FUSCOE ENGINEERING

PRELIMINARY WATER QUALITY MANAGEMENT PLAN (WQMP)

4TH AND MORTIMER – BLOCK A

October 20, 2022

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4TH AND MORTIMER

BLOCK A

Santa Ana, California

PREPARED FOR
RED OAK INVESTMENTS, LLC
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Irvine, CA 92612
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PROJECT MANAGER
Josh Ruiz, PE

DATE PREPARED: July 20, 2022
REVISED OCTOBER 20, 2022

PROJECT NUMBER: 774-009-01

full circle thinking®

City of Santa Ana

Priority Project

Water Quality Management Plan (WQMP)

Project Name:

4TH & MORTIMER - BLOCK A

409 East 4th Street, City of Santa Ana, County of Orange

APN: 398-325-01

Prepared for:

Red Oak Investments, LLC

4199 Campus Drive #200

Irvine, CA 92612

949.733.2000

Prepared by:

Fuscoe Engineering, INC.

16795 Von Karman, Suite 100

Irvine, CA 92618

949.474.1960

Josh Ruiz, PE

Date Prepared: July 20, 2022
Revised: October 20, 2022

Project Owner's Certification			
Planning Application No. (If applicable)	Pending	Grading Permit No.	Pending
Tract/Parcel Map and Lot(s) No.	County of Orange: Book 398, Paged 32	Building Permit No.	Pending
Address of Project Site and APN	409 East 4th Street, Santa Ana, CA 92701 APN: 398-325-01		

This Water Quality Management Plan (WQMP) has been prepared for Red Oak Investments, LLC by Fuscoe Engineering, INC. The WQMP is intended to comply with the requirements of the County of Orange 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 , including the ongoing operation and maintenance of all best management practices (BMPs), 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.

Representation on the Authority of Parties/Signatories. Each person signing this Agreement represents and warrants that he or she is duly authorized and has legal capacity to execute and deliver this Agreement. Each party represents and warrants to the other that the execution and delivery of the Agreement and the performance of such party's obligations hereunder have been duly authorized and that the Agreement is a valid and legal agreement binding on such party and enforceable in accordance with its terms. This agreement is binding on any successors in interest, designees or transferees. Attach proof of authority to execute this agreement.

Owner: Andrew Nelson			
Title			
Company	Red Oak Investments, LLC		
Address	4199 Campus Drive #200, Irvine, CA 92612		
Email	anelson@redoakinv.com		
Telephone #	949.733.2000		
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.			
Owner Signature		Date	
Preparer (Engineer): Josh Ruiz			

Title	Senior Project Manager	PE Registration #	090418
Company	Fuscoe Engineering		
Address	16795 Von Karman, Suite 100, Irvine, CA 92618		
Email	jruiz@fuscoe.com		
Telephone #	949.474.1960		

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	
Place Stamp Here			

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EXHIBITS & BMP DETAILS (INCLUDED IN SECTION VI)

- **Vicinity Map**
- **Site Plan**
- **Preliminary WQMP Exhibit**
- **Typical Cross Sections**
- **INF-7 Underground Infiltration BMP Fact Sheet**

EDUCATIONAL MATERIALS (INCLUDED IN APPENDIX C)

- **The Ocean Begins at Your Front Door**
- **Homeowners Guide for Sustainable Water Use**
- **Household Tips**

- **Proper Disposal of Household Hazardous Waste**
- **Recycle at your Local Used Oil Collection Center (Central County)**
- **Responsible Pest Control**
- **Tips for Landscaping and Gardening**
- **Tips for Pool Maintenance**
- **Tips for Protecting your Watershed**
- **Tips for the Food Service Industry**
- **Proper Maintenance Practices for your Business**
- **DF-1 Drainage System Operations & Maintenance**
- **SD-10 Site Design & Landscape Planning**
- **SD-11 Roof Runoff Control**
- **SD-12 Efficient Irrigation**
- **SD-13 Storm Drain Signage**

Section I Permit(s) and Water Quality Conditions of Approval or Issuance

Provide discretionary or grading/building permit information and water quality conditions of approval, or permit issuance, applied to the project. If conditions are unknown, please request applicable conditions from staff. *Refer to Section 2.1 in the Technical Guidance Document (TGD) available on the OC Planning website (ocplanning.net).*

Project Infomation			
Permit/Application No. (If applicable)	Pending	Grading or Building Permit No. (If applicable)	Pending
Address of Project Site (or Tract Map and Lot Number if no address) and APN	409 East 4th Street, Santa Ana, CA 92701 APN: 398-325-01		
Water Quality Conditions of Approval or Issuance			
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim.)	A Project Water Quality Management plan (WQMP) conforming to the current Waste Discharge Requirements Permit for the County of Orange (Order No. R8-2009-0030) [MS4 Permit] prepared by a Licensed Civil Engineer, shall be submitted to the Department of Public Works for review and acceptance. The WQMP shall address Section XII of the MS4 Permit and all current surface water quality issues. The project WQMP shall include the following: a. Low Impact Development b. Discusses regional or watershed programs (if applicable). c. Address Site Design BMPs (as applicable) such as minimizing impervious areas, maximizing permeability, minimizing directly connected impervious areas, creating reduced or "zero discharge" areas, and conserving natural areas. d. Incorporates the applicable Routine Source Control BMPs as defined in the Drainage Area Management Plan. (DAMP) e. Incorporates Treatment Control BMPs as defined in the DAMP. f. Generally describes the long-term operation and maintenance requirements for the Treatment Control BMPs. g. Identifies the entity that will be responsible for long-term operation and maintenance of the Treatment Control BMPs. h. - Describes the mechanism for funding the long-term operation and maintenance of the Treatment Control BMPs.		

	i. Includes an Operations and Maintenance (O&M) Plan for all structural BMPs j. After incorporating plan check comments of Public Works, three final WQMPs (signed by the owner and the Registered Civil Engineer of record) shall be submitted to Public Works for acceptance. After acceptance, two copies of the final report shall be returned to the applicant for the production of a single complete electronic copy of the accepted version of the WQMP on CD media that includes: 1. The 24" x 36" Site Plan in .TIFF format (400 by 400 dpi minimum). 2. The remainder of the complete WQMP in .PDF format including the signed and stamped title sheet, owner's certification sheet, Inspection/Maintenance Responsibility sheet, appendices, attachments and all educational material. The project is considered to be a significant redevelopment project, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect health and safety. The project redevelopment results in the addition or replacement of 56,756 square feet of impervious area, which accounts for the greater than 50 percent of the impervious area on-site. The numeric sizing criteria applies to the entire development.

Conceptual WQMP

Was a Conceptual Water Quality Management Plan previously approved for this project?	A Preliminary Water Quality Management Plan was previously approved for the project.

Watershed-Based Plan Conditions

Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	Applicable TMDLs for Santa Ana Delhi Channel, Upper and Lower Newport Bay, include the following: • Metals • Nutrients • Pesticides • Siltation

	• Pathogens • Priority Organics

Section II Project Description

II.1 Project Description

The proposed 4th and Mortimer – Block A project site encompasses approximately 1.42 acres in the City of Santa Ana. The project site is bounded by Fifth Street to the north, French Street to the west, Fourth Street to the south, and Mortimer Street to the east. A Vicinity Map is included in Section VI.

Under existing conditions, parcel is a Northgate Market grocery store and parking lot. Adjacent land uses include mainly commercial structures to the south with residential complexes to the northwest and northeast. The project site is located in the District Center in Downtown Santa Ana (DTSA).

The table below summarizes the proposed project.

Description of Proposed Project				
Development Category (From Model WQMP, Table 7.11-2; or -3):	8. All significant redevelopment projects, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety.			
Project Area (ft^2): 118,265	Number of Dwelling Units: 123		SIC Code: TBD; to include residential and commercial land use pending lease agreements	
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	0.142 ac	10.0%	1.278 ac	90.0%
Post-Project Conditions	0.120 ac	8.4%	1.303 ac	91.6%
Drainage Patterns/Connections	Under existing conditions, runoff surface flows across the project site in a southwesterly direction. Flows enter a public storm drain system along French street and travel south before joining the Santa Ana Delhi Channel which drains to Upper			

	and Lower Newport Bay and ultimately into the Pacific Ocean. Under proposed conditions, runoff the project site will be picked up by area drains and routed to an underground detention chamber, then to a drywell located underground at the center of the site. Low flows and first flush runoff will be retained onsite, first passing through a Jensen precast vault chamber (or similar) then into a Maxwell drywell (or similar) for water quality treatment via infiltration. High flows will bypass the system and immediately join the public storm drain system along French street. From there flows will travel south before joining the Santa Ana Delhi Channel which drains to Upper and Lower Newport Bay and ultimately into the Pacific Ocean.
Narrative Project Description: (Use as much space as necessary.)	The proposed project plans to demolish the existing commercial buildings and parking structures and construct a mixed-use development consisting of 123 residential units as well as providing restaurant and retail space in the downtown district. The west parcel will consist of a seven-story mixed use structure wrapped around a five-story parking structure. There will be 99,633 SF of residential space, 10,800 SF of retail space, 5,000 SF of restaurant space, and 7,200 SF of leasing and amenity space. A total of 123 residential units and 220 parking spaces will be provided.

