Ext. 4257, jpflueger@leightongroup.com

Carl Kim PE, GE 2620
Senior Principal Engineer
Ext. 4262, ckim@leightongroup.com

KMD/JMP/CCK/lr

Distribution: (1) Addressee

Leighton

TABLE OF CONTENTS

Leighton

ATTACHMENTS

1.0 INTRODUCTION

1.1 Site Description and Proposed Development

The project site is located to the northeast of the intersection between Anaheim Boulevard and E. La Palma Avenue in the City of Anaheim, California. The site location (latitude 33.8493°, longitude -117.9187°) and immediate vicinity are shown on Figure 1, *Site Location Map.*

The project site covers approximately 4.6 acres and is currently used for industrial purposes. The Orange County Assessor's Office identifies the site as Assessor Parcel Number (APN) 035-010-51. The site is bordered by Anaheim Boulevard to the west, existing industrial properties to the north and east, and a future residential development currently under construction to the south. The project site is currently occupied by a towing business with a majority of the property covered with asphalt concrete paving and three existing structures. Based on review of aerial photographs (NETR, 2019), the property appears to have been used by a towing business or similar to its current configuration since at least 1953.

Review of the United States Geological Survey (USGS) *7.5-Minute Anaheim Quadrangle* (USGS, 1972) indicates the site is relatively flat at approximate elevation (El.) +155 feet mean sea level (msl) with sheet flow generally directed to the southwest.

Based on information provided by you, we understand the proposed development is to construct a 4-story, multi-family residential apartment building surrounding a 6-level parking structure. In addition, two underground detention/infiltration facilities are proposed at the site, one in the northwestern portion of the site and one in the southeastern portion of the site. Ancillary improvements such as utility infrastructure, pavement, flatwork, and landscaping are also proposed.

1.2 Purpose and Scope

The purpose of our geotechnical exploration was to evaluate the subsurface conditions at the site relative to the proposed development concept and provide preliminary geotechnical recommendations to aid in the design and construction for the project as currently planned. The scope of this geotechnical exploration included the following tasks:

- *Background Review* – We reviewed readily available geotechnical reports, literature, aerial photographs, and maps relevant to the site available from our in-house library or in the public domain. We evaluated geological hazards and potential geotechnical issues that may significantly impact the site. The documents reviewed are listed in Appendix A, *References*.

- *Pre-Field Exploration Activities* – A site visit was performed by a member of our technical staff to mark the proposed exploration locations. Underground Service Alert (USA) was notified to locate and mark existing underground utilities prior to our subsurface exploration.

- *Field Exploration* – Our field exploration was performed in two phases. The initial phase was performed on December 6, 2017, and consisted of two (2) Cone Penetrometer Test (CPT) soundings (designated CPT-1 and CPT-2). Each CPT was advanced to an approximate depth of 50 feet below ground surface (bgs). Shear wave velocity measurements were recorded at CPT-2 to develop seismic design parameters. The CPT soundings were performed in accordance with ASTM D5778 advanced by a 30-ton CPT rig in which a standard Cone equipped with a 15 cm^2 tip advanced at a constant rate of approximately 1 inch per second. The CPT provides a continuous record of the subsurface stratigraphy via data regarding tip and sleeve resistance which is continuously recorded electronically as the probe is advanced through the subsurface stratigraphy. The recorded data is processed yielding interpretations of soil type based upon the anticipated engineering behavior of the various soil strata though which the probe penetrates.

  The second phase was performed on August 19 and 20, 2019 and included drilling, logging, and sampling of seven (7) hollow-stem auger borings advanced at the site (designated LB-1 through LB-7) to approximate depths between 20 and 51½ feet bgs. In the borings, soil sampling was performed by the Standard Penetration Test (SPT) in accordance with ASTM D 1586 procedures. In addition, relatively undisturbed drive samples were collected by ASTM D 3550 procedures. Samples were collected at 5-foot intervals throughout the depth of exploration. In both test methods, the sampler is driven below the bottom of the borehole by a 140-pound weight (hammer) free-falling 30 inches. The drilling rig was equipped with an automatic hammer to provide greater consistency in the drop height and striking frequency. The number of blows to drive the sampler the final 12 inches of the 18-inch drive interval is termed the “blowcount” or SPT N-value. The N-values provide a measure of

relative density in granular (non-cohesive) soils and comparative consistency in cohesive soils. Bulk samples were also obtained from the borings for laboratory analysis

The approximate locations of the borings and CPTs are shown on Figure 2, *Exploration Location Map*. The boring and CPT logs are presented in Appendix B, *Exploration Logs.*

- *Percolation Testing* – Borings LB-1, LB-2, LB-3 and LB-4 (Figure 2) were converted to temporary percolation test wells upon completion of drilling and sampling. In-situ percolation testing was performed on August 20 and 21, 2019 in general accordance with the Orange County Department of Public Works *Technical Guidance Document* (OCPW, 2013). The results of the percolation testing are presented in Appendix C, *Percolation Test Data*. Refer to the discussion of infiltration rate presented in Section 2.3.1, *Infiltration*. Upon completion of the percolation testing, the well casing was removed from each boring and the borings were backfilled with soil cuttings and patched at the surface with cold-mix asphalt concrete to match existing site conditions.

- *Laboratory Testing* – Laboratory tests were performed on representative soil samples to verify the field classification of the samples and to determine the geotechnical properties of the subsurface materials. The following tests were performed:

  - In-situ moisture content and density (ASTM D2216 and ASTM D2937);
  - Atterberg Limits (ASTM D 4318)
  - Consolidation (ASTM D 2435);
  - Direct shear (ASTM D3080);
  - Expansion Index (ASTM D4829);
  - R-value (DOT CA 301);
  - Sand Equivalent (DOT CA 217)
  - Maximum dry density and optimum moisture content (ASTM D1557); and
  - Corrosivity Suite - Sulfate, Chloride, pH and Resistivity (DOT CA 417, 422 and 532/643).

All laboratory tests were performed in general conformance with American Society of the International Association for Testing and Materials (ASTM) or

Caltrans procedures (DOT CA). The results of the in-situ moisture and density tests are presented on the geotechnical boring logs in Appendix A. The results of other laboratory tests are presented in Appendix D, *Laboratory Test Results.*

- *Engineering Analysis* – The data obtained from our background review and subsurface field exploration were evaluated and analyzed to develop conclusions and preliminary recommendations for the proposed development.
- *Report Preparation* – This report presents our findings, conclusions and preliminary recommendations for the proposed development.

2.0 GEOTECHNICAL FINDINGS

2.1 Regional Geology

The project site is located on the lowest reach of the Santa Ana River basin within the Peninsular Ranges geomorphic province. The Peninsular Ranges geomorphic province extends southward from the Los Angeles Basin to the tip of Baja California (Yerkes et al., 1965) and is characterized by elongated northwest-trending mountain ranges separated by sediment-floored valleys. The most dominant structural features of the province are the northwest trending fault zones, most of which die out, merge with, or are terminated by the steep reverse faults at the southern margin of the Transverse Ranges geomorphic province. East of the site are the northwest-trending Santa Ana Mountains, a large range which has been uplifted on its eastern side along the Whittier-Elsinore Fault Zone, producing a tilted, irregular highland that slopes westward toward the Pacific Ocean.

Approximately 65 million years ago (at the end of the Cretaceous Period) a deep, structural trough existed off the coast of southern California (Yerkes, 1972). Over time the trough was filled with sediments eroded from the surrounding highlands and mountains. About 7 million years ago the boundary between the Pacific and North American plates shifted to its present position and the geologically modern Los Angeles basin began to form. The deepest part of the Los Angeles basin contains Tertiary to Quaternary-aged (65 million years and younger) marine and non-marine sedimentary rocks that are about 24,000 feet thick (Yerkes, et al, 1965; Wright, 1991). During the Pleistocene epoch (the last two million years) the region was flooded as the sea level rose in response to the worldwide melting of the Pleistocene glaciers depositing sediments across the Los Angeles Basin during transgression and regression of sea level.

The area south and west of the Santa Ana Mountains is generally characterized as a broad, complex, alluvial fan which receives sediments from the Santa Ana River and its tributaries draining the Santa Ana and San Bernardino Mountains. These sediments are comprised of relatively flat-lying, unconsolidated to loosely consolidated clastic deposits that are approximately 3,000 feet thick beneath the site (Sprotte et al., 1980, and Real, 1985). The project site is located approximately 3 miles west of the Santa Ana River. Regional geologic mapping of the project site and vicinity indicates that near-surface native soils beneath the site consist of Quaternary age young alluvial fan deposits comprised of varying proportions of sand, silt and clay (Morton and Miller, 2006). The surficial geologic units mapped in the vicinity of the project site are shown on Figure 3, *Regional Geology Map*.

2.2 Subsurface Soil Conditions

Based on our subsurface explorations, the site is underlain by a thin layer of undocumented artificial fill materials (Afu) overlying Quaternary-aged young alluvial fan deposits (Qyf).

The artificial fill encountered in our borings at the explored locations is generally about 1 to 2½ feet in thickness likely associated with the existing and previous site improvements. The fill soils are variable in type and generally consist primarily of sandy silt and silty sand with minor amounts of clay. Localized thicker accumulations of fill materials and possible foundation remnants should be anticipated during future earthwork construction. The existing artificial fill materials at the site are likely associated with the existing improvements and initial development of the site to its current configuration. However, records documenting observation and testing during fill placement were not available for review. Therefore, for purposes of this report all fill material is considered undocumented and unsuitable in its current configuration for structural support.

Below the artificial fill materials are Quaternary-aged young alluvial fan deposits as encountered in the borings to the maximum depth explored (51½ feet bgs). The alluvium generally consists of a mixture of thick sequences of sand and silty sand to a depth of approximately 15 to 25 feet bgs and below approximately 30 to 35 feet across the site. A zone of interbedded clay, silt, and silty clay of variable thickness exists between approximately 20 to 35 feet bgs and again between approximately 40 to 45 feet bgs.

The stratigraphy of the subsurface soils as interpreted in each boring and CPT is presented on the logs included in Appendix B and the locations of the explorations are shown on Figure 2, *Exploration Location Map*. Some of the engineering properties of these soils are described in the following sections.

2.2.1 Expansive Soil Characteristics

Expansive soils contain significant amounts of clay particles that swell considerably when wetted and shrink when dried. Foundations constructed on these soils are subject to uplifting forces caused by the swelling. Without proper mitigation measures, heaving and cracking of both building foundations and slabs-on-grade could result. Based on our exploration, the near surface (upper 5 feet) onsite soils consist predominantly of sand, silty sand, sandy silt, silty clay, and clay. The laboratory test result of

representative near-surface (upper 5 feet) bulk soil samples from borings LB-5 and LB-7 indicate very low expansion potential when wetted (EI values of 0 and 2). Accordingly, we recommend that the upper onsite soils be assumed to have very low expansion potential. The Expansion Index test results for the onsite soil from our geotechnical exploration are included in Appendix D of this report.

Variance in expansion potential of onsite soil is anticipated; therefore, additional testing is recommended upon completion of rough grading to confirm the expansion potential result presented in this report. Standard engineering and earthwork construction practices, such as proper foundation design and controlled moisture conditioning will reduce impacts associated with expansive soils.

2.2.2 Soil Corrosivity

In general, soil environments that are detrimental to concrete have high concentrations of soluble sulfates and/or pH values of less than 5.5. Section 4.3 of ACI 318 (ACI, 2014). The 2016 California Building Code (CBC), provides specific guidelines for the concrete mix-design when the soluble sulfate content of the soil exceeds 0.1 percent by weight or 1,000 parts per million (ppm). The minimum amount of chloride ions in the soil environment that are corrosive to steel, either in the form of reinforcement protected by concrete cover or plain steel substructures, such as steel pipes, is 500 ppm per California Test 532. Concentrations of chloride ions above the stated concentration or other characteristics such as soil resistivity or redox potential may warrant special corrosion protection measures.

Representative near-surface (upper 5 feet) bulk soil samples collected from borings LB-5 and LB-7 were tested to evaluate site soil corrosivity. The test results indicates soluble sulfate concentrations of 79 to 114 ppm, chloride contents of 20 to 40 ppm, pH values of 6.23 to 7.10 and minimum resistivity values of 5,220 to 11,980 ohm-cm.

The results of the resistivity test indicate that the underlying soil is mildly corrosive to buried ferrous metals per ASTM STP 1013. Based on the measured water-soluble sulfate content from the soil sample, concrete in contact with the soil is expected to have negligible exposure to sulfate attack per ACI 318-14. The sample tested for water-soluble chloride content

indicate a low potential for corrosion of steel in concrete due to the chloride content of the soil. The chemical analysis test results for the onsite soil from our geotechnical exploration are included in Appendix D of this report.

2.2.3 Soil Compressibility

Two samples of the onsite soils recovered from the borings were subjected to consolidation testing to evaluate the compressibility of these materials under assumed loads representative of anticipated structural bearing stresses. The results of testing indicate these soils did not exhibit a significant compressibility potential. The results of testing are presented in Appendix D.

2.2.4 Shear Strength

Evaluation of the shear strength characteristics of the soils included laboratory direct shear testing. The results of testing are included in Appendix D as well as summary graphs that provide values of angle of internal friction (ø) and cohesion (c) for use in geotechnical analysis.

2.2.5 Shear Wave Velocity Profile

Shear wave velocities were measured in CPT-2, see Figure 2 for location. Results are presented in Appendix B. Based on the average shear wave velocity of about 870 feet per second recorded at CPT-2, from the ground surface down to about 50 feet bgs, the seismic site class is characterized as Site Class D.

2.2.6 Excavation Characteristics

Based on our subsurface explorations performed at the site and our experience from grading jobs in the vicinity of the site, we anticipate the onsite artificial fill and alluvial materials can generally be excavated using conventional excavation equipment in good operating condition.

The soils within the planned excavation depths consist of layers that may contain granular, unconsolidated soils with little or no cementation and few fines. These materials are prone to cave in or collapse in unshored excavations. See Section 3.7, *Temporary Excavations* for additional information on soil type and excavation characteristics.

2.3 Groundwater Conditions

Groundwater was not encountered in our borings advanced at the site to the maximum depth explored of approximately 51½ feet bgs. According to groundwater information obtained through the California Geological Survey (CGS) and presented in the Seismic Hazard Zone Report for the Anaheim Quadrangle (CGS, 1997), the historically shallowest groundwater depth in the vicinity of the project site is greater than 50 feet bgs. In addition, based on review of available groundwater information from the California Department of Water Resources Water Data Library (DWR, 2019) for a nearby groundwater monitoring well located near the eastern project boundary (State Well # 04S10W03P001S), the shallowest groundwater level measured for a monitoring period between February 1971 and August 2003 was approximately 89 feet bgs.

Based on the currently proposed development scheme, groundwater does not pose a constraint during and after construction. Although groundwater is not considered a constraint for the project, seasonal fluctuations in groundwater level, localized zones of perched water including water due to nearby landscaping, and an increase in soil moisture should be anticipated during and following locally intense rainfall or stormwater runoff.

2.3.1 Infiltration

Percolation testing was performed within borings LB-1 through LB-4 to evaluate the infiltration characteristics of subsurface soils. The percolation tests were conducted in general accordance with the Orange County Department of Public Works *Technical Guidance Document* (OCPW, 2013). Results of the percolation testing are presented in Appendix C, *Percolation Test Data*. The test locations and zones tested are shown on Figure 2, *Exploration Location Map*.

A boring percolation test is useful for field measurements of the infiltration rate of soils, and is suited for testing when the design depth of the infiltration device is deeper than current existing grades, especially in areas where it is difficult to dig test pits, or where the depths of these test pits would be considerably deep. At the subject site, testing consisted of advancing the borings to general depths anticipated for the invert of typical infiltration devices.

A falling-head test was implemented at two of the percolation well locations (LB-1 and LB-4) for a test zone approximately 30 to 40 feet bgs. The infiltration rate for the test was calculated by dividing the discharge volume by the infiltration surface area over a period of time. The volume of discharge was calculated by adding the total volume of water that dropped within the PVC pipe and within the annulus, and incorporating a reduction factor to account for the porosity of the annulus material. The infiltration surface area was based on the average water height within the test zone for each time interval.

A constant-head test, or high flowrate test, was implemented at the other two percolation well locations (LB-2 and LB-3) for a test zone approximately 15 to 20 feet bgs due to the generally favorable percolation characteristics of the site soils at the testing depth. The infiltration rate was calculated by recording the approximate volume of water delivered to the test zone while maintaining a relatively constant height of water in the well over the testing period. A water source (garden hose from onsite water source) was used to deliver water to the wells at a relatively constant rate. The measured infiltration rate was calculated by dividing the total volume of water by the total duration of the test, and dividing by the percolation surface area.

Detailed results of the field testing data and measured infiltration rate for the test well are presented in Appendix C, *Percolation Test Data*. The test results are summarized below:

Table 1 – Measured (Unfactored) Infiltration Rate

Test Well Designation	Approximate Depth of Test Zone (feet bgs)	Measured Infiltration Rate (inches per hour)
LB-1	30 to 40	4.18
LB-2	15 to 20	179.5
LB-3	15 to 20	77.1
LB-4	30 to 40	0.81

Based on the results of the percolation tests, the site soils are generally favorable and feasible infiltration at the locations and depths evaluated. However, the results of the testing performed at a depth of 15 to 20 feet bgs at the tested locations of LB-2 and LB-3 indicate significantly higher rates than the deeper zone tested of 30 to 40 feet bgs at the tested locations of

LB-1 and LB-4. Design considerations for infiltration BMPs, including a reduction factor that should be incorporated into design of the system, are presented in Section 3.10.

2.4 Surface Fault Rupture

Our review of available in-house literature indicates that no known active faults have been mapped across the site, and the site is **not** located within a designated Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007). Therefore, the potential for surface fault rupture at the site is expected to be low and a surface fault rupture hazard evaluation is not mandated for this site.

The location of the closest active faults to the site was evaluated using the United States Geological Survey (USGS) Earthquake Hazards Program National Seismic Hazard Maps (USGS, 2008c). The closest active faults to the site are the Puente Hills fault, Whittier-Elsinore Fault Zone, San Joaquin Hills fault and the Newport-Inglewood Fault Zone, located approximately 1.5 miles, 6.5 miles, 10.6 miles and 12.0 miles from the site, respectively. The Puente Hills and San Joaquin Hills faults are blind thrust faults that are concealed at depth, without the potential for surface fault rupture. The San Andreas fault, which is the largest active fault in California, is approximately 38 miles northeast of the site. Major regional faults with surface expression in proximity to the site are shown on Figure 4, *Regional Fault and Historic Seismicity Map*.

2.5 Seismicity and Ground Shaking

The principal seismic hazard to the site is ground shaking resulting from an earthquake occurring along any of several major active and potentially active faults in southern California. The intensity of ground shaking at a given location depends primarily upon the earthquake magnitude, the distance from the seismic source, and the site response characteristics. The site should be expected to experience strong ground shaking after the proposed project is developed resulting from an earthquake occurring along one or more of the major active faults (Figure 4). Accordingly, the project should be designed in accordance with all applicable current codes and standards utilizing the appropriate seismic design parameters to reduce seismic risk as defined by California Geological Survey (CGS) Chapter 2 of Special Publication 117a (CGS, 2008). The 2016 edition of the California Building Code (CBC) is the current edition of the code. Through compliance with these regulatory requirements and the utilization of appropriate seismic design

parameters selected by the design professionals for the project, potential effects relating to seismic shaking can be reduced.

The following parameters should be considered for design under the 2016 CBC:

Table 2 – 2016 CBC Seismic Design Parameters

Categorization/Coefficients	Code-Based
Site Longitude (decimal degrees) West	-117.9187°
Site Latitude (decimal degrees) North	33.8493°
Site Class	D
Mapped Spectral Response Acceleration at 0.2s Period, S_s	1.554 g
Mapped Spectral Response Acceleration at 1s Period, S_1	0.593 g
Short Period Site Coefficient at 0.2s Period, F_a	1.0
Long Period Site Coefficient at 1s Period, F_v	1.5
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS}	1.554 g
Adjusted Spectral Response Acceleration at 1s Period, S_{M1}	0.890 g
Design Spectral Response Acceleration at 0.2s Period, S_{DS}	1.036 g
Design Spectral Response Acceleration at 1s Period, S_{D1}	0.593 g
Site-adjusted geometric mean Peak Ground Acceleration, PGA_m	0.595 g

2.6 Liquefaction Potential

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: 1) shallow groundwater; 2) low density, fine, clean sandy soils; and 3) high-intensity ground motion. Studies indicate that saturated, loose and medium dense, near-surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential.

In general, liquefaction hazards are the most severe in the upper 50 feet bgs. As shown on the State of California Seismic Hazard Zones map for the Anaheim Quadrangle (CGS, 1998), the project site is **not** located within an area that has been identified as being potentially susceptible to liquefaction (see Figure 5, *Seismic Hazard Map*). In addition, the historically shallowest groundwater depth in the vicinity of the project site is greater than 50 feet bgs (CGS, 1997). Based on these findings, the potential for liquefaction to occur at the project site is low.

2.7 Seismically-Induced Settlement

Seismically induced settlement consists of dynamic settlement of unsaturated soil (above groundwater) and liquefaction-induced settlement (below groundwater). These settlements occur primarily within low density sandy soil due to reduction in volume during and shortly after an earthquake event.

Based on the results of our analysis, seismically-induced settlement at the site due to dry dynamic settlement (above groundwater) at the site was estimated to be on the order of ½ inch across the site. The differential settlement can be taken as one-half the total estimated settlement over a horizontal distance of 30 feet.

2.8 Seismically Induced Lateral Spreading

Liquefaction may also cause lateral spreading. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined area. Since liquefaction is not considered a hazard at the site and the site is relatively constrained laterally, earthquake induced lateral spreading is also not considered a hazard at the site.

2.9 Seismically Induced Landsliding

The potential for seismically induced landsliding to occur at the site is considered low due to the absence of slopes at the site. In addition, based on review of the State of California Seismic Hazard Zones Map for the Anaheim Quadrangle (CGS, 1998), the site is **not** located within an area that has been identified by the State of California as being potentially susceptible to seismically induced landslides (see Figure 5, *Seismic Hazard Map*). Proposed slopes, if any, should be engineered and constructed at a gradient of 2:1 (horizontal:vertical) or flatter.

2.10 Flooding

According to a Federal Emergency Management Agency (FEMA) flood insurance rate map (FEMA, 2009), the project site is located within a flood hazard area identified as “Zone X”, which is defined as areas of 0.2 percent annual chance floodplain; areas of 1 percent annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1 percent annual chance flood. Regionally, storm runoff flow is generally directed to the southwest to Carbon Creek channel. As shown on Figure 6, *Flood Hazard Zone Map*, the site **is** located within a 500-year flood hazard zone.

Earthquake induced flooding can be caused by failure of dams or other water-retaining structures as a result of earthquakes. The project site **is** located within a flood impact zone from Prado Dam as indicated on Figure 7, *Dam Inundation Map*. However, catastrophic failure of this dam is expected to be a very unlikely event in that dam safety regulations exist and are enforced by the Division of Safety of Dams, Army Corp of Engineers and Department of Water Resources. Inspectors may require dam owners to perform work, maintenance or implement controls if issues are found with the safety of the dam.

2.11 Seiches and Tsunamis

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Tsunamis are waves generated in large bodies of water by fault displacement or major ground movement. Based on the absence of an enclosed water body near the site and the inland location of the site, seiche and tsunami risks at the site are considered negligible.

2.12 Sedimentation and Erosion

The erosion characteristics of the unconsolidated alluvial deposits exposed on any future slopes onsite are expected to be moderately susceptible to erosion. These materials will be particularly prone to erosion during excavation and site development, especially during heavy rains.

The potential for erosion can be mitigated through the application of best management practices (BMPs) and other Storm Water Pollution Prevention Plan (SWPPPs), such as temporary catchment basins and/or sandbagging to control runoff and contain sediment transport within the project site during construction. Following completion of the project, the site is anticipated to be improved with structures, hardscape, landscaping and appropriate drainage infrastructure. Therefore, sedimentation and erosion impacts upon completion of construction are considered less than significant.

3.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

Based upon this study, we conclude that the proposed development for the subject site is feasible from a geotechnical standpoint, provided that the preliminary recommendations presented in this report are properly incorporated in design and construction.

The proposed structure may be supported on shallow spread-type foundations established in engineered fill soils. The floor slab may be supported directly on grade. There may be existing underground utilities that will also be impacted. Information on these utilities should be provided to Leighton for evaluation. All existing undocumented fill is recommended to be removed from the proposed building/structure footprint areas prior to placement of engineered fill.

The recommendations below are based upon the exhibited geotechnical engineering properties of the soils and their anticipated response both during and after construction. The recommendations are also based upon proper field observation and testing during construction. The project geotechnical engineer should be notified of suspected variances in field conditions to determine the effect upon the recommendations subsequently presented. These recommendations are considered minimal and may be superseded by more restrictive requirements of the civil and structural engineers, the City of Anaheim, the County of Orange and other governing agencies.

Leighton should review the grading and foundation plans and project specifications as they become available to verify that the recommendations presented in this report have been incorporated into the plans for this project.

3.1 Site Grading

All site grading should be performed in accordance with the applicable local codes and in accordance with the project specifications that are prepared by the appropriate design professional.

3.1.1 Site Preparation

Prior to construction, the site should be cleared of any vegetation, trash, and/or debris within the area of proposed grading. These materials should be removed from the site. Any underground obstructions onsite should be removed. Efforts should be made to locate any existing utility lines to be removed or rerouted where interfering with the proposed construction. Any

resulting cavities should be properly backfilled and compacted. After the site is cleared, the soils should be carefully observed for the removal of all unsuitable deposits. All undocumented fill or man-made debris, unsuitable native soils and former foundation remnants should be excavated and removed from the proposed building/structure footprint areas prior to placement of engineered fill.

3.1.2 Removals and Overexcavations

To provide uniform foundation support and reduce the potential for excessive static settlement, all existing undocumented fill and any unsuitable soil, as deemed by the geotechnical engineer, should be removed to expose suitable native soils and replaced as engineered fill below the proposed building and other structural improvements. Removals and overexcavations should be performed such that all undocumented fill is removed and a minimum of 3 feet of engineered fill is established below the proposed building foundation elements. Based on an assumed footing embedment depth on the order of roughly 2 feet, the depth of overexcavation is anticipated to be on the order of approximately 5 feet below existing grade across the site. The lateral extent of overexcavation beyond foundations should be equal to the depth of overexcavation below the foundation. Deeper overexcavations in localized areas may be recommended during grading by a representative of the geotechnical engineer depending on observed subsurface conditions.

3.1.3 Excavation Bottom Preparation

All excavation or removal bottoms should be observed by a representative of the geotechnical engineer prior to placement of fill or other improvements to determine that geotechnically suitable soil is exposed. Excavation bottoms observed to be suitable for fill placement or other improvements should be scarified to a depth of at least 8 inches, moisture-conditioned as necessary to achieve a moisture content of at least 2 percentage points above the optimum moisture content, and then compacted to a minimum of 90 percent of the laboratory derived maximum density as determined by ASTM Test Method D 1557 (Modified Proctor).

3.1.4 Fill Materials

On-site soil that is free of construction debris, organics, cobbles, boulders, rubble, or rock larger than 6-inches in largest dimension is suitable to be used as fill for support of structures. Oversized materials larger than 6-inches in diameter encountered during site grading may require special handling, and may be placed in non-structural areas or areas of deep fill at depth below anticipated excavations such as for any footings, utilities, future developments, etc. Any imported fill soil should be approved by the geotechnical engineer prior to import or use onsite.

3.1.5 Fill Placement and Compaction

Fill soils should be placed in loose lifts not exceeding 8 inches, moisture-conditioned to at least 2 percent above optimum moisture content, and compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM Test Method D 1557. Aggregate base should be compacted to a minimum of 95 percent relative compaction.

3.1.6 Shrinkage

The change in volume of excavated and recompacted soil varies according to soil type and location. This volume change is represented as a percentage increase (bulking) or decrease (shrinkage) in volume of fill after removal and recompaction. Field and laboratory data used in our calculations included laboratory-measured maximum dry density for the general soil type encountered at the subject site, the measured in-place densities of near surface soils encountered and our experience.

Based upon the results of the in-place density and the moisture-density relationship exhibited by representative bulk samples of the near surface soils, recompaction of the soils is anticipated to result in volume shrinkage in the range of 10 to 15 percent. The estimated shrinkage does not include material losses due to removal of organic material or other unsuitable bearing materials (debris, rubble, oversize material greater than 6-inches) and the actual shrinkage that occurs during grading may vary throughout the site.

3.1.7 Reuse of Concrete and Asphalt Rubble

If encountered during site clearing and/or during preparation activities, construction rubble (i.e., Portland cement concrete and asphalt concrete) may be incorporated in the proposed development. For use as structural fill, the processed material should be crushed to develop a relatively well-graded mixture with a maximum particle size of 3-inch nominal diameter. Concrete rubble should be free of rebar; processed asphalt pavement rubble may be used if mixed with the existing base course (where present) and soils in proportion of 1 part processed asphalt to 3 parts soil. For use as pavement base course, rubble should be crushed to satisfy gradation requirements of Section 200-2.4 of the SSPWC. Such materials must be free of and segregated from any hazardous materials and/or organic material of any kind.

3.2 Foundation Design

Conventional spread footings established in engineered fill may be used to support the proposed building. Footings should be embedded a minimum 18 inches below the lowest adjacent grade. An allowable soil bearing pressure of 4,000 pounds per square foot (psf) may be used for footings with a minimum width of 12 inches for continuous footings and 18 inches for isolated footings.

A one-third increase in the bearing value for short duration loading, such as wind or seismic forces may be used. The ultimate bearing capacity can be taken as 12,000 psf, which does not incorporate a factor of safety. A resistance factor of 0.5 should be used for initial bearing capacity evaluation with factored loads.

The allowable bearing capacity for shallow footings is based on a total static settlement of 1 inch. Differential settlement can be taken as half the total settlement over a horizontal distance of 30 feet.

For static loading, 50 pounds per cubic inch (pci) may be assumed as the modulus of subgrade reaction (*k*). For seismic loading, a *k* value of 150 pci may be assumed.

Since settlement is a function of footing size and contact bearing pressure, differential settlement can be expected between adjacent columns or walls where a large differential loading condition exists. Once developed by the structural

engineer, we should review total dead and sustained live loads for each column including plan location and span distance, to evaluate if differential settlements between dissimilarly loaded columns will be tolerable. Excessive differential settlement can be mitigated with the use of reduced bearing pressures, deeper footing embedment, possibly changing overexcavation schemes and using imported base material under spread footings, or possibly other methods.

Resistance to lateral loads will be provided by a combination of friction between the soil and structure interface and passive pressure acting against the vertical portion of the footings structures. For calculating lateral resistance, a passive pressure of 300 psf per foot of depth to a maximum of 3,000 psf and a frictional coefficient of 0.30 may be used. Note that the passive and frictional coefficients do not include a factor of safety. The frictional resistance and the passive resistance of the soils can be combined without reduction in determining the total lateral resistance.

3.3 Slabs-on-Grade

Concrete slabs may be designed using a modulus of subgrade reaction of 100 pci provided the subgrade is prepared as described in Section 3.1. From a geotechnical standpoint, we recommend slab-on-grade be a minimum 5 inches thick with No. 3 rebar placed at the center of the slab at 24 inches on center in each direction. The structural engineer should design the actual thickness and reinforcement based on anticipated loading conditions. Where moisture-sensitive floor coverings or equipment is planned, the slabs should be protected by a minimum 10-mil-thick vapor barrier between the slab and subgrade. A coefficient of friction of 0.35 can be used between the floor slab and the vapor barrier.

Minor cracking of concrete after curing due to drying and shrinkage is normal and should be expected; however, concrete is often aggravated by a high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. The use of low-slump concrete or low water/cement ratios can reduce the potential for shrinkage cracking. Additionally, our experience indicates that the use of reinforcement in slabs and foundations can generally reduce the potential but not eliminate for concrete cracking.

To reduce the potential for excessive cracking, concrete slabs-on-grade should be provided with construction or weakened plane joints at frequent intervals. Joints should be laid out to form approximately square panels.

3.4 Cement Type and Corrosion Protection

Based on the results of laboratory testing, concrete structures in contact with the onsite soil are expected to have negligible exposure to water-soluble sulfates in the soil. Common Type II cement may be used for concrete construction onsite and the concrete should be designed in accordance with CBC 2016 requirements. However, concrete exposed to recycled water should be designed using Type V cement.

Based on our laboratory testing, the onsite soil is considered mildly corrosive to ferrous metals. Ferrous pipe should be avoided by using high-density polyethylene (HDPE) or other non-ferrous pipe when possible. Ferrous pipe, if used, should be protected by polyethylene bags, tap or coatings, di-electric fittings or other means to separate the pipe from onsite soils.

3.5 Retaining Walls

Recommended lateral earth pressures are provided as equivalent fluid unit weights, in psf/ft. or pcf. These values do not contain an appreciable factor of safety, so the structural engineer should apply the applicable factors of safety and/or load factors during design.

On-site soils are likely suitable to be used as retaining wall backfill due to its low expansion potential, field and laboratory verification are recommended before use. However, site soils can be variable in composition, clast size and expansive characteristics. Should site soil for reuse behind retaining walls should be tested to ensure expansion potential is less than 20 (EI<20). Recommended lateral earth pressures for retaining walls backfilled with sandy soils with drained conditions as shown on Figure 8, *Retaining Wall Backfill and Subdrain Detail* are as follows:

Table 3 – Retaining Wall Design Earth Pressures

Retaining Wall Condition (Level Backfill)	Equivalent Fluid Pressure (pounds-per-cubic-foot)*
Active (cantilever)	35
At-Rest (braced)	60
Passive Resistance (compacted fill)	300
Seismic Increment (add to active pressure)	20
*Only for level and drained properly compacted backfill	

Walls that are free to rotate or deflect may be designed using active earth pressure. For basement walls or walls that are fixed against rotation, the at-rest pressure should be used. For seismic condition, the pressure should be distributed as an inverted triangular distribution and the dynamic thrust should be applied at a height of 0.6H above the base of the wall.

3.5.1 Sliding and Overturning

Total depth of retained earth for design of walls and for uplift resistance, should be measured as the vertical height of the stem below the ground surface at the wall face for stem design, or measured at the heel of the footing for overturning and sliding. A soil unit weight of 120 pcf may be assumed for calculating the actual weight of the soil over the wall footing, if drained, or 60 pcf if submerged, for properly compacted backfill.

3.5.2 Drainage

Adequate drainage may be provided by a subdrain system positioned behind the walls (Figure 8). Typically, this system consists of a 4-inch minimum diameter perforated pipe placed near the base of the wall (perforations placed downward). The pipe should be bedded and backfilled with pervious backfill material described in Section 300-3.5.2 of the Standard Specifications for Public Works Construction (Green Book), 2018 Edition. This pervious backfill should extend at least 2 feet out from the wall and to within 2 feet of the outside finished grade. This pervious backfill and pipe should be wrapped in filter fabric, such as Mirafi 140N or equivalent, placed as described in Section 300-8.1 of the Standard Specifications for

Public Works Construction (Green Book), 2018 Edition. The subdrain outlet should be connected to a free-draining outlet or sump.

Miradrain, Geotech Drainage Panels, or Enkadrain drainage geocomposites, or similar, may be used for wall drainage as an alternative to the Class 2 Permeable Material or drain rock backfill, particularly where horizontal space is limited adjacent to shoring (where walls are cast against shoring). These drainage panels should be connected to the perforated drainpipe at the base of the wall.

3.6 Paving

To provide support for paving, the subgrade soils should be prepared as recommended in the Section 3.1. Compaction of the subgrade, including trench backfills, to at least 90 percent of the maximum dry density as determined by ASTM Test Method D 1557, and achieving a firm, hard, and unyielding surface will be important for paving support. The preparation of the paving area subgrade should be performed immediately prior to placement of the base course. Proper drainage of the paved areas should be provided since this will reduce moisture infiltration into the subgrade and increase the life of the paving.

3.6.1 Asphalt Concrete

The required paving and base thicknesses will depend on the expected wheel loads and volume of traffic (Traffic Index or TI). Assuming that the paving subgrade will consist of engineered fill with an R-value greater than 50, compacted to at least 90 percent as recommended, the minimum recommended paving thicknesses are presented in the following table. Results of R-value testing on near surface samples of existing onsite soils indicate values of 70 and 71.

Table 4 – Asphalt Concrete Pavement Sections

Traffic Index	Asphalt Concrete (inches)	Base Course (inches)
5	3	4
6	3	6
7	4	6
8	5	6
9	5	8

The asphalt paving sections were determined using the Caltrans design method. We can determine the recommended paving and base course thicknesses for other Traffic Indices if required. Careful inspection is recommended to verify that the recommended thicknesses or greater are achieved, and that proper construction procedures are followed.

3.6.2 Portland Cement Concrete Paving

We have assumed that such a subgrade will have an R-value of at least 50, which will need to be verified after the completion of site grading.

Portland cement concrete (PCC) paving sections were determined in accordance with procedures developed by the Portland Cement Association. Concrete paving sections for a range of Traffic Indices are presented in the following table. We have assumed that the Portland cement concrete will have a compressive strength of at least 3,000 pounds per square inch.

Table 5 – PCC Pavement Sections

Traffic Index	PCC (inches)	Base Course (inches)
5	5	4
6	6	4
7	6½	4
8	7	4
9	8	4

The paving should be provided with expansion joints at regular intervals no more than 15 feet in each direction. Load transfer devices, such as dowels or keys, are recommended at joints in the paving to reduce possible offsets. The paving sections in the above table have been developed based on the strength of unreinforced concrete. Steel reinforcing may be added to the paving to reduce cracking and to prolong the life of the paving.

3.6.3 Base Course

The base course for both asphalt concrete and Portland cement concrete paving should meet the specifications for Class 2 Aggregate Base as defined in Section 26 of the latest edition of the State of California,

Department of Transportation, Standard Specifications. Alternatively, the base course could meet the specifications for untreated base as defined in Section 200-2 of the latest edition of the Standard Specifications for Public Works Construction. The base course should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM Test Method D 1557.

3.7 Temporary Excavations

All temporary excavations, including utility trenches, retaining wall excavations, and foundation excavations should be performed in accordance with project plans, specifications, and all OSHA requirements. Excavations 4 feet or deeper should be laid back or shored in accordance with OSHA requirements before personnel are allowed to enter.

No surcharge loads should be permitted within a horizontal distance equal to the height of cut or 5 feet, whichever is greater from the top of the cut, unless the cut is shored appropriately. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing site foundation should be properly shored to maintain support of the adjacent structure.

Temporary excavations should be treated in accordance with the State of California version of OSHA excavation regulations, Construction Safety Orders for Excavation General Requirements, Article 6, Section 1541, effective October 1, 1995. The sides of excavations should be shored or sloped in accordance with OSHA regulations. OSHA allows the sides of unbraced excavations, up to a maximum height of 20 feet, to be cut to a ¾H:1V (horizontal:vertical) slope for Type A soils, 1H:1V for Type B soils, and 1½H:1V for Type C soils. Onsite sandy soils are to be considered Type C soils which are subject to collapse in shallow unbraced excavations (i.e. approximately 3-feet in vertical height).

During construction, the soil conditions should be regularly evaluated to verify that conditions are as anticipated. The contractor shall be responsible for providing the "competent person" required by OSHA standards to evaluate soil conditions. Close coordination between the competent person and the geotechnical engineer should be maintained to facilitate construction while providing safe excavations.

3.8 Trench Backfill

Utility trenches should be backfilled with compacted fill in accordance with Sections 306-1 and 306-6 of the Standard Specifications for Public Works Construction, ("Greenbook"), 2018 Edition. Utility trenches can be backfilled with onsite sandy material free of rubble, debris, organic and oversized material up to (≤) 3-inches in largest dimension. Prior to backfilling trenches, pipes should be bedded in and covered with either:

(1) **Sand:** A uniform, sand material that has a Sand Equivalent (SE) greater-than-or-equal-to (≥) 30, passing the No. 4 U.S. Standard Sieve (or as specified by the pipe manufacturer), water densified in place, or

(2) **CLSM:** Controlled Low Strength Material (CLSM) conforming to Section 201-6 of the *Standard Specifications for Public Works Construction,* ("Greenbook"), 2018 Edition. CLSM should not be jetted.

Pipe bedding should extend at least 4 inches below the pipeline invert and at least 12 inches over the top of the pipeline. Native and clean fill soils can be used as backfill over the pipe bedding zone, and should be placed in thin lifts, moisture conditioned above optimum, and mechanically compacted to at least 90 percent relative compaction, relative to the ASTM D 1557 laboratory maximum density.

3.9 Drainage and Landscaping

Surface drainage should be designed to direct water away from foundations and toward approved drainage devices. Irrigation of landscaping should be controlled to maintain, as much as possible, consistent moisture content sufficient to provide healthy plant growth without overwatering.

3.10 Infiltration BMP Design Considerations

It should be noted that the measured infiltration rates presented in Section 2.3.1 may degrade over time due to complete saturation of underlying soils, and fines build-up and plugging if pretreatment of the storm water is not performed. As such, a reduction of the measured infiltration rates using a factor of safety of 6 or more should be considered to establish a conservative infiltration rate for the service life of the system. This factor should not be less than 6, but may be higher at the discretion of the design engineer.

In general, a vast majority of geotechnical distress issues are related to improper drainage. Distress in the form of foundation movement could occur. Direct infiltration to the subsurface is not recommended adjacent to curb and gutter, public pavements or within 10 feet away from the design saturation zone as soil saturation could lead to a loss of soil support, settlement or collapse, and internal erosion (piping). The design saturation zone may be assumed as a 1:1 plane projected downward from the top of an infiltration device's discharge zone. Additionally, infiltration water will migrate along pipe backfill (typically sand or gravel bedding) affecting improvements far from the point of infiltration. Proposed direct open bottom infiltration systems, should be located as far away from existing or proposed foundations, rigid improvements and utilities as is practical in order to reduce the geotechnical distress issues related to water. Where sufficient distance from improvements cannot be achieved, additional recommendations may be warranted and can be provided during plan review.

Prior to construction of any infiltration device intended for the site, the plans should be reviewed by the geotechnical consultant to verify that our geotechnical recommendations have been appropriately incorporated into the plans and not compromised by the addition of an infiltration system to the site. The designer of any infiltration system should contact the geotechnical consultant for geotechnical input during the design process as they feel necessary.

3.11 Additional Geotechnical Services

Leighton should review the grading plans, foundation plans, and specifications when they are available to verify that the recommendations presented in this report have been properly interpreted and incorporated.

Geotechnical observation and testing should be provided during the following activities:

- Grading and excavation of the site;
- Subgrade Preparation;
- Compaction of all fill materials;
- Utility trench backfilling and compaction;
- Footing excavation and slab-on-grade preparation;
- Pavement subgrade and base preparation;
- Placement of asphalt concrete and/or concrete; and
- When any unusual conditions are encountered.

4.0 LIMITATIONS

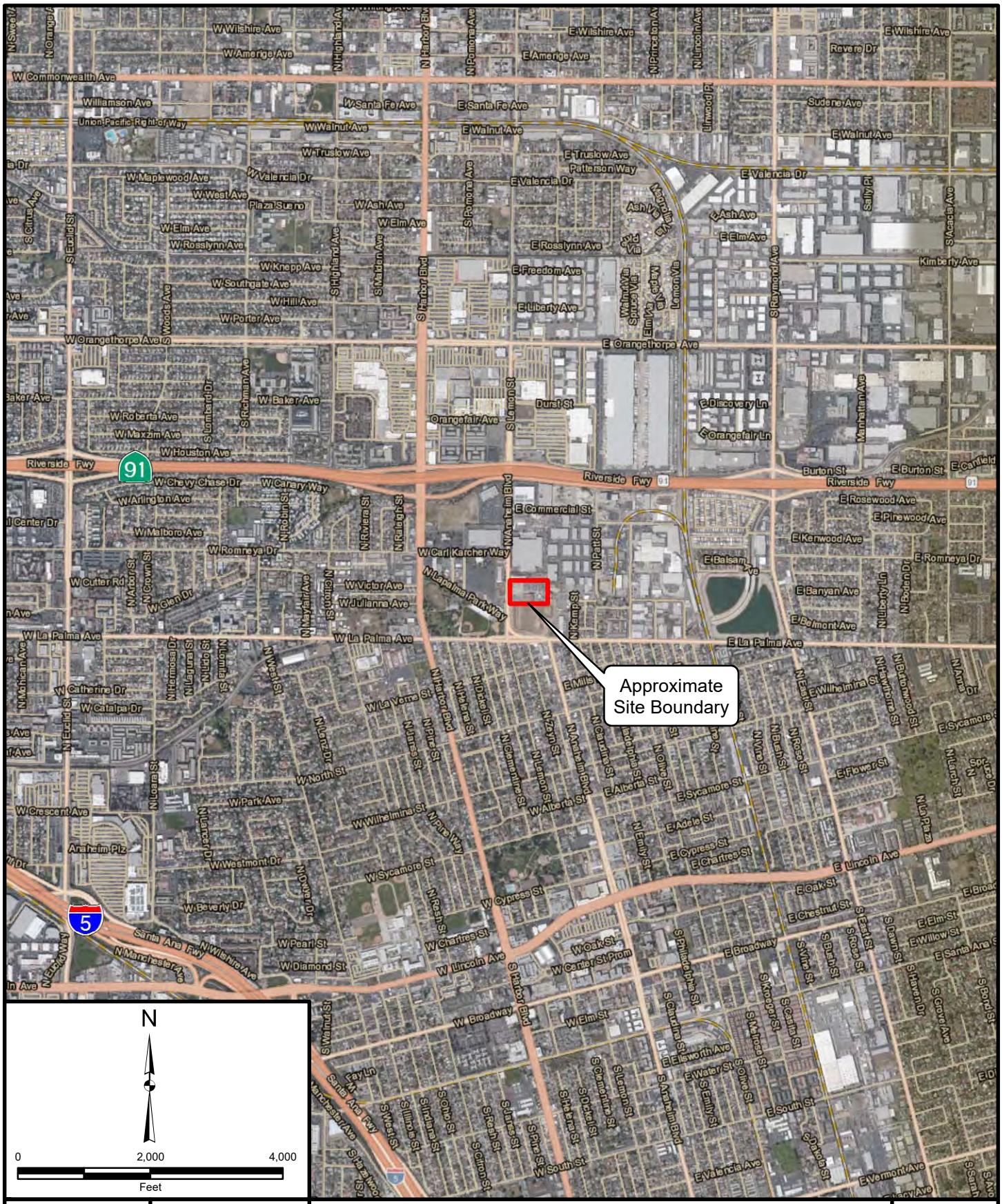
Leighton's work was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical consultants practicing in California at this time. No other warranty, express or implied, is made as to the conclusions and professional opinions included in this report.

This report is issued with the understanding that it is the responsibility of the owner or a duly authorized agent acting on behalf of the owner, to ensure that information and preliminary recommendations contained herein are brought to the attention of the necessary design consultants for this project and incorporated into plans and specifications.

Until reviewed and accepted by the local governing Agency, this report may be subject to change. Changes may be required as part of the Agency review process. Leighton assumes no risk or liability for consequential damages that may arise due to design work progressing before this report is reviewed and accepted by the reviewing Agency.

The findings of this report are considered valid as of the present date. However, changes in the condition of a property can occur with the passage of time, whether due to natural processes or the work of man on the subject or adjacent properties. In addition, changes in standards of practice may occur from legislation or the broadening of knowledge. Accordingly, the findings of this report may at some future time be invalidated wholly or partially by changes outside Leighton's control. Conditions revealed in construction excavations may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by Leighton and additional recommendations may be warranted based on additional observations and findings.

The conclusions and recommendations in this report are based in part upon data that were obtained from a necessarily limited number of observations, site visits, excavations, samples and testes. Such information can be obtained only with respect to the specific locations explored, and therefore may not completely define all subsurface conditions throughout the site. The nature of many sites is that differing geotechnical and/or geological conditions can occur within small distances and under varying climatic conditions. Furthermore, changes in subsurface conditions can and do occur over time. Therefore, the findings, conclusions, and recommendations presented in this report should be considered preliminary if unanticipated conditions are encountered and additional explorations, testing and analyses may be necessary to develop alternative recommendations.



Project: 11862.003	Eng/Geol: CCK/JMP
Scale:1 " = 2,000 '	Date: March 2016
Base Map: ESRI ArcGIS Online 2019 Author: Leighton Geomatics (btran)	

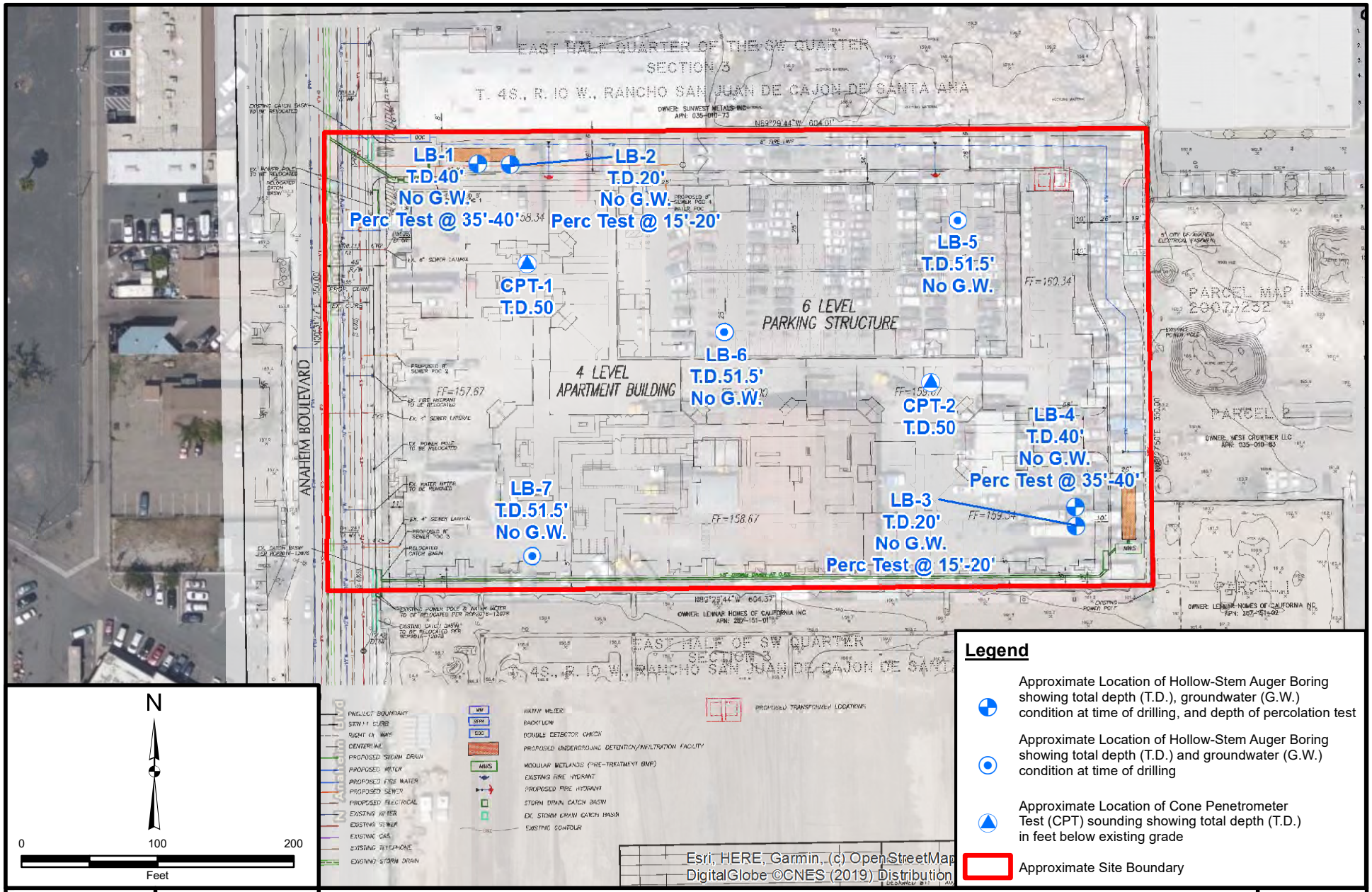
SITE LOCATION MAP

1122 N. Anaheim Boulevard
Anaheim, California

Figure 1

Leighton

Map Saved as V:\Drafting\11862\003\Maps\11862-003_F01_SLM_2019-09-24.mxd on 9/24/2019 10:11:47 AM



N

0 100 200

Feet

Legend

- Approximate Location of Hollow-Stem Auger Boring showing total depth (T.D.), groundwater (G.W.) condition at time of drilling, and depth of percolation test
- Approximate Location of Hollow-Stem Auger Boring showing total depth (T.D.) and groundwater (G.W.) condition at time of drilling
- Approximate Location of Cone Penetrometer Test (CPT) sounding showing total depth (T.D.) in feet below existing grade
- Approximate Site Boundary

Project: 11862.003	Eng/Geol: CCK/JMP
Scale: 1 " = 100 '	Date: September 2019

Base Map: ESRI ArcGIS Online 2019
Thematic Information: Leighton
Author: Leighton Geomatics (btran)

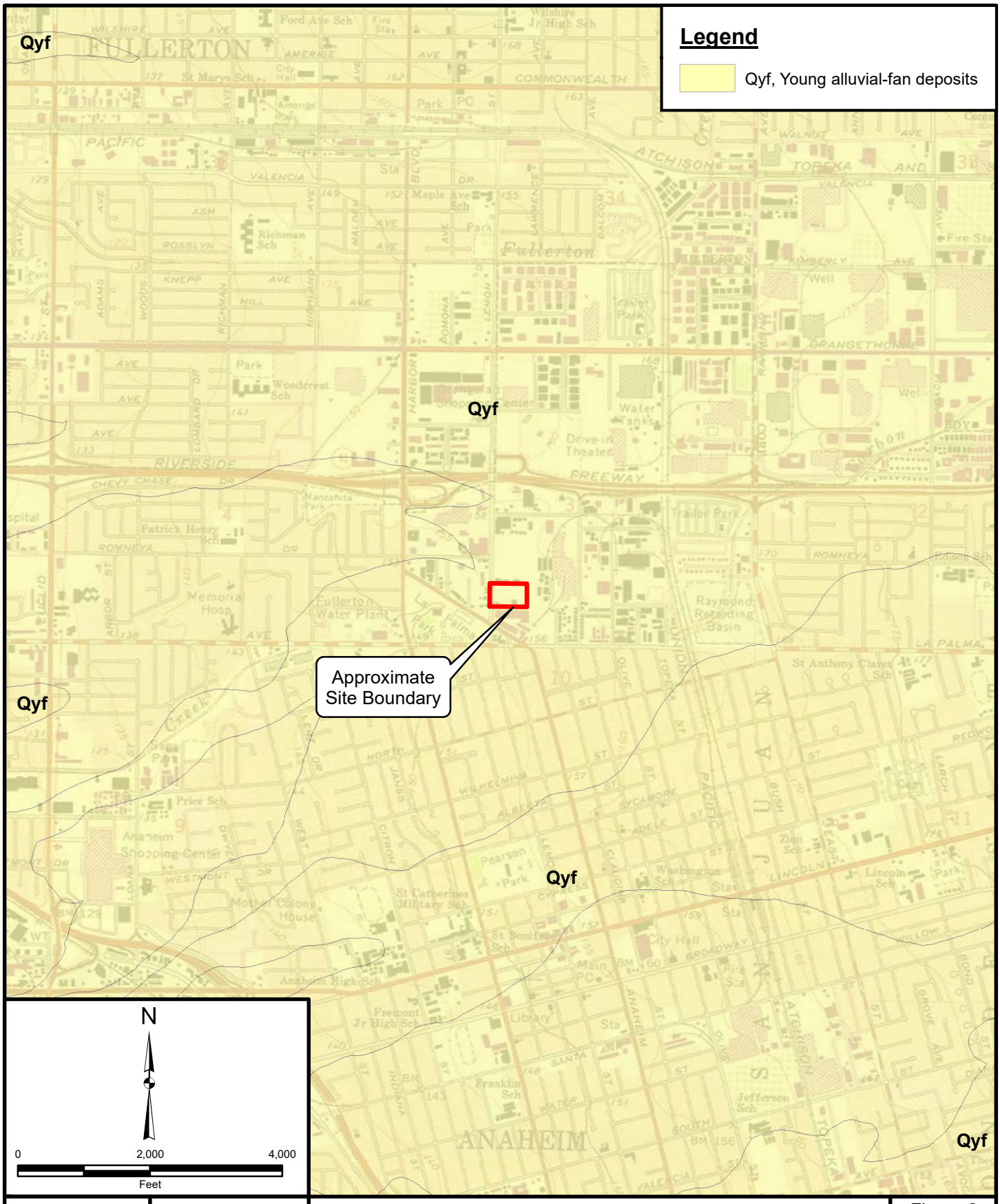
EXPLORATION LOCATION MAP

1122 N. Anaheim Boulevard
Anaheim, California

Figure 2

Leighton

Map Saved as V:\Drafting\11862\003\Maps\11862-003_F02_ELM_2019-09-24.mxd on 9/24/2019 11:20:35 AM



Project: 11862.003	Eng/Geol: CCK/JMP
Scale: 1 " = 2,000 '	Date: September 2019

Base Map: USGS, 2006, Geologic map of the San Bernardino and Santa Ana 30'x60' quadrangles, California, version 1.

Author: Leighton Geomatics (btran)

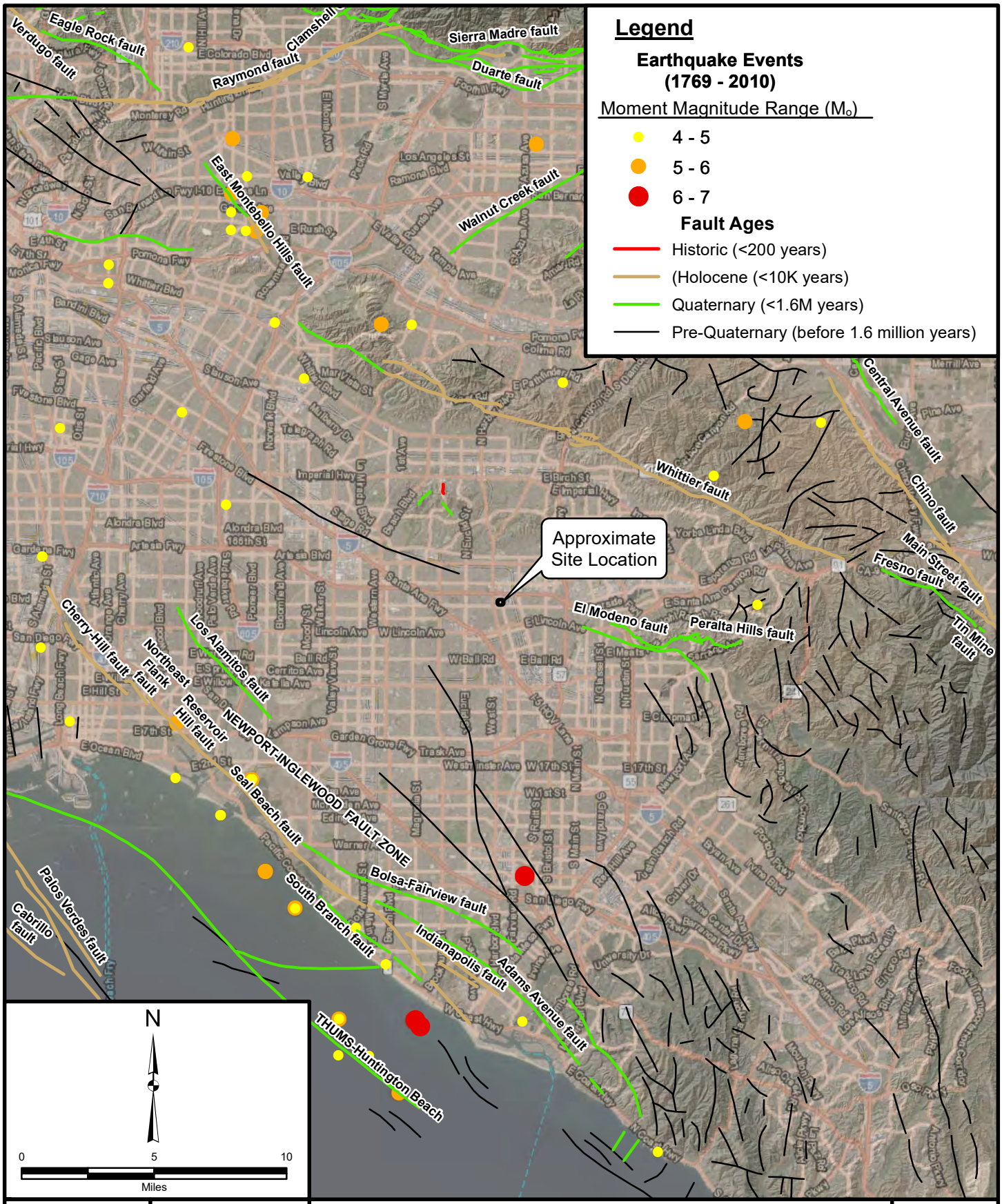
REGIONAL GEOLOGY MAP

1122 N. Anaheim Boulevard
Anaheim, California

Figure 3

Leighton

Map Saved as V:\Drafting\11862\003\Maps\11862-003_F03_RGM_2019-09-24.mxd on 9/24/2019 10:15:17 AM



Project: 11862.003	Eng/Geol: CCK/EBP
Scale:1 " = 5 miles	Date: September 2019

Base Map: ESRI ArcGIS Online 2019
Thematic Information: Leighton, Bryant, W. A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: CGS, USGS, SCEC.
Author: Leighton Geomatics (btran)

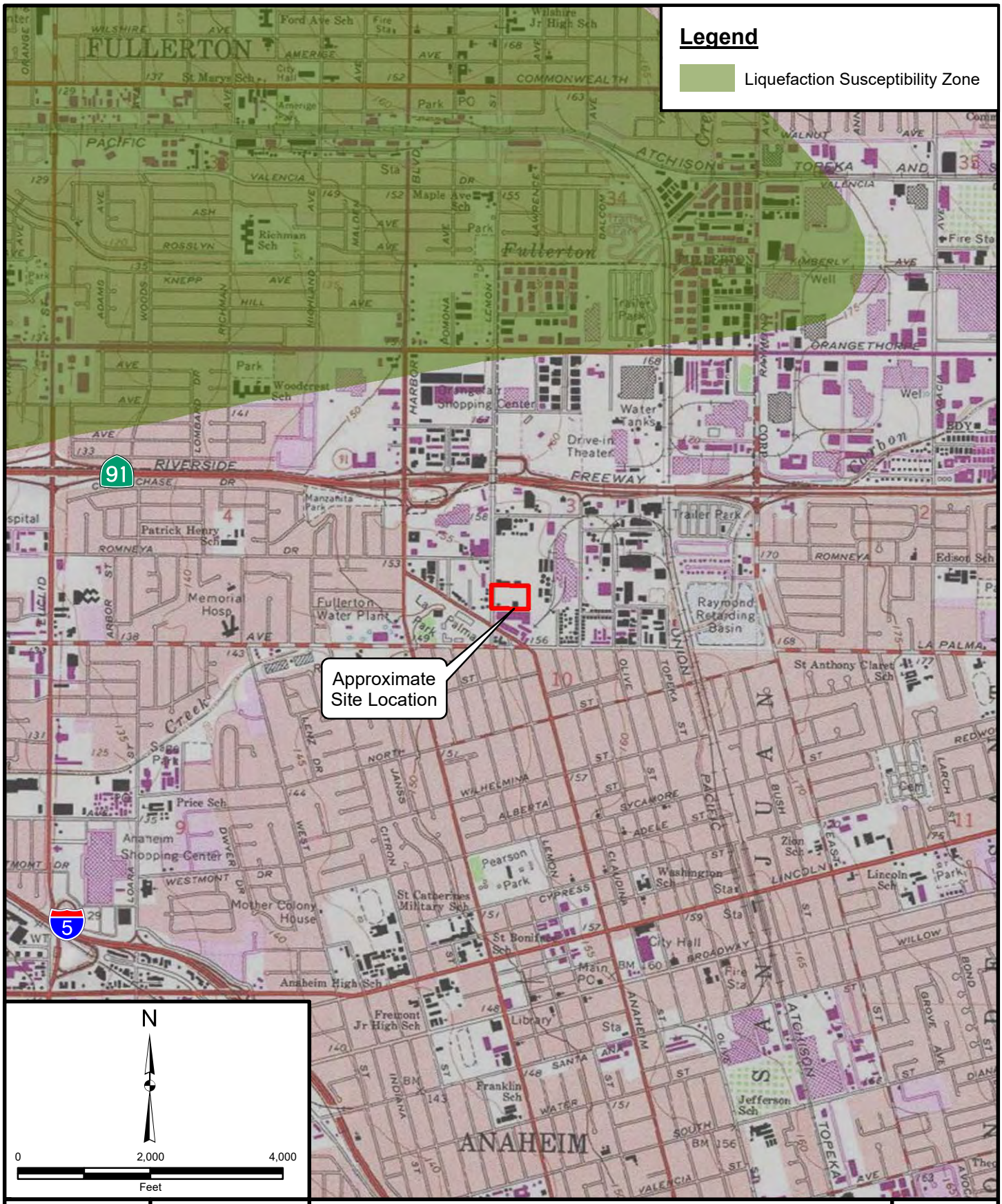
REGIONAL FAULT AND HISTORIC SEISMICITY MAP

1122 N. Anaheim Boulevard
Anaheim, California

Figure 4

Leighton

Map Saved as V:\Drafting\11862\003\Maps\11862-003_F04_RFHS_2019-09-24.mxd on 9/24/2019 10:18:59 AM



Project: 11862.003	Eng/Geol: CCK/JMP
Scale:1 " = 2,000 '	Date: March 2016
Base Map, CGS	
Author: Leighton Geomatics (btran)	

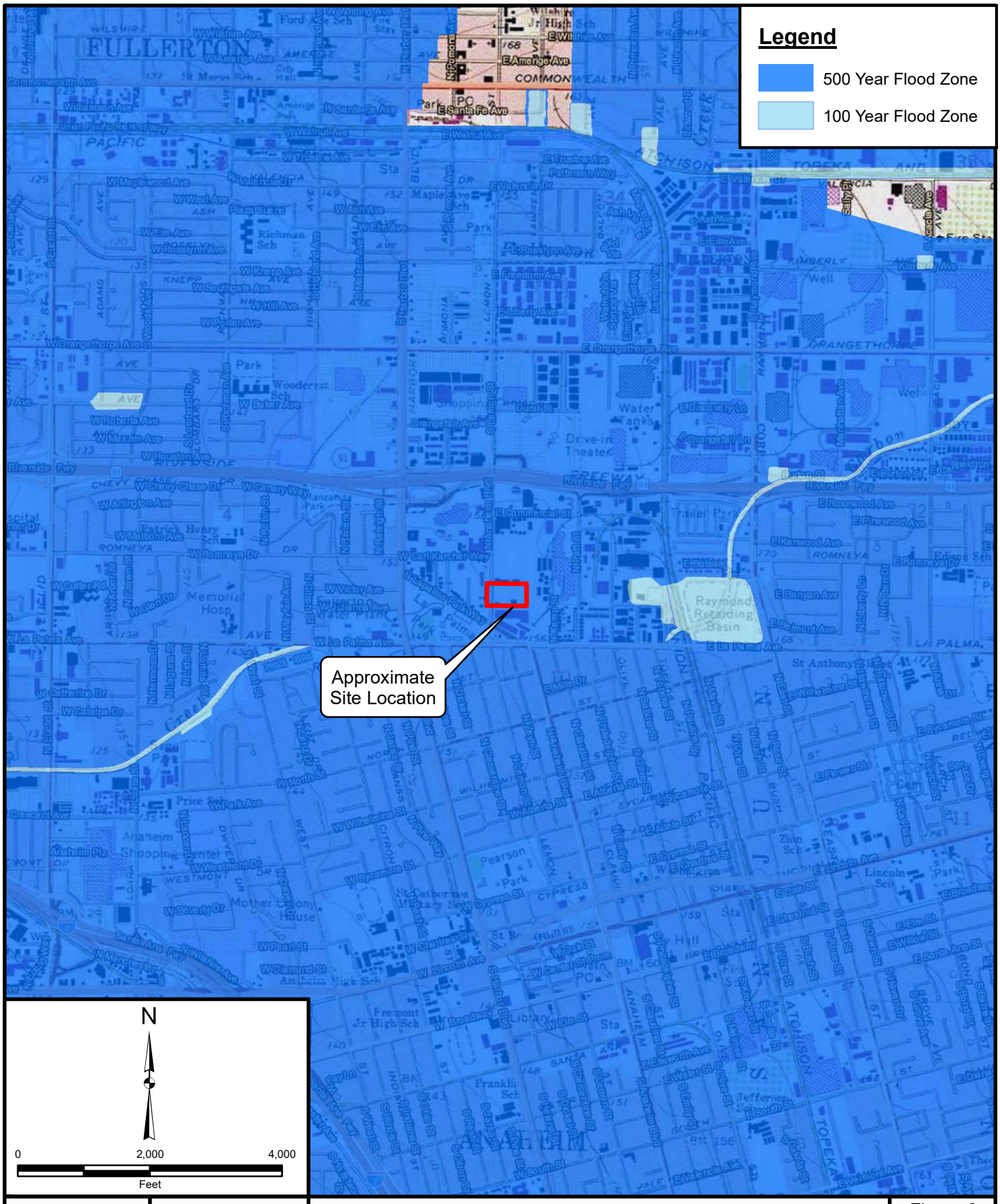
SEISMIC HAZARD MAP

1122 N. Anaheim Boulevard
Anaheim, California

Figure 5

Leighton

Map Saved as V:\Drafting\11862\003\Maps\11862-003_F05_SHM_2019-09-24.mxd on 9/24/2019 10:20:28 AM



Project: 11862.003	Eng/Geol: CCK/JMP
Scale:1 " = 2,000 '	Date: March 2016
Base Map: CA DWR, FEMA	
Author: Leighton Geomatics (btran)	

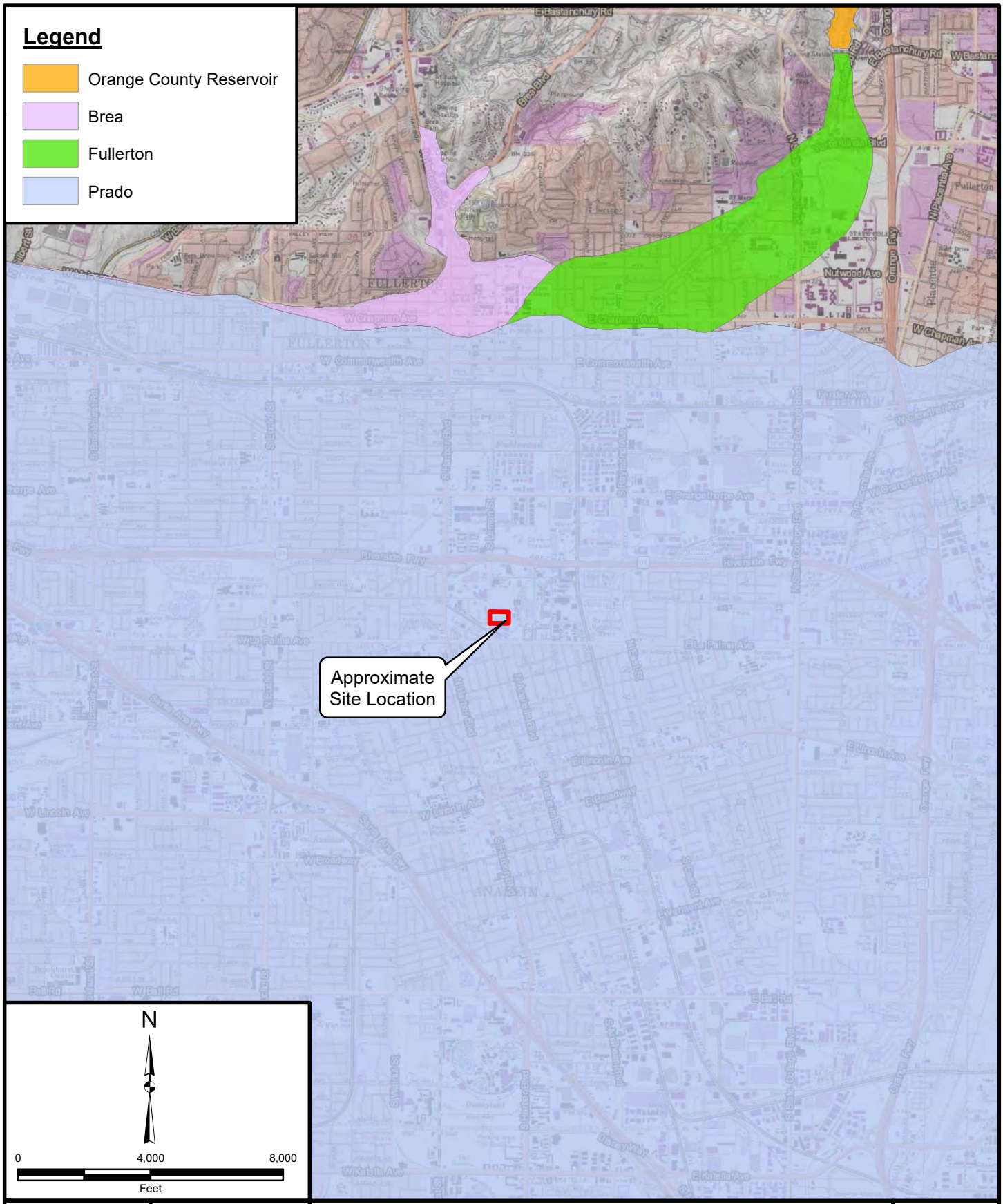
FLOOD HAZARD MAP

1122 N. Anaheim Boulevard
Anaheim, California

Figure 6

Leighton

Map Saved as V:\Drafting\11862\003\Maps\11862-003_F06_FHZM_2019-09-24.mxd on 9/24/2019 10:22:19 AM



Project: 11862.003	Eng/Geol: CCK/JMP
Scale:1 " = 4,000 '	Date: March 2016
Base Map: CGS	
Author: Leighton Geomatics (btran)	

DAM INUNDATION MAP

1122 N. Anaheim Boulevard
Anaheim, California

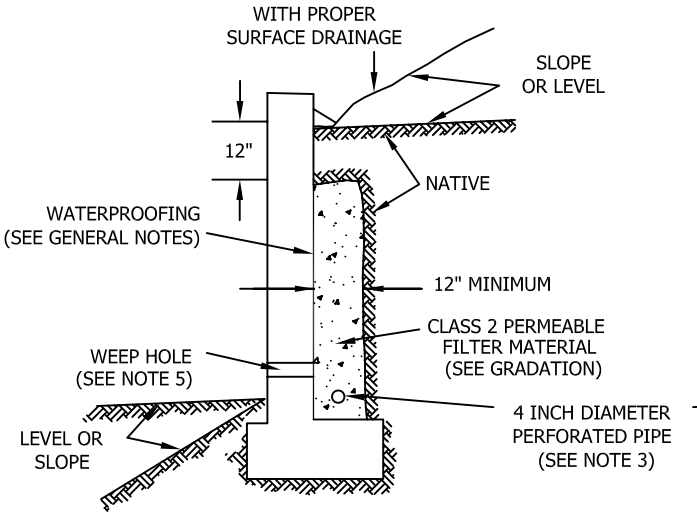
Figure 7

Leighton

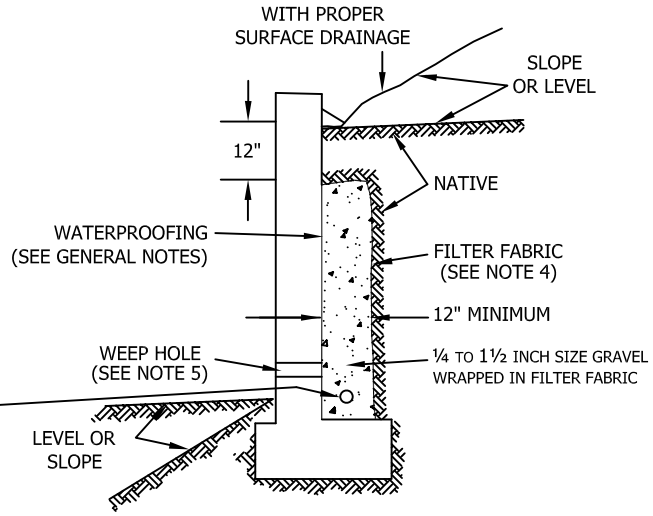
Map Saved as V:\Drafting\11862\003\Maps\11862-003_F07_DIM_2019-09-24.mxd on 9/24/2019 10:24:02 AM

SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

OPTION 1: PIPE SURROUNDED WITH CLASS 2 PERMEABLE MATERIAL



OPTION 2: GRAVEL WRAPPED IN FILTER FABRIC



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

GENERAL NOTES:

* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum
*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:
1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS 6 FEET OR LESS IN HEIGHT

WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

H-8/5

Leighton

Figure 8

P:\Drafting\templates\details\retain-wall-backfill-and subdrain.dwg (7/00)

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

American Concrete Institute (ACI), 2014, Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary, an ACI Standard, reported by ACI Committee 318.

American Society of Civil Engineers (ASCE), 2013, Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 7-10, Third Printing, Errata Incorporated through March 15.

Bryant, W.A. and Hart, E.W., Interim Revision 2007, Fault Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps: California Geological Survey, Special Publications 42, 42p.

California Building Standards Commission, 2016, 2016 California Building Code (CBC), California Code of Regulations, Title 24, Part 2, Volume 2 of 2, Based on 2015 International Building Code, Effective January 1, 2017.

California Department of Water Resources (DWR), 2019, Water Data Library, groundwater well data, http://wdl.water.ca.gov.

California Division of Oil, Gas and Geothermal Resources (DOGGR), 2019, Interactive Wellfinder Website, http://www.conservation.ca.gov/dog/Pages/Wellfinder.aspx

California Geological Survey (CGS; formally California Division of Mines and Geology), 1997, Seismic Hazard Zone Report for the Anaheim and Newport Beach 7.5-Minute Quadrangles, Orange County, California, Seismic Hazard Zone Report No. 03.

_____, 1998, State of California Seismic Hazards Zones Map, Anaheim Quadrangle, map scale 1:24,000, released April 15, 1998.

_____, 2000, CD-ROM containing digital images of Official Maps of Alquist-Priolo Earthquake Fault Zones that affect the Southern Region, DMG CD 2000-003 2000.

_____, 2008, Special Publication 117a, Guidelines for Evaluating and Mitigating Seismic Hazards in California, originally adopted March 13, 1997 by the State Mining and Geology Board in Accordance with the Seismic Hazards Mapping Act of 1990, Revised and Re-Adopted September 11, 2008.

California State Water Resources Control Board (CSWRCB), GeoTracker, http://geotracker.waterboards.ca.gov/.

City of Anaheim, 2004, City of Anaheim General Plan – Safety Element, dated May 2004.

Federal Emergency Management Agency, 2009, Flood Insurance Rate Map, Orange County and Incorporated Areas, Map Number 06059C0131J, dated December 3, 2009.