II.2 Potential Stormwater Pollutants

Determine and list expected stormwater pollutants based on land uses and site activities. *Refer to Section 2.2.2 and Table 2.1 in the Technical Guidance Document (TGD) for guidance.*

Pollutants of Concern			
Pollutant	Check One for each: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E ☒	N ☐	
Nutrients	E ☒	N ☐	303(d) listed impairment for downstream receiving waters.
Heavy Metals	E ☒	N ☐	303(d) listed impairment for downstream receiving waters
Pathogens (Bacteria/Virus)	E ☒	N ☐	303(d) listed impairment for downstream receiving waters.
Pesticides	E ☒	N ☐	303(d) listed impairment for downstream receiving waters.
Oil and Grease	E ☒	N ☐	
Toxic Organic Compounds	E ☒	N ☐	303(d) listed impairment for downstream receiving waters.
Trash and Debris	E ☒	N ☐	

II.3

Hydrologic Conditions of Concern

☐ No – Show map

☒ Yes – Describe applicable hydrologic conditions of concern below. *Refer to Section 2.2.3 in the Technical Guidance Document (TGD).*

2-YEAR, 24-HOUR STORM SUMMARY – WEST PARCEL (DMA A1)				
Condition	Acreage	Tc (min)	Peak Runoff (cfs)	Volume (cu-ft)
Pre-development	1.42	8.87	2.0	7,950
Proposed	1.42	8.87	2.0	7,510
Difference	0	0	0	-440
% Change		0	0	-5.5%

The calculations above reflect the conditions for the site. The results indicate the 2-year time of concentration (Tc) and peak runoff does not change from predeveloped conditions. The proposed project will not increase volume or peak flow, therefore, hydromodification does not need to be considered further.

Also depicted in the table above, the post-condition has no change in Tc or peak runoff, while runoff volumes decrease by 5.5%, which is less than 105% percent of the pre-development runoff volumes. Therefore, the project is not subject to HCOCs).

II.4 Post Development Drainage Characteristics

Under proposed conditions, water quality runoff from site will be picked up by area drains and routed to an underground detention chamber, then to a drywell located underground at the center of the site. Low flows and first flush runoff will be retained onsite, first passing through a Jensen precast vault chamber (or similar) then into a Maxwell drywell (or similar) for water quality treatment via infiltration. High flows will bypass the system and immediately join the public storm drain system along French street. From there flows will travel south before joining the Santa Ana Delhi Channel which drains to Upper and Lower Newport Bay and ultimately into the Pacific Ocean.

II.5 Property Ownership/Management

PROPERTY OWNERSHIP/MANAGEMENT	
Public Streets:	City of Santa Ana
Landscaped Areas:	Red Oak Investments, LLC
Open Space:	Red Oak Investments, LLC
Buildings:	Red Oak Investments, LLC
Structural BMPs:	Red Oak Investments, LLC

The Owner, Red Oak Investments, LLC shall assume all BMP maintenance and inspection responsibilities for the proposed project. Inspection and maintenance responsibilities are outlined in Section V of this report.

Section III Site Description

III.1 Physical Setting

Fill out table with relevant information. *Refer to Section 2.3.1 in the Technical Guidance Document (TGD).*

Name of Planned Community/Planning Area (if applicable)	4th and Mortimer Mixed-Use Development (Downtown Santa Ana)
Location/Address	409 East 4th Street, Santa Ana, CA 92701
	The project site is bounded by Fifth Street to the north, French Street to the west, Fourth Street to the south, and Mortimer Street to the east.
General Plan Land Use Designation	District Center (DC)
Zoning	SD84 - Specific Development 84
Acreage of Project Site	1.42 acres
Predominant Soil Type	HSG Soils Type B (see TGD Figure XVI-2a in Appendix A)

III.2 Site Characteristics

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.2 in the Technical Guidance Document (TGD).*

Site Characteristics	
Precipitation Zone	0.75 inches per Figure XVI-1 (see Appendix A)
Topography	The project site is generally flat and fully developed under existing conditions with commercial buildings and associated pavement and landscaping.
Drainage Patterns/Connections	Under existing conditions, runoff surface flows across the project site in a southwesterly direction. Flows enter a public storm drain system along French street and travel south before joining the Santa Ana Delhi Channel which drains to Upper and Lower Newport Bay and ultimately into the Pacific Ocean. Under proposed conditions, runoff the project site will be picked up by area drains and routed to an underground detention chamber, then to a drywell located underground at the center of the site. Low flows and first flush runoff will be retained onsite, first passing through a Jensen precast vault chamber (or similar) then into a Maxwell drywell (or similar) for water quality treatment via infiltration. High flows will bypass the system and immediately join the public storm drain system along French street. From there flows will travel south before joining the Santa Ana Delhi Channel which drains to Upper and Lower Newport Bay and ultimately into the Pacific Ocean.
Soil Type, Geology, and Infiltration Properties	Based on geotechnical investigations conducted by Geocon West, Inc. in June 2022, the site is underlain by artificial fill and Holocene age alluvial fan deposits. The artificial fill extends to a maximum depth of 5 feet below existing ground surface and generally consists of brown to dark brown silty sand. The artificial fill is characterized as dry to slightly moist and medium dense with trace brick fragments. The alluvial fan deposits in the upper 20 feet consist of loose to medium dense silty sand and poorly graded sand. These sediments are underlain by soft to firm silt and clay to the total depth explored (55 ft bgs).
Hydrogeologic (Groundwater) Conditions	Based on geotechnical investigations conducted by Geocon West, Inc. in May 2018, and June 2022, groundwater was not encountered during field exploration drilling down to 40.5 feet below existing ground surface. The historical high groundwater level is approximately 40 feet below ground surface (bgs).

Geotechnical Conditions (relevant to infiltration)	A Leaking Underground Storage Tank (LUST) cleanup site was identified along the south side of the project site, RB Case #: 083002444T. Tis site shows as "Completed - Case Closed" as of 6/30/1994. A percolation test was performed by Geocon West, Inc. at the project site in March of 2022. Test boring P2 had a measured infiltration rate of 13.68 inches per hour at 40-45' bgs. For BMP design, boring P2 will be utilized. After applying a safety factor of 2.5 to the measured rate of 13.68 in/hr, the design infiltration rate is 5.47 in/hr. The design infiltration rate exceeds the 0.3 in/hr. minimum requirement specified in the OC TGD for site infiltration. Infiltration is deemed feasible for the project site. See attached Geotechnical Investigation for boring/percolation test locations.
Off-Site Drainage	The project site does not receive any off-site storm water flows onto the property.
Utility and Infrastructure Information	Dry and wet utilities will be incorporated into the proposed project and will tie into existing facilities.

III.3 Watershed Description

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.3 in the Technical Guidance Document (TGD).*

Receiving Waters	Santa Ana Delhi Channel; Upper Newport Bay, Lower Newport Bay
303(d) Listed Impairments	**Newport Bay, Upper:** chlordane, copper, DDT, metals, nutrients, PCBs, sediment toxicity, sedimentation, **Newport Bay, Lower:** chlordane, DDT, nutrients, PCBs, pesticides, sediment toxicity
Applicable TMDLs	**Newport Bay, Upper:** metals, nutrients, pathogens, pesticides, sedimentation **Newport Bay, Lower:** metals, nutrients, pathogens, pesticides/priority organics, sedimentation
Pollutants of Concern for the Project	▪ Suspended Solid/Sediments – 303(d) listed impairment & Total Maximum Daily Load (TMDL) for Sediment ▪ Nutrients – 303(d) listed impairment & TMDL for Nutrients ▪ Pathogens/Bacteria/Virus – 303(d) listing for Fecal Coliform, TMDL for Pathogens ▪ Pesticides

	303(d) listings for Pesticides & DDT, TMDLs for Organochlorine Compounds, Metals, Diazinon & Clorpyrifos, Trash & Debris
Environmentally Sensitive and Special Biological Significant Areas	Santa Ana Delhi Channel; Upper Newport Bay, Lower Newport Bay

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

Describe project performance criteria. Several steps must be followed in order to determine what performance criteria will apply to a project. These steps include:

- If the project has an approved WIHMP or equivalent, then any watershed specific criteria must be used and the project can evaluate participation in the approved regional or sub-regional opportunities. (Please ask your assigned planner or plan checker regarding whether your project is part of an approved WIHMP or equivalent.)
- Determine applicable hydromodification control performance criteria. *Refer to Section 7.II-2.4.2.2 of the Model WQMP.*
- Determine applicable LID performance criteria. *Refer to Section 7.II-2.4.3 of the Model WQMP.*
- Determine applicable treatment control BMP performance criteria. *Refer to Section 7.II-*3.2.2 *of the Model WQMP.*
- Calculate the LID design storm capture volume for the project. *Refer to Section 7.II-2.4.3 of the Model WQMP.*

(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.	N/A	

Project Performance Criteria

If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	If a hydrologic condition of concern (HCOC) exists, priority projects shall implement onsite or regional hydromodification controls such that: ▪ Post-development runoff volume for the two-year frequency storm does not exceed that of the predevelopment condition by more than five percent, and ▪ Time of concentration of post-development runoff for the two-year storm event is not less than that for the predevelopment condition by more than five percent. Where the Project WQMP documents that excess runoff volume from the two-year runoff event cannot feasibly be retained and where in-stream controls cannot be used to otherwise mitigate HCOCs, the project shall implement on-site or regional hydromodification controls to: ▪ Retain the excess volume from the two-year runoff event to the MEP, and Implement on-site or regional hydromodification controls such that the post-development runoff two-year peak flow rate is no greater than 110 percent of the predevelopment runoff two-year peak flow rate.
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	Infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume). LID BMPs must be designed to retain, on-site, (infiltrate, harvest and use, or evapotranspire) storm water runoff up to 80 percent average annual capture efficiency.
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	If it is not feasible to meet LID performance criteria through retention and/or biotreatment provided on-site or at a sub-regional/regional scale, then treatment control BMPs shall be provided on-site or offsite prior to discharge to waters of the US. Sizing of treatment control BMP(s) shall be based on either the unmet volume after claiming applicable water quality credits, if appropriate.
Calculate LID design storm capture volume for Project.	DCV = C × d × A × 43560 sf/ac × 1/12 in/ft Where: DCV = design storm capture volume, cu-ft C = runoff coefficient = (0.75 × imp + 0.15) Imp = impervious fraction of drainage area (ranges from 0 to 1) d = storm depth (inches)