Jennings, C.W., 2010, Fault Activity Map of California, California Geological Survey, Geologic Data Map No. 6, map scale 1:750,000.

Leighton and Associates, Inc., 2018, Due-Diligence Geotechnical Exploration, Proposed Multi-Family Residential Development Project, 1122 N. Anaheim Boulevard and 1041, 1057 and 1071 N. Kemp Street, Anaheim, California, Project No. 11862.001, dated December 22, 2017.

_____, 2019, Phase II Environmental Site Assessment, 1122 North Anaheim Boulevard, Anaheim, California, Project No. 11862.002, dated March 6, 2019.

Morton D.M., and Miller, F.K., 2006, Geologic Map of the San Bernardino and Santa Ana, 30' x 60' Quadrangles, California, USGS Open File Report 2006-1217.

Nationwide Environmental Title Research, LLC (NETR), 2019, Historic Aerials by NETR Online, website: https://www.historicaerials.com/viewer.

Orange County Public Works (OCPW), 2013, Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs), dated December 20, 2013.

Public Works Standards, Inc., 2018, The "Greenbook", Standard and Specifications for Public Works Constructions, 2018 Edition, BNI Building News.

Real, C.R., 1985, Introduction, *in* Sherburne, R.W., Fuller, D.R., Cole, J.W., Greenwood, R.B., Mumm, H.A., and Real, C.R. (editors), Classification and Mapping of Quaternary Sedimentary Deposits for Purposes of Seismic Zonation, South Coastal Los Angeles Basin, Orange County, California; California Division Of Mines And Geology Open File Report 81-10LA, pp. 1.1-1.7.

Sprotte, E.C., Fuller, D.R., Greenwood, R.B., Mumm, H.A., Real, C.R., and Sherburne, R.W., 1980, Annual Technical Report Text and Plates, Classification and Mapping of Quaternary Sedimentary Deposits for Purposes of Seismic Zonation, South

Coastal Los Angeles Basin, Orange County, California: California Division Of Mines And Geology Open File Report 80-19LA, 268 p.

United States Geological Survey (USGS), 1965 (Photorevised 1972), Anaheim 7.5 Minute Series Quadrangle, California, Scale 1:24,000.

_____, 2008a, Unified Hazard Tool for Deaggregations, https://earthquake.usgs.gov/hazards/interactive/

_____, 2008b, National Seismic Hazard Maps – Fault Parameters, https://earthquake.usgs.gov/cfusion/hazfaults_2008_search/query_main.cfm

_____, 2019, Interactive Geologic Map, http://ngmdb.usgs.gov/maps/MapView/

Yerkes, R.F., McCulloh, T.H., Schoellhamer, J.E. and Vedder, J.G., 1965, Geology of the Los Angeles Basin, California -- An Introduction: U. S. Geological Survey Professional Paper 420-A, 57 p.

APPENDIX B

EXPLORATION LOGS

GEOTECHNICAL BORING LOG LB-1

Project No.	11862.003	**Date Drilled**	8-19-19
Project	RCNA LLC Anaheim	**Logged By**	JMP
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~158'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
	0							SM	@Surface: 3" asphalt concrete over 2" aggregate base	
									Artificial Fill, undocumented (Afu):	
								SP-SM	@0.42': Silty SAND with Clay, dark brown, moist to very moist, loose/soft	
									Quaternary Young Alluvial Fan Deposits (Qyf):	
									@1.5': SAND to Silty SAND, light yellow brown, slightly moist to moist, fine to medium sand	
	5			R1	5 8 9	97	2	SP	@5': SAND, light yellow brown, moist, medium dense, fine to medium sand	
				R2	4 6 10	97	2		@7': Loose, moist, trace coarse sand, few coarse gravels	
	10			R3	4 5 9	107	16	SP-ML	@10': Sandy SILT to SAND, brown to orange brown, moist, stiff/loose, fine to medium sand	
	15			S1	4 9 12		2	SP	@15': SAND, light orange brown, slightly moist, medium dense, fine to medium sand	
	20			R4	7 10 8	97	2		@20': Orange-brown, fine sand	
	25			S2	4 10 13		2		@25': Light yellow brown	
	30									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-1

Project No.	11862.003	**Date Drilled**	8-19-19
Project	RCNA LLC Anaheim	**Logged By**	JMP
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~158'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			R5	5 17 29	98	14	SP-CL	**Quaternary Young Alluvial Fan Deposits (Qyf), continued:** @30': Interlayered SAND and CLAY, light yellow brown to olive brown, slightly moist to very moist, medium dense/very stiff, fine sand	
	35			S3	8 14 15		3	SP	@35': SAND, light yellow brown, slightly moist, medium dense, fine sand	
				R6	9 17 27	117	5	SP-ML	@38.5': SAND to Sandy SILT, light yellow brown to gray brown, moist, medium dense/very stiff, fine to coarse sand	
	40								**Total Depth: 40 feet bgs** **No groundwater encountered during drilling** **Temporary percolation well installed:** **2-inch solid PVC @ 0-30 feet bgs** **2-inch slotted PVC (0.020") @ 30-40 feet bgs** **#3 Monterey Sand @ 29-40 feet bgs** **Upon completion of percolation testing, well casing removed, boring backfilled with soil cuttings**	
	45									
	50									
	55									
	60									

SAMPLE TYPES:

- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-2

Project No.	11862.003	**Date Drilled**	8-19-19
Project	RCNA LLC Anaheim	**Logged By**	JMP
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~157'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
	0			B1				SM	@Surface: 3" asphalt concrete over artificial fill	
									Artificial Fill, undocumented (Afu):	
									@0.25': Silty SAND with Clay, brown, moist, fine to medium sand	
								SP-SM	**Quaternary Young Alluvial Fan Deposits (Qyf):**	
									@2': SAND to Silty SAND, light yellow brown, slightly moist to moist, fine to medium sand	
	5			R1	3 4 10	105	2	SP	@5': SAND, light yellow brown, slightly moist, loose, fine to coarse sand	
	10			S1	3 5 5		2		@10': Loose to medium dense	
	15			R2	6 11 23	108	2		@15': Medium dense	
				S2	5 9 8		2			
	20								**Total Depth 20 feet bgs** **No groundwater encountered during drilling** **Temporary percolation well installed:** **2-inch solid PVC @ 0-15 feet bgs** **2-inch slotted PVC (0.020") @ 15-20 feet bgs** **#3 Monterey Sand @ 14-20 feet bgs** **Upon completion of percolation testing, well casing removed, boring backfilled with soil cuttings**	
	25									
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG LB-3

Project No.	11862.003	**Date Drilled**	8-19-19
Project	RCNA LLC Anaheim	**Logged By**	JMP
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~159'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
	0			B1				ML	@Surface: 3" asphalt concrete over artificial fill	
								SP	**Artificial Fill, undocumented (Afu):**	
									@0.25': Sandy SILT, brown, moist, fine sand	
									Quaternary Young Alluvial Fan Deposits (Qyf):	
									@1': SAND, light yellow brown, slightly moist to moist, fine to medium sand	
	5			R1	3 5 7	95	3		@5': SAND, light yellow brown, slightly moist, loose, fine to medium sand	
	10			S1	1 3 4		3		@10': SAND, light orange brown, moist, loose, fine to coarse sand	
	15			R2	8 19 27	102	4		@15': SAND, light yellow brown, moist, medium dense, fine to medium sand	
				S2	4 9 6		4			
	20								**Total Depth 20 feet bgs** **No groundwater encountered during drilling** **Temporary percolation well installed:** **2-inch solid PVC @ 0-15 feet bgs** **2-inch slotted PVC (0.020") @ 15-20 feet bgs** **#3 Monterey Sand @ 14-20 feet bgs** **Upon completion of percolation testing, well casing removed, boring backfilled with soil cuttings**	
	25									
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-4

Project No.	11862.003	**Date Drilled**	8-19-19
Project	RCNA LLC Anaheim	**Logged By**	JMP
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~158'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
	0							ML-SM	@Surface: 2" asphalt concrete over artificial fill	
									Artificial Fill, undocumented (Afu):	
									@0.17': Sandy SILT to Silty SAND, brown, moist, fine sand	
								SP	**Quaternary Young Alluvial Fan Deposits (Qyf):**	
									@1.5': SAND, light yellow brown, moist, fine to medium sand, uniform	
	5			R1	3 6 11	100	3		@5': Medium dense	
				R2	4 8 11	95	3			
	10			R3	6 12 13	104	5		@10': Few fine gravels	
	15			S1	4 9 12		4			
	20			R4	11 14 9	102	4		@20': Fine sand	
	25			S2	2 4 2		23	CL-ML	@25': CLAY to Clayey SILT, olive brown, moist to very moist, medium stiff, trace fine sand, micaceous	
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG LB-4

Project No.	11862.003	**Date Drilled**	8-19-19
Project	RCNA LLC Anaheim	**Logged By**	JMP
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~158'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			R5	4 8 11	102	23	CL	**Quaternary Young Alluvial Fan Deposits (Qyf), continued:** @30': Silty CLAY, olive brown, very moist, stiff, trace fine sand, micaceous	
	35			S3	3 5 7		19	ML	@35': SILT to Clayey SILT, olive brown, moist to very moist, stiff, micaceous	
				R6	3 7 14	102	22	CL	@38.5': Silty CLAY, olive brown, very moist, stiff, micaceous	
	40								**Total Depth: 40 feet bgs** **No groundwater encountered during drilling** **Temporary percolation well installed:** **2-inch solid PVC @ 0-30 feet bgs** **2-inch slotted PVC (0.020") @ 30-40 feet bgs** **#3 Monterey Sand @ 29-40 feet bgs** **Upon completion of percolation testing, well casing removed, boring backfilled with soil cuttings**	
	45									
	50									
	55									
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-5

Project No.	11862.003	**Date Drilled**	8-19-19
Project	RCNA LLC Anaheim	**Logged By**	JMP
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~157'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
	0							ML	@Surface: 3" asphalt concrete over artificial fill	CR, EI, MD, RV
									Artificial Fill, undocumented (Afu):	
								SP	@0.25': Sandy SILT, brown, very moist, fine sand	
									Quaternary Young Alluvial Fan Deposits (Qyf):	
									@1.5': SAND, light yellow brown, slightly moist, fine to medium sand	
	5			R1	2 4 7	99	4		@5': Loose, some fine gravel	DS
				R2	7 13 16			SP-SM	@7': SAND with Silt, light yellow brown, slightly moist, medium dense, fine to medium sand	
	10			R3	6 11 13	102	5		@10': Fine sand	
	15			R4	7 14 20				@15': SAND with Silt, light yellow brown, moist, medium dense, fine to coarse sand, some fine gravel	DS
	20			S1	3 3 3		19	CL-ML	@20': Silty CLAY to Sandy SILT, olive brown, moist to very moist, medium stiff, micaceous, fine sand	
	25			R5	4 3 6				@25': Silty CLAY, olive brown, moist, medium stiff, fine sand, micaceous	CN
	30									

SAMPLE TYPES:

B	BULK SAMPLE
C	CORE SAMPLE
G	GRAB SAMPLE
R	RING SAMPLE
S	SPLIT SPOON SAMPLE
T	TUBE SAMPLE

TYPE OF TESTS:

-200	% FINES PASSING	DS	DIRECT SHEAR	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	EI	EXPANSION INDEX	SE	SAND EQUIVALENT
CN	CONSOLIDATION	H	HYDROMETER	SG	SPECIFIC GRAVITY
CO	COLLAPSE	MD	MAXIMUM DENSITY	UC	UNCONFINED COMPRESSIVE STRENGTH
CR	CORROSION	PP	POCKET PENETROMETER		
CU	UNDRAINED TRIAXIAL	RV	R VALUE		

GEOTECHNICAL BORING LOG LB-5

Project No.	11862.003	**Date Drilled**	8-19-19
Project	RCNA LLC Anaheim	**Logged By**	JMP
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~157'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	JMP

Elevation Feet	Depth Feet	Graphic Log (N / S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S2	4 7 10		13	SP-ML	**Quaternary Young Alluvial Fan Deposits (Qyf), continued:** @30': Interlayered Sandy SILT and SAND, olive brown to light yellow brown, moist, very stiff, medium dense, fine sand	
	35			R6	11 20 31	99	2	SP	@35': SAND, light yellow brown, slightly moist, dense, fine sand	
	40			S3	7 13 15		5		@40': Medium dense	
	45			R7	12 21 35	106	4		@45': Dense, fine to coarse sand	
	50			S4	9 12 16		5		@50': Medium dense, fine sand	
	55								**Total Depth 51.5 feet bgs** **No groundwater encountered during drilling** **Boring backfilled with soil cuttings** **Bentonite plug placed in bottom of hole and near surface** **Surface patched with asphalt concrete**	
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-6

Project No.	11862.003	**Date Drilled**	8-20-19
Project	RCNA LLC Anaheim	**Logged By**	KMD
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~155'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	KMD

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
	0								@Surface: 3" asphalt concrete over 5" aggregate base	
				B1				SM	**Artificial Fill, undocumented (Afu):** @0.67': Silty SAND, dark brown, moist, fine sand, some fine to medium gravels	
								SP-SM	**Quaternary Young Alluvial Fan Deposits (Qyf):** @2': SAND with Silt to Silty SAND, yellow brown, moist, fine to medium sand, some coarse sand, some fine to medium subround gravels, slightly micaceous	
	5			R1	4 5 8	98	3	SP	@5': SAND, tan, moist, medium dense, fine to medium sand, some coarse sand, few trace fine gravels, micaceous	
				R2	6 11 16	101	5		@7': Tan-brown, fine sand, few medium sand, some oxidation staining, weakly bedded to laminated, coarsening with depth	
	10			R3	5 3 5	98	24	ML	@10.75': SILT with Clay, olive, very moist, stiff, low plasticity, oxidized, some medium sand	
	15			S1	3 6 8		2	SP	@15': SAND, tan, moist, medium dense, medium sand, some fine and coarse sand, trace fine gravels, few to trace silt	
	20			R4	7 12 8	109	10	SM	@20': Silty SAND, olive, moist to very moist, medium dense, very fine to fine sand, laminated	
	25			S2	4 6 2		8	SP CL-ML	@25': SAND, olive brown, moist, medium dense, very fine to fine sand, few medium to coarse sand, trace fine gravels, some to few silt @26': Sandy Silty CLAY, olive, moist to very moist, fine grained sand, some oxidized laminations	
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-6

Project No.	11862.003	**Date Drilled**	8-20-19
Project	RCNA LLC Anaheim	**Logged By**	KMD
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~155'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	KMD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			R5	10 17 27	107	5	SP	**Quaternary Young Alluvial Fan Deposits (Qyf), continued:** @30': SAND, tan/brown, very moist, dense, fine sand, some medium sand, few silt	
	35			S3	5 10 14		2		@35': SAND, pale tan, slightly moist to moist, medium dense, fine sand, some medium sand, few coarse sand, trace fine gravels, micaceous, few to trace silt	
	40			R6	19 25 43	109	3		@40': Moist, very dense, fine to medium sand, few coarse sand	
	45			S4	6 6 8		19		@45': Medium dense	
								ML	@45.83': SILT, variegated olive and red brown, moist, nonplastic, laminated, some oxidized laminations, few interlaminations of fine sand	
	50			R7	15 23 32	105	6	SP	@50': SAND, pale tan, very moist, dense, medium to coarse sand, some fine sand with lainations of sandy SILT, dark olive, very moist, fine sand, stiff	
	55								**Total Depth 51.5 feet bgs** **No groundwater encountered during drilling** **Boring backfilled with soil cuttings** **Bentonite plug placed in bottom of hole and near surface** **Surface patched with asphalt concrete**	
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-7

Project No.	11862.003	**Date Drilled**	8-20-19
Project	RCNA LLC Anaheim	**Logged By**	KMD
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~155'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	KMD

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
		N S							*This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	
	0								@Surface: 4" asphalt concrete over 6" aggregate base	
				B1				SM	**Artificial Fill, undocumented (Afu):** @0.83': Silty SAND with Clay, dark brown, moist, fine to medium sand, fine to coarse gravels	CR, EI, MD, RV
								SP	**Quaternary Young Alluvial Fan Deposits (Qyf):** @2.5': SAND with Silt, pale brown to tan, moist, fine to medium sand, some coarse sand	
	5			R1	6 10 7			SP-SM	@5': SAND, pale tan, slightly moist to moist, medium dense, fine sand, few medium sand, trace silt, micaceous	DS
				R2	6 10 15	101	3		@7.5': Moist, medium to coarse sand, trace fine gravel, fining with depth to fine to medium sand, few coarse sand	
	10			R3	5 9 11			SP	@10': SAND, light yellow brown, slightly moist, medium dense, coarsening to medium to coarse sand and trace fine gravels	DS
	15			R4	5 11 11	101	2		@15': Increase in grain size to coarse sand, some medium sand	
	20			S1	4 6 4		15	SM-CL	@20': Silty SAND with Clay, medium olive, very moist, medium dense, fine sand, slightly micaceous, grades to silty CLAY with sand, olive, very moist, stiff, low plasticity, some fine sand	
	25			R5	10 16 9			SM	@25': Silty SAND, tan, very moist, medium dense, fine sand, some medium to coarse sand	CN
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

GEOTECHNICAL BORING LOG LB-7

Project No.	11862.003	**Date Drilled**	8-20-19
Project	RCNA LLC Anaheim	**Logged By**	KMD
Drilling Co.	Martini Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	~155'
Location	1122 N. Anaheim Boulevard, Anaheim, CA	**Sampled By**	KMD

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	30			S2	3 8 9		12	CL	**Quaternary Young Alluvial Fan Deposits (Qyf), continued:** @30': Sandy CLAY, dark olive, very moist, stiff, fine sand, medium to low plasticity, grades to Clayey Silty SAND, dark olive, very moist, medium dense, fine sand, some medium sand, then SAND, light brown, very moist, fine to medium sand, some silt	
								SC-SM		
								SP		
	35			R6	10 21 32	104	5		@35': SAND, pale tan, very moist, dense, fine sand, few medium sand, grades to medium to coarse sand at bottom of sample	
	40			S3	7 13 15		5		@40': Fine sand, few medium sand	
	45			R7	11 8 15	97	22			
								ML	@46': Becoming SILT, variegated olive and red brown, stiff, moist to very moist, nonplastic, laminated with oxidated laminations, very micaceous laminations	
	50			S4	7 13 13		7	SP	@50': SAND, pale tan to gray, slightly moist to moist, medium dense, very fine to fine sand, few silt, coarsening slightly with depth, single coarse gravel in sampler shoe	
	55								**Total Depth 51.5 feet bgs** **No groundwater encountered during drilling** **Boring backfilled with soil cuttings** **Bentonite plug placed in bottom of hole and near surface** **Surface patched with asphalt concrete**	
	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

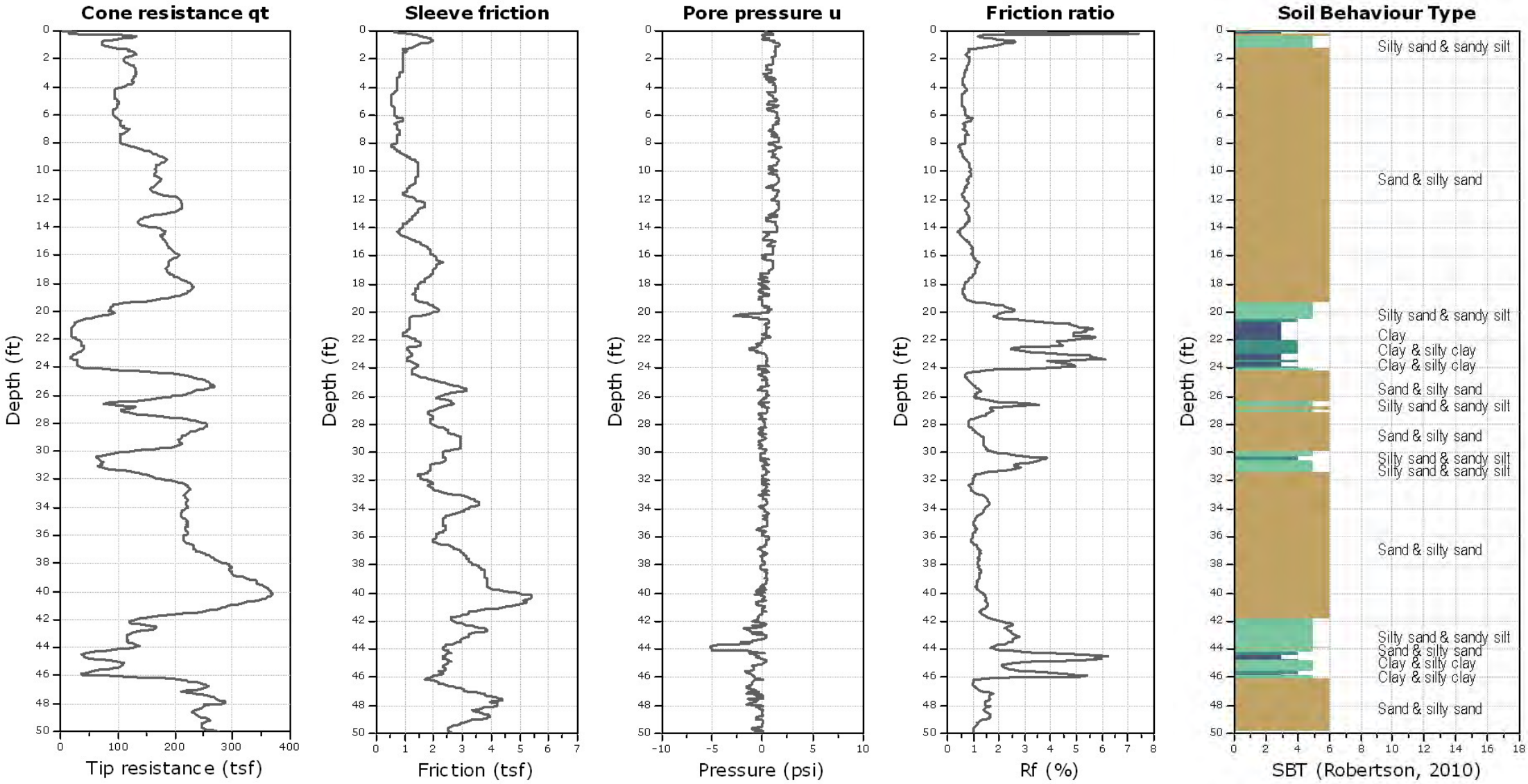
*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT-1

Project: **Leighton & Asscociates/RPP Anaheim**
Total depth: 50.28 ft, Date: 12/6/2017

Location: **1041-1071 N. Kemp St & 1122 N. Anaheim Blvd Anaheim, CA**
Cone Type: Vertek

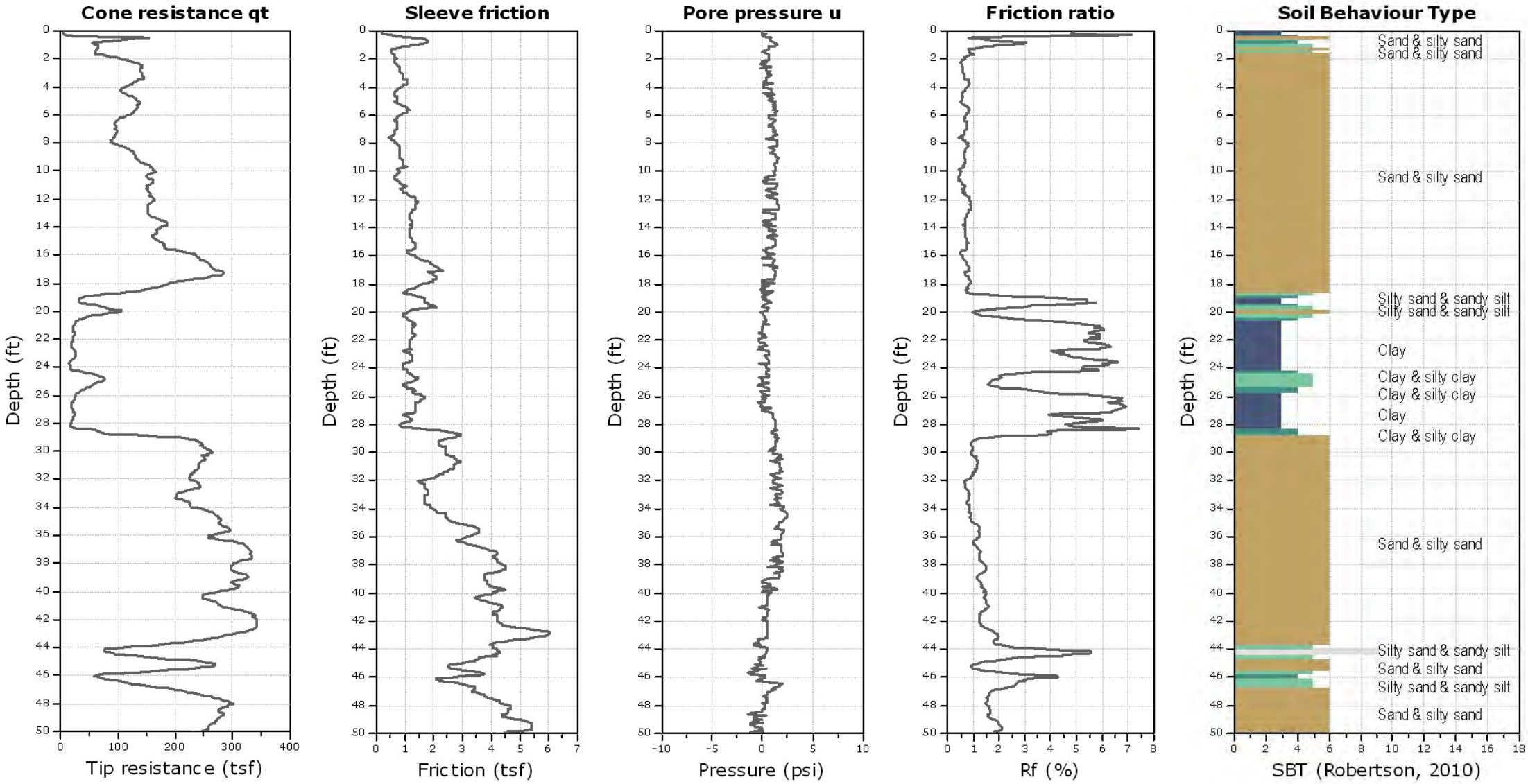


Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT-2

Project: **Leighton & Asscociates/RPP Anaheim**
Total depth: 50.40 ft, Date: 12/6/2017

Location: **1041-1071 N. Kemp St & 1122 N. Anaheim Blvd Anaheim, CA**
Cone Type: Vertek



N., Kemp St & N. Anaheim Blvd
Anaheim, CA

CPT Shear Wave Measurements

CPT-2	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
	10.07	9.07	10.36	17.14	604.25	
	20.11	19.11	19.75	29.28	674.63	774.00
	30.28	29.28	29.70	43.76	678.79	687.19
	40.12	39.12	39.44	53.26	740.49	1024.67
	50.07	49.07	49.32	63.28	779.46	986.61

Shear Wave Source Offset = 5 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

APPENDIX C

PERCOLATION TEST DATA

Leighton

Boring Percolation Test Data Sheet

Project Number:	11862.003	**Test Hole Number:**	LB-1
Project Name:	RCNA Anaheim	**Date Excavated:**	8/19/2019
Earth Description:	Alluvium	**Date Tested:**	8/20/2019
Liquid Description:	Tap water	**Depth of boring (ft):**	40
Tested By:	JMP	**Radius of boring (in):**	4
Time Interval Standard		**Radius of casing (in):**	1
Start Time for Pre-Soak:	7:34	**Length of slotted of casing (ft):**	10
Start Time for Standard:	8:35	**Depth to Initial Water Depth (ft):**	30
Standard Time Interval		**Porosity of Annulus Material, *n* :**	0.35
Between Readings, mins:	10	**Bentonite Plug at Bottom:** No	

Percolation Data

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H_0/H_f (in.)	Total Water Drop, Δd (in.)	Percolation Rate (min./in.)	Infiltration Rate (in./hr.)
P1	7:34	25	30.00	120.0	91.2	0.27	2.24
	7:59		37.60	28.8			
P2	8:02	25	30.00	120.0	79.8	0.31	1.82
	8:27		36.65	40.2			
1	8:35	10	30.00	120.0	78.4	0.13	4.44
	8:45		36.53	41.6			
2	8:46	10	30.00	120.0	78.1	0.13	4.42
	8:56		36.51	41.9			
3	8:57	10	30.00	120.0	77.6	0.13	4.38
	9:07		36.47	42.4			
4	9:09	10	30.00	120.0	77.0	0.13	4.33
	9:19		36.42	43.0			
5	9:20	10	30.00	120.0	76.6	0.13	4.29
	9:30		36.38	43.4			
6	9:32	10	30.00	120.0	75.5	0.13	4.20
	9:42		36.29	44.5			
7	9:44	10	30.00	120.0	75.8	0.13	4.23
	9:54		36.32	44.2			
8	9:55	10	30.00	120.0	75.6	0.13	4.21
	10:05		36.30	44.4			
9	10:07	10	30.00	120.0	75.5	0.13	4.20
	10:17		36.29	44.5			
10	10:20	10	30.00	120.0	75.2	0.13	4.18
	10:30		36.27	44.8			

Infiltration Rate (I) = Discharge Volume/Surface Area of Test Section/Time Interval

Infiltration Rate, I (Last Reading) = 4.18 in./hr.

Boring Percolation Test Data Sheet

Project Number:	11862.003	**Test Hole Number:**	LB-2
Project Name:	RCNA Anaheim	**Date Excavated:**	8/19/2019
Earth Description:	Alluvium	**Date Tested:**	8/20/2019
Liquid Description:	Tap water	**Depth of boring (ft):**	20
Tested By:	JMP	**Radius of boring, r (in):**	4
		Radius of casing (in):	1
		Length of slotted of casing (ft):	5
		Depth to Initial Water Depth (ft):	15
		Porosity of Annulus Material, *n* :	0.35
		Bentonite Plug at Bottom:	No

Field Percolation Data

Reading	Time	Time Interval, Δt (minutes)	Depth to Water (feet bgs)	Water Height, H (inches)	Cumulative Water Volume Delivered (gallons)
1	10:38	-	-	-	-
2	10:43	5	17.83	26.0	57.7
3	10:48	5	17.62	28.6	115.4
4	10:53	5	17.54	29.5	173.1
5	10:58	5	17.47	30.4	230.8
6	11:03	5	17.45	30.6	288.5
7	11:08	5	17.39	31.3	346.2
8	11:13	5	17.30	32.4	403.9
9	11:18	5	17.25	33.0	461.6
10	11:23	5	17.20	33.6	519.3
11	11:28	5	17.18	33.8	577.0
12	11:33	5	17.16	34.1	634.7
13	11:38	5	17.13	34.4	692.4
14	11:43	5	17.14	34.3	750.1
15	11:48	5	17.11	34.7	807.8
16	11:53	5	17.09	34.9	865.5
17	11:58	5	17.08	35.0	923.2
18	12:03	5	17.06	35.3	980.9
19	12:08	5	17.05	35.4	1038.6
20	12:13	5	17.04	35.5	1096.3
21	12:18	5	17.03	35.6	1154.0
22	12:23	5	17.00	36.0	1211.7
23	12:28	5	17.01	35.9	1269.4
24	12:33	5	16.99	36.1	1327.1
25	12:38	5	16.98	36.2	1384.8

High Flowrate Percolation Test Calculation

Total Volume of Water Delivered (gallons)	1384.8
Total Volume of Water Delivered (cubic inches)	319888.8
Average Water Height (inches)	33.5
Average Percolation Surface Area (cubic Inches)	891.0
Duration of Test (minutes)	120
Duration of Test (hours)	2.00

$$\text{Measured Infiltration Rate} = (\text{Total Volume})/(\text{Test Duration})/(\text{Surface Area})$$

Measured Infiltration Rate (inches per hour) = 179.5

Boring Percolation Test Data Sheet

Project Number:	11862.003	**Test Hole Number:**	LB-3
Project Name:	RCNA Anaheim	**Date Excavated:**	8/19/2019
Earth Description:	Alluvium	**Date Tested:**	8/21/2019
Liquid Description:	Tap water	**Depth of boring (ft):**	20
Tested By:	JMP	**Radius of boring, r (in):**	4
		Radius of casing (in):	1
		Length of slotted of casing (ft):	5
		Depth to Initial Water Depth (ft):	15
		Porosity of Annulus Material, *n* :	0.35
		Bentonite Plug at Bottom:	No

Field Percolation Data

Reading	Time	Time Interval, Δt (minutes)	Depth to Water (feet bgs)	Water Height, H (inches)	Cumulative Water Volume Delivered (gallons)
1	7:20	-	-	-	-
2	7:25	5	16.45	42.6	39.2
3	7:30	5	16.20	45.6	78.4
4	7:35	5	15.96	48.5	117.6
5	7:40	5	15.83	50.0	156.8
6	7:45	5	15.79	50.5	196.0
7	7:50	5	15.90	49.2	235.2
8	7:55	5	15.64	52.3	274.4
9	8:00	5	15.59	52.9	313.6
10	8:05	5	15.63	52.4	352.8
11	8:10	5	15.50	54.0	392.0
12	8:15	5	15.47	54.4	431.2
13	8:20	5	15.57	53.2	470.4
14	8:25	5	15.42	55.0	509.6
15	8:30	5	15.40	55.2	548.8
16	8:35	5	15.37	55.6	588.0
17	8:40	5	15.34	55.9	627.2
18	8:45	5	15.31	56.3	666.4
19	8:50	5	15.28	56.6	705.6
20	8:55	5	15.25	57.0	744.8
21	9:00	5	15.25	57.0	784.0
22	9:05	5	15.25	57.0	823.2
23	9:10	5	15.20	57.6	862.4
24	9:15	5	15.18	57.8	901.6
25	9:20	5	15.18	57.8	940.8
26	9:25	5	15.15	58.2	980.0
27	9:30	5	15.13	58.4	1019.2
28	9:35	5	15.12	58.6	1058.4

High Flowrate Percolation Test Calculation

Total Volume of Water Delivered (gallons)	1058.4
Total Volume of Water Delivered (cubic inches)	244494.024
Average Water Height (inches)	54.1
Average Percolation Surface Area (cubic Inches)	1409.0
Duration of Test (minutes)	135
Duration of Test (hours)	2.25

$$\text{Measured Infiltration Rate} = (\text{Total Volume})/(\text{Test Duration})/(\text{Surface Area})$$

Measured Infiltration Rate (inches per hour) = 77.1

Boring Percolation Test Data Sheet

Project Number:	11862.003	**Test Hole Number:**	LB-4
Project Name:	RCNA Anaheim	**Date Excavated:**	8/19/2019
Earth Description:	Alluvium	**Date Tested:**	8/21/2019
Liquid Description:	Tap water	**Depth of boring (ft):**	40
Tested By:	KMD	**Radius of boring (in):**	4
Time Interval Standard		**Radius of casing (in):**	1
Start Time for Pre-Soak:	10:14	**Length of slotted of casing (ft):**	10
Start Time for Standard:	11:06	**Depth to Initial Water Depth (ft):**	30
Standard Time Interval		**Porosity of Annulus Material, *n* :**	0.35
Between Readings, mins:	10	**Bentonite Plug at Bottom:** No	

Percolation Data

Reading	Time	Time Interval, Δt (min.)	Initial/Final Depth to Water (ft.)	Initial/Final Water Height, H_0/H_f (in.)	Total Water Drop, Δd (in.)	Percolation Rate (min./in.)	Infiltration Rate (in./hr.)
P1	10:14	25	30.00	120.0	43.4	0.58	0.81
	10:39		33.62	76.6			
P2	10:40	25	30.00	120.0	41.6	0.60	0.77
	11:05		33.47	78.4			
1	11:06	10	30.00	120.0	22.8	0.44	0.97
	11:16		31.90	97.2			
2	11:17	10	30.00	120.0	21.0	0.48	0.88
	11:27		31.75	99.0			
3	11:31	10	30.00	120.0	19.4	0.51	0.81
	11:41		31.62	100.6			
4	11:42	10	30.00	120.0	21.0	0.48	0.88
	11:52		31.75	99.0			
5	11:53	10	30.00	120.0	19.0	0.53	0.79
	12:03		31.58	101.0			
6	12:06	10	30.00	120.0	21.0	0.48	0.88
	12:16		31.75	99.0			
7	12:17	10	30.00	120.0	21.0	0.48	0.88
	12:27		31.75	99.0			
8	12:29	10	30.00	120.0	19.7	0.51	0.82
	12:39		31.64	100.3			
9	12:41	10	30.00	120.0	19.8	0.51	0.83
	12:51		31.65	100.2			
10	12:53	10	30.00	120.0	19.3	0.52	0.81
	13:03		31.61	100.7			
11	13:05	10	30.00	120.0	19.4	0.51	0.81
	13:15		31.62	100.6			

Infiltration Rate (I) = Discharge Volume/Surface Area of Test Section/Time Interval

Infiltration Rate, I (Last Reading) = **0.81** **in./hr.**

APPENDIX D

LABORATORY TEST RESULTS

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	RCNA Anaheim	Tested By:	O. Figueroa	Date:	09/12/19
Project No.:	11862.003	Input By:	J. Ward	Date:	09/17/19
Boring No.:	LB-5	Depth (ft.):	0-5		
Sample No.:	B1				
Soil Identification:	Brown poorly-graded sand with silt (SP-SM)				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03320

Ram Weight = 10 lb.; Drop = 18 in.