	A = tributary area (acres) Imp = 91.6 d = 0.75 inches A = 1.423 acres ***DCV*** *= (0.75 x .916 +0.15) x* 0.75 *inches x 1.423 ac x 43560 sf/ac x* *1/12 in/ft* = *3243* cu-ft *Refer to Section IV.2.2 for specific Drainage Manage Area (DMA) breakdown and Appendix A for detailed calculations (Worksheet B).*

IV.2. Site Design and Drainage

Describe site design and drainage including

- A narrative of site design practices utilized or rationale for not using practices;
- A narrative of how site is designed to allow BMPs to be incorporated to the MEP
- A table of DMA characteristics and list of LID BMPs proposed in each DMA.
- Reference to the WQMP "BMP Exhibit."
- Calculation of Design Capture Volume (DCV) for each drainage area.
- A listing of GIS coordinates for LID and Treatment Control BMPs.

Refer to Section 2.4.2 in the Technical Guidance Document (TGD).

The following section describes the site design BMPs used in this project and the methods used to incorporate them. Careful consideration of site design is a critical first step in storm water pollution prevention from new developments and redevelopments.

Minimize Impervious Area

Impervious surfaces have been minimized by incorporating landscaped areas throughout the site surrounding the proposed building. Landscaping will be provided throughout the site within the common areas as well as around the perimeter of the building.

Maximize Natural Infiltration Capacity

Infiltration is deemed feasible based on the geotechnical study performed by Geocon West, Inc. Refer to Section IV.3.2 for details.

Preserve Existing Drainage Patterns and Time of Concentration

Runoff from the site will continue to flow similar to existing conditions. Low-flows and first-flush runoff from will drain to the underground detention chamber and then to the drywell for water quality treatment via infiltration.

Disconnect Impervious Areas

Landscaping will be provided adjacent to sidewalks and between the proposed buildings in courtyards. Low-flows and first-flush runoff will drain to an underground detention chamber and then to a drywell for water quality treatment via infiltration. DMA A3 low-flows and first-flush runoff drain to a 4x6 modular wetland for water quality via biofiltration. Refer to Section IV.3.2 for further details.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

There are no existing vegetated or sensitive areas to preserve on the project site. All disturbed areas will either be paved or landscaped.

Xeriscape Landscaping

Xeriscape landscaping is not proposed for the project. However, native and/or tolerant landscaping will be incorporated into the site design consistent with City guidelines.

Drainage Management Areas

In accordance with the MS4 permit and the 2011 Model WQMP, the project site has been divided into Drainage Management Areas (DMAs) to be utilized for defining drainage areas and sizing LID and other treatment control BMPs. DMAs have been delineated based on the proposed site grading patterns, drainage patterns, storm drain and catch basin locations.

The design capture volumes (DCV) and treatment flow rates (Q_{Design}) for each DMA are summarized in the table below. These have been derived utilizing the "Simple Method" in accordance with the TGD Section III.1.1. Actual BMP sizing requirements, including 80 percent capture design volumes, flow rates, depths, and other design details for the specific BMPs proposed are provided in Sections IV.3.2. Locations of DMAs and associated LID and treatment BMPs are identified on the exhibits in Section VI. Additional calculations and TGD Worksheets are provided in Appendix A.

DRAINAGE MANAGEMENT AREAS (DMAs)								
DMA/ Drainage Area ID[1]	Tributary Drainage Area (ft^2)	Tributary Drainage Area (ac)	% Imp.	Design Storm Depth[2] (in)	Estimated Tc (min)	Rainfall Intensity[3] (in/hr)	Simple Method DCV[4] (ft^3)	Q_{Design} [5] (cfs)
DMA A1	61,986	1.423	91.6	0.75	5	0.26	3,242.6	0.310

Notes:

1. Refer to exhibits in Section VI for locations of each DMA.
2. Per Figure XVI-1 of the Technical Guidance Document, dated December 20, 2013. See also Appendix A.
3. Per Figure III.4 of the Technical Guidance Document, dated December 20, 2013. See also Appendix A.
4. Per Section III.1.1 of the Technical Guidance Document.
5. Per Section III.3.3 and Worksheet D of the Technical Guidance Document.

IV.3 LID BMP Selection and Project Conformance Analysis

Each sub-section below documents that the proposed design features conform to the applicable project performance criteria via check boxes, tables, calculations, narratives, and/or references to worksheets. *Refer to Section 2.4.2.3 in the Technical Guidance Document (TGD) for selecting LID BMPs and Section 2.4.3 in the Technical Guidance Document (TGD) for conducting conformance analysis with project performance criteria.*

IV.3.1 Hydrologic Source Controls (HSCs)

If required HSCs are included, fill out applicable check box forms. If the retention criteria are otherwise met with other LID BMPs, include a statement indicating HSCs not required.

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)	☐

HSCs were not incorporated into the project's design at this stage in the project's development. Any HSC's will be accounted for during final design and the cumulative volume of the HSC's will be subtracted from the required treatment volume in the Final WQMP.

IV.3.2 Infiltration BMPs

Identify infiltration BMPs to be used in project. If design volume cannot be met, state why.

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	☐

As mentioned before in Section III.2, infiltration rates tested by Geocon West, Inc. and deep groundwater make infiltration feasible for the majority of the project site. Since infiltration is feasible, underground detention and drywell infiltration is proposed to retain and infiltrate stormwater runoff from the site. The field infiltration rates measured at 13.68 in/hr at 40-45 foot depths. BMP design will be placed 40 feet below ground surface and utilize the measured infiltration rate of 13.68 in/hr. After applying a Safety Factor of 2.5, the design infiltration rate is 5.47 in/hr. The design infiltration rate at the 40-45 foot depth exceeds the 0.3 in/hr. minimum requirement specified in the OC TGD for site infiltration.

Underground Detention and Infiltration

Under proposed conditions, roof drains and area drains will intercept runoff throughout the site. These drains will convey runoff to the center of the site to a proposed detention chamber, then to drywell located underground at the center of the parcel. Refer to Section VI for standard cross section details of the proposed Jensen detention chamber and Maxwell drywells. BMP sizing was calculated using the Simple DCV method in accordance with the OC TGD.

The table below represents the minimum volume of storm water runoff required to be treated by LID and/or treatment control BMPs for the proposed project. Detailed calculations will be provided in the Final WQMP. Refer to WQMP exhibit in Section VI for proposed location of chambers and drywells. The remaining DCV is addressed via biofiltration in Section IV 3.4.

Pre-Treatment BMPs

To ensure the longevity and efficiency of the drywells, the Jensen chambers allow for sediment and large solids to settle before flowing to drywell chambers for infiltration. The Maxwell IV drywells are equipped with pretreatment chambers to allow for additional settling before infiltration. Refer to Appendix D for operations and maintenance and function details.

INFILTRATION DRAINAGE MANAGEMENT AREAS (DMAs)							
DMA/ Drainage Area ID[1]	Tributary Drainage Area (ac)	Design Infiltration Rate (in/hr)	Simple Design DCV (ft^3)[2]	Storage in Drywells (ft^3)[2]	Volume Needed to Detain (ft^3) After 80% CE & Detention Type	Upstream Storage Provided (ft^3)	Sufficient
DMA A1	1.423	5.47	3,243	532	1409	2,480	Yes

Notes:

1. Refer to exhibits in Section VI for locations of each DMA.
2. Per Worksheet B of the Technical Guidance Document, dated May 19, 2011. See also Appendix A & Drywell sizing sheets.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, describe any evapotranspiration and/or rainwater harvesting BMPs included.

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

N/A

IV.3.4 Biotreatment BMPs

Biotreatment BMPs are a broad class of LID BMPs that reduce storm water volume to the maximum extent practicable, treat storm water using a suite of treatment mechanisms characteristic of biologically active systems, and discharge water to the downstream storm drain system or directly to receiving waters. Treatment mechanisms include media filtration (though biologically-active media), vegetative filtration (straining, sedimentation, interception, and stabilization of particles resulting from shallow flow through vegetation), general sorption processes (i.e., absorption, adsorption, ion-exchange, precipitation, surface complexation), biologically-mediated transformations, and other processes to address both suspended and dissolved constituents. Examples of biotreatment BMPs include bioretention with underdrains, vegetated swales, constructed wetlands, and proprietary biotreatment systems.

Name	Included?
Bioretention with underdrains	☐
Stormwater planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☐
Wet extended detention basin	☐
Dry extended detention basins	☐

.

Biofiltration

Bioretention/biotreatment BMPs will not be used

IV.3.5 Hydromodification Control BMPs

Not applicable. Refer to Section II.3 for further details.

Hydromodification Control BMPs	
BMP Name	**BMP Description**
N/A	N/S

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable. LID BMPs (infiltration) and biofiltration will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

Regional/Sub-Regional LID BMPs
N/A

IV.3.7 Treatment Control BMPs

Treatment control BMPs can only be considered if the project conformance analysis indicates that it is not feasible to retain the full design capture volume with LID BMPs. Describe treatment control BMPs including sections for selection, sizing, and infeasibility, as applicable.

Treatment Control BMPs	
BMP Name	**BMP Description**
N/A	N/A

IV.3.8 Non-structural Source Control BMPs

Fill out non-structural source control check box forms or provide a brief narrative explaining if non-structural source controls were not used.

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)	☐	☒	Not applicable – no hazardous materials.
N6	Local Industrial Permit Compliance	☐	☒	The City of Santa Ana does not issue water quality permits.
N7	Spill Contingency Plan	☐	☒	Not applicable – no hazardous materials.
N8	Underground Storage Tank Compliance	☐	☒	No underground storage tanks are proposed.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Hazardous materials will not be stored on-site.
N10	Uniform Fire Code Implementation	☐	☒	Not applicable – no hazardous materials.
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☒	☐	
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	No retail gasoline outlets are proposed.

N1, Education for Property Owners, Tenants and Occupants

Educational materials will be provided to tenants, including brochures and restrictions to reduce pollutants from reaching the storm drain system. Examples include tips for pet care, household tips, and proper household hazardous waste disposal. Tenants will be provided with these materials by the property management prior to occupancy, and periodically thereafter. Refer to Section VII for a list of materials available and attached to this WQMP. Additional materials are available through the County of Orange Stormwater Program website (http://ocwatersheds.com/PublicEd/) and the California Stormwater Quality Association's (CASQA) BMP Handbooks (http://www.cabmphandbooks.com/).

N2, Activity Restrictions

The Owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution.

N3, Common Area Landscape Management

Management programs will be designed and implemented by the Owner to maintain all the common areas within the project site. These programs will cover how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices and proper disposal of landscape wastes by the owner/developer and/or contractors.

N4, BMP Maintenance

The Owner will be responsible for the implementation and maintenance of each applicable non-structural BMP, as well as scheduling inspections and maintenance of all applicable structural BMP facilities through its staff, landscape contractor, and/or any other necessary maintenance contractors. Details on BMP maintenance are provided in Section V of this WQMP, and the O&M Plan is included in Appendix D.

N11, Common Area Litter Control

The Owner will be responsible for performing trash pickup and sweeping of littered common areas on a weekly basis or whenever necessary. Responsibilities will also include noting improper disposal materials by the public and reporting such violations for investigation.

N12, Employee Training

All employees of the Owner and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, housekeeping practices, etc.

N13, Housekeeping of Loading Docks

Housekeeping measures will be implemented by the Owner to keep the proposed loading dock and delivery areas clean and orderly condition. Includes sweeping, removal of trash & debris on a weekly basis, and use of dry methods for cleanup (e.g., sweeping).

N14, Common Area Catch Basin Inspection

All on-site catch basin inlets and drainage facilities shall be inspected and maintained by the Owner at least once a year, prior to the rainy season, no later than October 1st of each year.

N15, Street Sweeping Private Streets and Parking Lots

The Owner shall be responsible for sweeping all on-site drive aisles and parking spaces within the project on a quarterly basis.

IV.3.9 Structural Source Control BMPs

Fill out structural source control check box forms or provide a brief narrative explaining if structural source controls were not used.

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 storage areas are proposed.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☐	☒	No outdoor trash enclosures are proposed.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	There are no slopes or channels on the project site.
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☒	☐	
S6	Dock areas	☒	☐	
S7	Maintenance bays	☐	☒	No maintenance bays are proposed.

S8	Vehicle wash areas	☐	☒	No vehicle wash areas are proposed.
S9	Outdoor processing areas	☐	☒	No outdoor processing areas are proposed.
S10	Equipment wash areas	☐	☒	No equipment wash areas are proposed.
S11	Fueling areas	☐	☒	No fueling areas are proposed.
S12	Hillside landscaping	☐	☒	Project is not located in a hillside area.
S13	Wash water control for food preparation areas	☒	☐	
S14	Community car wash racks	☐	☒	No community car wash racks are proposed.

IV.4 Alternative Compliance Plan (If Applicable)

IV.4.1 Water Quality Credits

Local jurisdictions may develop a water quality credit program that applies to certain types of development projects after they first evaluate the feasibility of meeting LID requirements on-site. If it is not feasible to meet the requirements for on-site LID, project proponents for specific project types can apply credits that would reduce project obligations for selecting and sizing other treatment BMPs or participating in other alternative programs.

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td colspan="5">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td colspan="2">☐Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="2">☐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.</td><td>☐ 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).</td></tr>
<tr><td colspan="2">☐ 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 vehicle trip traffic with the potential to reduce sources of water or air pollution).</td><td colspan="2">☐ 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 would not be able to take credit for both categories, but may have greater credit assigned</td><td>☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).</td></tr>
<tr><td>☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td>☐ 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.</td><td>☐In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
<tr><td>Calculation of Water Quality Credits
(if applicable)</td><td colspan="4">N/A</td></tr>
</table>

Not applicable. Water quality credits will not be applied for the project. LID BMPs will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section

IV.4.2 Alternative Compliance Plan Information

Describe an alternative compliance plan (if applicable). Include alternative compliance obligations (i.e., gallons, pounds) and describe proposed alternative compliance measures. *Refer to Section 7.II 3.0 in the Model WQMP.*

N/A

Section V Inspection/Maintenance Responsibility for BMPs

It has been determined that Red Oak Investments, LLC shall assume all BMP inspection and maintenance responsibilities for the 4th and Mortimer - Block A project.

Contact Name:	Andrew Nelson
Title:	
Company:	Red Oak Investments, LLC
Address:	4199 Campus Drive #200, Irvine, CA 92612
Phone:	949.733.2000
Email:	anelson@redoakinv.com

Should the maintenance responsibility be transferred at any time during the operational life of 4th and Mortimer – Block A, such as when an HOA or POA is formed for a project, a formal notice of transfer shall be submitted to the City of Santa Ana at the time responsibility of the property subject to this WQMP is transferred. The transfer of responsibility shall be incorporated into this WQMP as an amendment.

The Owner shall verify BMP implementation and ongoing maintenance through inspection, self-certification, survey, or other equally effective measure. The certification shall verify that, at a minimum, the inspection and maintenance of all structural BMPs including inspection and performance of any required maintenance in the late summer / early fall, prior to the start of the rainy season. A form that may be used to record implementation, maintenance, and inspection of BMPs is included in Appendix D.

The City of Santa Ana may conduct verifications to assure that implementation and appropriate maintenance of structural and non-structural BMPs prescribed within this WQMP is taking place at the project site. The Owner shall retain operations, inspections and maintenance records of these BMPs and they will be made available to the City or County upon request. All records must be maintained for at least five (5) years after the recorded inspection date for the lifetime of the project.

Long-term funding for BMP maintenance will be provided by Red Oak Investments, LLC.

The Operations and Maintenance (O&M) Plan can be found in Appendix D.

BMP Inspection/Maintenance

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
INF-5 Drywell	Red Oak Investments, LLC	Performed in accordance with manufacturer specifications. Typical maintenance includes conducting routine inspections for accumulation and cleaning /pollutant removal as necessary from the pre-treatment settling chamber. Quarterly inspections will help maintain optimal performance and to determine typical accumulation levels during both dry-weather and wet-weather flows. The pretreatment settling chamber shall be cleaned when sediment accumulation is at or above the "cleanout line" marked inside of the chamber, and at a minimum of once per year, prior to the start of the storm season. Care should be taken to prevent spills during pollutant removal and cleaning. Oil and other hydrocarbons shall be cleaned out of the settling chamber as needed, once per year at a minimum. See Appendix D for additional maintenance information provided by the manufacturer.	Quarterly Inspections Cleanout Annually
Detention System	Red Oak Investments, LLC	The underground detention system shall be inspected annually and after major storm events, and cleaned at a minimum of once per year, prior to the start of the rainy season (October 1st). Cleaning and maintenance will be performed per manufacturer specifications and will typically include removal of any trash and debris and excess sediment within the pipes. Sediment shall be removed when deposits approach within 6 inches of the invert heights of the structures. See Appendix D for additional maintenance information provided by the manufacturer.	Annually

N1 Education for Property Owners, Tenants and Occupants	Red Oak Investments, LLC	Educational materials will be provided to tenants annually. Materials to be distributed are found in Appendix C of this WQMP. Tenants will be provided these materials by the Property Management prior to occupancy and annually thereafter.	Annually
N2 Activity Restrictions	Red Oak Investments, LLC	The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Restrictions include, but are not limited to, prohibiting vehicle maintenance or vehicle washing.	Ongoing
N3 Common Area Landscape Management	Red Oak Investments, LLC	Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (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 to prevent exposure of erodible surfaces. Trimmings, clippings, and other landscape wastes shall be properly disposed of in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and storm drains inlets.	Monthly
N4 BMP Maintenance	Red Oak Investments, LLC	Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be kept by the Owner and shall be available for review upon request.	Ongoing
N11 Common Area Litter Control	Red Oak Investments, LLC	Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities.	Weekly