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3650	3697	3728	3746		
Weight of Mold (g)	1817	1817	1817	1817		
Net Weight of Soil (g)	1833	1880	1911	1929		
Wet Weight of Soil + Cont. (g)	378.3	434.7	463.5	496.2		
Dry Weight of Soil + Cont. (g)	353.9	400.5	416.2	436.6		
Weight of Container (g)	38.2	62.5	39.2	38.7		
Moisture Content (%)	7.73	10.12	12.55	14.98		
Wet Density (pcf)	121.7	124.8	126.9	128.1		
Dry Density (pcf)	113.0	113.4	112.8	111.4		

Maximum Dry Density (pcf) 113.4 **Optimum Moisture Content (%)** 9.8

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

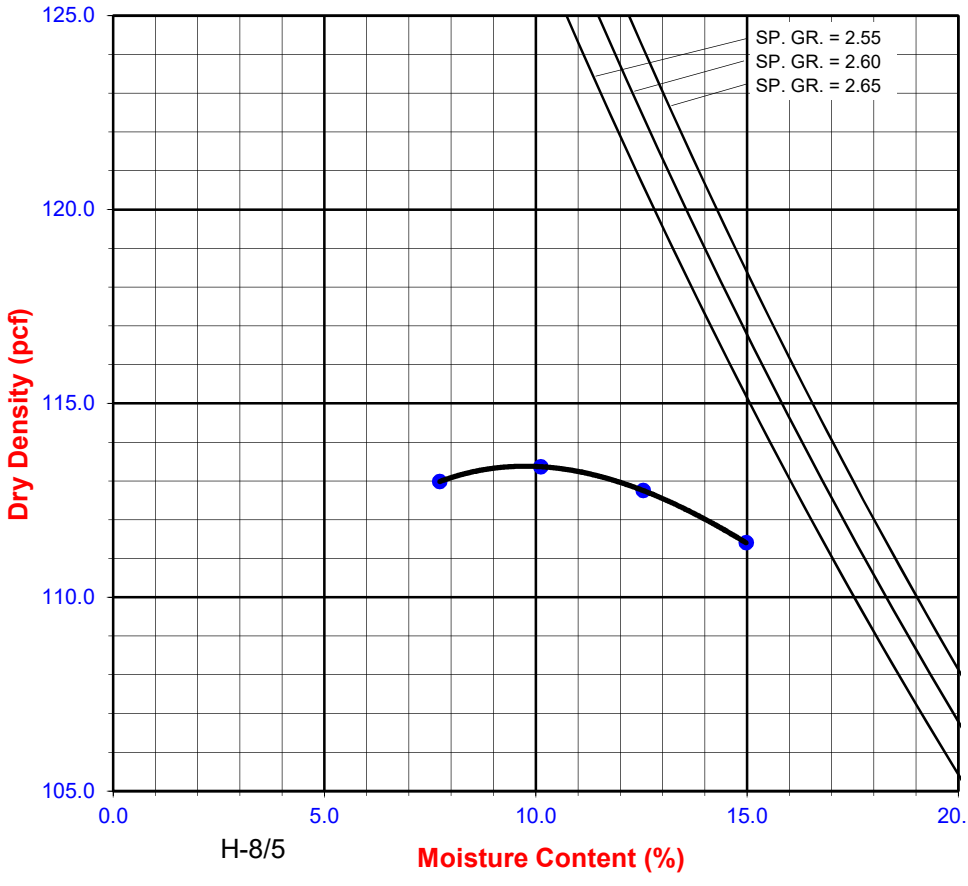
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



H-8/5

MX LB-5, B1 @ 0-5

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	RCNA Anaheim	Tested By:	R. Manning	Date:	09/16/19
Project No.:	11862.003	Input By:	J. Ward	Date:	09/17/19
Boring No.:	LB-7	Depth (ft.):	0-5		
Sample No.:	B1				
Soil Identification:	Light olive brown poorly-graded sand with silt (SP-SM)				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03320 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3776	3906	3851			
Weight of Mold (g)	1817	1817	1817			
Net Weight of Soil (g)	1959	2089	2034			
Wet Weight of Soil + Cont. (g)	499.8	425.2	481.9			
Dry Weight of Soil + Cont. (g)	464.3	387.4	429.3			
Weight of Container (g)	39.3	39.0	37.7			
Moisture Content (%)	8.35	10.85	13.43			
Wet Density (pcf)	130.1	138.7	135.1			
Dry Density (pcf)	120.1	125.1	119.1			

Maximum Dry Density (pcf) 125.1 **Optimum Moisture Content (%)** 10.8

PROCEDURE USED

[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

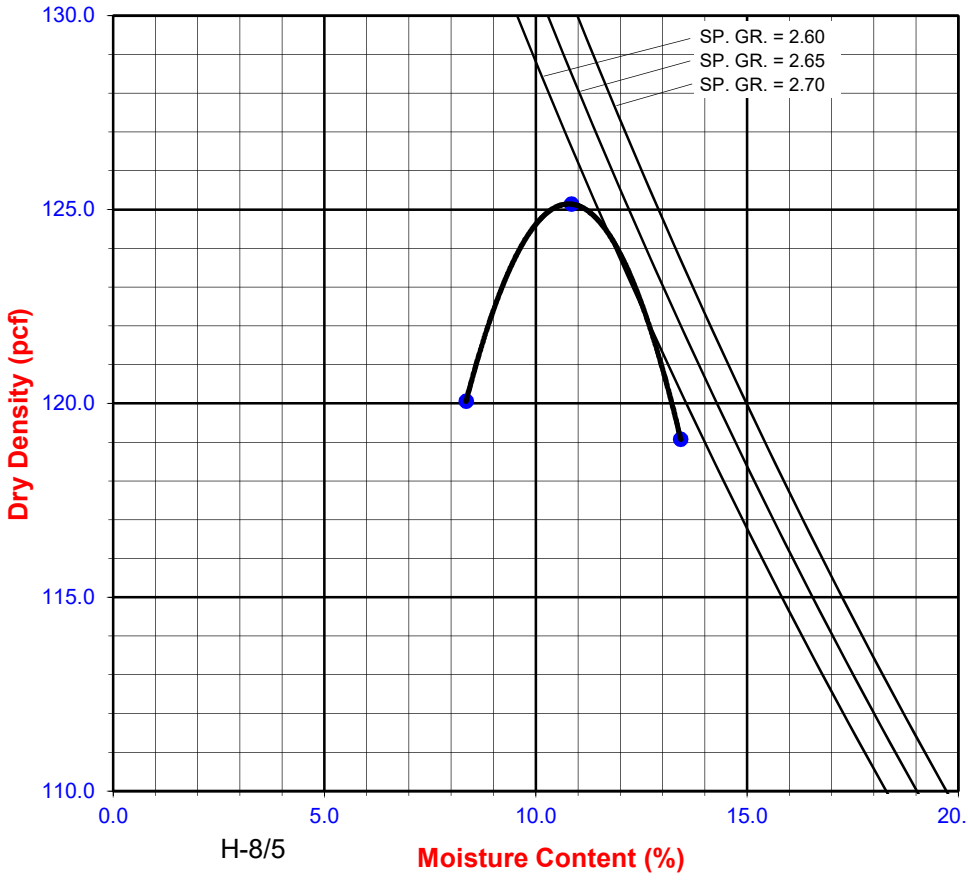
[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



H-8/5

MX LB-7, B1 @ 0-5

Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	RCNA Anaheim	Tested By:	S. Felter	Date:	09/11/19
Project No.:	11862.003	Checked By:	J. Ward	Date:	09/17/19
Boring No.:	LB-5	Depth (ft.):	0-5		
Sample No.:	B1				
Soil Identification:	Brown poorly-graded sand with silt (SP-SM)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.0000
Wt. Comp. Soil + Mold	(g)	567.20	394.46
Wt. of Mold	(g)	178.90	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	787.90	573.36
Dry Wt. of Soil + Cont.	(g)	713.10	530.22
Wt. of Container	(g)	0.00	178.90
Moisture Content	(%)	10.49	12.28
Wet Density	(pcf)	117.1	119.0
Dry Density	(pcf)	106.0	106.0
Void Ratio		0.590	0.591
Total Porosity		0.371	0.371
Pore Volume	(cc)	76.8	76.9
Degree of Saturation (%) [S meas]		**48.0**	56.1

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
09/11/19	8:00	1.0	0	0.4760
09/11/19	8:10	1.0	10	0.4760
Add Distilled Water to the Specimen				
09/11/19	11:13	1.0	183	0.4760
09/12/19	6:45	1.0	1355	0.4760
09/12/19	7:43	1.0	1413	0.4760

Expansion Index (EI meas) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**0**

Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	RCNA Anaheim	Tested By:	S. Felter	Date:	09/11/19
Project No.:	11862.003	Checked By:	J. Ward	Date:	09/17/19
Boring No.:	LB-7	Depth (ft.):	0-5		
Sample No.:	B1				
Soil Identification:	Light olive brown poorly-graded sand with silt (SP-SM)				

Dry Wt. of Soil + Cont. (g)	1000.00
Wt. of Container No. (g)	0.00
Dry Wt. of Soil (g)	1000.00
Weight Soil Retained on #4 Sieve	0.00
Percent Passing # 4	100.00

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0015
Wt. Comp. Soil + Mold (g)	584.60	418.59
Wt. of Mold (g)	184.60	0.00
Specific Gravity (Assumed)	2.70	2.70
Container No.	O	O
Wet Wt. of Soil + Cont. (g)	798.10	603.19
Dry Wt. of Soil + Cont. (g)	725.50	548.06
Wt. of Container (g)	0.00	184.60
Moisture Content (%)	10.01	15.17
Wet Density (pcf)	120.7	126.1
Dry Density (pcf)	109.7	109.5
Void Ratio	0.537	0.540
Total Porosity	0.349	0.351
Pore Volume (cc)	72.3	72.7
Degree of Saturation (%) [S meas]	**50.3**	75.8

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
09/11/19	8:25	1.0	0	0.3955
09/11/19	8:35	1.0	10	0.3955
Add Distilled Water to the Specimen				
09/11/19	11:12	1.0	157	0.3960
09/12/19	6:46	1.0	1331	0.3970
09/12/19	7:44	1.0	1389	0.3970

Expansion Index (EI meas) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**2**

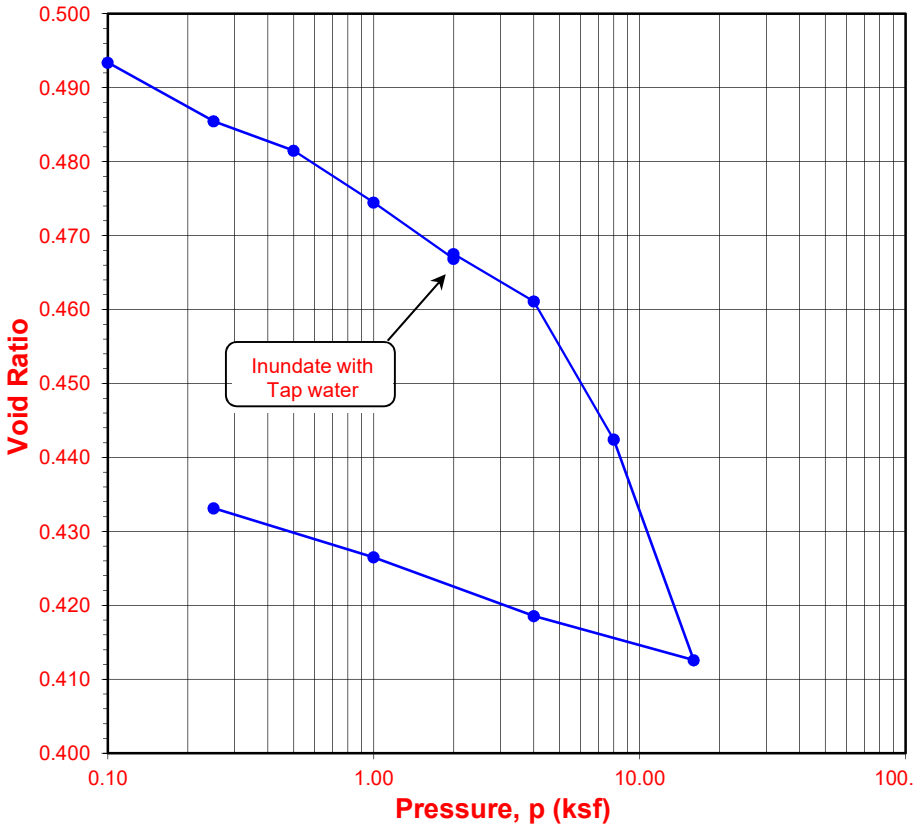
Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Project Name:	RCNA Anaheim		Tested By:	G. Bathala	Date: 08/26/19
Project No.:	11862.003		Checked By:	J. Ward	Date: 09/17/19
Boring No.:	LB-5		Depth (ft.):	25.0	
Sample No.:	R5		Sample Type:	Ring	
Soil Identification:	Olive brown silty clay (CL-ML)				

Sample Diameter (in.)	2.415
Sample Thickness (in.)	1.000
Wt. of Sample + Ring (g)	203.51
Weight of Ring (g)	44.25
Height after consol. (in.)	0.9587
Before Test	
Wt.Wet Sample+Cont. (g)	211.12
Wt.of Dry Sample+Cont. (g)	188.54
Weight of Container (g)	59.24
Initial Moisture Content (%)	17.5
Initial Dry Density (pcf)	112.8
Initial Saturation (%)	95
Initial Vertical Reading (in.)	0.3139
After Test	
Wt.of Wet Sample+Cont. (g)	240.93
Wt. of Dry Sample+Cont. (g)	219.71
Weight of Container (g)	39.71
Final Moisture Content (%)	15.63
Final Dry Density (pcf)	117.8
Final Saturation (%)	98
Final Vertical Reading (in.)	0.2693
Specific Gravity (assumed)	2.70
Water Density (pcf)	62.43

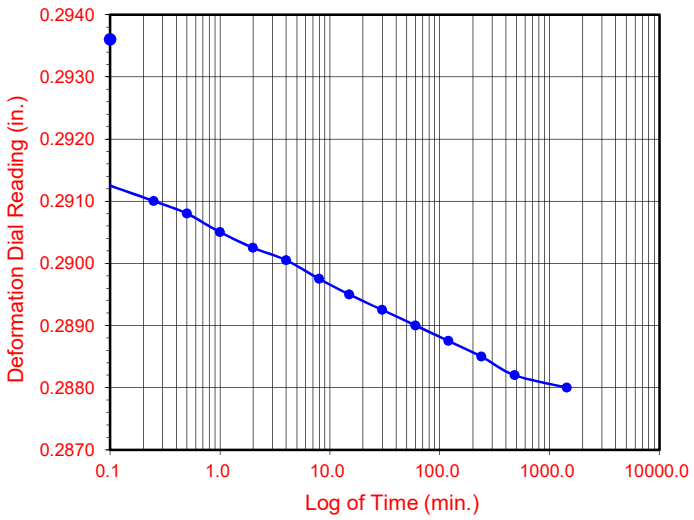


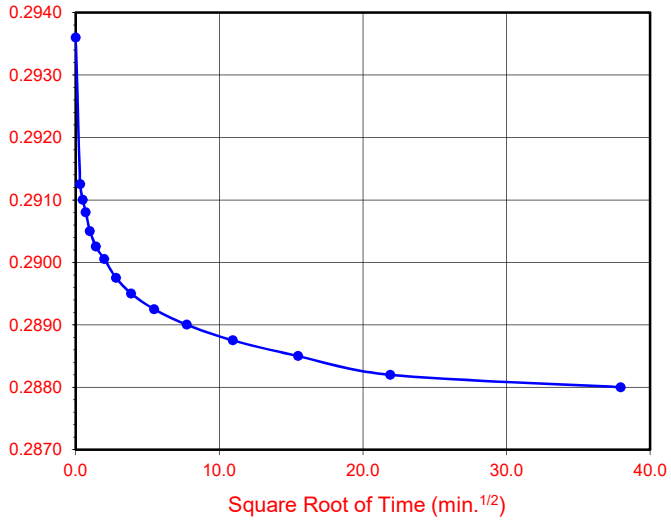
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.3129	0.9990	0.00	0.10	0.493	0.10
0.25	0.3073	0.9934	0.03	0.66	0.485	0.63
0.50	0.3044	0.9905	0.06	0.95	0.482	0.89
1.00	0.2992	0.9853	0.11	1.48	0.474	1.37
2.00	0.2932	0.9793	0.20	2.08	0.467	1.88
2.00	0.2936	0.9797	0.20	2.03	0.468	1.83
4.00	0.2880	0.9741	0.33	2.59	0.461	2.26
8.00	0.2740	0.9601	0.48	3.99	0.442	3.51
16.00	0.2522	0.9383	0.67	6.18	0.413	5.51
4.00	0.2579	0.9440	0.50	5.60	0.419	5.10
1.00	0.2643	0.9504	0.39	4.97	0.426	4.58
0.25	0.2693	0.9554	0.33	4.46	0.433	4.13

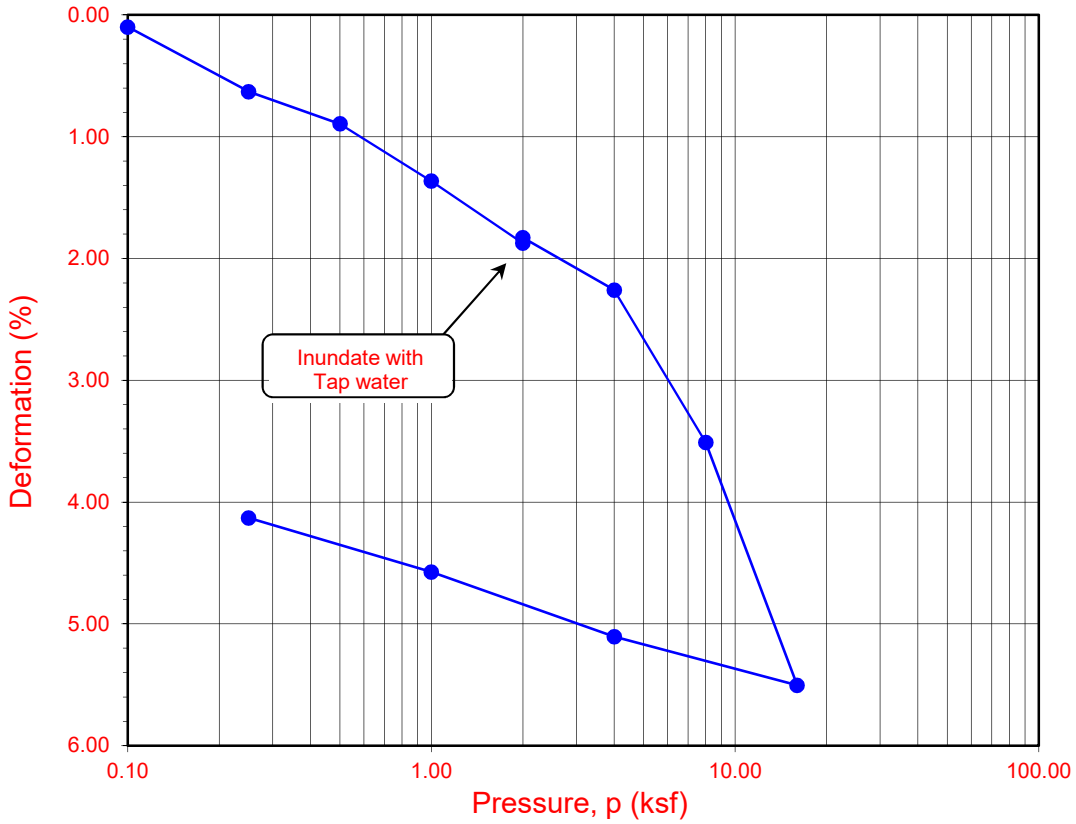
Time Readings @ 4.0 ksf

Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)
8/29/19	8:00:00	0.0	0.0	0.2936
8/29/19	8:00:06	0.1	0.3	0.2913
8/29/19	8:00:15	0.2	0.5	0.2910
8/29/19	8:00:30	0.5	0.7	0.2908
8/29/19	8:01:00	1.0	1.0	0.2905
8/29/19	8:02:00	2.0	1.4	0.2903
8/29/19	8:04:00	4.0	2.0	0.2901
8/29/19	8:08:00	8.0	2.8	0.2898
8/29/19	8:15:00	15.0	3.9	0.2895
8/29/19	8:30:00	30.0	5.5	0.2893
8/29/19	9:00:00	60.0	7.7	0.2890
8/29/19	10:00:00	120.0	11.0	0.2888
8/29/19	12:00:00	240.0	15.5	0.2885
8/29/19	16:00:00	480.0	21.9	0.2882
8/30/19	8:00:00	1440.0	37.9	0.2880

Time Readings @ 4.0 ksf







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-5	**R5**	**25.0**	**17.5**	**15.6**	**112.8**	**117.8**	**0.495**	**0.433**	**95**	**98**

Soil Identification: Olive brown silty clay (CL-ML)

Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 11862.003

RCNA Anaheim

09-19

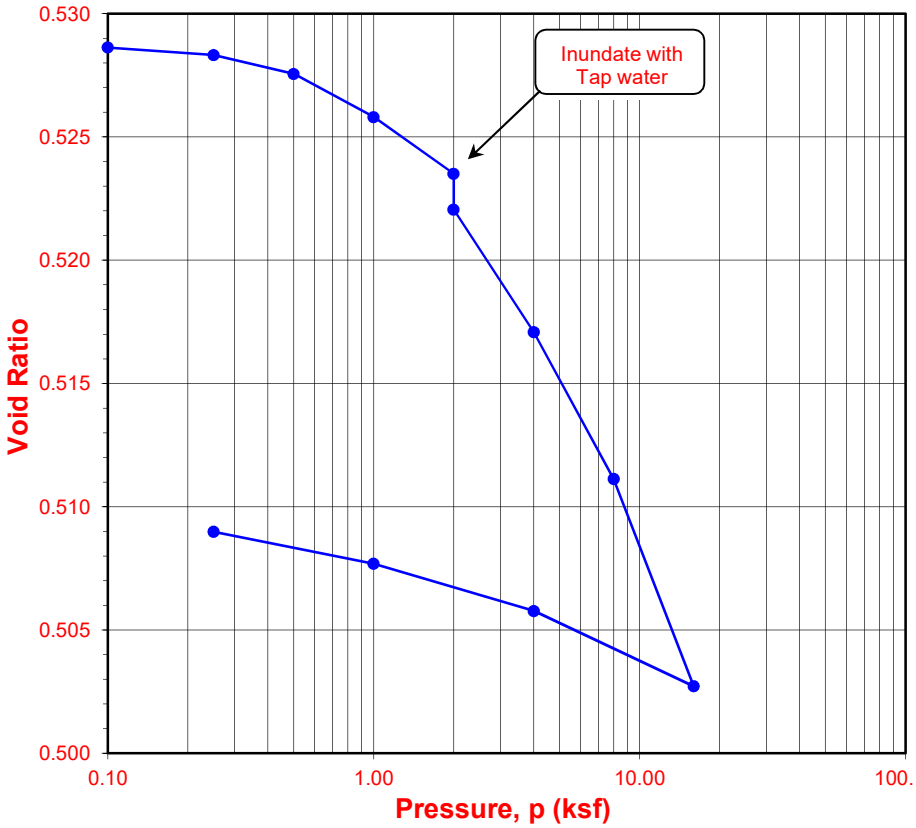
Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Project Name:	RCNA Anaheim	Tested By: G. Bathala	Date: 08/26/19
Project No.:	11862.003	Checked By: J. Ward	Date: 09/17/19
Boring No.:	LB-7	Depth (ft.): 25.0	
Sample No.:	R5	Sample Type: Ring	
Soil Identification:	Light olive brown silty sand (SM)		

Sample Diameter (in.)	2.415
Sample Thickness (in.)	1.000
Wt. of Sample + Ring (g)	179.28
Weight of Ring (g)	41.33
Height after consol. (in.)	0.9870
Before Test	
Wt.Wet Sample+Cont. (g)	173.25
Wt.of Dry Sample+Cont. (g)	168.71
Weight of Container (g)	56.85
Initial Moisture Content (%)	4.1
Initial Dry Density (pcf)	110.3
Initial Saturation (%)	21
Initial Vertical Reading (in.)	0.2844
After Test	
Wt.of Wet Sample+Cont. (g)	270.66
Wt. of Dry Sample+Cont. (g)	249.36
Weight of Container (g)	77.40
Final Moisture Content (%)	16.31
Final Dry Density (pcf)	110.1
Final Saturation (%)	83
Final Vertical Reading (in.)	0.2677
Specific Gravity (assumed)	2.70
Water Density (pcf)	62.43

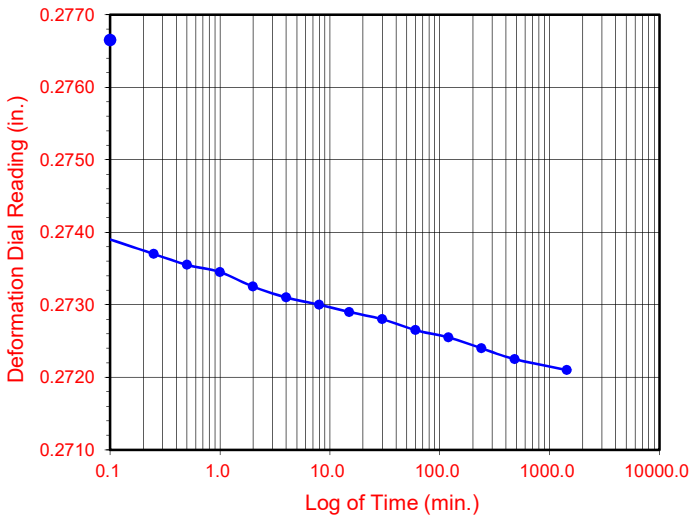


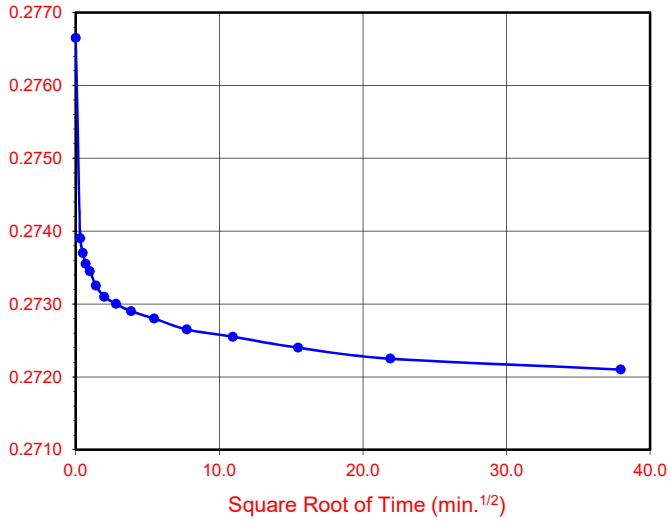
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.2843	0.9999	0.00	0.01	0.529	0.01
0.25	0.2834	0.9990	0.07	0.11	0.528	0.03
0.50	0.2823	0.9979	0.13	0.21	0.528	0.08
1.00	0.2803	0.9959	0.21	0.41	0.526	0.20
2.00	0.2776	0.9932	0.33	0.68	0.524	0.35
2.00	0.2767	0.9923	0.33	0.77	0.522	0.44
4.00	0.2721	0.9877	0.46	1.23	0.517	0.77
8.00	0.2664	0.9820	0.64	1.80	0.511	1.16
16.00	0.2587	0.9743	0.86	2.57	0.503	1.71
4.00	0.2625	0.9781	0.68	2.19	0.506	1.51
1.00	0.2656	0.9812	0.50	1.89	0.508	1.39
0.25	0.2677	0.9833	0.37	1.67	0.509	1.30

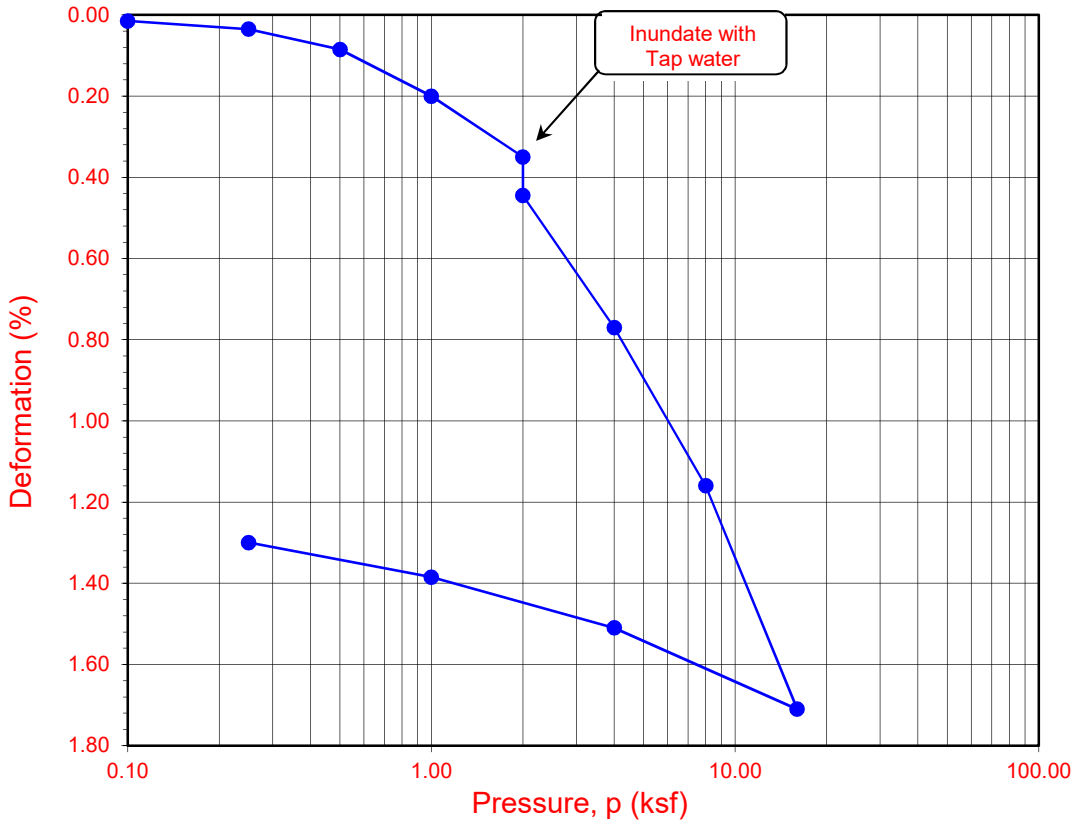
Time Readings @ 4.0 ksf

Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)
8/29/19	8:05:00	0.0	0.0	0.2767
8/29/19	8:05:06	0.1	0.3	0.2739
8/29/19	8:05:15	0.2	0.5	0.2737
8/29/19	8:05:30	0.5	0.7	0.2736
8/29/19	8:06:00	1.0	1.0	0.2735
8/29/19	8:07:00	2.0	1.4	0.2733
8/29/19	8:09:00	4.0	2.0	0.2731
8/29/19	8:13:00	8.0	2.8	0.2730
8/29/19	8:20:00	15.0	3.9	0.2729
8/29/19	8:35:00	30.0	5.5	0.2728
8/29/19	9:05:00	60.0	7.7	0.2727
8/29/19	10:05:00	120.0	11.0	0.2726
8/29/19	12:05:00	240.0	15.5	0.2724
8/29/19	16:05:00	480.0	21.9	0.2723
8/30/19	8:05:00	1440.0	37.9	0.2721

Time Readings @ 4.0 ksf







Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-7	**R5**	**25.0**	**4.1**	**16.3**	**110.3**	**110.1**	**0.529**	**0.509**	**21**	**83**

Soil Identification: Light olive brown silty sand (SM)

Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 11862.003

RCNA Anaheim

09-19

Leighton

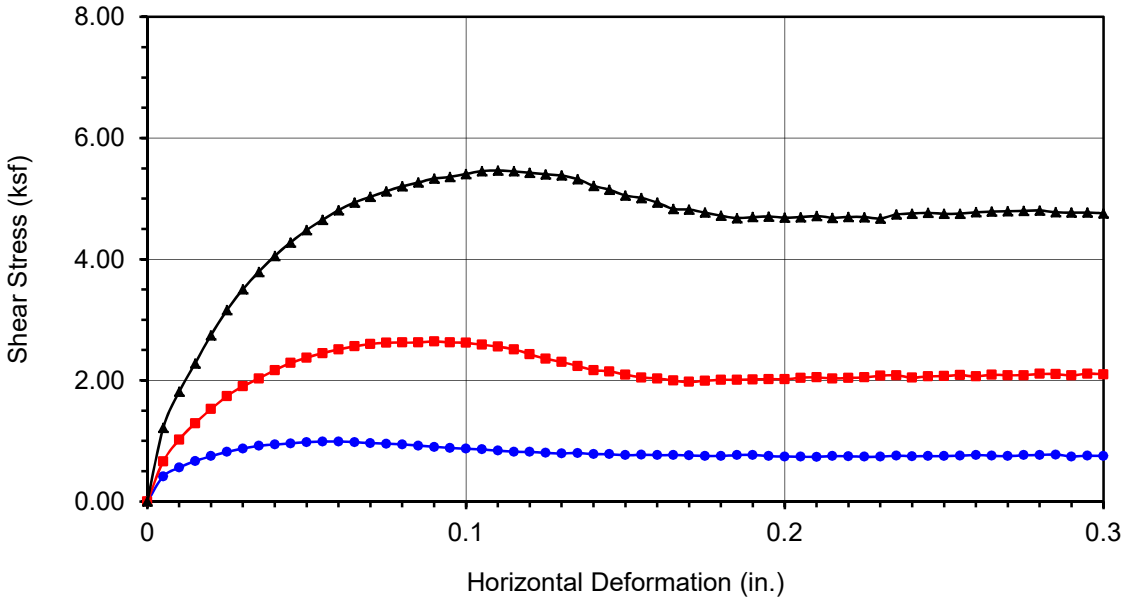
DIRECT SHEAR TEST

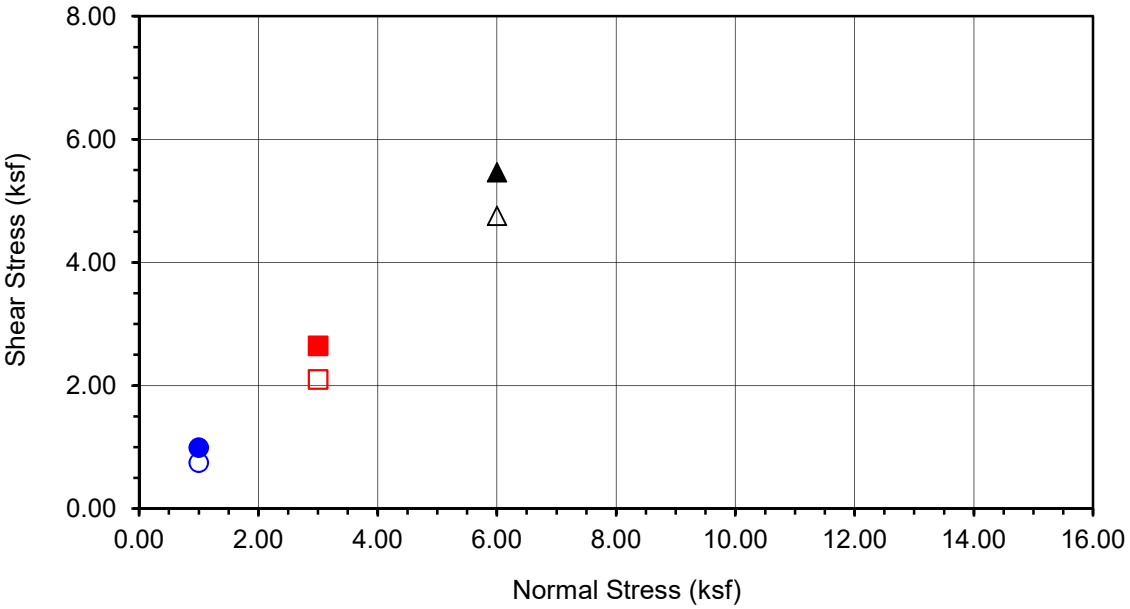
Consolidated Drained - ASTM D 3080

Project Name:	RCNA Anaheim	Tested By:	G. Bathala	Date:	09/05/19
Project No.:	11862.003	Checked By:	J. Ward	Date:	09/17/19
Boring No.:	LB-5	Sample Type:	Ring		
Sample No.:	R2	Depth (ft.):	7.0		

Soil Identification: Light olive brown poorly-graded sand with silt (SP-SM)

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	173.14	176.62	178.92
Weight of Ring(gm):	44.17	44.55	45.65
Before Shearing			
Weight of Wet Sample+Cont.(gm):	188.80	188.80	188.80
Weight of Dry Sample+Cont.(gm):	183.79	183.79	183.79
Weight of Container(gm):	57.20	57.20	57.20
Vertical Rdg.(in): Initial	0.0000	0.2521	0.2552
Vertical Rdg.(in): Final	-0.0086	0.2664	0.2765
After Shearing			
Weight of Wet Sample+Cont.(gm):	180.41	182.29	214.03
Weight of Dry Sample+Cont.(gm):	157.83	161.24	193.04
Weight of Container(gm):	37.24	39.70	69.88
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**LB-5**
Sample No.	**R2**
Depth (ft)	**7**
Sample Type: Ring	
Soil Identification: Light olive brown poorly-graded sand with silt (SP-SM)	

Normal Stress (kip/ft²)	1.000	3.000	6.000
Peak Shear Stress (kip/ft²)	● 0.990	■ 2.644	▲ 5.464
Shear Stress @ End of Test (ksf)	○ 0.748	□ 2.100	△ 4.757
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	3.96	3.96	3.96
Dry Density (pcf)	103.2	105.7	106.6
Saturation (%)	16.9	17.9	18.4
Soil Height Before Shearing (in.)	0.9914	0.9857	0.9787
Final Moisture Content (%)	18.7	17.3	17.0

Leighton

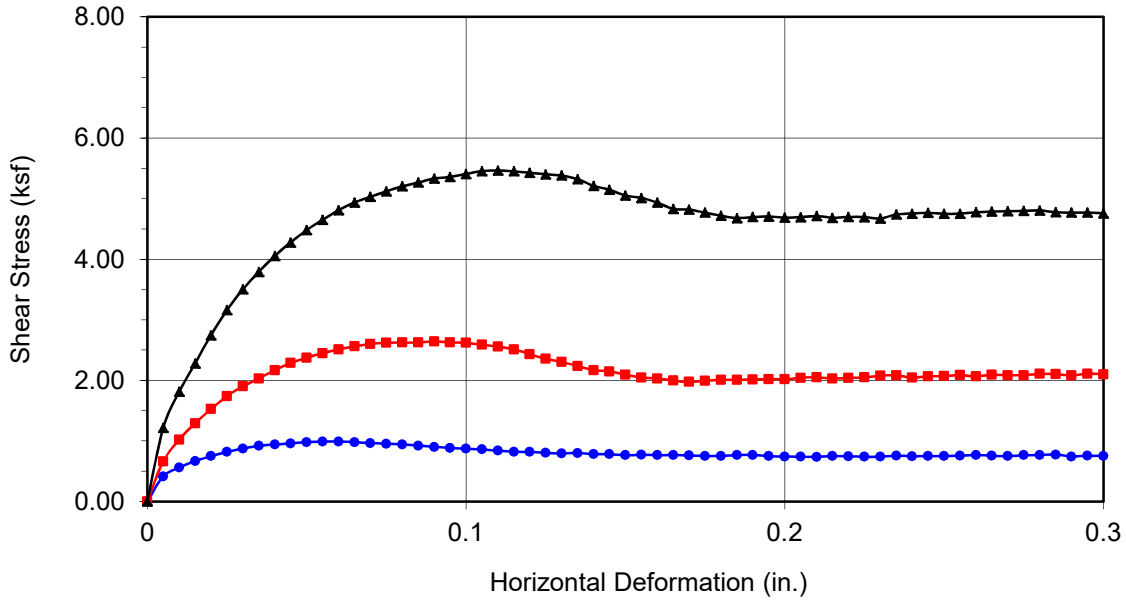
DIRECT SHEAR TEST RESULTS

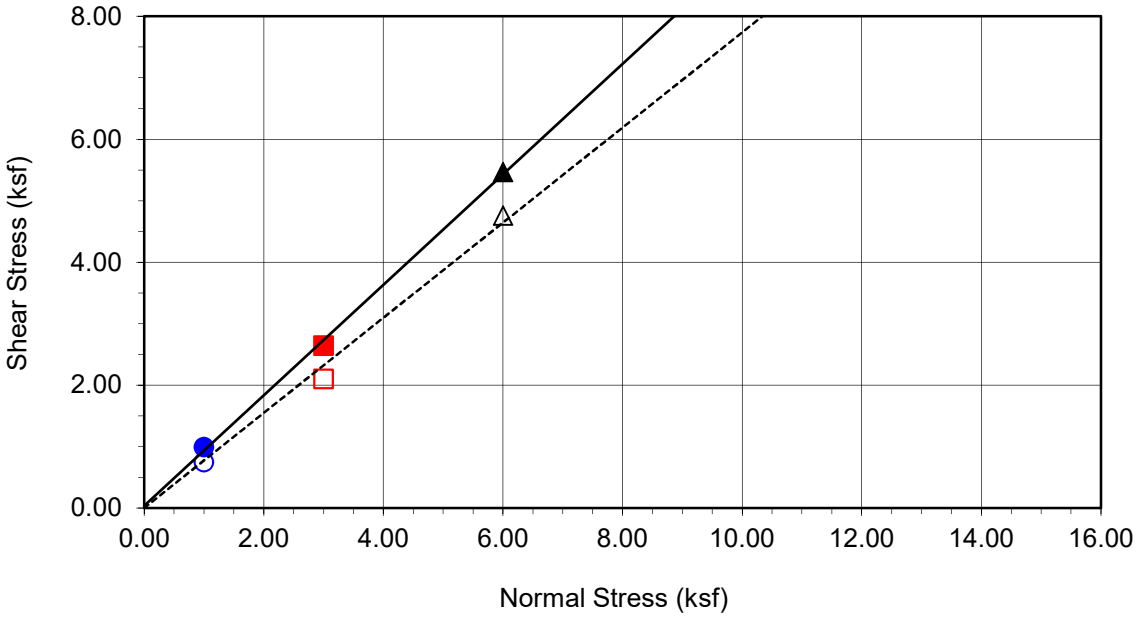
Consolidated Drained - ASTM D 3080

Project No.: 11862.003

RCNA Anaheim

09-19





Boring No.	**LB-5**
Sample No.	**R2**
Depth (ft)	**7**
Sample Type:	Ring
Soil Identification: Light olive brown poorly-graded sand with silt (SP-SM)	

Strength Parameters

	C (psf)	ϕ (°)
Peak	38	42
Ultimate	0	38

Normal Stress (kip/ft²)	1.000	3.000	6.000
Peak Shear Stress (kip/ft²)	● 0.990	■ 2.644	▲ 5.464
Shear Stress @ End of Test (ksf)	○ 0.748	□ 2.100	△ 4.757
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	3.96	3.96	3.96
Dry Density (pcf)	103.2	105.7	106.6
Saturation (%)	16.9	17.9	18.4
Soil Height Before Shearing (in.)	0.9914	0.9857	0.9787
Final Moisture Content (%)	18.7	17.3	17.0

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 11862.003

RCNA Anaheim

09-19

II 8/5

Leighton

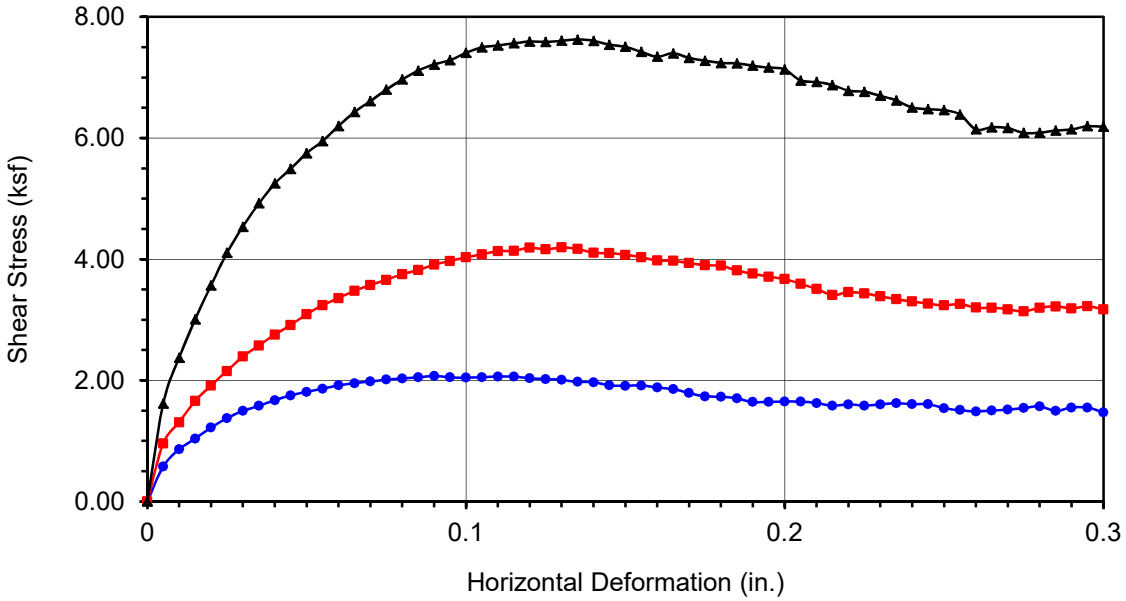
DIRECT SHEAR TEST

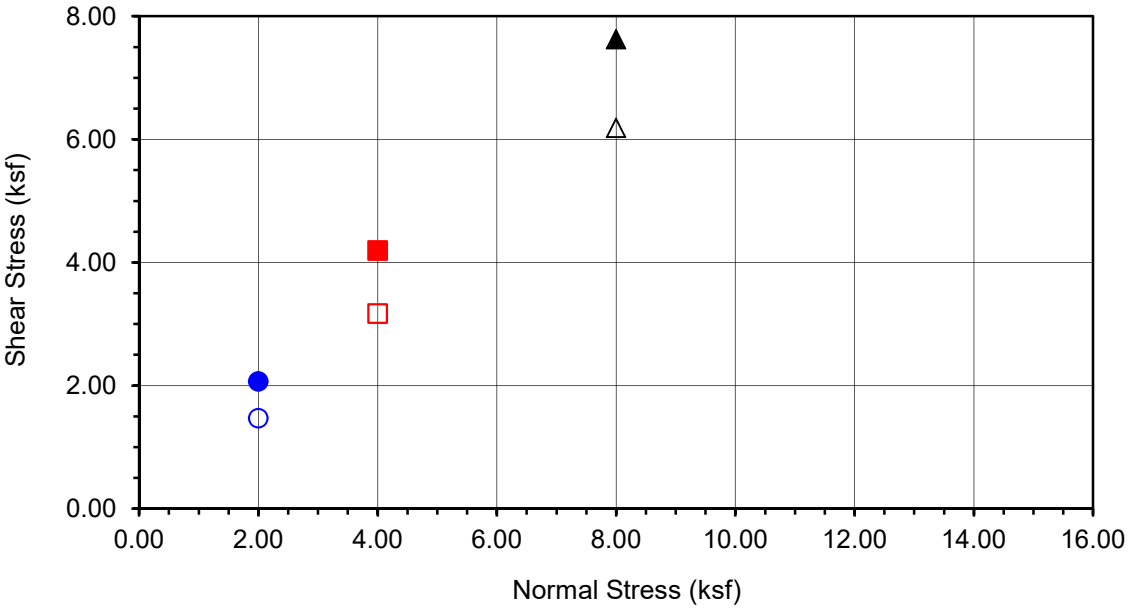
Consolidated Drained - ASTM D 3080

Project Name:	RCNA Anaheim	Tested By:	G. Bathala	Date:	09/07/19
Project No.:	11862.003	Checked By:	J. Ward	Date:	09/17/19
Boring No.:	LB-5	Sample Type:	Ring		
Sample No.:	R4	Depth (ft.):	15.0		

Soil Identification: Light olive brown poorly-graded sand with silt (SP-SM)

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	172.11	175.99	177.33
Weight of Ring(gm):	40.46	41.68	42.80
Before Shearing			
Weight of Wet Sample+Cont.(gm):	226.30	226.30	226.30
Weight of Dry Sample+Cont.(gm):	221.23	221.23	221.23
Weight of Container(gm):	57.51	57.51	57.51
Vertical Rdg.(in): Initial	0.2293	0.0000	0.0000
Vertical Rdg.(in): Final	0.2412	-0.0173	-0.0302
After Shearing			
Weight of Wet Sample+Cont.(gm):	205.50	208.93	204.81
Weight of Dry Sample+Cont.(gm):	183.77	189.08	186.24
Weight of Container(gm):	58.53	63.40	61.49
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**LB-5**
Sample No.	**R4**
Depth (ft)	**15**
Sample Type: Ring	
Soil Identification: Light olive brown poorly-graded sand with silt (SP-SM)	

Normal Stress (kip/ft²)	2.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 2.069	■ 4.194	▲ 7.627
Shear Stress @ End of Test (ksf)	○ 1.468	□ 3.169	△ 6.187
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	3.10	3.10	3.10
Dry Density (pcf)	106.2	108.3	108.5
Saturation (%)	14.2	15.0	15.1
Soil Height Before Shearing (in.)	0.9881	0.9827	0.9698
Final Moisture Content (%)	17.4	15.8	14.9

Leighton

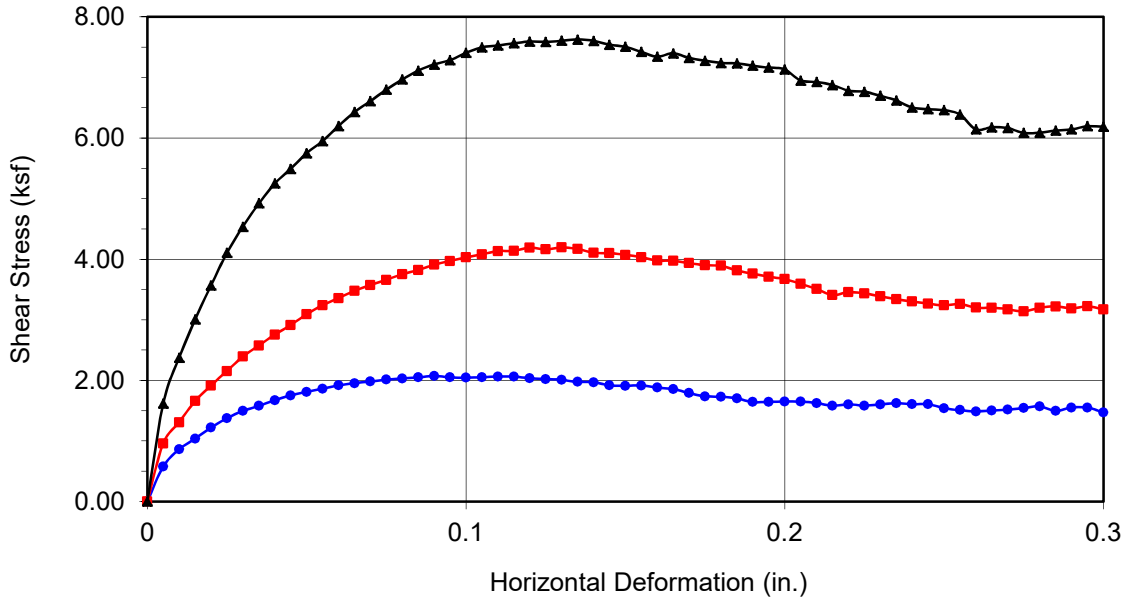
DIRECT SHEAR TEST RESULTS

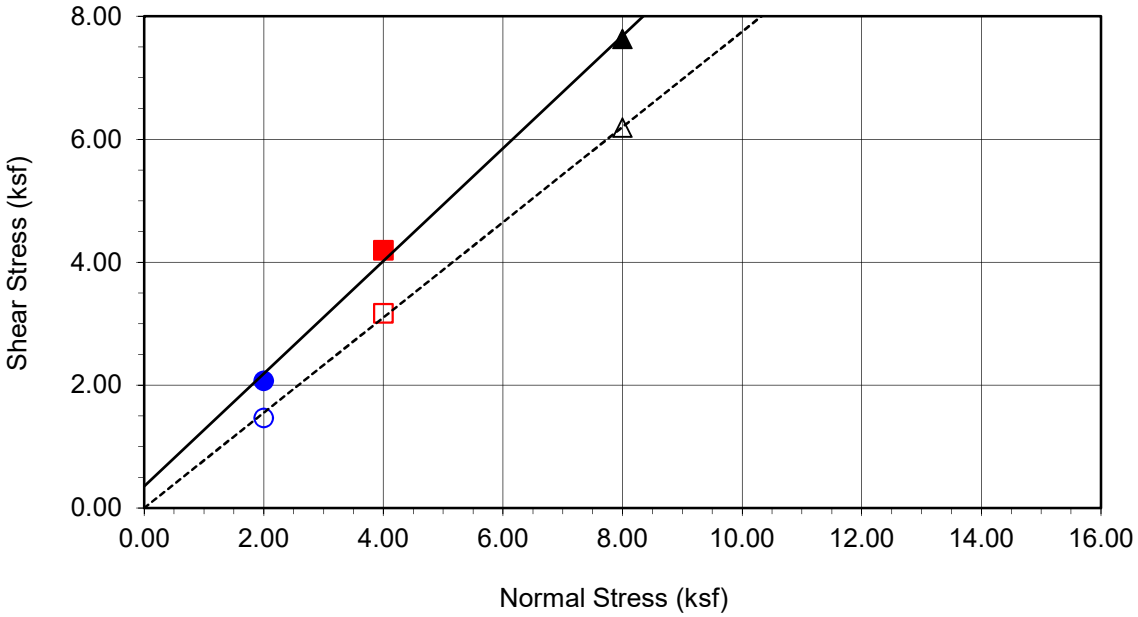
Consolidated Drained - ASTM D 3080

Project No.: 11862.003

RCNA Anaheim

09-19





Boring No.	**LB-5**
Sample No.	**R4**
Depth (ft)	**15**
Sample Type:	Ring
Soil Identification:	Light olive brown poorly-graded sand with silt (SP-SM)

Strength Parameters

	C (psf)	ϕ (°)
Peak	352	43
Ultimate	0	38

Normal Stress (kip/ft²)	2.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 2.069	■ 4.194	▲ 7.627
Shear Stress @ End of Test (ksf)	○ 1.468	□ 3.169	△ 6.187
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	3.10	3.10	3.10
Dry Density (pcf)	106.2	108.3	108.5
Saturation (%)	14.2	15.0	15.1
Soil Height Before Shearing (in.)	0.9881	0.9827	0.9698
Final Moisture Content (%)	17.4	15.8	14.9

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 11862.003

RCNA Anaheim

09-19

II 8/5

Leighton

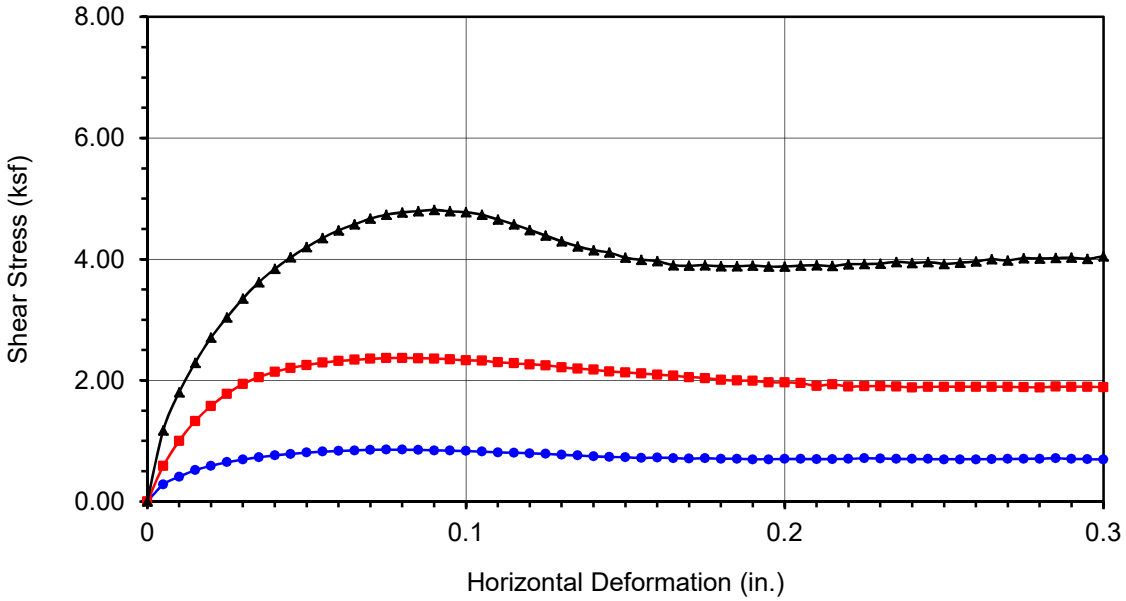
DIRECT SHEAR TEST

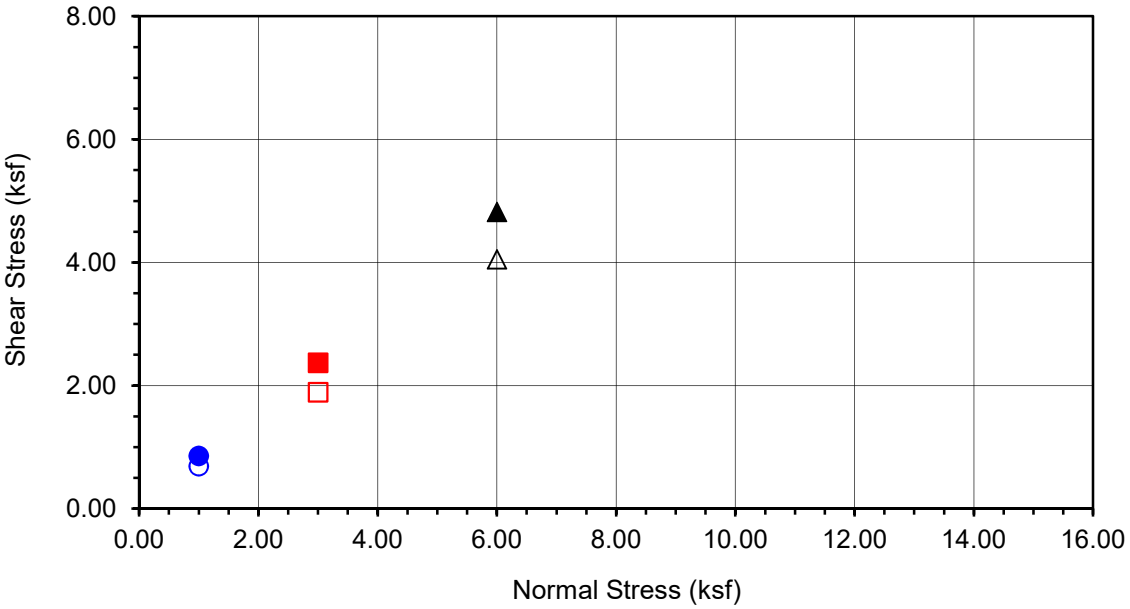
Consolidated Drained - ASTM D 3080

Project Name:	RCNA Anaheim	Tested By:	G. Bathala	Date:	09/07/19
Project No.:	11862.003	Checked By:	J. Ward	Date:	09/17/19
Boring No.:	LB-7	Sample Type:	Ring		
Sample No.:	R1	Depth (ft.):	5.0		

Soil Identification: Light olive brown poorly-graded sand with silt (SP-SM)

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	167.26	166.31	168.56
Weight of Ring(gm):	45.49	43.76	44.00
Before Shearing			
Weight of Wet Sample+Cont.(gm):	186.17	186.17	186.17
Weight of Dry Sample+Cont.(gm):	183.42	183.42	183.42
Weight of Container(gm):	57.28	57.28	57.28
Vertical Rdg.(in): Initial	0.2477	0.2467	0.0000
Vertical Rdg.(in): Final	0.2539	0.2693	-0.0269
After Shearing			
Weight of Wet Sample+Cont.(gm):	203.70	194.07	198.94
Weight of Dry Sample+Cont.(gm):	180.87	173.15	176.93
Weight of Container(gm):	67.21	58.94	59.05
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**LB-7**
Sample No.	**R1**
Depth (ft)	**5**
Sample Type: Ring	
Soil Identification: Light olive brown poorly-graded sand with silt (SP-SM)	

Normal Stress (kip/ft²)	1.000	3.000	6.000
Peak Shear Stress (kip/ft²)	● 0.855	■ 2.370	▲ 4.816
Shear Stress @ End of Test (ksf)	○ 0.692	□ 1.889	△ 4.049
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	2.18	2.18	2.18
Dry Density (pcf)	99.1	99.7	101.4
Saturation (%)	8.4	8.5	8.9
Soil Height Before Shearing (in.)	0.9938	0.9774	0.9731
Final Moisture Content (%)	20.1	18.3	18.7

Leighton

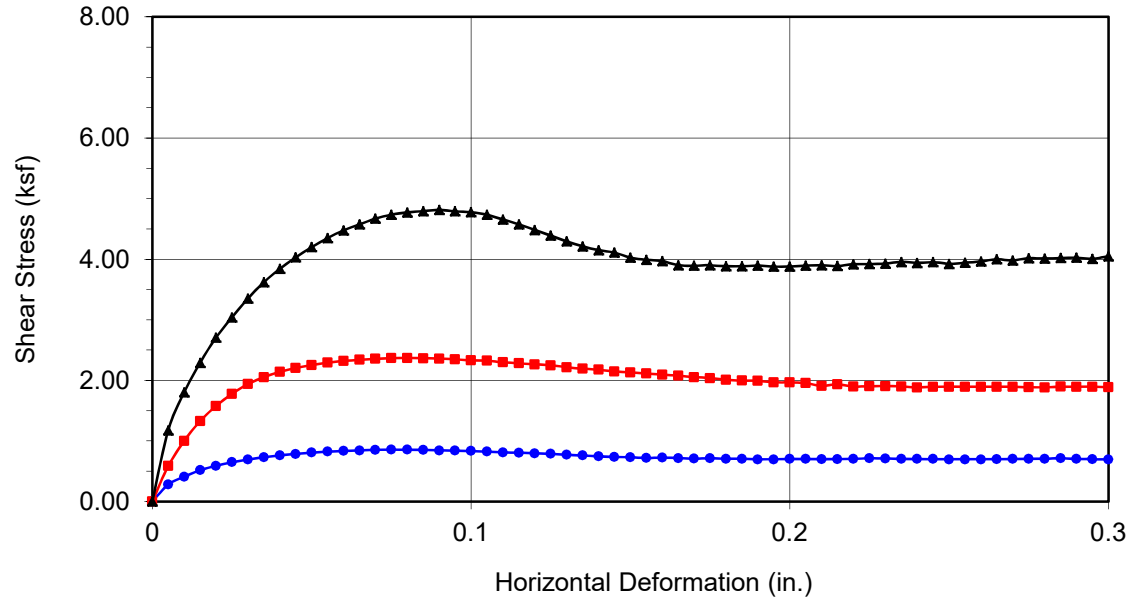
DIRECT SHEAR TEST RESULTS

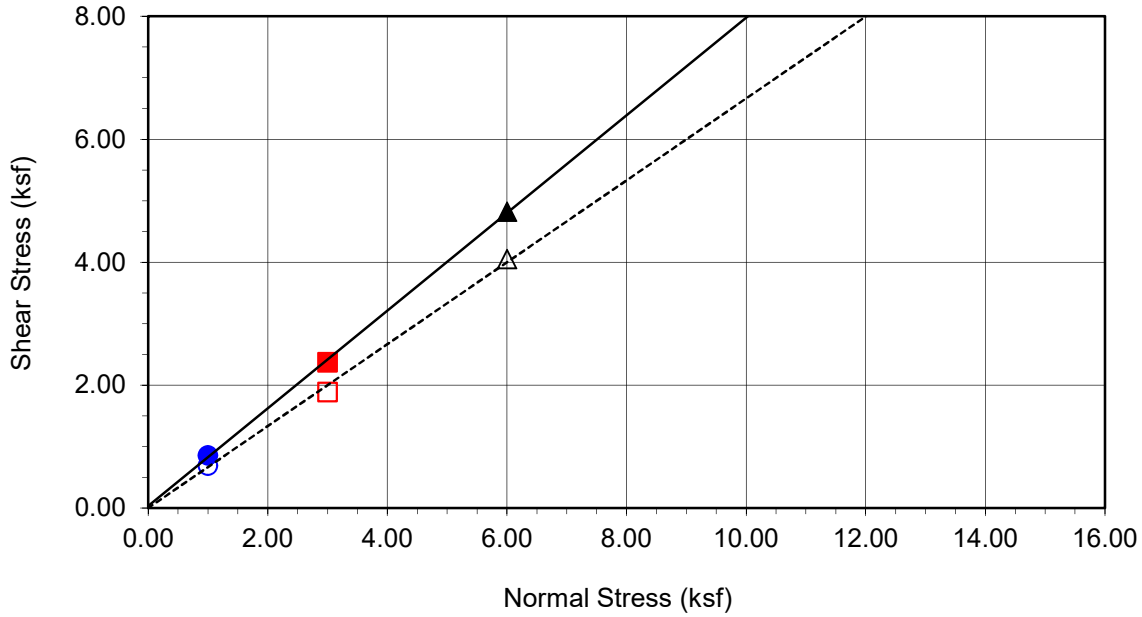
Consolidated Drained - ASTM D 3080

Project No.: 11862.003

RCNA Anaheim

09-19





Boring No.	**LB-7**
Sample No.	**R1**
Depth (ft)	**5**
Sample Type:	Ring
Soil Identification: Light olive brown poorly-graded sand with silt (SP-SM)	

Strength Parameters

	C (psf)	ϕ (°)
Peak	34	38
Ultimate	0	34

Normal Stress (kip/ft²)	1.000	3.000	6.000
Peak Shear Stress (kip/ft²)	● 0.855	■ 2.370	▲ 4.816
Shear Stress @ End of Test (ksf)	○ 0.692	□ 1.889	△ 4.049
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	2.18	2.18	2.18
Dry Density (pcf)	99.1	99.7	101.4
Saturation (%)	8.4	8.5	8.9
Soil Height Before Shearing (in.)	0.9938	0.9774	0.9731
Final Moisture Content (%)	20.1	18.3	18.7

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 11862.003

RCNA Anaheim

09-19

II 8/5

Leighton

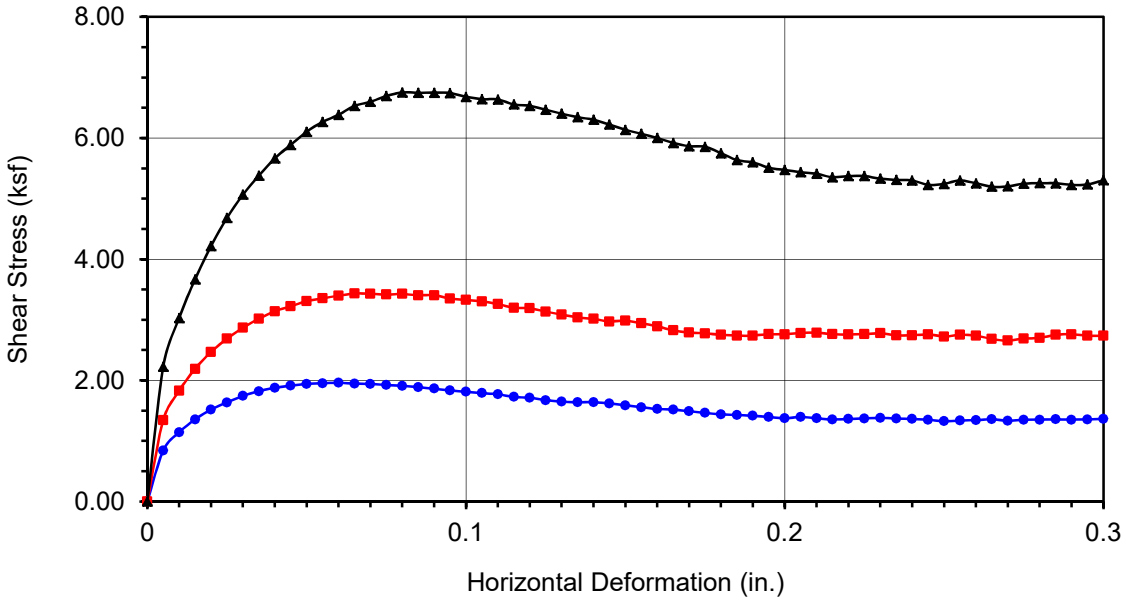
DIRECT SHEAR TEST

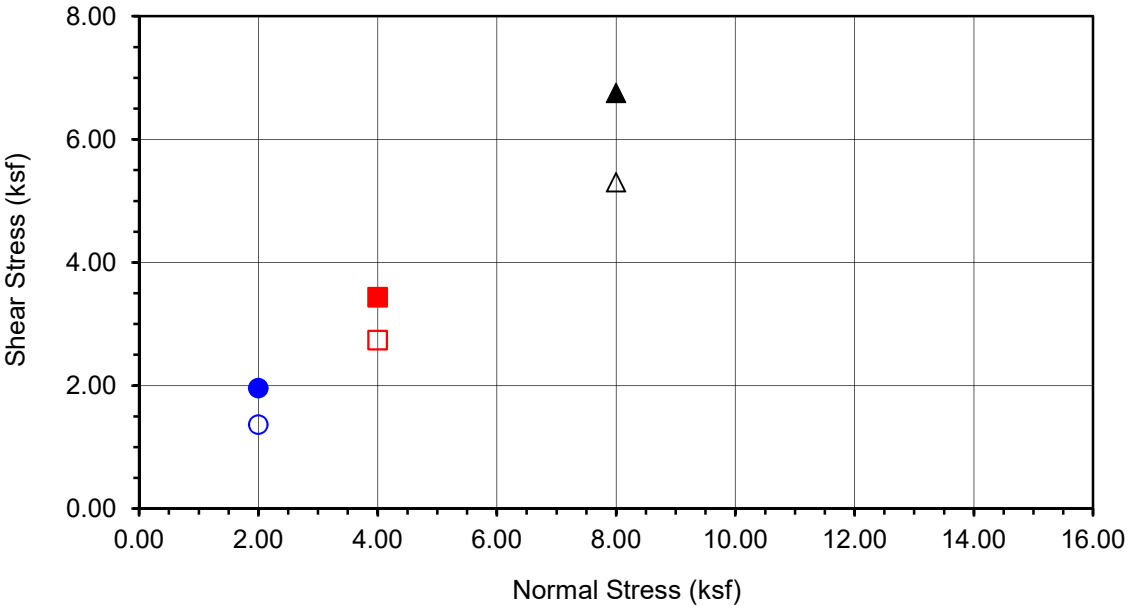
Consolidated Drained - ASTM D 3080

Project Name:	RCNA Anaheim	Tested By:	G. Bathala	Date:	08/27/19
Project No.:	11862.003	Checked By:	J. Ward	Date:	09/17/19
Boring No.:	LB-7	Sample Type:	Ring		
Sample No.:	R3	Depth (ft.):	10.0		

Soil Identification: Light yellowish brown poorly-graded sand (SP)

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	162.86	171.13	168.47
Weight of Ring(gm):	40.91	45.86	42.59
Before Shearing			
Weight of Wet Sample+Cont.(gm):	186.07	186.07	186.07
Weight of Dry Sample+Cont.(gm):	184.72	184.72	184.72
Weight of Container(gm):	77.39	77.39	77.39
Vertical Rdg.(in): Initial	0.0000	0.2488	0.2580
Vertical Rdg.(in): Final	-0.0121	0.2735	0.2954
After Shearing			
Weight of Wet Sample+Cont.(gm):	195.22	208.30	202.19
Weight of Dry Sample+Cont.(gm):	174.25	186.86	181.87
Weight of Container(gm):	59.07	69.52	61.51
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**LB-7**
Sample No.	**R3**
Depth (ft)	**10**
Sample Type: Ring	
Soil Identification: Light yellowish brown poorly-graded sand (SP)	

Normal Stress (kip/ft²)	2.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 1.959	■ 3.433	▲ 6.753
Shear Stress @ End of Test (ksf)	○ 1.364	□ 2.738	△ 5.304
Deformation Rate (in./min.)	0.0050	0.0050	0.0050
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	1.26	1.26	1.26
Dry Density (pcf)	100.2	102.9	103.4
Saturation (%)	5.0	5.3	5.4
Soil Height Before Shearing (in.)	0.9879	0.9753	0.9626
Final Moisture Content (%)	18.2	18.3	16.9

Leighton

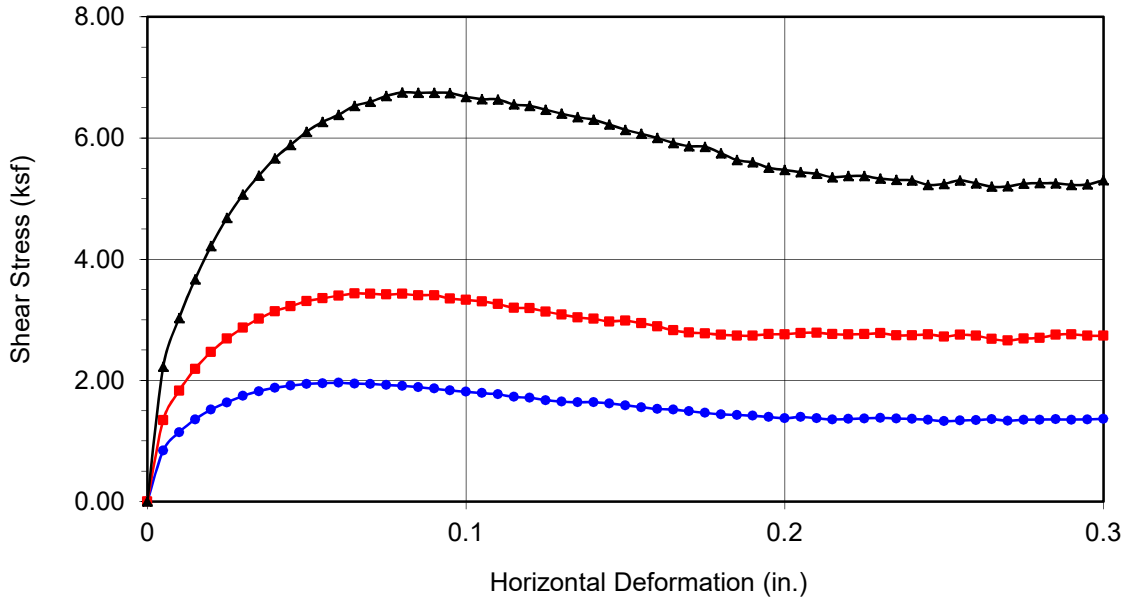
DIRECT SHEAR TEST RESULTS

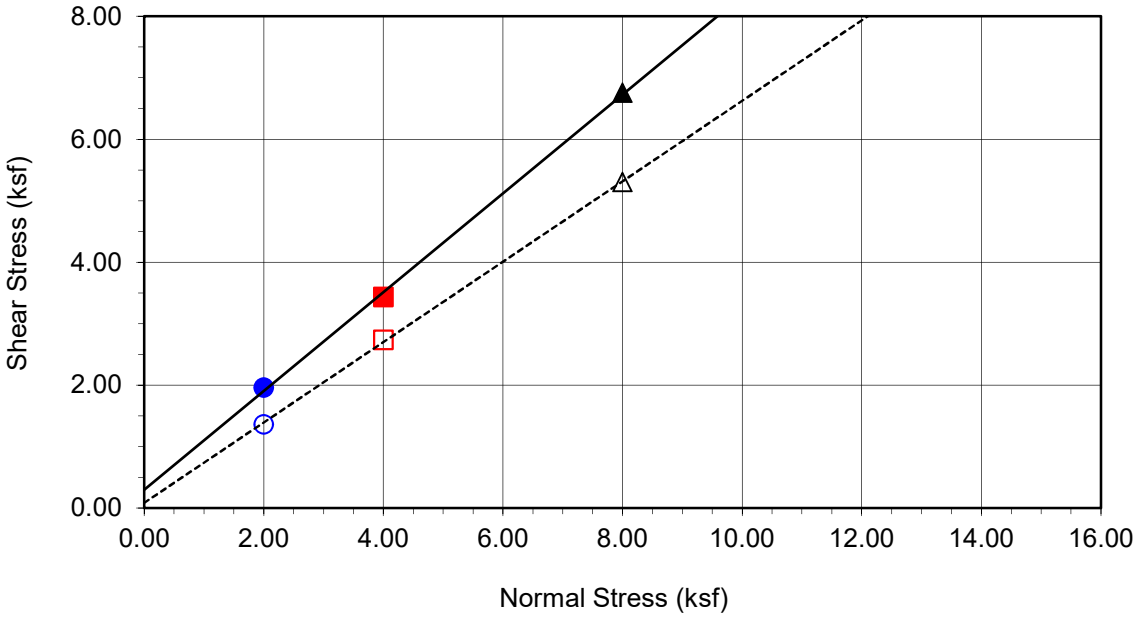
Consolidated Drained - ASTM D 3080

Project No.: 11862.003

RCNA Anaheim

08-19





Boring No.	**LB-7**
Sample No.	**R3**
Depth (ft)	**10**
Sample Type:	Ring
Soil Identification: Light yellowish brown poorly-graded sand (SP)	

Strength Parameters

	C (psf)	ϕ (°)
Peak	299	39
Ultimate	81	33

Normal Stress (kip/ft²)	2.000	4.000	8.000
Peak Shear Stress (kip/ft²)	● 1.959	■ 3.433	▲ 6.753
Shear Stress @ End of Test (ksf)	○ 1.364	□ 2.738	△ 5.304
Deformation Rate (in./min.)	0.0050	0.0050	0.0050
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	1.26	1.26	1.26
Dry Density (pcf)	100.2	102.9	103.4
Saturation (%)	5.0	5.3	5.4
Soil Height Before Shearing (in.)	0.9879	0.9753	0.9626
Final Moisture Content (%)	18.2	18.3	16.9

Leighton

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 11862.003

RCNA Anaheim

08-19

Leighton

R-VALUE TEST RESULTS

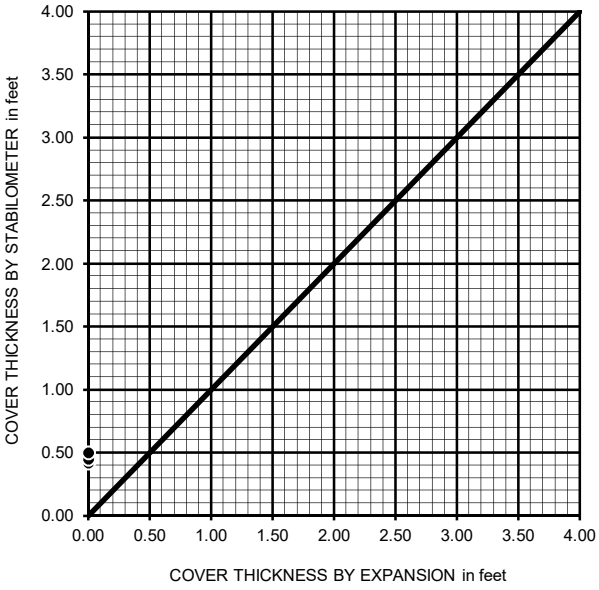
DOT CA Test 301

PROJECT NAME:	RCNA Anaheim	PROJECT NUMBER:	11862.003
BORING NUMBER:	LB-5	DEPTH (FT.):	0-5
SAMPLE NUMBER:	B1	TECHNICIAN:	R. Manning
SAMPLE DESCRIPTION:	Brown poorly-graded sand with silt (SP-SM)	DATE COMPLETED:	9/11/2019

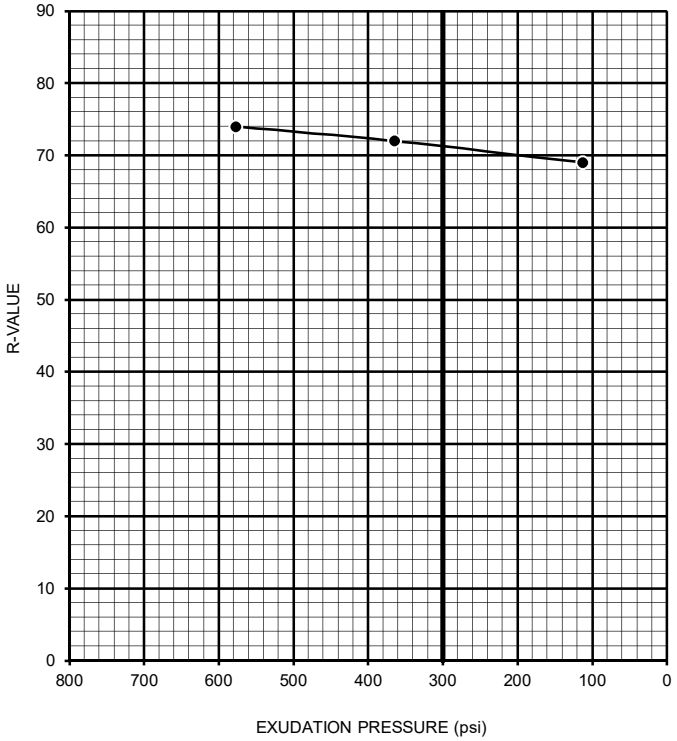
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	8.7	9.8	11.9
HEIGHT OF SAMPLE, Inches	2.52	2.53	2.54
DRY DENSITY, pcf	112.3	111.8	111.4
COMPACTOR PRESSURE, psi	200	175	150
EXUDATION PRESSURE, psi	577	365	113
EXPANSION, Inches x 10exp-4	0	0	0
STABILITY Ph 2,000 lbs (160 psi)	22	24	27
TURNS DISPLACEMENT	5.43	5.43	5.63
R-VALUE UNCORRECTED	74	72	69
R-VALUE CORRECTED	74	72	69