N12 Employee Training	Red Oak Investments, LLC	The Owner shall educate all new employees/managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Materials that may be utilized on BMP maintenance are included in Appendix B.	Within 6 Months of Hiring and Annually Thereafter
N13 Housekeeping of Loading Docks	Red Oak Investments, LLC	Sweep area routinely and before October 1 each year. Keep area clean of trash and debris at all times. Spills shall be cleaned up immediately using dry methods.	Weekly
N14 Common Area Catch Basin Inspection	Red Oak Investments, LLC	On-site catch basin inlets shall be inspected and, if necessary, cleaned prior to the storm season by October 1st each year.	Annually
N15 Street Sweeping Private Streets and Parking Lots	Red Oak Investments, LLC	All private streets, drive aisles and exposed parking areas within the project shall be swept at a minimum frequency quarterly as well as once per year prior to the storm season, no later than October 1 each year.	Quarterly
S1 / SD-13 Provide storm drain system stencilling and signage	Red Oak Investments, LLC	On-site 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
S4 / SD-12 Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Red Oak Investments, LLC	In conjunction with routine maintenance, verify that landscape design continues to function properly by adjusting systems to eliminate overspray to hardscape areas and to verify that irrigation timing and cycle lengths are adjusted in accordance to water demands, given the time of year, weather, and day or nighttime temperatures. System testing shall occur twice per year. Water from testing/flushing shall be collected and	2x per year

		properly disposed to the sewer system and shall not discharge to the storm drain system.	
S6 / SD-31 Properly Design: Dock areas	Red Oak Investments, LLC	Sweep area routinely and before October 1 each year. Keep area clean of trash and debris at all times. Spills shall be cleaned up immediately. See also BMP N13.	Weekly
S13 Properly Design: Wash water control for food preparation areas	Red Oak Investments, LLC	Adequate signs shall be provided and appropriately placed stating the prohibition of discharging wash water to the storm drain system. Employees shall be trained in discharge and safety requirements outlined in State Health & Safety Code 27520. All cooking utensils shall be cleaned in appropriate wash stations.	Ongoing

Section VI BMP Exhibit (Site Plan)

VI.1 BMP Exhibit (Site Plan)

Include a BMP Exhibit (Site Plan), at a size no less than 24" by 36," which includes the following minimum information:

- Insert in the title block (lower right hand corner) of BMP Exhibit: the WQMP Number (assigned by staff) and the grading/building or Planning Application permit numbers
- Project location (address, tract/lot number(s), etc.)
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural BMP locations
- Drainage delineations and flow information
- Delineate the area being treated by each structural BMP
- GIS coordinates for LID and Treatment Control BMPs
- Drainage connections
- BMP details
- Preparer name and stamp

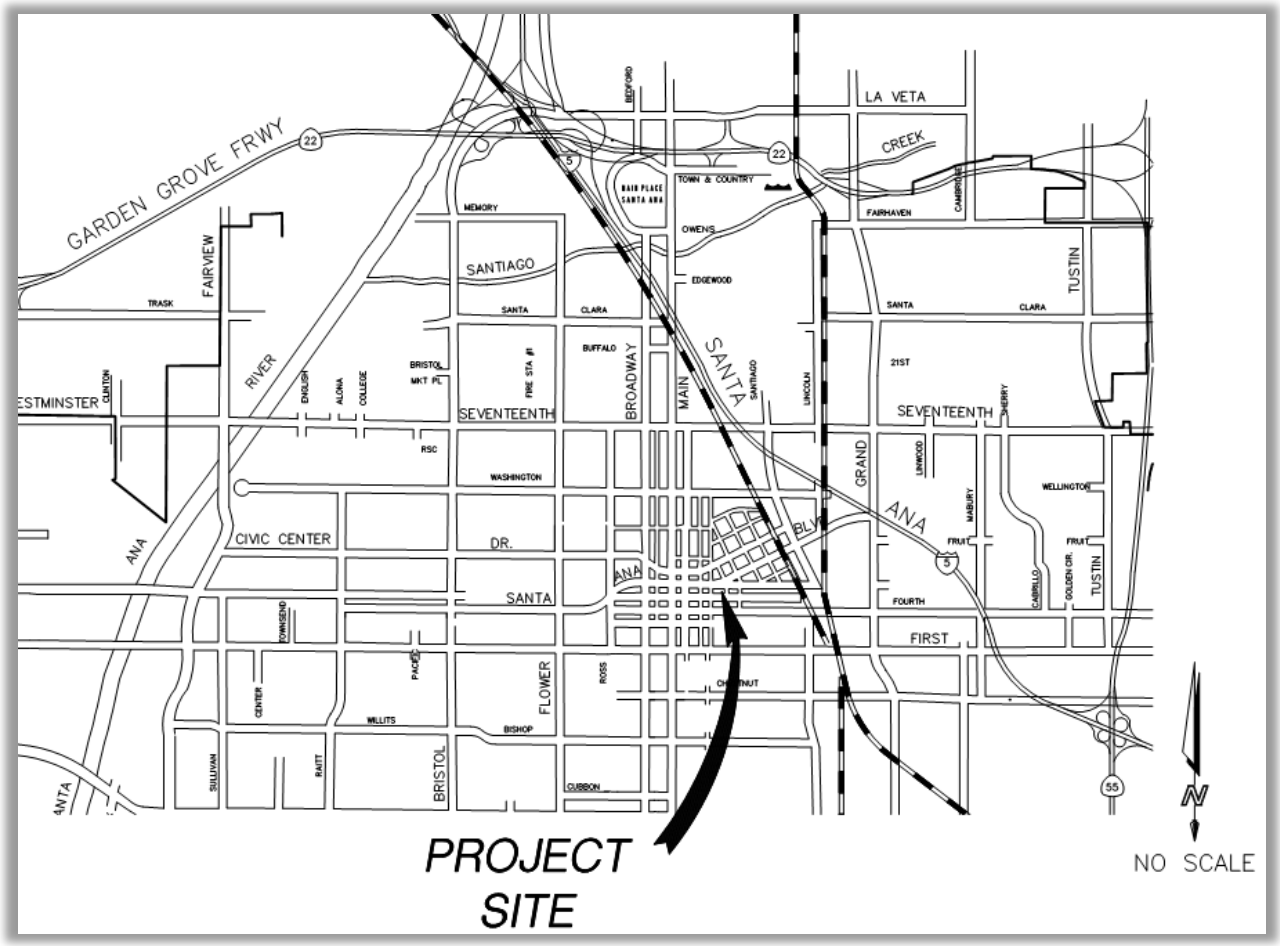
Please do not include any areas outside of the project area or any information not related to drainage or water quality. The approved BMP Exhibit (Site Plan) shall be submitted as a plan sheet on all grading and building plan sets submitted for plan check review and approval. The BMP Exhibit shall be at the same size as the rest of the plan sheets in the submittal and shall have an approval stamp and signature prior to plan check submittal.

VI.2 Submittal and Recordation of Water Quality Management Plan

Following approval of the Final Project-Specific WQMP, three copies of the approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be submitted. In addition, these documents shall be submitted in a PDF format.

Each approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be recorded in the Orange County Clerk-Recorder's Office, prior to close-out of grading and/or building permit. Educational Materials are not required to be included.