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.42	0.45	0.50
EXPANSION PRESSURE THICKNESS, ft.	0.00	0.00	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	N/A
R-VALUE BY EXUDATION:	71
EQUILIBRIUM R-VALUE:	71

Leighton

R-VALUE TEST RESULTS

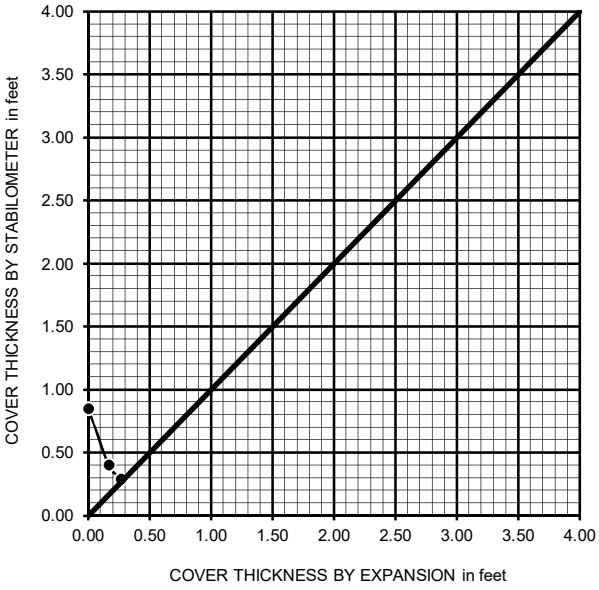
DOT CA Test 301

PROJECT NAME:	RCNA Anaheim	PROJECT NUMBER:	11862.003
BORING NUMBER:	LB-7	DEPTH (FT.):	0-5
SAMPLE NUMBER:	B1	TECHNICIAN:	R. Manning
SAMPLE DESCRIPTION:	Light olive brown SP-SM	DATE COMPLETED:	9/11/2019

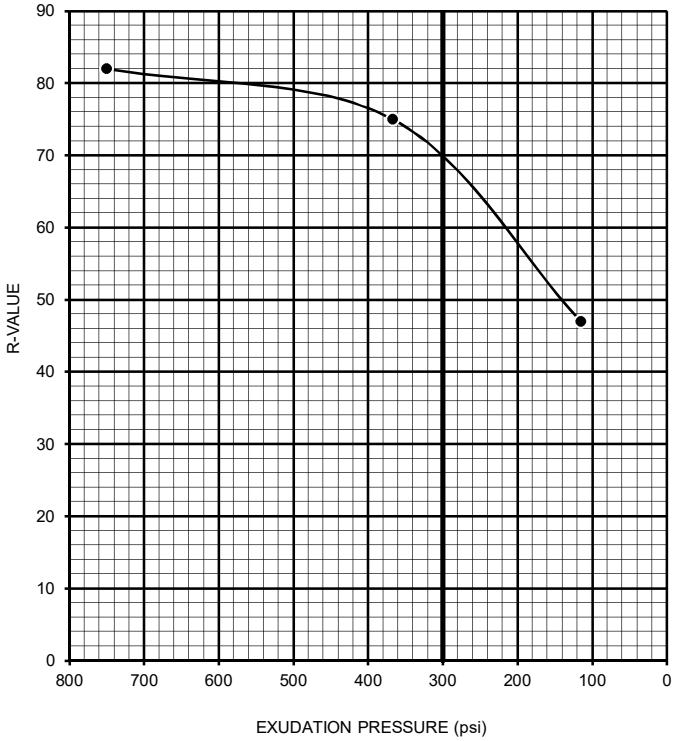
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	10.7	12.0	14.1
HEIGHT OF SAMPLE, Inches	2.46	2.48	2.50
DRY DENSITY, pcf	119.3	118.4	117.4
COMPACTOR PRESSURE, psi	200	150	100
EXUDATION PRESSURE, psi	750	368	115
EXPANSION, Inches x 10exp-4	8	5	0
STABILITY Ph 2,000 lbs (160 psi)	19	22	62
TURNS DISPLACEMENT	3.98	5.17	4.52
R-VALUE UNCORRECTED	82	75	47
R-VALUE CORRECTED	82	75	47

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.29	0.40	0.85
EXPANSION PRESSURE THICKNESS, ft.	0.27	0.17	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	83
R-VALUE BY EXUDATION:	70
EQUILIBRIUM R-VALUE:	70

Leighton

TESTS for SULFATE CONTENT
CHLORIDE CONTENT and pH of SOILS

Project Name: RCNA Anaheim | Tested By : G. Berdy | Date: 09/10/19

Project No. : 11862.003 | Input By: J. Ward | Date: 09/17/19

Boring No.	LB-5	LB-7		
Sample No.	B1	B1		
Sample Depth (ft)	0-5	0-5		
Soil Identification:	Brown SP-SM	Light olive brown SP-SM		
Wet Weight of Soil + Container (g)	240.75	177.12		
Dry Weight of Soil + Container (g)	239.51	174.17		
Weight of Container (g)	39.89	51.37		
Moisture Content (%)	0.62	2.40		
Weight of Soaked Soil (g)	100.32	100.40		

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	0	61		
Crucible No.	5	15		
Furnace Temperature (°C)	860	860		
Time In / Time Out	7:45/8:30	7:45/8:30		
Duration of Combustion (min)	45	45		
Wt. of Crucible + Residue (g)	18.4891	25.5599		
Wt. of Crucible (g)	18.4872	25.5572		
Wt. of Residue (g) (A)	0.0019	0.0027		
PPM of Sulfate (A) x 41150	78.18	111.10		
PPM of Sulfate, Dry Weight Basis	**79**	**114**		

CHLORIDE CONTENT, DOT California Test 422

ml of Extract For Titration (B)	15	15		
ml of AgNO3 Soln. Used in Titration (C)	0.4	0.3		
PPM of Chloride (C -0.2) * 100 * 30 / B	40	20		
PPM of Chloride, Dry Wt. Basis	**40**	**20**		

pH TEST, DOT California Test 643

pH Value	**6.23**	**7.10**		
Temperature °C	20.2	20.3		

Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 643

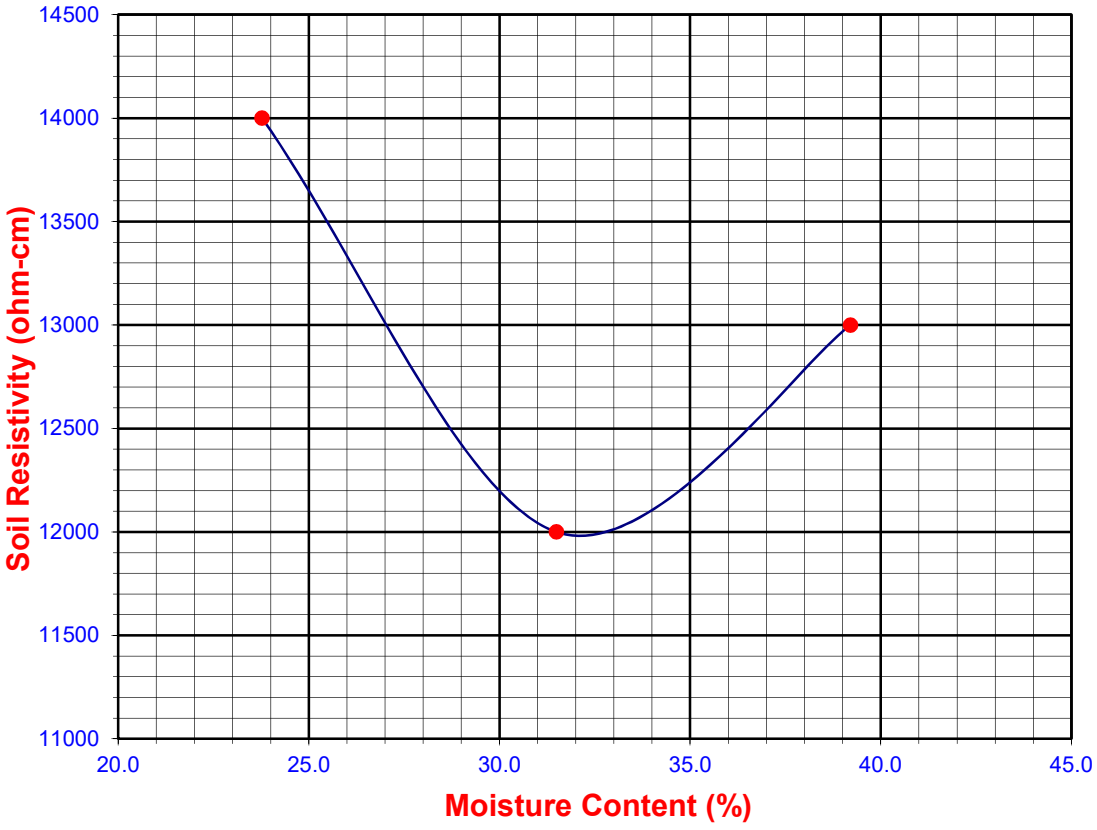
Project Name:	RCNA Anaheim		Tested By :	G. Berdy	Date: 09/12/19
Project No. :	11862.003		Input By:	J. Ward	Date: 09/17/19
Boring No.:	LB-5		Depth (ft.) :	0-5	
Sample No. :	B1				
Soil Identification:*	Brown SP-SM				

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	30	23.77	14000	14000
2	40	31.49	12000	12000
3	50	39.21	13000	13000
4				
5				

Moisture Content (%) (MCi)	0.62
Wet Wt. of Soil + Cont. (g)	240.75
Dry Wt. of Soil + Cont. (g)	239.51
Wt. of Container (g)	39.89
Container No.	
Initial Soil Wt. (g) (Wt)	130.38
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
11980	**32.1**	**79**	**40**	**6.23**	**20.2**



Leighton

SOIL RESISTIVITY TEST

DOT CA TEST 643

Project Name:	RCNA Anaheim		Tested By :	G. Berdy	Date: 09/12/19
Project No. :	11862.003		Input By:	J. Ward	Date: 09/17/19
Boring No.:	LB-7		Depth (ft.) :	0-5	
Sample No. :	B1				

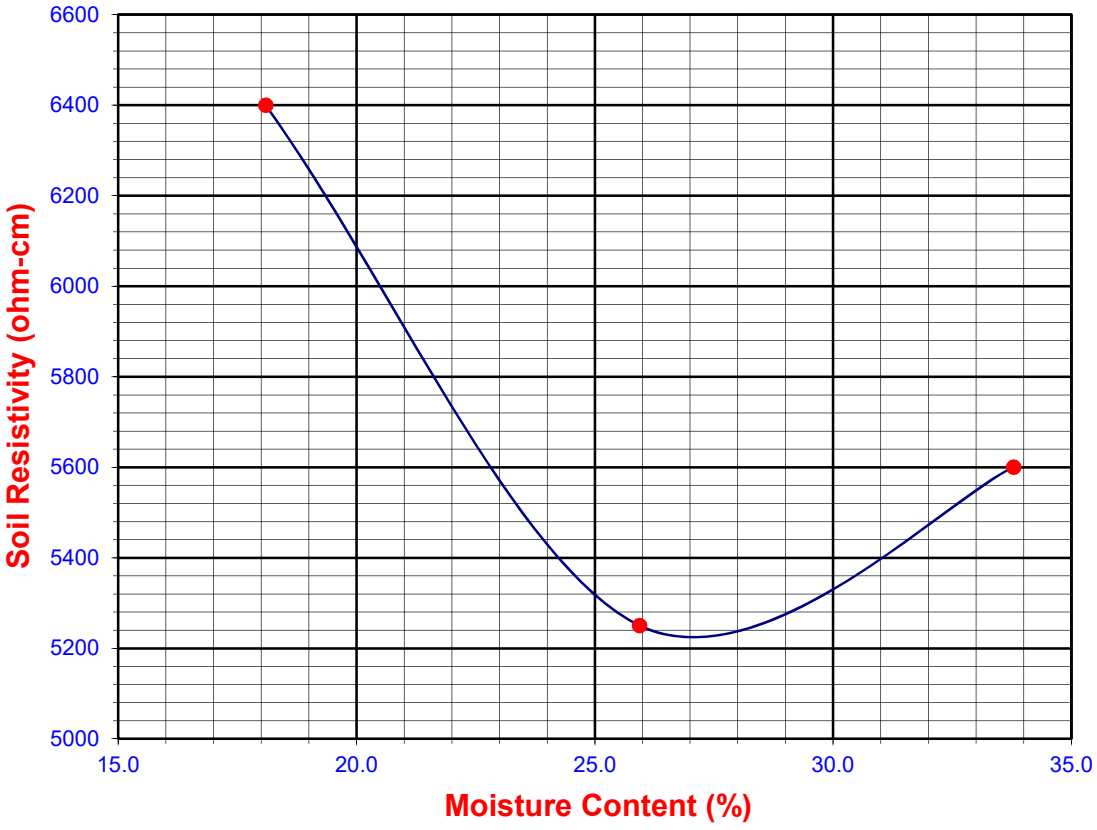
Soil Identification:* Light olive brown SP-SM

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	20	18.10	6400	6400
2	30	25.94	5250	5250
3	40	33.79	5600	5600
4				
5				

Moisture Content (%) (MCi)	2.40
Wet Wt. of Soil + Cont. (g)	177.12
Dry Wt. of Soil + Cont. (g)	174.17
Wt. of Container (g)	51.37
Container No.	
Initial Soil Wt. (g) (Wt)	130.50
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
5220	**27.0**	**114**	**20**	**7.10**	**20.3**



Attachment F

ESA Report

Leighton and Associates, Inc.
A LEIGHTON GROUP COMPANY

April 8, 2020

Project No. 11862.002

Renaissance City North Anaheim LLC
4675 MacArthur Court, Suite 550
Newport Beach, California 92660

Attention: Mr. Robert Kim

Subject: Response to the City of Anaheim's Comment No. 1 in their January 24, 2020 Memorandum, 1122 North Anaheim Boulevard, Anaheim, California

Leighton and Associates, Inc. (Leighton) is pleased to present this memorandum summarizing the recommended approach in response to the City of Anaheim's (City) Comments No. 1 presented in their Public Works Department, Engineering Division Memorandum dated January 24, 2020 (see Attachment 1) for the proposed multi-family residential project located at 1122 North Anaheim Boulevard, Anaheim, California (site).

Comment No.1 requests "…*documentation from the Regional Water Quality Control Board (RWQCB) demonstrating that the proposed residential project complies with the requirements of the remediation and corrective action*."

To respond to this request, three remaining environmental remediation issues remain to be addressed. Once these activities are completed, the requested RWQCB and Anaheim Fire Department (AFD) documentation can be provided to the City's Public Works Department. This Memorandum outlines the methods by which these outstanding environmental concerns will be addressed. The three remediation issues are as follows:

1. A 20,000-gallon diesel underground storage tank (UST) located along the southern site boundary and associated piping that ran from the tank to the dispenser were abandoned in-place in April 1999 (see **Figure 1**). The abandonment-in-place of the UST and pipelines was the subject of a Tank

17781 Cowan ▪ Irvine, CA 92614-6009
949.250.1421 ▪ 949.250.1114 Fax

Closure Report issued in July 1999, which resulted in the issuance of a No Further Action letter by the City of Anaheim's Public Utilities Department in February 2000.

2. Soil impacted with Total Petroleum Hydrocarbons (TPH) was left in place in the vicinity of the former dispenser island with approval from the Anaheim Public Utilities in February 2000 (see **Figure 2**). The agency estimated that approximately 50 cubic yards of impacted soil remain in-place, with concentrations up to 13,120 milligram per kilogram (mg/kg) to a maximum depth of 10 feet below ground surface (bgs). The Agency's approval to leave this soil in-place was predicated on Industrial Land Use at the Site. With redevelopment of the Site for residential use, approximately 50 cubic yards of TPH-impacted soil may require removal.

3. Soil impacted by TPH found in vicinity of an oil/water separator located on the north side of the existing maintenance building in the central portion of the site (see **Figure 3**). Diesel range organics (DRO) and oil range organics (ORO) were detected at maximum concentrations of 4,100 mg/kg and 1,800 mg/kg at depths of 2.5 and 5 feet below ground surface (bgs), respectively. The estimated quantity of DRO and ORO-impacted soil is approximately 36 cubic yards, in an area 10 feet by 15 feet ranging in vertical depths between 5 feet and 7.5 feet bgs.

PATH TO REGULATORY AGENCY CLOSURE

Based on our professional experience with properties having similar environmental issues, our technical review of site assessment and remediation documents prepared by others, and the results of Leighton's soil sampling conducted in January 2019, the recommended path to regulatory agency closure from the City of Anaheim Fire Department and the RWQCB is as follows:

1. Remove and properly dispose of the formerly abandoned in-place 20,000-gallon UST under the oversight of Anaheim Fire Department (AFD); and

2. Excavate and properly dispose offsite of TPH-impacted soil in both the former UST dispenser area and near the oil/water separator with confirmation samples collected from the bottom and sidewalls of the resulting excavations.

These activities would occur after demolition of all buildings has taken place to facilitate access to the underground features.

Diesel UST Removal: The 20,000-gallon diesel UST and pipelines abandoned in-place on the south side of the main shop building will be removed under the oversight of the AFD. This work will consist of:

- Obtaining a UST removal permit from the AFD;
- Notifying AFD to inspect and schedule an inspection;
- Removing soil from above the UST sufficiently to allow access to the tank top for verification of the tank contents (assumed to be concrete slurry);
- Excavating and stockpiling soil surrounding the UST, collect soil samples for profiling (either for onsite reuse or offsite disposal);
- Removing the UST (may require cutting tank and slurry loading/disposal);
- Collecting any required confirmation soil samples from beneath the UST for laboratory analysis as directed by the AFD inspector;
- Submitting documentation of UST Removal to AFD for issuance of a UST Closure letter; and
- Compiling soil sampling results for inclusion into a larger report documenting the condition of all onsite soil and requesting Closure from the RWQCB.

TPH Impacted Soil Excavation and Disposal: Shallow soil impacted with TPH requires removal in two areas of the Site, the former diesel dispenser area and the oil/water separator area. Since the Site has historically been cleaned up to Industrial Use Standards and is now being redeveloped for Residential Use, the RWQCB will be engaged to provide the documentation requested by the City of Anaheim in the Memorandum. Accordingly, the following steps will be carried out to ensure an expedited issuance of a No Further Action Letter by the RWQCB:

- Preparing a Work Plan for the excavation and offsite disposal of soil with concentrations in excess of Residential Use Screening Levels promulgated and accepted by Cal EPA and the RWQCB;
- Meeting with RWQCB to present the Work Plan and to discuss site redevelopment plans and facilitating rapid review and approval of the Work Plan;
- Following RWQCB approval and start date notification, excavation of impacted soil from both areas, either stockpiling or direct loading the removed soil for proper offsite disposal;
- Collection of confirmation soil samples specified in the Work Plan for laboratory analysis; and

- Compiling all site soil sample results for inclusion in a Remedial Excavation Report documenting the condition of remaining onsite soil and requesting a No Further Action Letter from the RWQCB.

C L O S I N G

If you have questions regarding this letter, please call us at your convenience at **866-*LEIGHTON***, directly at the phone extension and/or e-mail address listed below.

Respectfully submitted,

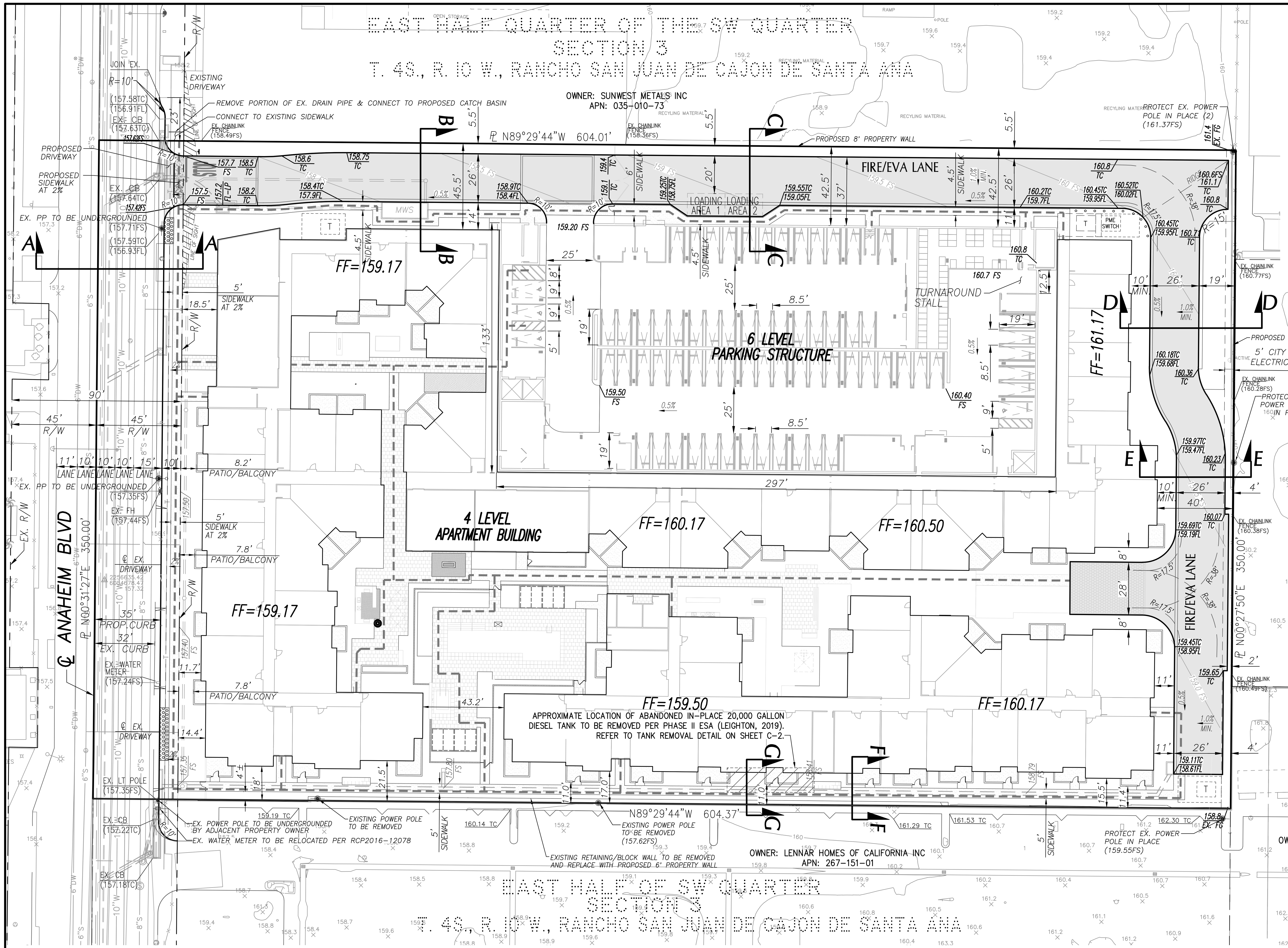
LEIGHTON AND ASSOCIATES, INC.

Brynn McCulloch
Principal Geologist
Extension 4287, bmcculloch@leightongroup.com

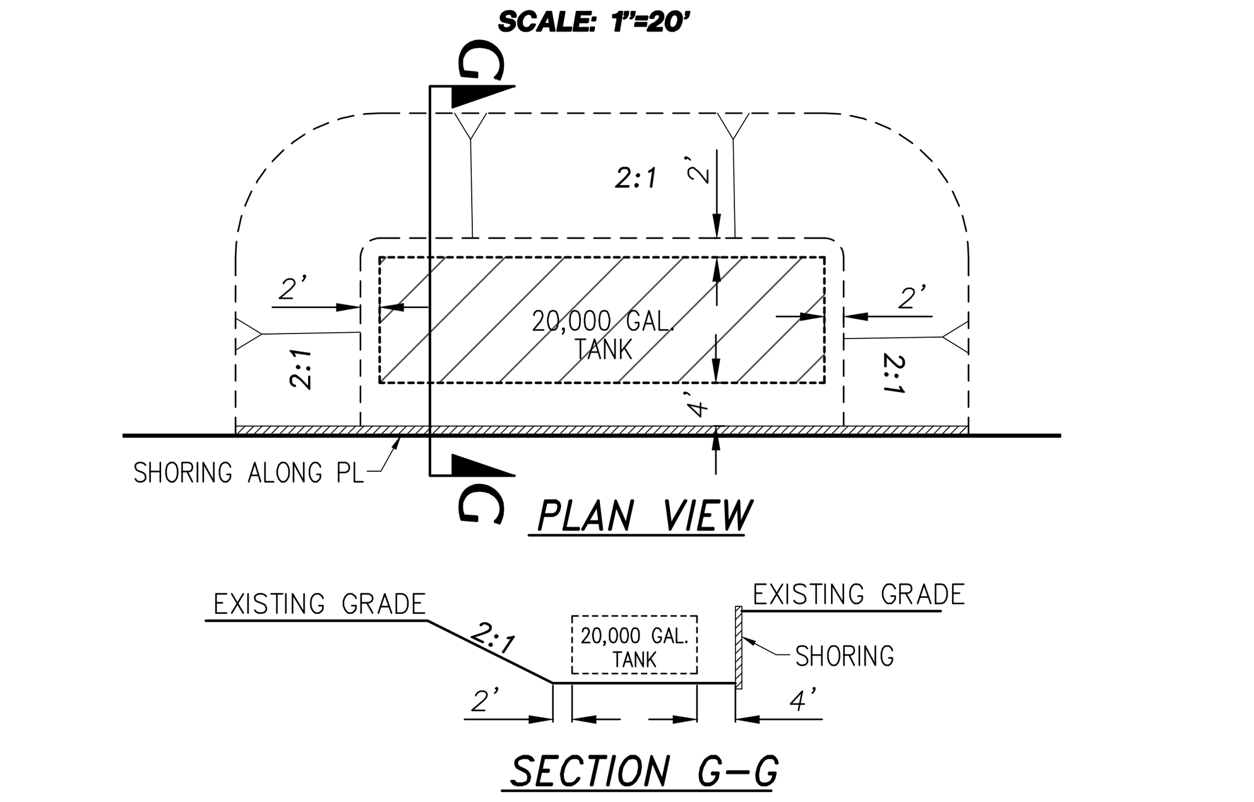
Attachments

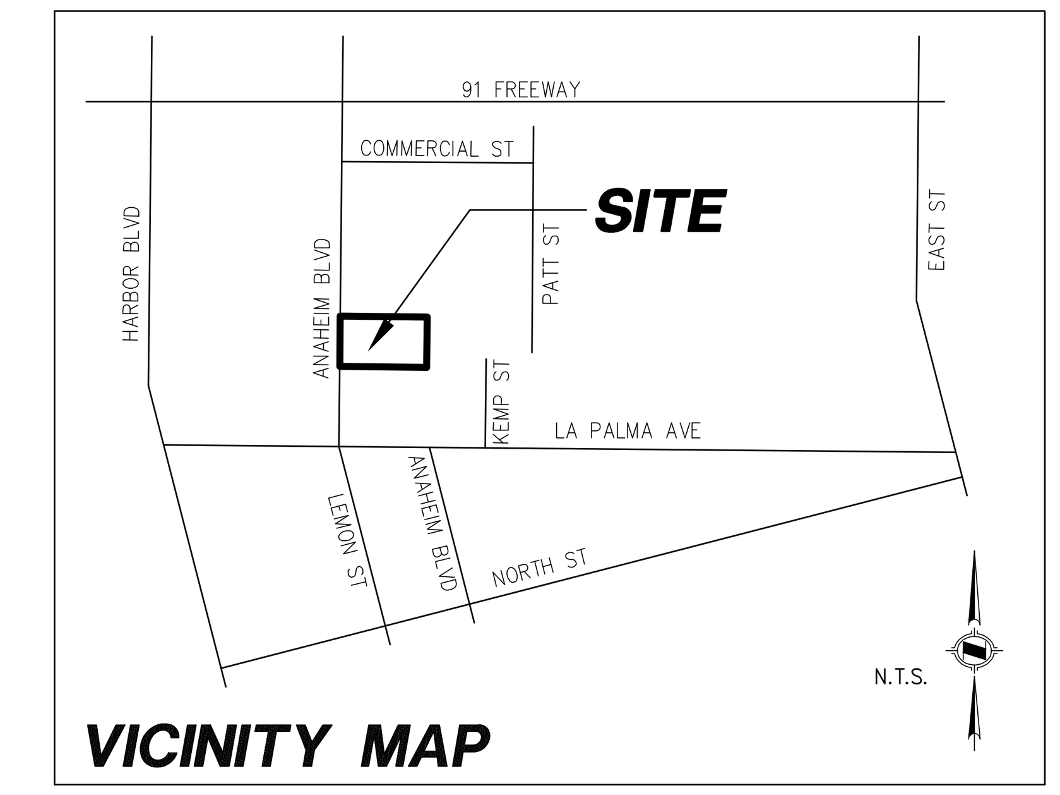
Figure 1 – Hunsaker & Associates Conceptual Grading Plan (March 2020)
Figure 2 – PIC Site Sketch Map (November 1999)
Figure 3 – Leighton Site Plan (March 2019)
Attachment 1 - Public Works Department Memorandum Excerpt (January 24, 2020)

Leighton



UNDERGROUND TANK REMOVAL DETAIL





VICINITY MAP

LEGAL DESCRIPTION

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE CITY OF ANAHEIM, COUNTY OF ORANGE, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

THAT PORTION OF THE EAST HALF OF THE SOUTHWEST QUARTER OF SECTION 3, TOWNSHIP 4 SOUTH, RANGE 10 WEST, IN THE RANCHO SAN JUAN CAJON DE SANTA ANA, AS PER MAP RECORDED IN BOOK 51, PAGE 10 OF MISCELLANEOUS MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHWEST CORNER OF THE SOUTH HALF OF THE NORTHEAST QUARTER, OF SAID SOUTHWEST QUARTER; THENCE EASTERLY ALONG THE NORTHERLY LINE OF SAID SOUTH HALF TO THE NORTHERLY PROLONGATION OF THE WESTERLY LINE OF THE LAND DESCRIBED AS PARCEL 2 IN THE DEED TO U.S. INDUSTRIAL ALCOHOL CO., RECORDED NOVEMBER 15, 1926 IN BOOK 689, PAGE 83 OF DEEDS; THENCE SOUTH 0° 02' 15" EAST ALONG SAID PROLONGATION AND ALONG SAID WESTERLY LINE TO A POINT NORTH 0° 02' 15" WEST 907.00 FEET FROM THE SOUTHERLY LINE OF SAID SECTION 3, SAID POINT BEING THE TRUE POINT OF BEGINNING; THENCE SOUTH 0° 02' 15" EAST 350.00 FEET; THENCE PARALLEL WITH THE SOUTHERLY LINE OF SAID SECTION 3, WEST 604.33 FEET TO THE WESTERLY LINE OF SAID EAST HALF, BEING THE CENTER OF NORTH LEMON STREET, 60.00 FEET IN WIDTH, THENCE ALONG SAID WESTERLY LINE AND THE CENTER LINE OF NORTH LEMON STREET, NORTH 0° 01' 50" EAST 350.00 FEET; THENCE EAST 603.99 FEET TO THE TRUE POINT OF BEGINNING.

APN: 035-010-51

BENCHMARK

CITY OF ANAHEIM BENCHMARK NO. 2A-40
ELEVATION: 157.59
DATUM: NAVD 88
DESCRIPTION: BRASS CAP MKD C OF A BM, IN THE TOP OF CURB AT THE NE BCR

CITY OF ANAHEIM BENCHMARK NO. 2A-38A
ELEVATION: 156.41
DATUM: NAVD 88

DESCRIPTION: BRASS CAP MKD C OF A BM IN THE TOP OF CURB AT THE NW BCR

DATUM STATEMENT

COORDINATES SHOWN ARE BASED ON THE CALIFORNIA COORDINATE SYSTEM (CCS83), ZONE VI, 1983 NAD, (2007.00 EPOCH OCS GPS ADJUSTMENT).

ALL DISTANCES SHOWN ARE GROUND, UNLESS OTHERWISE NOTED. TO OBTAIN GRID DISTANCE MULTIPLY GROUND DISTANCE BY 0.99999100. (PROJECT SPECIFIC COMBINATION FACTOR)

BASIS OF BEARINGS

THE BEARINGS SHOWN HEREON ARE BASED ON THE BEARING BETWEEN O.C.S. HORIZONTAL CONTROL STATION GPS NO. SACY AND STATION GPS NO. CCCS BEING N38°31'17"W PER RECORDS ON FILE IN THE OFFICE OF THE ORANGE COUNTY SURVEYOR.

NOTES

1. EXISTING STRUCTURES AND SURFACE PARKING AREAS WILL BE DEMOLISHED PRIOR TO CONSTRUCTION PURSUANT TO AN APPROVED DEMOLITION PERMIT.
2. NO GRADING SHALL COMMENCE WITHOUT FIRST OBTAINING A GRADING PERMIT ISSUED BY THE CITY OF ANAHEIM PUBLIC WORKS DEPARTMENT, UNLESS IT IS EXEMPT PER THE CITY OF ANAHEIM MUNICIPAL CODE.
3. ALL PROPOSED GRADING, EROSION CONTROL AND DRAINAGE SHALL BE CONSISTENT WITH THE REQUIREMENTS SET FORTH IN TITLE 17 OF THE CITY OF ANAHEIM MUNICIPAL CODE, THE STATE CONSTRUCTION SAFETY ORDERS, AND ANY SPECIAL REQUIREMENTS OF THE PERMIT.
4. ALL IMPROVEMENTS WITHIN THE PUBLIC RIGHT-OF-WAY SHALL REQUIRE A RIGHT-OF-WAY CONSTRUCTION PERMIT.
5. ALL IMPROVEMENTS TO BE CONSTRUCTED PER CITY OF ANAHEIM STANDARD DETAILS, UNLESS OTHERWISE APPROVED BY CITY ENGINEER.
6. CONSTRUCTION AND GRADING MAY BE DONE IN PHASES.
7. THE R100B(CA) SIGN, INDICATING TOW AWAY ZONE, SHOULD BE INSTALLED AT THE ENTRANCE. AS WELL AS, THE PRIVATE PROPERTY SIGN CONSISTENT WITH ANAHEIM MUNICIPAL CODE SECTION 4.75.090 FOR THE PURPOSES OF TOW-AWAY OUTSIDE OF DISABLED PARKING STALLS.
8. FINAL FINISH FLOOR ELEVATIONS SHALL BE 1-FT. MINIMUM ABOVE WATER SURFACE ELEVATION OF THE 100-YEAR EVENT.
9. EXISTING ANAHEIM BOULEVARD CATCH BASINS ARE TO BE RELOCATED AND THE NEW CATCH BASINS SHALL HAVE FULL CAPTURE SCREENS AND AUTOMATIC SCREENS ON THE CURB SURFACE.
10. LA PALMA VILLAGE DRIVEWAY APPROACH WILL NEED TO BE REBUILT DURING STREET WIDENING AS WELL AS GUTTER. COORDINATION FOR THESE IMPROVEMENTS WITH LA PALMA VILLAGE WILL BE MADE.
11. RIGHT-OF-WAY BMP'S SHALL BE PRIVATELY MAINTAINED BY PROPERTY OWNER.
12. REMOVE AND DISPOSE EXISTING UNDERGROUND TANK AND PIPELINES, AS SHOWN ON DETAIL, AND BACKFILL PER CITY STANDARDS AND SOIL ENGINEER RECOMMENDATIONS.

ACREAGE SUMMARY:

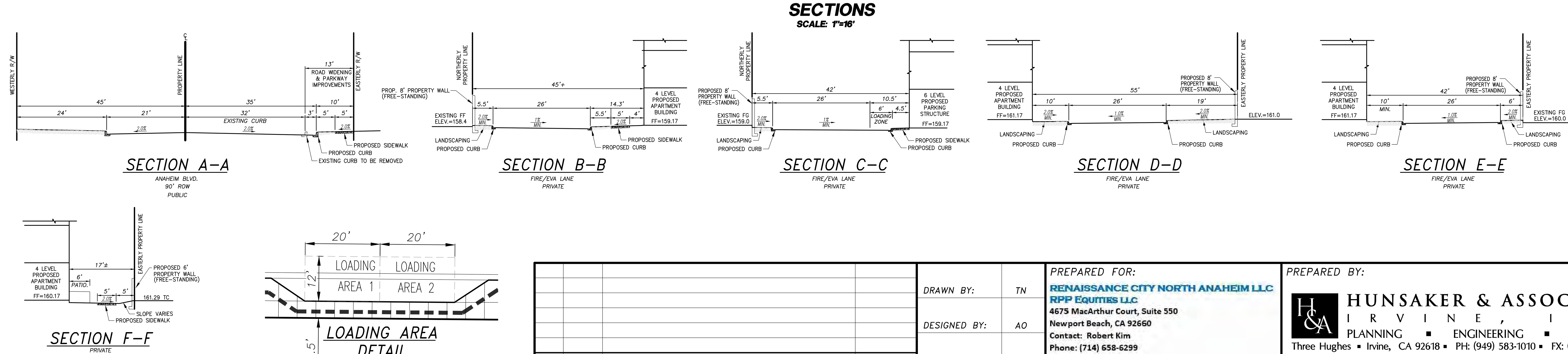
GROSS AREA	4.86 AC
ANAHEIM BLVD ROW	-0.37 AC
NET AREA	4.49 AC

LEGEND

- RIGHT OF WAY
- LOT LINE
- TRACT BOUNDARY
- EASEMENT
- EXISTING CONTOUR
- PROPOSED CURB
- EXISTING CURB
- ACCESSIBLE PATH OF TRAVEL
- BIO-RETENTION AREA
- MWS — MODULAR WETLAND SYSTEM

SCALE: 1" = 30'

SECTIONS



DATE: MARCH 31, 2020

NO.	DATE	REVISIONS	APPROVED

DRAWN BY: TN
DESIGNED BY: AO
CHECKED BY: AO/TF

PREPARED FOR:
RENAISSANCE CITY NORTH ANAHEIM LLC
RPP EQUITIES LLC
4675 MacArthur Court, Suite 550
Newport Beach, CA 92660
Contact: Robert Kim
Phone: (714) 658-6299

PREPARED BY:
HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

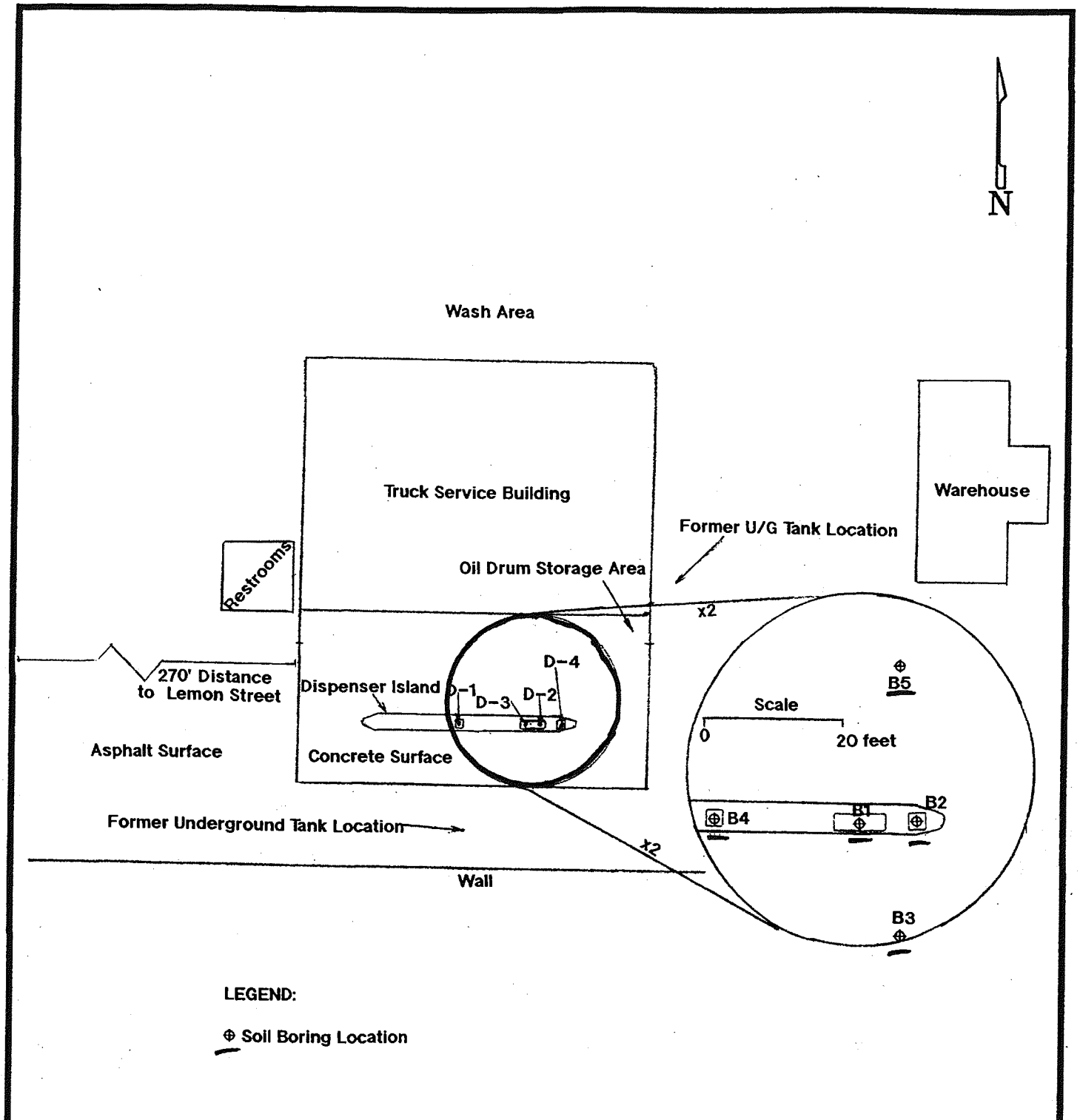
1122 N. ANAHEIM BLVD
"THE INVITATION"
CONCEPTUAL GRADING PLAN
City of Anaheim

SHEET C-2

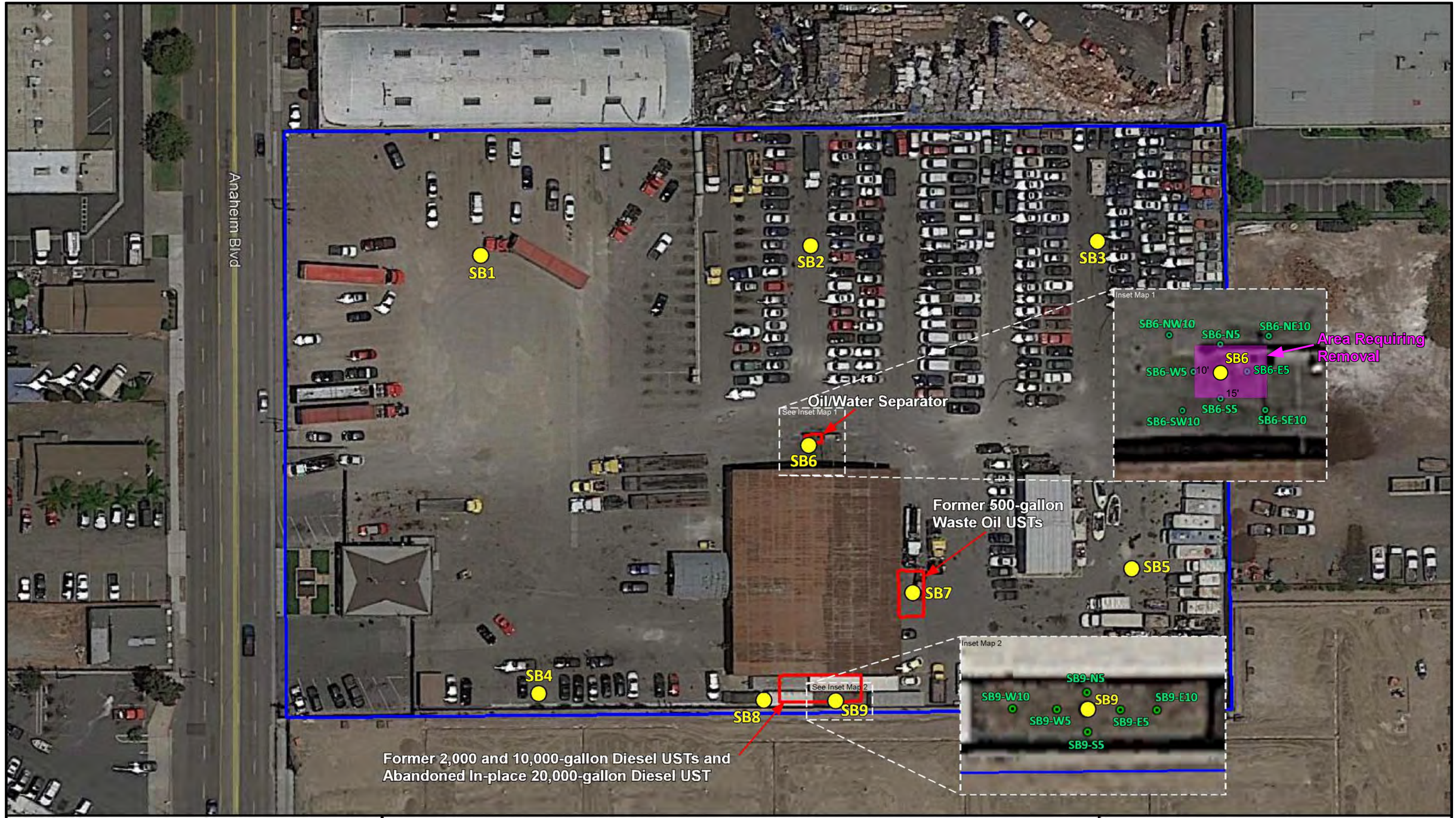
THE RENAISSANCE SITE PLAN
W.O.: 4260-3

H-8/5

PLOTTED BY: Luis Pina DATE: Mar. 31, 2020 11:16:06 AM FILE: F:\1027\Engineering\Site Plan\C-2 GRADING.dwg



PIC ENVIRONMENTAL SERVICES 5102 GAYHURST AVENUE BALDWIN PARK, CA 91706	0 40 SCALE IN FEET	SITE SKETCH MAP	
CLIENT: Anaheim Towing	FILE:	PROJECT MANAGER:	PROJECT NO.: E3084.2
LOCATION: 1122 North Lemon Street, Anaheim CA	DRAFTED BY:	DATE: 11/99	FIGURE: 2



LEGEND

- Approximate Subject Site Boundary
- Approximate Initial Boring Location and ID
- Approximate Step-out Boring Location and ID

SITE PLAN

1122 North Anaheim Boulevard
Anaheim, California

Project No.	11862.002
Scale	1" = 55'
Engr./Geol.	BFM
Drafted By	BFM
Date	March 2019

Figure No. 3

M E M O R A N D U M

CITY OF ANAHEIM

DATE: January 24, 2020

TO: Scott Koehm, Planning Services, Planning

FROM: Edgar Garcia, Development Services, Public Works
(714) 765-4953
Eunice Lee, Traffic Engineering, Public Works Department
(714) 765-5183, Ext. 5738

SUBJECT: CUP2019-06040 (DEV2019-00087)
1122 N Anaheim Blvd.,
Request to reclassify the property to the Mixed Use Overlay Zone and CUP Request for a multiple-family residential development in the Mixed-Use Overlay Zone for 269 apartment units. Second Review

The Public Works Department, Engineering Division has reviewed the proposed development for issues related to land subdivision, grading, street right-of-way and easement dedications, traffic engineering, street improvements, sewer improvements and site drainage. Public Works Procedures and Fee Schedule are available on the Department of Public Works website at http://www.anaheim.net/229/Public-Works. City Standard Details are available at: http://www.anaheim.net/285/Standard-Plans-and-Details

THE SITE PLAN IS NOT RECOMMENDED FOR APPROVAL UNTIL THE FOLLOWING COMMENTS ARE ADDRESED:

Plan Corrections/ Additional Information Required from Development Services

1. Geotracker indicates prior contamination at this site, which may have been remediated for industrial land use. Proposed development work onsite must conform to any requirements of the remediation and conditions of closure. **Please provide documentation from the Regional Water Quality Control Board demonstrating that the proposed residential project complies with the requirements of the remediation and corrective action**. Since the land use is being changed to residential use, the owner shall ensure that the requirements of the closure conditions or any updated remediation requirements are met. The Regional Water Quality Control Board, Orange County Health, or other applicable agency may impose remediation requirements as outlined in a Human Health Risk Assessment corrective action plan and it needs to be coordinated with issuance of city permits. The owner assumes full responsibility and liability for work on this site relative to past contamination.

2. **Plans shall show the location of the existing abandoned-in-place 20,000 gallon tank and pipelines and call out their disposition (removal and resulting cavities backfilled with engineered fill) on the plans**.

3. Architectural site plans shall show the dimension of the existing electrical easement. The dimension was not shown on the architectural site plan.

4. Cross-sections on Sheet A-8 shall show, label, and dimension the existing ROW of Anaheim Blvd., which is 45-ft. from the street centerline. The street centerline shall also be shown and labeled. Sheet A-8 was not updated to show them.

5. Locate existing dry utilities on Anaheim Blvd. to ensure there will not be conflicts with the proposed utilities to serve this development. The La Palma Village project to the south found an existing AT&T duct-bank on Anaheim Blvd. close to the curb. Therefore, verify proposed catch basins, storm drain, and sewer will not conflict with this existing AT&T duct-bank. Once potholing is completed, please update the plans with the field information.

6. Once the potholing is completed, please update the preliminary profiles of the storm drain connections within the public ROW with the field information to ensure that the catch basin relocations are feasible and there are no physical obstructions.18-inch minimum vertical clearance is required between storm drain facilities and other utilities. In addition, please show the proposed clearance from the back of the relocated catch basins to the edge of the existing duct bank. Proposed clearances are subject to review and approval of the City's Design Services Division after the potholing is completed.

PHASE II
ENVIRONMENTAL SITE ASSESSMENT
1122 NORTH ANAHEIM BOULEVARD,
ANAHEIM, CALIFORNIA

Prepared for

RPP Equities, LLC

4675 MacArthur Court, Suite 550
Newport Beach, California 92660

Project No. 11862.002

March 6, 2019

Leighton and Associates, Inc.
A LEIGHTON GROUP COMPANY

Leighton and Associates, Inc.
A LEIGHTON GROUP COMPANY

March 6, 2019

Project No. 11862.002

RPP Equities, LLC
4675 MacArthur Court, Suite 550
Newport Beach, California 92660

Attention: Mr. Robert Kim

Subject: Phase II Environmental Site Assessment
1122 North Anaheim Boulevard, Anaheim, California

INTRODUCTION

Leighton and Associates, Inc. (Leighton) is pleased to present this report summarizing the Phase II Environmental Site Assessment (ESA) activities completed for the proposed residential development located 1122 North Anaheim Boulevard in the city of Anaheim, California (site, Figure 1).

BACKGROUND

The site is approximately 4.5 acres and is currently occupied by Anaheim Fullerton Towing, who leases a portion of the site to Ecosystem Trucking. The site is developed with a small office building, an automobile and freight truck shop, an automobile storage warehouse, an employee breakroom building, an asphalt-paved impounded automobile parking lot, an unpaved freight truck parking lot, and a materials storage yard (e.g., shipping containers, truck trailer storage). Anaheim Fullerton Towing uses the site to store, maintain, and repair their company vehicles, as well as store vehicles that have been impounded by various city and police departments. Ecosystem Trucking uses the site to store/park their company vehicles (AECOM, 2017). Historical research completed by AECOM indicated that the site has been used as an automobile and freight truck storage/tow yard, maintenance and repair facility, and fueling site since at

least 1947. An oil-water separator is currently located in the automobile washing area located adjacent to the north of the main shop building (AECOM, 2017).

The site formerly operated five underground storage tanks (USTs) and associated fueling dispenser pumps. The USTs consisted of the following: one 2,000-gallon, one 10,000-gallon, and one 20,000-gallon diesel USTs and two 500-gallon waste oil USTs. The 2,000-gallon, 10,000-gallon, and two 500-gallon USTs were removed from the site in January 1999. The 20,000-gallon UST was abandoned in-place in April 1999. Soil sampling completed during tank removal/abandonment activities identified elevated concentrations of diesel-range petroleum hydrocarbons (TPHd) beneath the fuel dispensers associated with the 20,000-gallon UST. Additional assessment was completed in the vicinity of the TPHd-impacted soil identified during the tank abandonment activities and consisted of the advancement of five soil borings and the collection and analysis of 24 soil samples. Two soil samples contained elevated concentrations of TPHd (13,200 milligrams per kilogram [mg/kg] and 1,850 mg/kg). The Santa Ana Regional Water Quality Control Board (RWQCB) subsequently opened an investigation and recommended additional subsurface investigation at the site. Additional soil sampling was conducted in November 1999. Following the removal of petroleum impacted soil, the RWQCB issued regulatory case closure in 2000 (AECOM, 2017).

The property located adjacent to the east of the site was occupied by U.S. Industrial Chemicals Incorporated Anaheim Plant (a chemical plant) from at least 1938 to at least 1977. The chemical plant was developed with three steel molasses aboveground storage tank (ASTs), cooling towers, an evaporation and machine shop building, a liquid carbon and dry ice building, and additional associated buildings (AECOM, 2017).

The property located adjacent to the south of the site was formerly occupied by Regal Beloit Corporation – Electra Gear (Electra property), an automobile and truck parts manufacturer and operated multiple historical USTs on the property. Potential contaminants of concern include polychlorinated biphenyls (PCBs), motor oil, and tetrachloroethene (PCE) in soil. A soil gas survey was performed at the property in November 2017 and indicated that significant VOC impacts, specifically PCE, are present in soil gas beneath the neighboring property (AECOM, 2017).

OBJECTIVE

The purpose of the Phase II ESA was to determine what, if any, environmental impacts are present in the subsurface soil and soil gas from historic industrial uses of the site, as well as potential offsite sources, which could affect the future residential redevelopment of the site.

SCOPE OF WORK

The scope of work included the following:

- Advancement of nine initial exploratory soil borings (SB1 through SB9) to total depths between 15 and 35 feet below ground surface (bgs) and collection of soil samples for chemical analysis;
- Advancement of 14 step-out borings in the vicinity of initial borings SB6 and SB9 to total depths of 10 feet bgs and collection of soil samples for chemical analysis;
- Installation of soil gas probes in initial borings SB1 through SB6 and SB9 and collection of soil gas samples for chemical analysis; and
- Preparation of this report summarizing our findings and conclusions, including tables, illustrations, and appendices.

PHASE II ESA

Health and Safety Plan

Prior to starting work, Leighton prepared a site-specific Health and Safety Plan (HSP) to include safety aspects of the work performed at the site. The HSP was in compliance with the Occupational Safety and Health and Administration (OSHA) regulation 29 CFR 1910.120. The HSP was onsite with Leighton personnel at all times. The HSP outlined site procedures, potential hazards, and contains a hospital location map. All onsite Leighton personnel signed the HSP acknowledging acceptance.

after collection. Each soil gas sample, including the duplicates, was analyzed for the tracer gas and VOCs by modified EPA Method 8260B.

Copies of the chain of custody forms and complete analytical reports are included in Appendix D.

RESULTS

Soil Analytical Results

The soil analytical results were compared to one or more of the following regulatory screening criteria:

- The EPA Region IX Residential Regional Screening Levels (RSLs, November 2018);
- The DTSC Southern California Background concentration of 12 mg/kg for arsenic; and
- The DTSC Office of Human and Ecological Risk (HERO) Note Number 3 (June 2018).

The complete laboratory reports are included in Appendix D. A summary of laboratory results are presented in Tables 1 and 2 and below.

Volatile Organic Compounds

Three VOCs were detected in soil samples collected from the site during this investigation. The VOC results are summarized below:

- 1,2,4-Trimethylbenzene was detected in one of the 12 soil samples analyzed during this investigation at a concentration of 3.9 micrograms per kilogram (µg/kg) (SB9-25). The detection of 1,2,4-Trimethylbenzene did not exceed the residential HERO Note Number 3 screening criteria of 300,000 µg/kg.
- 1,3,5-Trimethylbenzene was detected in one of the 12 soil samples analyzed during this investigation at an estimated concentration of 1.3 µg/kg (SB9-25). The detection of 1,3,5-Trimethylbenzene did not exceed the residential HERO Note Number 3 screening criteria of 270,000 µg/kg.

- Methylene Chloride was detected in one of the 12 soil samples analyzed during this investigation at an estimated concentration of 4.9 µg/kg (SB6-2.5). The detection of methylene chloride did not exceed the residential HERO Note Number 3 screening criteria of 1,800 µg/kg.

Total Petroleum Hydrocarbons

TPH as gasoline, also referred to as gasoline range organics (GRO), was detected in four of the 37 soil samples analyzed during this investigation at concentration ranging from 0.41 mg/kg (SB9-W5-5) to 260 mg/kg (SB9-5). The detected concentration of GRO in one soil sample, SB9-5, exceeded the residential RSL of 86 mg/kg.

TPH as diesel, also referred to as diesel range organics (DRO), was detected in 19 of the 39 soil samples analyzed during this investigation at concentrations ranging from 2.5 mg/kg to 1,800 mg/kg. The detected concentrations of DRO in three soil samples, SB6-2.5, SB6-E5-2.5, and SB6-5, exceeded the residential RSL of 96 mg/kg.

TPH as motor oil, also referred to as oil range organics (ORO), was detected in 38 of the 39 soil samples analyzed during this investigation at concentrations ranging from 2.5 mg/kg to 4,100 mg/kg. The detected concentrations of ORO in two soil samples (SB6-2.5 and SB6-5) exceeded the residential RSL of 2,500 mg/kg.

Title 22 Metals

Title 22 Metals were detected in each of the soil samples analyzed during this investigation with the exception of antimony, selenium, silver, and thallium. No samples contained metals at concentrations exceeding their respective screening criteria.

Soil Gas Analytical Results

The soil gas analytical results were compared to the adjusted HERO Note 3 (June 2018) and EPA Region 9 RSLs (November 2018) for indoor air in the more conservative residential setting assuming a future slab attenuation factor of 0.001 (DTSC, 2011). The selected decision criteria are conservative values typically used for screening purposes on residential properties and are not regulatory cleanup goals for the site.

The results of the laboratory analyses of the soil gas samples collected during this investigation are summarized in Table 3 and below:

- PCE was detected in 12 of the 16 soil gas samples analyzed during this investigation at concentrations ranging from 0.03 micrograms per liter (µg/L) to 0.21 µg/L. Detected concentrations of PCE did not exceed the residential HERO Note Number 3 screening criteria of 0.46 µg/L.

- Benzene was detected in one of the 16 soil gas samples analyzed during this investigation at a concentration of 0.02 µg/L (SB6-5). The detected concentration of benzene did not exceed the residential HERO Note Number 3 screening criteria of 0.097 µg/L.

- n-Propylbenzene was detected in one of the 16 soil gas samples analyzed during this investigation at a concentration of 0.13 µg/L (SB9-5). The detected concentration of n-Propylbenzene did not exceed the residential RSL screening criteria of 1,000 µg/L.

- N-Butylbenzene was detected in one of the 16 soil gas samples analyzed during this investigation at a concentration of 0.26 µg/L (SB9-5). There is no applicable screening criteria for n-Butylbenzene.

- Sec-Butylbenzene was detected in one of the 16 soil gas samples analyzed during this investigation at a concentration of 0.12 µg/L (SB9-5). There is no applicable screening criteria for sec-Butylbenzene.

CONCLUSIONS

Soil sample analytical results indicate that soil in the vicinity of two borings, SB6 and SB9, contain GRO or DRO and ORO at concentrations exceeding the RSL for residential land use.

- GRO was detected at a concentration of 260 mg/kg in boring SB9 at a depth of 5 feet bgs. GRO was not detected above the laboratory reporting limit in the soil samples collected above, at a depth of 2.5 feet bgs, and below, at a depth of 10 feet bgs, from within boring SB9. Soil samples collected at depths of 2.5, 5, and 7.5 feet bgs from step-out soil borings located approximately 2.5 feet north and south of SB9 and 5 feet east and west of SB9 did not contain GRO at concentrations exceeding the regulatory screening limits. Based on the results of our step-out soil samples, the GRO-impacted soil identified in boring SB9 appears to be very limited in vertical and lateral extent and is considered *de minimis*.

- DRO and ORO were detected at maximum concentrations of 4,100 mg/kg and 1,800 mg/kg in boring SB6 at depths of 2.5 and 5 feet bgs, respectively. DRO and ORO were not detected at concentrations exceeding the RSL for residential use in the soil sample collected at a depth of 10 feet bgs from within boring SB6. SB6 was advanced adjacent to the oil/water separator on the north side of the main shop building, and a potential release associated with the oil/water separator could be attributed as the source of contamination. DRO was detected at a concentration exceeding the residential RSL in one step-out soil boring, SB6-E5 (located 5 feet east of boring SB6) at a depth of 2.5 feet bgs. DRO was not detected above the laboratory reporting limits in step-out borings SB6-NE10 and SB6-SE10, located approximately 10 feet southeast and northeast of boring SB6. The extent of DRO-impacted soil is limited to an area approximately 10 feet by 15 feet and ranges in vertical depth from 5 feet in the vicinity of boring SB6-E5 up to 7.5 feet in the vicinity of boring SB6.

Concentrations of metals and VOCs detected in soil samples analyzed during this investigation do not exceed residential use screening criteria. Additionally, concentrations of VOCs detected in soil gas samples analyzed during this investigation do not exceed proposed residential use screening criteria.

RECOMMENDATIONS

Based on the results of this Phase II ESA, it is Leighton's opinion that additional assessment of the site is not warranted. The GRO-impacted soil in the vicinity of boring SB9 is considered *de minimis* and remediation and/or mitigation is not warranted prior to redevelopment of the site based on the insignificant quantity detected.

The lateral and vertical limits of DRO/ORO-impacted soil in the vicinity of boring SB6 have been delineated. The area of soil requiring removal and offsite disposal prior to redevelopment of the site is approximately 10 feet by 15 feet up to an average depth of 6.5 feet. The estimated quantity is approximately 36 cubic yards or roughly 58 tons. The area requiring removal is illustrated on Figure 2.

Prior to redevelopment of the site for residential use, it is likely that the abandoned in-place 20,000-gallon diesel, located on the south side of the main shop building will need to be removed under the guidance and direction of the Anaheim Fire Department. The

Anaheim Fire Department may require soil beneath the tank to be excavated and disposed of based on sample results collected during removal activities.

An estimate to provide the remedial activities listed above is provided below. It should be noted that the remedial activities (soil excavation and tank removal) are an approximation (based on current rates and tipping fees) and will be more precisely estimated prior to completion of remedial activities.

REMEDIAL ACTIVITIES (ROUGH ORDER MAGNITUDE)

Removal of oil/water separator, excavation of TPH-impacted soil (assumed up to 250 cubic yards of non-haz soil), and tank removal activities	**$ 135,000.00**

In general, observations should be made during any future Site redevelopment for areas of possible contamination such as, but not limited to, the presence of underground facilities, buried debris, waste drums, tanks, stained soil or odorous soils. Should such materials be encountered, further investigation and analysis may be necessary at that time.

LIMITATIONS

This investigation was conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions.

The observations and conclusions presented in this report are professional opinions based on the scope of activities, work schedule, and information obtained through the activities described herein, and are limited to the portion of the Site investigated. Opinions presented herein apply to property conditions existing at the time of our study and cannot necessarily be taken to apply to property conditions outside of the area investigated or changes that we are not aware of or have not had the opportunity to evaluate. It must be recognized that conclusions drawn from these data are limited to the portion of the Site investigated, and the amount, type, distribution, and integrity of the information collected at the time of the investigation, and the methods utilized to collect and evaluate the data. Although Leighton has taken steps to obtain true copies of available information, we make no representation or warranty with respect to the accuracy or completeness of the information provided by others.

TABLE 1
Soil Analytical Results for Title 22 Metals
1122 North Anaheim Boulevard, Anaheim, California

Boring ID	Sample ID	Depth (feet bgs)	Sample Date	Title 22 Metals (mg/kg)																
				Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium (Total)	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
HERO Note 3 Residential SL - June 2018				--	**0.11**	--	**15**	**5.2**	**36,000**	--	--	**80**	**1.0**	--	**490**	--	**390**	--	**390**	--
USEPA Residential RSL - November 2018				**310**	**0.68**	**15,000**	**160**	**71**	--	**23**	**3,100**	**400**	**1.1**	**390**	**670**	**390**	**390**	**0.78**	**390**	**23,000**
SoCal Background (Arsenic Only)				--	**12**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB1	SB1-0.5	0.5	1/15/2019	<10	**2.2 J**	**76**	**0.42 J**	**0.85**	**20**	**7.4**	**50**	**17**	**0.037**	<2.0	**15**	<3.0	<1.5	<10	**42**	**65**
	SB1-2.5	2.5	1/15/2019	<9.8	<2.9	**15**	<0.49	<0.49	**3.9**	**1.4**	**9.7**	**3.2**	**0.015 J**	<2.0	**3.1**	<2.9	<1.5	<9.8	**8.3**	**13**
SB2	SB2-0.5	0.5	1/15/2019	<9.9	<3.0	**15**	<0.50	<0.50	**4.2**	**1.6**	**4.9**	**1.4 J**	**0.038**	<2.0	**2.3**	<3.0	<1.5	<9.9	**11**	**13**
	SB2-2.5	2.5	1/15/2019	<9.9	**2.8 J**	**57**	**0.27 J**	**0.39 J**	**15**	**5.2**	**38**	**12**	**0.022**	<2.0	**9.4**	<3.0	<1.5	<9.9	**33**	**49**
SB3	SB3-0.5	0.5	1/15/2019	<10	<3.0	**32**	<0.50	<0.50	**11**	**3.2**	**9.4**	**3.7**	**0.036**	<2.0	**5.3**	<3.0	<1.5	<10	**26**	**29**
	SB3-2.5	2.5	1/15/2019	<9.9	**1.9 J**	**50**	**0.31 J**	**0.27 J**	**14**	**4.5**	**34**	**11**	**0.019 J**	<2.0	**8.1**	<3.0	<1.5	<9.9	**30**	**41**
SB4	SB4-0.5	0.5	1/15/2019	<10	<3.0	**20**	<0.50	<0.50	**8.4**	**2.0**	**4.9**	**1.2 J**	**0.071**	<2.0	**2.9**	<3.0	<1.5	<10	**21**	**17**
	SB4-2.5	2.5	1/15/2019	<9.9	**3.5**	**65**	**0.41 J**	**0.57**	**17**	**5.0**	**44**	**17**	**0.012 J**	**1.3 J**	**11**	<3.0	<1.5	<9.9	**35**	**56**
SB5	SB5-0.5	0.5	1/15/2019	<10	<3.0	**22**	<0.50	<0.50	**6.6**	**1.9**	**3.9**	**1.6 J**	**0.015 J**	<2.0	**3.2**	<3.0	<1.5	<10	**18**	**17**
	SB5-2.5	2.5	1/15/2019	<10	<3.0	**14**	<0.50	<0.50	**5.1**	**1.5**	**14**	**1.7 J**	**0.017 J**	<2.0	**2.7**	<3.0	<1.5	<10	**14**	**14**
SB6	SB6-0.5	0.5	1/15/2019	<10	**1.5 J**	**20**	<0.50	<0.50	**8.0**	**2.1**	**11**	**1.3 J**	**0.037**	**1.0 J**	**2.6**	<3.0	<1.5	<10	**17**	**16**
	SB6-2.5	2.5	1/15/2019	<9.9	**2.7 J**	**53**	**0.28 J**	**0.43 J**	**14**	**5.2**	**35**	**11**	**0.024**	<2.0	**9.3**	<3.0	<1.5	<9.9	**31**	**43**
SB7	SB7-0.5	0.5	1/15/2019	<10	<3.0	**25**	<0.51	<0.51	**6.0**	**1.9**	**4.2**	**11**	**0.017 J**	<2.0	**3.3**	<3.0	<1.5	<10	**15**	**19**
	SB7-2.5	2.5	1/15/2019	<9.9	**8.1**	**51**	<0.49	**0.34 J**	**11**	**2.5**	**15**	**19**	**0.016 J**	**1.7 J**	**6.6**	<3.0	<1.5	<9.9	**20**	**74**
SB8	SB8-0.5	0.5	1/15/2019	<10	**1.7 J**	**27**	<0.50	<0.50	**5.9**	**2.1**	**10**	**6.4**	**0.036**	<2.0	**3.5**	<3.0	<1.5	<10	**16**	**29**
	SB8-2.5	2.5	1/15/2019	<9.9	**6.8**	**120**	**0.35 J**	**2.5**	**28**	**3.3**	**8.2**	**4.4**	**0.013 J**	**2.2**	**21**	<3.0	<1.5	<9.9	**34**	**26**
SB9	SB9-0.5	0.5	1/15/2019	<9.9	**5.6**	**90**	**0.27 J**	**1.3**	**25**	**3.0**	**9.7**	**4.8**	**0.029**	**1.6 J**	**17**	<3.0	<1.5	<9.9	**32**	**30**
	SB9-2.5	2.5	1/15/2019	<10	**4.8**	**73**	<0.50	**0.79**	**17**	**2.7**	**15**	**12**	**0.023**	**1.4 J**	**12**	<3.0	<1.5	<10	**25**	**46**

Notes:
mg/kg = milligrams per kilogram
bgs = below ground surface
<2.0 = Not detected above laboratory reporting limit as shown
2.14 = A bold number indicates that the chemical compound has exceeded the laboratory report limit.
SoCal Background = DTSC Determination of a Southern California Regional Background Arsenic Concentration in Soil (DTSC, 2008)
HERO Note 3 = Department of Toxic Substances Control (DTSC) Office of Human and Ecological Risk (HERO) Note Number 3 for Residential Soil (June 2018)
RSL = United States Environmental Protection Agency (USEPA) Region 9 Regional Screening Levels for Residential Soil (November 2018)
SL = Screening Level (Residential)
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.
-- = Not applicable

TABLE 2
Soil Analytical Results for TPH and VOCs
1122 North Anaheim Boulevard, Anaheim, California

Boring ID	Sample ID	Depth (feet bgs)	Sample Date	TPH (mg/kg)			VOCs (µg/kg)													
				GRO (C4-C12)	DRO (C13-C22)	ORO (C23-C40)	Benzene	Toluene	Ethylbenzene	Xylenes	n-Butylbenzene	sec-butylbenzene	Chloroform	Isopropylbenzene	n-Propylbenzene	PCE	TCE	Methylene Chloride	1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene
HERO Note 3 Residential SL - June 2018				--	--	--	**330**	**1,100,000**	--	--	--	--	--	--	--	**590**	--	**1,800**	--	--
USEPA Residential RSL - November 2018				**86***	**96***	**2,500***	**1,200**	**4,900,000**	--	**560,000**	**7,800,000**	**3,900,000**	**320**	--	**24,000**	**24,000**	**940**	**57,000**	**270,000**	**300,000**
SB1	SB1-2.5	2.5	1/15/2019	<0.40	<5.0	**4.1 J**	<2.0	<2.0	<2.0	<4.0	<5.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<2.0
	SB1-10	10	1/15/2019	<0.40	**2.9 J**	**4.1 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB2	SB2-2.5	2.5	1/15/2019	<0.40	**4.2 J**	**8.4**	<2.0	<2.0	<2.0	<4.0	<5.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<2.0
	SB2-10	10	1/15/2019	<0.40	<4.9	**3.4 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB3	SB3-2.5	2.5	1/15/2019	<0.40	**2.5 J**	**12**	<2.0	<2.0	<2.0	<4.0	<4.9	<4.9	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<2.0
	SB3-10	10	1/15/2019	<0.40	<5.0	**7.1**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB4	SB4-2.5	2.5	1/15/2019	<0.40	<4.9	**6.8**	<2.0	<2.0	<2.0	<4.0	<5.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<2.0
	SB4-10	10	1/15/2019	<0.40	**3.2 J**	**5.3**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB5	SB5-2.5	2.5	1/15/2019	<0.40	**2.5 J**	**10**	<2.0	<2.0	<2.0	<4.0	<5.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<2.0
	SB5-10	10	1/15/2019	<0.40	<4.9	**3.6 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB6	SB6-2.5	2.5	1/15/2019	<0.40	**1,600**	**4,100**	<2.0	<2.0	<2.0	<3.9	<4.9	<4.9	<2.0	<2.0	<2.0	<2.0	<2.0	**4.9 J**	<2.0	<2.0
	SB6-5	5	1/15/2019	<0.40	**1,800**	**3,100**	<2.0	<2.0	<2.0	<3.9	<4.9	<4.9	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<2.0
	SB6-10	10	1/15/2019	<0.40	**2.8 J**	**4.3 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB6-N5	SB6-N5-2.5	2.5	2/21/2019	--	<5.0	**5.0**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB6-N5-5	5.0	2/21/2019	--	<5.0	3.5 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB6-N5-7.5	7.5	2/21/2019	--	<5.0	2.5 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB6-NE10	SB6-NE10-2.5	2.5	2/21/2019	--	<5.0	4.0 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB6-E5	SB6-E5-2.5	2.5	2/21/2019	--	**320**	**580**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB6-E5-5	5.0	2/21/2019	--	2.9 J	4.6 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB6-E5-7.5	7.5	2/21/2019	--	<5.0	2.8 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB6-SE10	SB6-SE10-2.5	2.5	2/21/2019	--	<5.0	3.1 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB6-S5	SB6-S5-2.5	2.5	2/21/2019	--	<5.0	3.0 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB6-S5-5	5.0	2/21/2019	--	<5.0	<5.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB6-S5-7.5	7.5	2/21/2019	--	<5.0	2.7 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB6-W5	SB6-W5-2.5	2.5	2/21/2019	--	<5.0	3.0 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB6-W5-5	5.0	2/21/2019	--	<5.0	4.7 J	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB6-W5-7.5	7.5	2/21/2019	--	<5.0	**5.4**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB7	SB7-2.5	2.5	1/15/2019	<0.40	**86**	**820**	<2.0	<2.0	<2.0	<4.0	<5.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<2.0
	SB7-10	10	1/15/2019	<0.40	**2.7 J**	**10**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB8	SB8-2.5	2.5	1/15/2019	<0.40	<4.9	**8.9**	<2.0	<2.0	<2.0	<4.0	<5.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<2.0
	SB8-10	10	1/15/2019	<0.40	<5.0	**3.2 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB9	SB9-0.5	0.5	1/15/2019	<0.40	**12**	**50**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-2.5	2.5	1/15/2019	<0.40	**8.3**	**20**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-5	5	1/15/2019	**260**	**5.2**	**9.0**	<2.0	<2.0	<2.0	<4.0	<5.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<2.0
	SB9-10	10	1/15/2019	<0.40	**23**	**180**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-20	20	1/15/2019	<0.40	<4.9	**3.6 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-25	25	1/15/2019	**0.48**	**3.3 J**	**7.0**	<2.0	<2.0	<2.0	<3.9	<4.9	<4.9	<2.0	<2.0	<2.0	<2.0	<2.0	<20	**1.3 J**	**3.9**
	SB9-30	30	1/15/2019	<0.40	**3.0 J**	**5.4**	<2.0	<2.0	<2.0	<4.0	<5.0	<5.0	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<2.0
	SB9-35	35	1/15/2019	<0.40	**2.5 J**	**4.4 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 2
Soil Analytical Results for TPH and VOCs
1122 North Anaheim Boulevard, Anaheim, California

Boring ID	Sample ID	Depth (feet bgs)	Sample Date	TPH (mg/kg)			VOCs (µg/kg)													
				GRO (C4-C12)	DRO (C13-C22)	ORO (C23-C40)	Benzene	Toluene	Ethylbenzene	Xylenes	n-Butylbenzene	sec-butylbenzene	Chloroform	Isopropylbenzene	n-Propylbenzene	PCE	TCE	Methylene Chloride	1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene
HERO Note 3 Residential SL - June 2018				--	--	--	**330**	**1,100,000**	--	--	--	--	--	--	--	**590**	--	**1,800**	--	--
USEPA Residential RSL - November 2018				**86***	**96***	**2,500***	**1,200**	**4,900,000**	--	**560,000**	**7,800,000**	**3,900,000**	**320**	--	**24,000**	**24,000**	**940**	**57,000**	**270,000**	**300,000**
SB9-E5	SB9-E5-2.5	2.5	2/21/2019	<0.39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-E5-5	5	2/21/2019	<0.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-E5-7.5	7.5	2/21/2019	<0.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB9-W5	SB9-W5-2.5	2.5	2/21/2019	<0.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-W5-5	5	2/21/2019	**0.41**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-W5-7.5	7.5	2/21/2019	<0.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB9-S5	SB9-S5-2.5	2.5	2/21/2019	<0.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-S5-5	5	2/21/2019	<0.39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-S5-7.5	7.5	2/21/2019	<0.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SB9-N5	SB9-N5-2.5	2.5	2/21/2019	<2.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-N5-5	5	2/21/2019	<0.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	SB9-N5-7.5	7.5	2/21/2019	**0.51**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

2.14 = A bold number indicates that the chemical compound has exceeded the laboratory report limit.
(bgs) = below ground surface
PCE = Tetrachloroethylene or Tetrachloroethene
TCE = Trichloroethylene or Trichloroethene
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
<0.020 = Not detected above the laboratory detection limit
TPH = Total Petroleum Hydrocarbons
VOC = Volatile Organic Compound
-- = Not analyzed or not applicable
J = Result is less than the Reporting Limit but greater than or equal to the Method Detection Limit and the concentration is an approximate value.