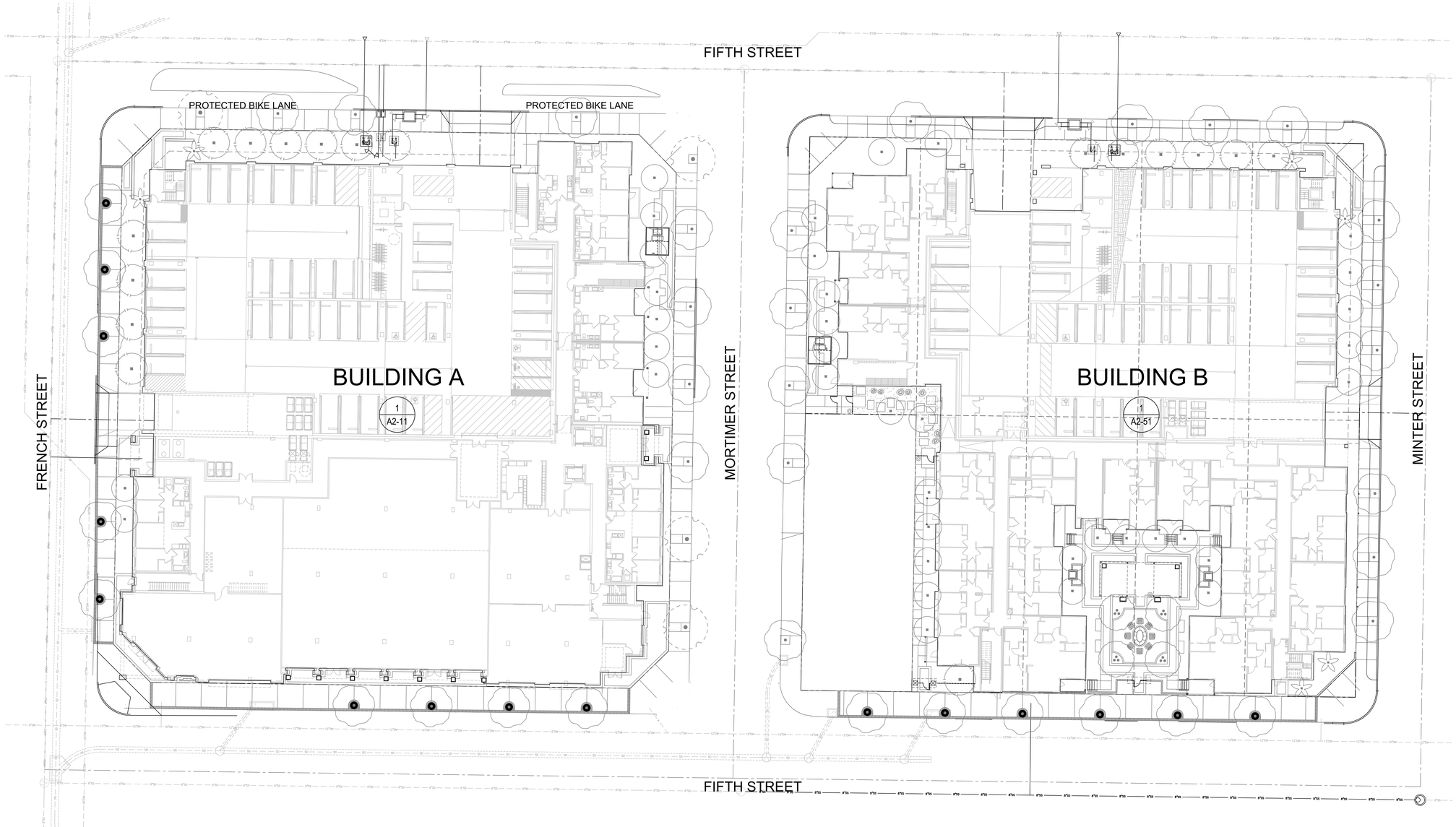
VICINITY MAP



Section VII Educational Materials

Refer to the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available. Please only attach the educational materials specifically applicable to this project. Other materials specific to the project may be included as well and must be attached.

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)	☒	DF-1 Drainage System Operation & Maintenance	☒
Recycle at Your Local Used Oil Collection Center (Central County)	☐	SD-10 Site Design & Landscape Planning	☒
Recycle at Your Local Used Oil Collection Center (South County)	☐	SD-11 Roof Runoff Controls	☒
Tips for Maintaining a Septic Tank System	☐	SD-12 Efficient Irrigation	☒
Responsible Pest Control	☒	SD-13 Storm Drain Signage	☒
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	☐		☐



SITE PLAN | SCALE: 1"=20'-0" | 1

PARKING TABLES

PARKING REQUIRED					PARKING PROVIDED			
Residential								
Building	**Ratio**	**Units**	**Spaces Required**		**Type**	**Standard**	**Accessible**	**Provided**
A-Res.	2	99	198		A-Res.	195	4	199
A-Guest	0.15	99	15		A-Guest	14	1	15
B-Res.	2	70	140		B-Res.	171	3	174
B-Guest	0.15	70	11		B-Guest	10	1	11
Total Res. Parking Required			**364**		**Total**	**390**	**9**	**399**
Non-Residential								
Non-Res.	1/400 SF	14,479	37		**Non-Res.**			
Total Non-Res. Parking Required			**37**		**Total**	**35**	**2**	**37**
Total Parking Required			**401**		**Total Parking Provided**			**436**

Accessible Stalls	**Req'd**		**Std**	**Van**	**Provided**
Bldg. A Assigned Parking CBC 1109A.4 - 2%x198	4.0		3	1	4
Bldg. A Guest Parking CBC 1109A.5 - 5%x15	1.0		0	1	1
Bldg. B Assigned Parking CBC 1109A.4 - 2%x140	3.0		2	1	3
Bldg. B Guest Parking CBC 1109A.5 - 5%x11	1.0		0	1	1
Non-Res. CBC 11B-208.2 - per table (26-50)	2.0		1	1	2

CALGREEN REQUIRED				**CALGREEN PROVIDED**
Residential Mandatory Measures				
EV charging for new construction		**Required**		**Provided**
EV charging	364x10%	37.0		74 (37 Installed + 37 Future)
Calgreen 4.106.4.2 New Multifamily Dwellings				
EV charging (Accessible)	1 in 25	2.0		4 (2 Installed + 2 Future)
Calgreen 4.106.4.2.1				
EV charging space dimensions (Refer to building Plans)				
Calgreen 4.106.4.2.2 - Minimum 9X18 space, with 8' minimum aisle at accessible EV charging stall				
Non-Residential Mandatory Measures				
EV charging for new construction		**Required**		**Provided**
EV charging	Table (26-50)	4.0		4
Calgreen 5.106.5.3.3				
EV charging (Accessible)	Table (1-4)	1.0		1
CBC 11B-228.3.2.1				
EV charging space dimensions (Refer to building Plans)				
Calgreen 4.106.4.2.2 - Minimum 9X18 space, with 8' minimum aisle at accessible EV charging stall				
Clean Air Vehicles		**Required**		**Provided**
Clean Air Vehicles	Table (26-50)	6.0		6
Calgreen 5.106.5.2				

BICYCLE PARKING REQUIRED				**BICYCLE PARKING PROVIDED**
Residential Mandatory Measures				
Bicycle Parking		**Required**		**Provided**
Bicycle Parking - Short Term	4 Min.	4.0		4
Santa Ana Municipal Code Sec. 41-1307.1				
Non-Residential Mandatory Measures				
Bicycle Parking		**Required**		**Provided**
Bicycle Parking - Short Term	37x5% (4 min.)	4.0		4
Santa Ana Municipal Code Sec. 41-1307.1				
Bicycle Parking - Long Term	13x5%	1.0		1
Calgreen 5.106.4.1.2				

KEYNOTES

1. PAVING - SEE CIVIL DRAWINGS
2. CONCRETE SIDEWALK - SEE CIVIL AND LANDSCAPE DRAWINGS
3. PLANTING AREA - SEE LANDSCAPE DRAWINGS
4. DASHED LINE INDICATES BUILDING OR EAVE OVERHANG ABOVE
5. TRANSFORMER - SEE DRY UTILITY DRAWINGS
6. LOADING ZONE
7. FIRE DEPARTMENT CONNECTION
8. RETAIL, RESIDENTIAL AND HOUSE GAS METERS
9. SHORT-TERM BICYCLE PARKING

SYMBOLS LEGEND

- EXIT — ACCESSIBLE EXIT
- ACCESSIBLE PARKING STALL
- BUILDING ENTRANCE
- PROPERTY LINE
- SETBACK LINE
- VEHICULAR ENTRY/ EXIT

SITE PLAN NOTES

1. THIS ARCHITECTURAL SITE PLAN IS PROVIDED FOR OVERALL SITE REFERENCE AND LOCATION OF ITEMS INCLUDED IN THIS SET OF PLANS. IT IS NOT INTENDED TO BE USED FOR THE CONSTRUCTION OF ANY SITE IMPROVEMENTS. SEE PLANS BY CIVIL ENGINEER AND LANDSCAPE ARCHITECT FOR ALL SITE IMPROVEMENTS.
2. THIS SITE PLAN IS FOR BUILDING DEPARTMENT USE ONLY. ALL DIMENSIONS SHOWN ARE APPROXIMATE. SEE PLANS PREPARED BY CIVIL ENGINEER FOR EXACT BUILDING LOCATIONS, CURBS, STREETS, DRIVEWAYS, UTILITIES, GRADING, SITE ACCESSIBILITY, BUILDING LOCATION, SETBACKS, SIDEWALKS, ETC. SEE PLANS PREPARED BY LANDSCAPE ARCHITECT FOR SIDEWALKS, POOLS, HARDSCAPES, LANDSCAPES, FENCING, ETC.
3. REFER TO CIVIL DRAWINGS FOR INFORMATION ON GRADING, FINISH GRADES, BUILDING PAD AND BUILDING TOP OF CONCRETE FINISH FLOOR ELEVATION.
4. REFER TO CIVIL ENGINEER DRAWINGS FOR ALL PROPERTY LINES, EASEMENTS AND BUILDINGS, BOTH EXISTING AND PROPOSED.
5. REFER TO LANDSCAPE & CIVIL DRAWINGS FOR PLANTING, IRRIGATION, DRAINAGE, WALKWAYS, PATIOS, SITE LIGHTING INFO AND FOR THE COMMON AREAS.
6. REFER TO CIVIL DRAWINGS FOR EXTERIOR ACCESSIBLE ROUTE.
7. BUILDING ADDRESS SHALL BE PROVIDED ON THE BUILDING IN SUCH A POSITION AS TO BE PLAINLY VISIBLE AND LEGIBLE FROM THE STREET. ADDRESS NUMBERS SHALL CONTRAST WITH THEIR BACKGROUND, 4" HIGH MINIMUM AND WITH A MINIMUM STROKE WIDTH OF 0.5" - CBC SECTION 502.1.
8. FOR SITE APPURTENANCES NOT SHOWN, SEE CIVIL, LANDSCAPE, ELECTRICAL SITE PLAN AND FIRE SPRINKLERS SITE PLAN.

ktgy
Architecture + Planning
17911 Von Karman Ave.
Suite 200
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949.851.2133

KTGY Project No: 2017-0934

Project Contact: Debbie Holland
Email: dholland@ktgy.com

Principal: Wil Wong
Project Designer: D. Schoolmeester
Project Director: Debbie Holland