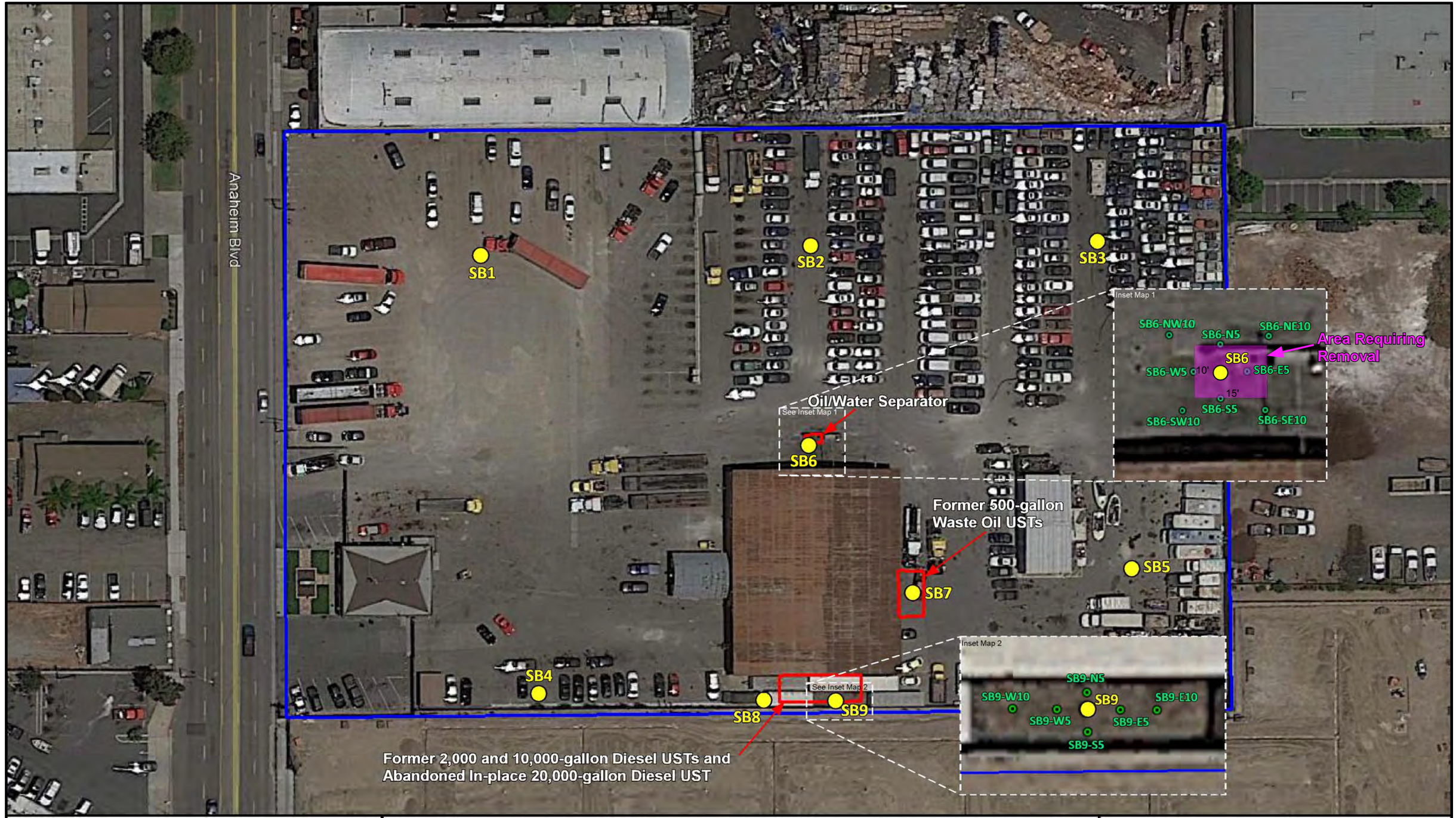
GRO = Gasoline Range Organics
DRO = Diesel Range Organics
ORO = Oil Range Organics
HERO Note 3 = Department of Toxic Substances Control (DTSC) Office of Human and Ecological Risk (HERO) Note Number 3 for Residential Soil (June 2018)
RSL = United States Environmental Protection Agency (USEPA) Region 9 Regional Screening Levels for Residential Soil (November 2018)
*Lowest aromatic/aliphatic TPH RSL selected for screening criteria
SL = Screening Level (Residential)

TABLE 3
Soil Gas Analytical Results for VOCs
1122 North Anaheim Boulevard, Anaheim, California

Boring ID	Sample ID	Probe Depth (feet bgs)	Date	VOCs (µg/L)								
				Ethylbenzene	Toluene	1,2,4-Trimethylbenzene	n-Propylbenzene	n-Butylbenzene	Benzene	sec-Butylbenzene	Xylenes	PCE
HERO Note 3 Residential SL (0.001 attenuation factor) - June 2018				--	**310**	--	--	--	**0.097**	--	--	**0.46**
USEPA Residential RSL (0.001 attenuation factor) - November 2018				**1.1**	**5,200**	**63**	**1,000**	--	**0.36**	--	**100**	**11**
SB1	SB1-5	5.0	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	**0.04**
	SB1-15	15	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	**0.04**
SB2	SB2-5	5.0	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	<0.02
	SB2-15	15	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	<0.02
SB3	SB3-5	5.0	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	<0.02
	SB3-15	15	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	<0.02
SB4	SB4-5	5.0	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	**0.03**
	SB4-15	15	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	**0.03**
SB5	SB5-5	5.0	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	**0.08**
	SB5-15	15	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	**0.12**
SB6	SB6-5	5.0	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	**0.02**	<0.10	<0.10	**0.04**
	SB6-5 Rep	15	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	**0.04**
	SB6-15	5.0	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	**0.03**
	SB6-15 Rep	15	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	**0.04**
SB9	SB9-5	5.0	01/25/19	<0.10	<0.20	<0.10	**0.13**	**0.26**	<0.02	**0.12**	<0.10	**0.13**
	SB9-15	15	01/25/19	<0.10	<0.20	<0.10	<0.10	<0.10	<0.02	<0.10	<0.10	**0.21**

Notes:

2.14 = A bold number indicates that the chemical compound has exceeded the laboratory report limit.
bgs = below ground surface
PCE = Tetrachloroethylene or Tetrachloroethene
µg/L = micrograms per liter
<0.020 = Not detected above the laboratory detection limit
HERO Note 3 = Department of Toxic Substances Control (DTSC) Office of Human and Ecological Risk (HERO) Note Number 3 for Residential Air (June 2018)
RSL = United States Environmental Protection Agency (USEPA) Region 9 Regional Screening Levels for Residential Air (November 2018)
SL = Screening Level (Residential)
-- = Not applicable
Screening levels are adjusted using a 0.001 attenuation factor for future residential use are from Table 2 of the 2011 Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance)



LEGEND

- Approximate Subject Site Boundary
- Approximate Initial Boring Location and ID
- Approximate Step-out Boring Location and ID

SITE PLAN

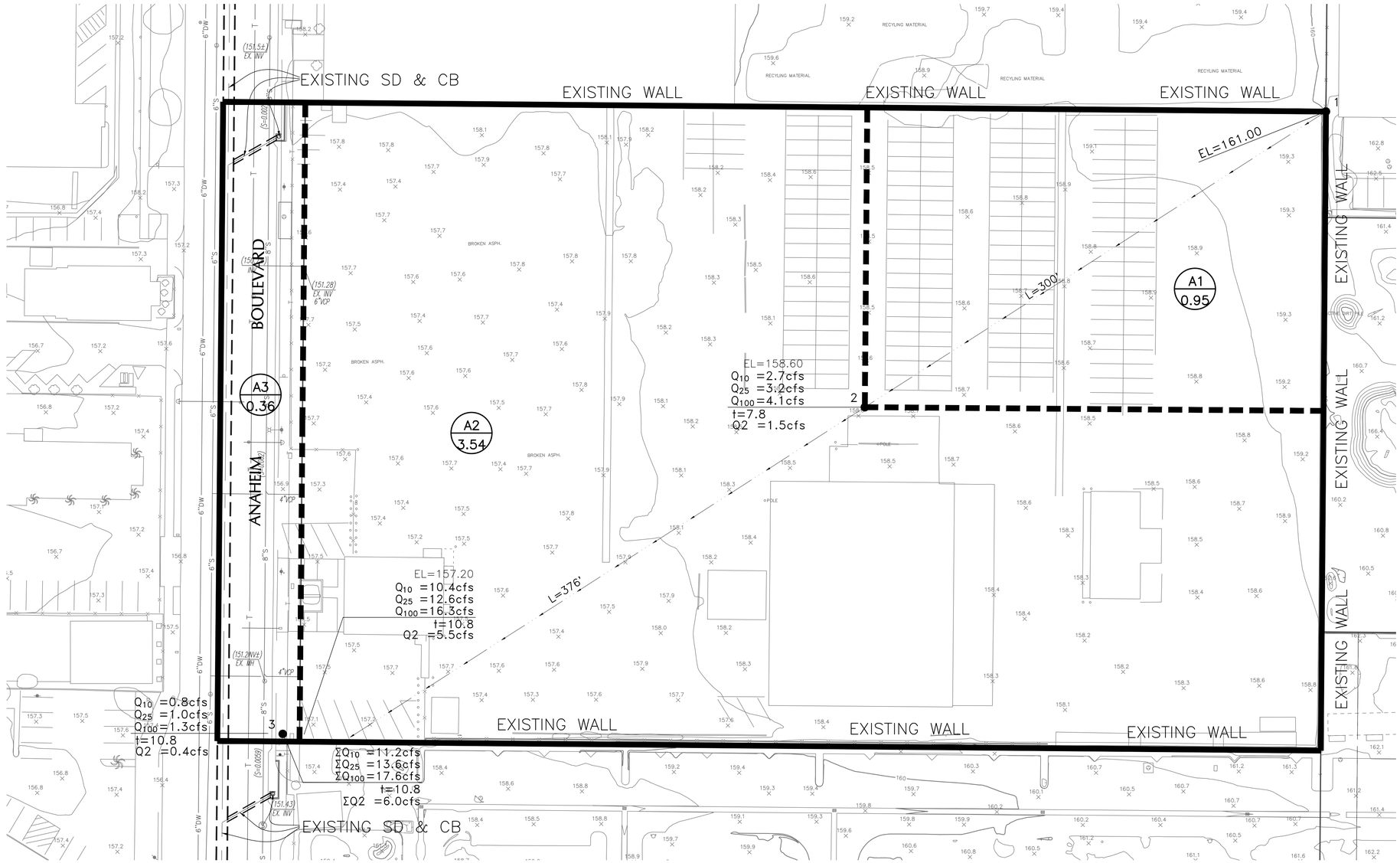
1122 North Anaheim Boulevard
Anaheim, California

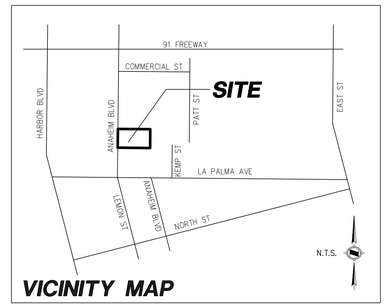
Project No.	11862.002
Scale	1" = 55'
Engr./Geol.	BFM
Drafted By	BFM
Date	March 2019

Figure No. 2

Attachment G

HCOC Reference





LEGEND

- MAJOR DRAINAGE BOUNDARY
- MINOR DRAINAGE BOUNDARY
- 1 — NODE NUMBER
- A / 1.0 — AREA DESIGNATION / AREA ACREAGE (IN ACRES)
- Q_{10} =6.0cfs, Q_{25} =8.0cfs, t=10.0 — PEAK FLOW RATE / TIME OF CONCENTRATION
- A — SOIL GROUP

1" = 30'

30 15 0 30 90

GRAPHIC SCALE 1"=30'

HYDROLOGY MAP
EXISTING CONDITION

1122 N. ANAHEIM BLVD
"THE INVITATION"
CITY OF ANAHEIM

PREPARED BY:

RENAISSANCE CITY NORTH ANAHEIM LLC.
RPP EQUITIES LLC.

4675 MacArthur Court, Suite 550
Newport Beach, CA 92660

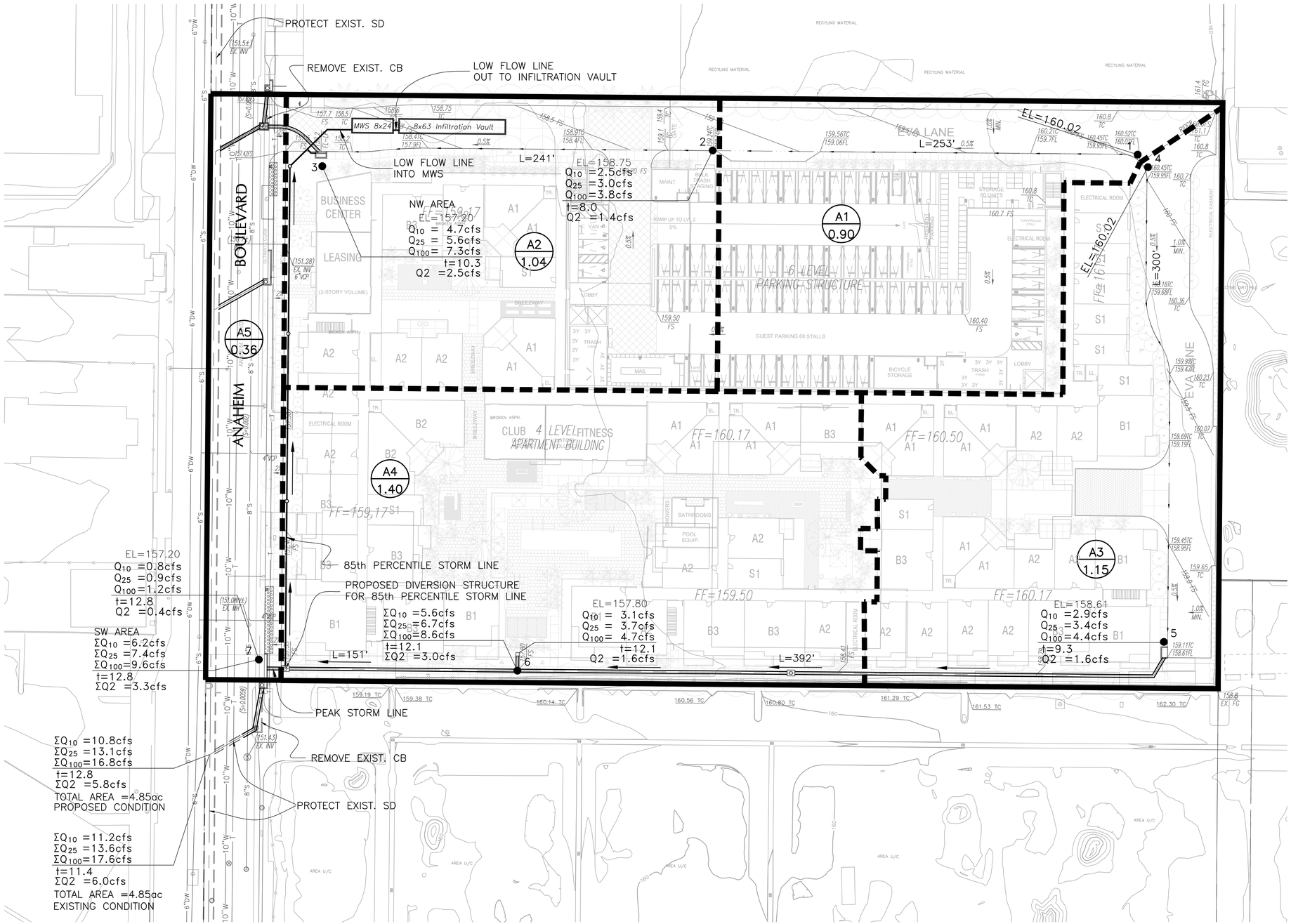
CONTACT: ROBERT KIM
PHONE: (714) 658-6299

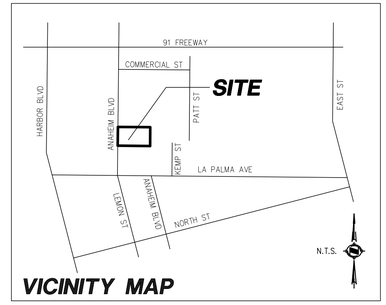
PREPARED BY:

HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

W.O. #4098-3

PLOTTED BY: Tu Trinh DATE: Mar. 29, 2020 01:04:05 PM FILE: F:\1027\Engineering\SY_Hydrology\Invitation Exist Map.dwg





LEGEND

- MAJOR DRAINAGE BOUNDARY
- MINOR DRAINAGE BOUNDARY
- NODE NUMBER
- AREA DESIGNATION / AREA ACREAGE (IN ACRES)
- Q_{10} =6.0cfs, Q_{25} =8.0cfs, t=10.0 — PEAK FLOW RATE / TIME OF CONCENTRATION
- A — SOIL GROUP
- PROPOSED STORM DRAIN

1" = 30'

30 15 0 30 90

GRAPHIC SCALE 1"=30'

HYDROLOGY MAP
PROPOSED CONDITION

1122 N. ANAHEIM BLVD
"THE INVITATION"
CITY OF ANAHEIM

PREPARED BY:

RENAISSANCE CITY NORTH ANAHEIM LLC.
RPP EQUITIES LLC.
4675 MacArthur Court, Suite 550
Newport Beach, CA 92660
CONTACT: ROBERT KIM
PHONE: (714) 658-6299

PREPARED BY:

HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

W.O. #4098-3

PLOTTED BY: Tu Trinh DATE: May. 06, 2020 05:57:27 PM FILE: F:\1027\Engineering\SY_Hydrology\Invitation Pro Map.dwg

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
         (C) Copyright 1989-2016 Advanced Engineering Software (aes)
             Ver. 23.0  Release Date: 07/01/2016  License ID 1239

                           Analysis prepared by:

                           HUNSAKER & ASSOCIATES
                                 Irvine,Inc
                       Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  W.O. 4260-3 THE INVITATION
  2-YR STUDY
  EXISTING CONDITION
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          4.85       10.00       44.(AMC II)     0.400       0.801

    TOTAL AREA (Acres) =      4.85

                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.040

                                  _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.199
==========================================================================

 Problem Descriptions:
  W.O. 4260-3 THE INVITATION
  2-YR STUDY
  EXISTING CONDITION
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    4.85
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.040
    LOW LOSS FRACTION = 0.199
    TIME OF CONCENTRATION(MIN.) = 11.42
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

--------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.62
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.21

**************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.01      0.0000      0.00  Q         .         .         .         .
```

0.20	0.0009	0.11	Q	.	.	.	.
0.39	0.0027	0.11	Q	.	.	.	.
0.58	0.0044	0.11	Q	.	.	.	.
0.77	0.0062	0.11	Q	.	.	.	.
0.96	0.0080	0.12	Q	.	.	.	.
1.15	0.0099	0.12	Q	.	.	.	.
1.34	0.0117	0.12	Q	.	.	.	.
1.53	0.0136	0.12	Q	.	.	.	.
1.72	0.0154	0.12	Q	.	.	.	.
1.92	0.0173	0.12	Q	.	.	.	.
2.11	0.0192	0.12	Q	.	.	.	.
2.30	0.0211	0.12	Q	.	.	.	.
2.49	0.0231	0.12	Q	.	.	.	.
2.68	0.0250	0.12	Q	.	.	.	.
2.87	0.0270	0.13	Q	.	.	.	.
3.06	0.0290	0.13	Q	.	.	.	.
3.25	0.0310	0.13	Q	.	.	.	.
3.44	0.0330	0.13	Q	.	.	.	.
3.63	0.0350	0.13	Q	.	.	.	.
3.82	0.0371	0.13	Q	.	.	.	.
4.01	0.0392	0.13	Q	.	.	.	.
4.20	0.0413	0.13	Q	.	.	.	.
4.39	0.0434	0.14	Q	.	.	.	.
4.58	0.0455	0.14	Q	.	.	.	.
4.77	0.0477	0.14	Q	.	.	.	.
4.96	0.0499	0.14	Q	.	.	.	.
5.15	0.0521	0.14	Q	.	.	.	.
5.34	0.0543	0.14	Q	.	.	.	.
5.53	0.0566	0.14	Q	.	.	.	.
5.72	0.0589	0.15	Q	.	.	.	.
5.91	0.0612	0.15	Q	.	.	.	.
6.10	0.0635	0.15	Q	.	.	.	.
6.29	0.0659	0.15	Q	.	.	.	.
6.48	0.0683	0.15	Q	.	.	.	.
6.67	0.0707	0.16	Q	.	.	.	.
6.86	0.0731	0.16	Q	.	.	.	.
7.05	0.0756	0.16	Q	.	.	.	.
7.24	0.0781	0.16	Q	.	.	.	.
7.43	0.0807	0.16	Q	.	.	.	.
7.63	0.0833	0.17	Q	.	.	.	.
7.82	0.0859	0.17	Q	.	.	.	.
8.01	0.0886	0.17	Q	.	.	.	.
8.20	0.0913	0.17	Q	.	.	.	.
8.39	0.0940	0.18	Q	.	.	.	.
8.58	0.0968	0.18	Q	.	.	.	.
8.77	0.0996	0.18	Q	.	.	.	.
8.96	0.1025	0.18	Q	.	.	.	.
9.15	0.1054	0.19	Q	.	.	.	.
9.34	0.1084	0.19	Q	.	.	.	.
9.53	0.1114	0.19	Q	.	.	.	.
9.72	0.1145	0.20	Q	.	.	.	.
9.91	0.1176	0.20	Q	.	.	.	.
10.10	0.1208	0.21	Q	.	.	.	.
10.29	0.1241	0.21	Q	.	.	.	.
10.48	0.1274	0.21	Q	.	.	.	.
10.67	0.1308	0.22	Q	.	.	.	.
10.86	0.1343	0.22	Q	.	.	.	.
11.05	0.1379	0.23	Q	.	.	.	.
11.24	0.1415	0.23	Q	.	.	.	.
11.43	0.1452	0.24	Q	.	.	.	.
11.62	0.1490	0.25	Q	.	.	.	.
11.81	0.1530	0.25	.Q	.	.	.	.
12.00	0.1570	0.26	.Q	.	.	.	.
12.19	0.1614	0.30	.Q	.	.	.	.
12.38	0.1664	0.34	.Q	.	.	.	.
12.57	0.1717	0.34	.Q	.	.	.	.
12.76	0.1772	0.36	.Q	.	.	.	.
12.95	0.1828	0.36	.Q	.	.	.	.
13.15	0.1887	0.38	.Q	.	.	.	.
13.34	0.1947	0.39	.Q	.	.	.	.
13.53	0.2010	0.41	.Q	.	.	.	.

```
 13.72      0.2075      0.42  .Q        .         .         .         .
 13.91      0.2143      0.45  .Q        .         .         .         .
 14.10      0.2214      0.46  .Q        .         .         .         .
 14.29      0.2291      0.51  . Q       .         .         .         .
 14.48      0.2373      0.53  . Q       .         .         .         .
 14.67      0.2460      0.58  . Q       .         .         .         .
 14.86      0.2553      0.61  . Q       .         .         .         .
 15.05      0.2654      0.68  . Q       .         .         .         .
 15.24      0.2765      0.73  . Q       .         .         .         .
 15.43      0.2890      0.85  .  Q      .         .         .         .
 15.62      0.3024      0.86  .  Q      .         .         .         .
 15.81      0.3195      1.32  .    Q    .         .         .         .
 16.00      0.3446      1.87  .      Q  .         .         .         .
 16.19      0.4063      5.97  .         .         .  Q      .         .
 16.38      0.4613      1.02  .   Q     .         .         .         .
 16.57      0.4756      0.80  .  Q      .         .         .         .
 16.76      0.4870      0.64  . Q       .         .         .         .
 16.95      0.4964      0.55  . Q       .         .         .         .
 17.14      0.5046      0.49  .Q        .         .         .         .
 17.33      0.5118      0.43  .Q        .         .         .         .
 17.52      0.5184      0.40  .Q        .         .         .         .
 17.71      0.5244      0.37  .Q        .         .         .         .
 17.90      0.5301      0.35  .Q        .         .         .         .
 18.09      0.5354      0.33  .Q        .         .         .         .
 18.28      0.5400      0.26  .Q        .         .         .         .
 18.47      0.5439      0.24  Q         .         .         .         .
 18.66      0.5477      0.23  Q         .         .         .         .
 18.86      0.5512      0.22  Q         .         .         .         .
 19.05      0.5546      0.21  Q         .         .         .         .
 19.24      0.5579      0.20  Q         .         .         .         .
 19.43      0.5610      0.20  Q         .         .         .         .
 19.62      0.5640      0.19  Q         .         .         .         .
 19.81      0.5670      0.18  Q         .         .         .         .
 20.00      0.5698      0.18  Q         .         .         .         .
 20.19      0.5725      0.17  Q         .         .         .         .
 20.38      0.5752      0.17  Q         .         .         .         .
 20.57      0.5778      0.16  Q         .         .         .         .
 20.76      0.5803      0.16  Q         .         .         .         .
 20.95      0.5828      0.15  Q         .         .         .         .
 21.14      0.5852      0.15  Q         .         .         .         .
 21.33      0.5875      0.15  Q         .         .         .         .
 21.52      0.5898      0.14  Q         .         .         .         .
 21.71      0.5920      0.14  Q         .         .         .         .
 21.90      0.5942      0.14  Q         .         .         .         .
 22.09      0.5963      0.13  Q         .         .         .         .
 22.28      0.5984      0.13  Q         .         .         .         .
 22.47      0.6005      0.13  Q         .         .         .         .
 22.66      0.6025      0.13  Q         .         .         .         .
 22.85      0.6045      0.13  Q         .         .         .         .
 23.04      0.6065      0.12  Q         .         .         .         .
 23.23      0.6084      0.12  Q         .         .         .         .
 23.42      0.6103      0.12  Q         .         .         .         .
 23.61      0.6121      0.12  Q         .         .         .         .
 23.80      0.6139      0.12  Q         .         .         .         .
 23.99      0.6157      0.11  Q         .         .         .         .
 24.18      0.6175      0.11  Q         .         .         .         .
 24.37      0.6184      0.00  Q         .         .         .         .
 ---------------------------------------------------------------------------
---------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated              Duration
        Peak Flow Rate                   (minutes)
    ======================               =========
               0%                         1450.3
              10%                          125.6
              20%                           34.3
              30%                           22.8
              40%                           11.4
```

50%	11.4
60%	11.4
70%	11.4
80%	11.4
90%	11.4

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
         (C) Copyright 1989-2016 Advanced Engineering Software (aes)
             Ver. 23.0  Release Date: 07/01/2016  License ID 1239

                           Analysis prepared by:

                           HUNSAKER & ASSOCIATES
                                 Irvine,Inc
                       Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  W.O. 4260-3 THE INVITATION
  2-YR STUDY
  PROPOSED CONDITION
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          4.85       15.00       44.(AMC II)     0.400       0.756

    TOTAL AREA (Acres) =      4.85

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.060

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.244
==========================================================================

 Problem Descriptions:
  W.O. 4260-3 THE INVITATION
  2-YR STUDY
  PROPOSED CONDITION
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    4.85
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.060
    LOW LOSS FRACTION = 0.244
    TIME OF CONCENTRATION(MIN.) = 12.80
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

--------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.59
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.24

**************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.21      0.0009      0.11  Q         .         .         .         .
```

0.43	0.0028	0.11	Q	.	.	.	.
0.64	0.0047	0.11	Q	.	.	.	.
0.85	0.0066	0.11	Q	.	.	.	.
1.07	0.0085	0.11	Q	.	.	.	.
1.28	0.0105	0.11	Q	.	.	.	.
1.49	0.0124	0.11	Q	.	.	.	.
1.71	0.0144	0.11	Q	.	.	.	.
1.92	0.0164	0.11	Q	.	.	.	.
2.13	0.0184	0.11	Q	.	.	.	.
2.35	0.0204	0.12	Q	.	.	.	.
2.56	0.0225	0.12	Q	.	.	.	.
2.77	0.0245	0.12	Q	.	.	.	.
2.99	0.0266	0.12	Q	.	.	.	.
3.20	0.0287	0.12	Q	.	.	.	.
3.41	0.0309	0.12	Q	.	.	.	.
3.63	0.0330	0.12	Q	.	.	.	.
3.84	0.0352	0.12	Q	.	.	.	.
4.05	0.0374	0.13	Q	.	.	.	.
4.27	0.0396	0.13	Q	.	.	.	.
4.48	0.0419	0.13	Q	.	.	.	.
4.69	0.0441	0.13	Q	.	.	.	.
4.91	0.0464	0.13	Q	.	.	.	.
5.12	0.0488	0.13	Q	.	.	.	.
5.33	0.0511	0.13	Q	.	.	.	.
5.55	0.0535	0.14	Q	.	.	.	.
5.76	0.0559	0.14	Q	.	.	.	.
5.97	0.0584	0.14	Q	.	.	.	.
6.19	0.0609	0.14	Q	.	.	.	.
6.40	0.0634	0.14	Q	.	.	.	.
6.61	0.0659	0.15	Q	.	.	.	.
6.83	0.0685	0.15	Q	.	.	.	.
7.04	0.0711	0.15	Q	.	.	.	.
7.25	0.0738	0.15	Q	.	.	.	.
7.47	0.0765	0.15	Q	.	.	.	.
7.68	0.0792	0.16	Q	.	.	.	.
7.89	0.0820	0.16	Q	.	.	.	.
8.11	0.0849	0.16	Q	.	.	.	.
8.32	0.0877	0.16	Q	.	.	.	.
8.53	0.0907	0.17	Q	.	.	.	.
8.75	0.0936	0.17	Q	.	.	.	.
8.96	0.0967	0.17	Q	.	.	.	.
9.17	0.0998	0.18	Q	.	.	.	.
9.39	0.1029	0.18	Q	.	.	.	.
9.60	0.1061	0.18	Q	.	.	.	.
9.81	0.1094	0.19	Q	.	.	.	.
10.03	0.1128	0.19	Q	.	.	.	.
10.24	0.1162	0.20	Q	.	.	.	.
10.45	0.1197	0.20	Q	.	.	.	.
10.67	0.1233	0.21	Q	.	.	.	.
10.88	0.1269	0.21	Q	.	.	.	.
11.09	0.1307	0.22	Q	.	.	.	.
11.31	0.1346	0.22	Q	.	.	.	.
11.52	0.1385	0.23	Q	.	.	.	.
11.73	0.1426	0.23	Q	.	.	.	.
11.95	0.1468	0.24	Q	.	.	.	.
12.16	0.1512	0.26	.Q	.	.	.	.
12.37	0.1563	0.32	.Q	.	.	.	.
12.59	0.1619	0.32	.Q	.	.	.	.
12.80	0.1677	0.34	.Q	.	.	.	.
13.01	0.1737	0.34	.Q	.	.	.	.
13.23	0.1799	0.36	.Q	.	.	.	.
13.44	0.1864	0.37	.Q	.	.	.	.
13.65	0.1932	0.40	.Q	.	.	.	.
13.87	0.2003	0.41	.Q	.	.	.	.
14.08	0.2078	0.44	.Q	.	.	.	.
14.29	0.2158	0.47	.Q	.	.	.	.
14.51	0.2245	0.51	. Q	.	.	.	.
14.72	0.2338	0.54	. Q	.	.	.	.
14.93	0.2438	0.60	. Q	.	.	.	.
15.15	0.2548	0.64	. Q	.	.	.	.
15.36	0.2672	0.76	. Q	.	.	.	.

15.57	0.2806	0.76	. Q	.	.	.	.
15.79	0.2973	1.12	. Q	.	.	.	.
16.00	0.3218	1.66	. Q	.	.	.	.
16.21	0.3847	5.48	.	.	.Q	.	.
16.43	0.4406	0.86	. Q	.	.	.	.
16.64	0.4543	0.69	. Q	.	.	.	.
16.85	0.4654	0.57	. Q	.	.	.	.
17.07	0.4748	0.49	.Q	.	.	.	.
17.28	0.4828	0.42	.Q	.	.	.	.
17.49	0.4899	0.38	.Q	.	.	.	.
17.71	0.4964	0.35	.Q	.	.	.	.
17.92	0.5025	0.33	.Q	.	.	.	.
18.13	0.5081	0.31	.Q	.	.	.	.
18.35	0.5129	0.24	Q	.	.	.	.
18.56	0.5170	0.23	Q	.	.	.	.
18.77	0.5209	0.21	Q	.	.	.	.
18.99	0.5245	0.20	Q	.	.	.	.
19.20	0.5280	0.19	Q	.	.	.	.
19.41	0.5314	0.19	Q	.	.	.	.
19.63	0.5346	0.18	Q	.	.	.	.
19.84	0.5377	0.17	Q	.	.	.	.
20.05	0.5407	0.17	Q	.	.	.	.
20.27	0.5436	0.16	Q	.	.	.	.
20.48	0.5463	0.16	Q	.	.	.	.
20.69	0.5490	0.15	Q	.	.	.	.
20.91	0.5517	0.15	Q	.	.	.	.
21.12	0.5542	0.14	Q	.	.	.	.
21.33	0.5567	0.14	Q	.	.	.	.
21.55	0.5591	0.14	Q	.	.	.	.
21.76	0.5615	0.13	Q	.	.	.	.
21.97	0.5638	0.13	Q	.	.	.	.
22.19	0.5660	0.13	Q	.	.	.	.
22.40	0.5682	0.12	Q	.	.	.	.
22.61	0.5704	0.12	Q	.	.	.	.
22.83	0.5725	0.12	Q	.	.	.	.
23.04	0.5746	0.12	Q	.	.	.	.
23.25	0.5766	0.11	Q	.	.	.	.
23.47	0.5786	0.11	Q	.	.	.	.
23.68	0.5805	0.11	Q	.	.	.	.
23.89	0.5825	0.11	Q	.	.	.	.
24.11	0.5843	0.11	Q	.	.	.	.
24.32	0.5853	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1446.4
10%	128.0
20%	38.4
30%	25.6
40%	12.8
50%	12.8
60%	12.8
70%	12.8
80%	12.8
90%	12.8

```
************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
        (c) Copyright 1983-2016 Advanced Engineering Software (aes)
            Ver. 23.0  Release Date: 07/01/2016  License ID 1239

                        Analysis prepared by:

                        HUNSAKER & ASSOCIATES
                              Irvine,Inc
                    Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY *************************
* W.O. #4260-3, RENAISSANCE APARTMENT                                   *
* 2-YR STUDY                                                            *
* EXISTING CONDITION                                                    *
 ************************************************************************

  FILE NAME: REN-E2.DAT
  TIME/DATE OF STUDY: 17:11 02/29/2020
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   26.0     21.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    161.00  DOWNSTREAM(FEET) =    158.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.818
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.751
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.95      0.40      0.100    17    7.82
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.46
  TOTAL AREA(ACRES) =      0.95   PEAK FLOW RATE(CFS) =      1.46

************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  51
```

```
------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    158.60  DOWNSTREAM(FEET) =    157.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =   376.00   CHANNEL SLOPE =  0.0037
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.409
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        3.54      0.40     0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.66
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.74
  AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   3.60
  Tc(MIN.) =   11.42
  SUBAREA AREA(ACRES) =     3.54       SUBAREA RUNOFF(CFS) =    4.36
  EFFECTIVE AREA(ACRES) =      4.49     AREA-AVERAGED Fm(INCH/HR) =   0.04
  AREA-AVERAGED Fp(INCH/HR) =   0.40  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        4.5         PEAK FLOW RATE(CFS) =       5.53

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   2.00
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     676.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  81
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
  MAINLINE Tc(MIN.) =   11.42
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.409
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.36      0.40     0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.36      SUBAREA RUNOFF(CFS) =    0.44
  EFFECTIVE AREA(ACRES) =      4.85   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        4.8       PEAK FLOW RATE(CFS) =       5.98
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.8  TC(MIN.) =     11.42
  EFFECTIVE AREA(ACRES) =      4.85  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       5.98
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
        (c) Copyright 1983-2016 Advanced Engineering Software (aes)
            Ver. 23.0  Release Date: 07/01/2016  License ID 1239

                          Analysis prepared by:

                          HUNSAKER & ASSOCIATES
                                Irvine,Inc
                     Planning * Engineering * Surveying
          Three Hughes * Irvine, California 92618 * (949)583-1010

 ************************* DESCRIPTION OF STUDY *************************
* W.O. #4260-3, RENAISSANCE APARTMENT                                    *
* 2-YR STUDY                                                             *
* PROPOSED CONDITION                                                     *
 ************************************************************************

  FILE NAME: INV-P.DAT
  TIME/DATE OF STUDY: 17:34 05/06/2020
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   26.0     21.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   253.00
  ELEVATION DATA: UPSTREAM(FEET) =    160.02  DOWNSTREAM(FEET) =    158.75

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.017
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.726
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                  A        0.90      0.40     0.100    17    8.02
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.37
  TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      1.37

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  158.75  DOWNSTREAM ELEVATION(FEET) =  157.20
  STREET LENGTH(FEET) =   241.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 26.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  21.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.05
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =   10.78
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.77
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.57
  STREET FLOW TRAVEL TIME(MIN.) =   2.27   Tc(MIN.) =   10.29
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.496
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  A        1.04      0.40     0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.04      SUBAREA RUNOFF(CFS) =    1.36
  EFFECTIVE AREA(ACRES) =      1.94    AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.9        PEAK FLOW RATE(CFS) =       2.54

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =  11.85
  FLOW VELOCITY(FEET/SEC.) =  1.85   DEPTH*VELOCITY(FT*FT/SEC.) =   0.63
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     494.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   157.20  DOWNSTREAM(FEET) =   156.40
  FLOW LENGTH(FEET) =   400.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.60
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.54
  PIPE TRAVEL TIME(MIN.) =   2.56    Tc(MIN.) =   12.85
```

```
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     894.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   12.85
 RAINFALL INTENSITY(INCH/HR) =   1.32
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.40
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.94
 TOTAL STREAM AREA(ACRES) =       1.94
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.54

****************************************************************************
 FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
 ELEVATION DATA: UPSTREAM(FEET) =    160.02  DOWNSTREAM(FEET) =    158.61

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.268
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.588
 SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                 A        1.15      0.40     0.200    17    9.27
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      1.56
 TOTAL AREA(ACRES) =      1.15   PEAK FLOW RATE(CFS) =      1.56

****************************************************************************
 FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   158.61  DOWNSTREAM(FEET) =   157.80
 FLOW LENGTH(FEET) =   392.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   2.33
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.56
 PIPE TRAVEL TIME(MIN.) =   2.81    Tc(MIN.) =   12.08
 LONGEST FLOWPATH FROM NODE      4.00 TO NODE      6.00 =     692.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.08
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.365
 SUBAREA LOSS RATE DATA(AMC  I ):
```

```
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  APARTMENTS                 A        1.40      0.40     0.200    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.40      SUBAREA RUNOFF(CFS) =    1.62
  EFFECTIVE AREA(ACRES) =      2.55   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.5       PEAK FLOW RATE(CFS) =       2.95

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   157.80  DOWNSTREAM(FEET) =   157.20
  FLOW LENGTH(FEET) =   151.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.50
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.95
  PIPE TRAVEL TIME(MIN.) =   0.72    Tc(MIN.) =   12.80
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      7.00 =     843.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.80
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.320
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        0.36      0.40     0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.36      SUBAREA RUNOFF(CFS) =    0.41
  EFFECTIVE AREA(ACRES) =      2.91   AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =        2.9       PEAK FLOW RATE(CFS) =       3.26

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.80
  RAINFALL INTENSITY(INCH/HR) =   1.32
  AREA-AVERAGED Fm(INCH/HR) =  0.08
  AREA-AVERAGED Fp(INCH/HR) =  0.40
  AREA-AVERAGED Ap =  0.19
  EFFECTIVE STREAM AREA(ACRES) =       2.91
  TOTAL STREAM AREA(ACRES) =       2.91
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.26

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

```
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
    1        2.54   12.85    1.317  0.40( 0.04) 0.10       1.9       1.00
    2        3.26   12.80    1.320  0.40( 0.08) 0.19       2.9       4.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.80   12.80    1.320  0.40( 0.06) 0.15       4.8       4.00
      2        5.79   12.85    1.317  0.40( 0.06) 0.15       4.8       1.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.80    Tc(MIN.) =    12.80
  EFFECTIVE AREA(ACRES) =       4.84   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.15
  TOTAL AREA(ACRES) =        4.8
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =     894.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.8  TC(MIN.) =     12.80
  EFFECTIVE AREA(ACRES) =      4.84  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap = 0.153
  PEAK FLOW RATE(CFS)   =       5.80

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        5.80   12.80    1.320  0.40( 0.06) 0.15       4.8       4.00
      2        5.79   12.85    1.317  0.40( 0.06) 0.15       4.8       1.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```