Developer

RED OAK INVESTMENTS
4199 CAMPUS DRIVE
IRVINE, CA 92612
PHONE NO. (714) 342-2502

4TH AND MORTIMER

SANTA ANA, CA

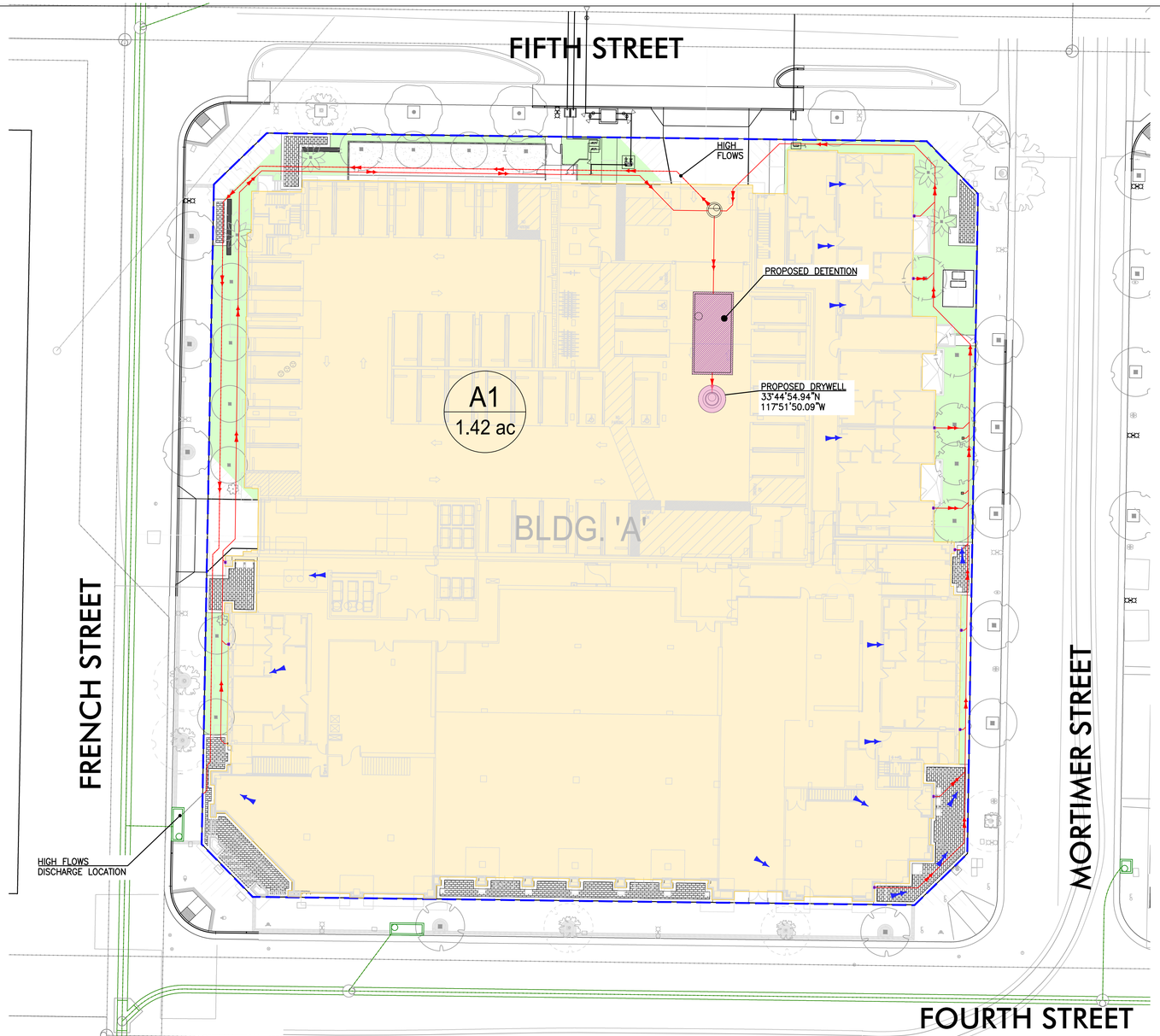
No.	Date	Description

05-20-2022 100% DESIGN DEVELOPMENT

License Stamp

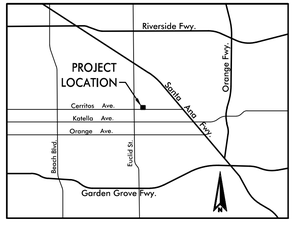
ARCHITECTURAL SITE PLAN

A1-20



LEGEND

- PROPERTY LINE
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- BMP DRAINAGE AREA BOUNDARY
- PROPOSED BUILDING
- PROPOSED LANDSCAPING
- PROPOSED UNDERGROUND DETENTION
- PROPOSED DRYWELL
- DRAINAGE DOWNSPOUT
- DIRECTION OF SURFACE FLOW
- DIRECTION OF PIPE FLOW
- DMA XX AC — DRAINAGE MANAGEMENT AREA AND ACREAGE



VICINITY MAP
NOT TO SCALE

SITE AREA DETIALS

TOTAL AREA = 1.423 AC
IMPERVIOUS AREA = 1.303 AC
PERVIOUS AREA = 0.120 AC
BUILDING AREA = 1.208 AC

N

20' 0' 10' 20'
SCALE: 1" = 20'

Exhibit Date: 10/20/2022

WQMP EXHIBIT
4th AND MORTIMER
BLOCK A
SANTA ANA, CA

FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 ◦ fax 949.474.5315
www.fuscoe.com

SUBJECT TO FURTHER REVISION

LEGEND

- Orange County Precipitation Stations
- 24 Hour, 85th Percentile Rainfall (Inches)
- 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
- City Boundaries

Rainfall Zones

Design Capture Storm Depth (inches)

- 0.65"
- 0.7
- 0.75
- 0.80
- 0.85
- 0.90
- 0.95
- 1.00
- 1.10"

Note: Events defined as 24-hour periods (calendar days) with greater than 0.1 inches of rainfall.
For areas outside of available data coverage, professional judgment shall be applied.

Project Site

0.9 0.9 0.95 0.7 0.75 0.7 0.65 0.8 0.75 0.85 0.9 0.95 1.05 1.1

0 3 6 12 Kilometers
0 1.8 3.6 7.2 Miles

TITLE: RAINFALL ZONES

JOB: ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT — ORANGE CO., CA

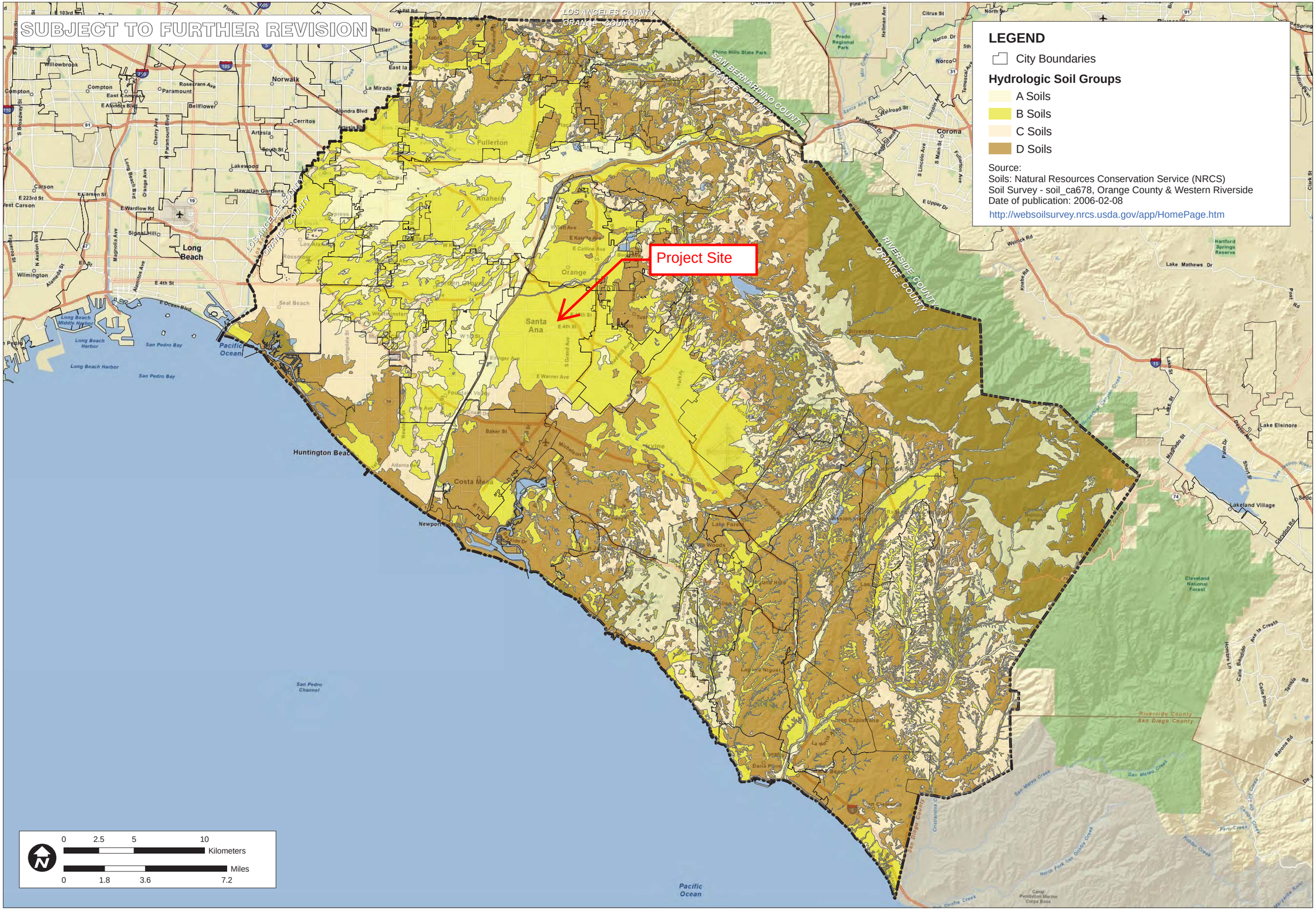
SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE XVI-1

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

SUBJECT TO FURTHER REVISION



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

0 2.5 5 10 Kilometers
0 1.8 3.6 7.2 Miles

P: \ 9526E \ 6-GIS \ Mxds \ Reports \ InfiltrationFeasability_20110215 \ 9526E_FigureXVI-2a_HydroSoils_20110215.mxd

TITLE
NRCS HYDROLOGIC SOILS GROUPS

JOB
ORANGE COUNTY INFILTRATION STUDY
CA
ORANGE CO.

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2a

SUBJECT TO FURTHER REVISION

LEGEND

- Depth To First Groundwater Contours
- City Boundaries
- OCWD Groundwater Basin Protection Boundary

Note: Data are not available for South Orange County at this time.

Source:
Sprotte, Fuller and Greenwood, 1980.
California Division of Mines and Geology;
California Geological Survey

Project Site

0 2 4 8 Kilometers

0 1.25 2.5 5 Miles

TITLE
NORTH ORANGE COUNTY
MAPPED DEPTH TO FIRST
GROUNDWATER

JOB
ORANGE CO.
ORANGE COUNTY
INFILTRATION STUDY
CA

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2d

P:\9526E\16-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2d_DepthToGroundwaterOverview_20110215.mxd

SUSCEPTIBILITY MAP UPATE (FEB 2013)

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
- Dam
- Lake
- Reservoir

Other Lands

- Airport/Military

AnaheimBay-HuntingtonHarbor Watershed

Santa Ana River Watershed

Santa Ana River Watershed

South Orange County

Project Site

El Modena-Irvine Retarding Basin

Lower Peters Canyon Retarding Basin

Eastfoot Retarding Basin

Orchard Estates Retention Basin

Hicks Canyon Retarding Basin

Rattlesnake Reservoir

East Hicks Canyon Retarding Basin

Siphon Reservoir

Bee Canyon Retarding Basin

Round Canyon Retarding Basin

Trabuco Retarding Basin

Marshburn Retarding Basin

Agua Chinon Retarding Basin

North Lake

South Lake

Basin Number 2

Basin Number 1

Sand Canyon Reservoir

Laguna Reservoir

Bonita Canyon Reservoir

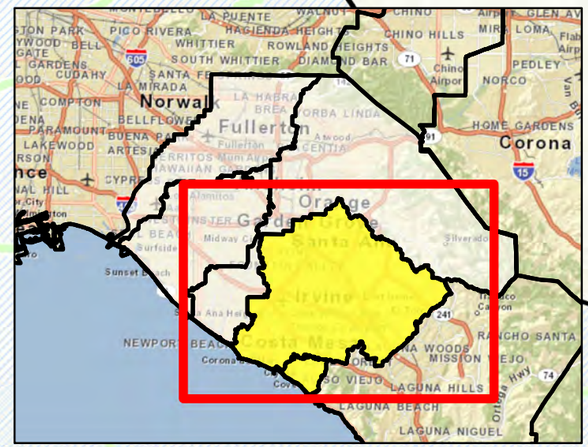
San Joaquin Reservoir

Big Canyon Reservoir

Harbor View Dam

John Wayne Airport

Village Pond Park



N

0 9,000 18,000 Feet

TITLE: SUSCEPTIBILITY ANALYIS NEWPORT BAY-NEWPORT COASTAL STREAMS

JOB: ORANGE COUNTY WATERSHED MASTER PLANNING ORANGE CO. CA

SCALE	1" = 12000'
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/30/10
JOB NO.	9526-E

PACE Advanced Water Engineering

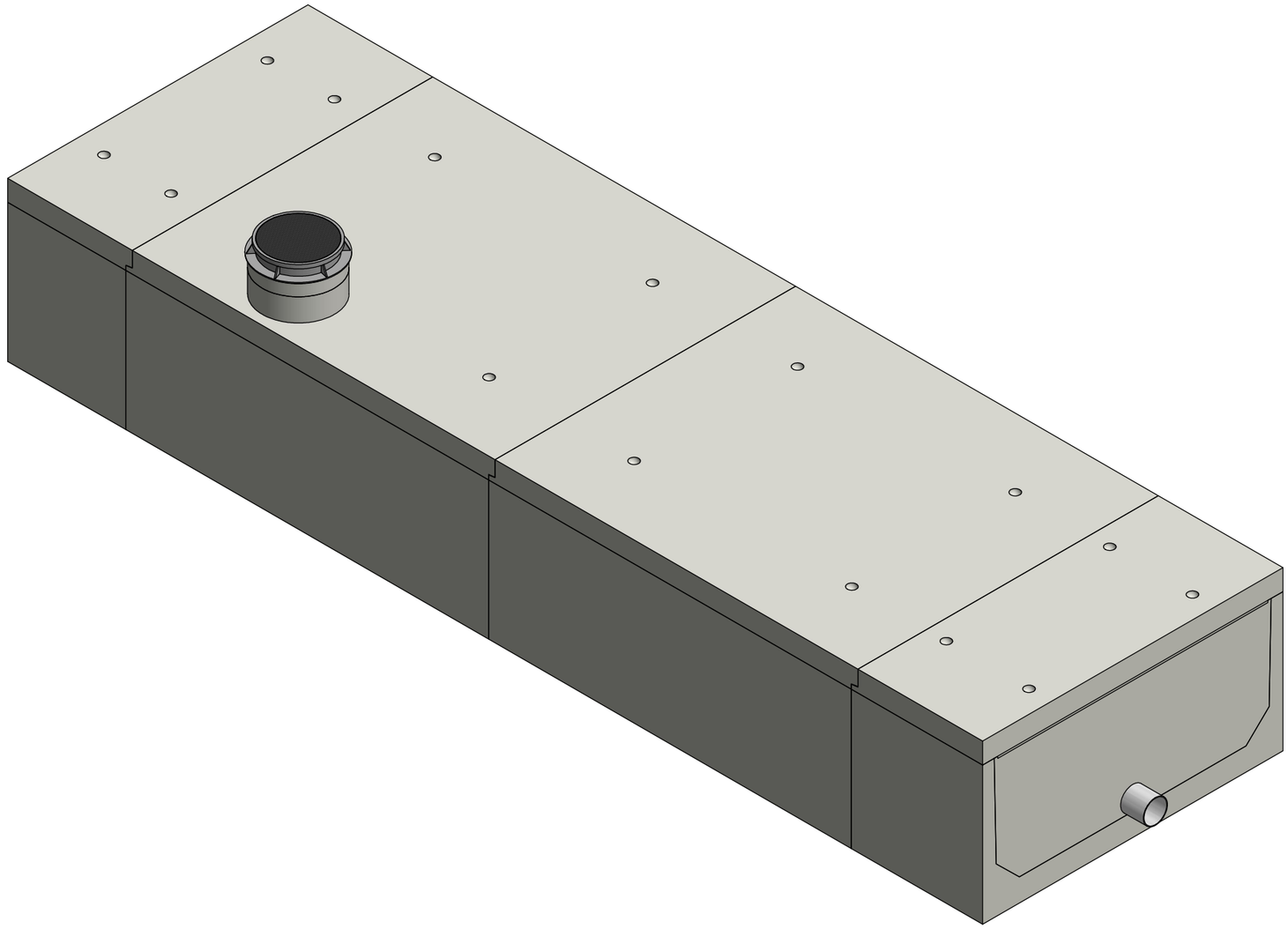
FIGURE 4

P:\9526E\16-GIS\Mxds\SuceptabilityMaps_20100505\9526E_NewportBaySuscebtibility_20100430.mxd

PRELIMINARY DRAWING
NOT FOR CONSTRUCTION

THICKNESSES, NUMBER OF PIECES, AND TYPES OF PIECES COULD CHANGE

TOTAL STORAGE VOLUME PROVIDED	2480 FT³ (23,367-GAL)



ISOMETRIC VIEW

DISCLAIMERS, INCLUDING BUT NOT LIMITED TO:

1.) All precast concrete materials and manufacturing methods shall conform to all current and applicable ASTM, AASHTO and NPCA standards and specifications.
2.) All precast concrete components to be manufactured in an NPCA certified plant.
3.) All elevations have been provided by others, and have not been verified by Jensen Precast. Contractor to verify all dimensions and elevations prior to installation.
4.) These layout drawings are intended to show overall system design only. All concrete component thicknesses, dimensions, lengths and joint orientations may vary across Jensen Precast's manufacturing facilities and are subject to change pending final design. Contractor to confirm all information prior to installation.
5.) System design criteria has been provided to Jensen Precast. Others are responsible for verification that system meets the intended application.
6.) Foundation, subgrade and backfill to be designed by others.
7.) For complete design and product information, or custom design conditions, please conctact Jensen Precast.

JENSEN® STORMWATER SYSTEMS
521 DUNN CIRCLE, SPARKS, NV 89431
www.jensenwaterresources.com
(855) 468-5600

DESCRIPTION: 4th & Mortimer West Vault

TITLEBLOCK

PART NUMBER:	4th and Mortimer West Vault	DRAWN BY:	Lloyd S.
CREATED:		MODIFIED:	7/20/2022

REV:

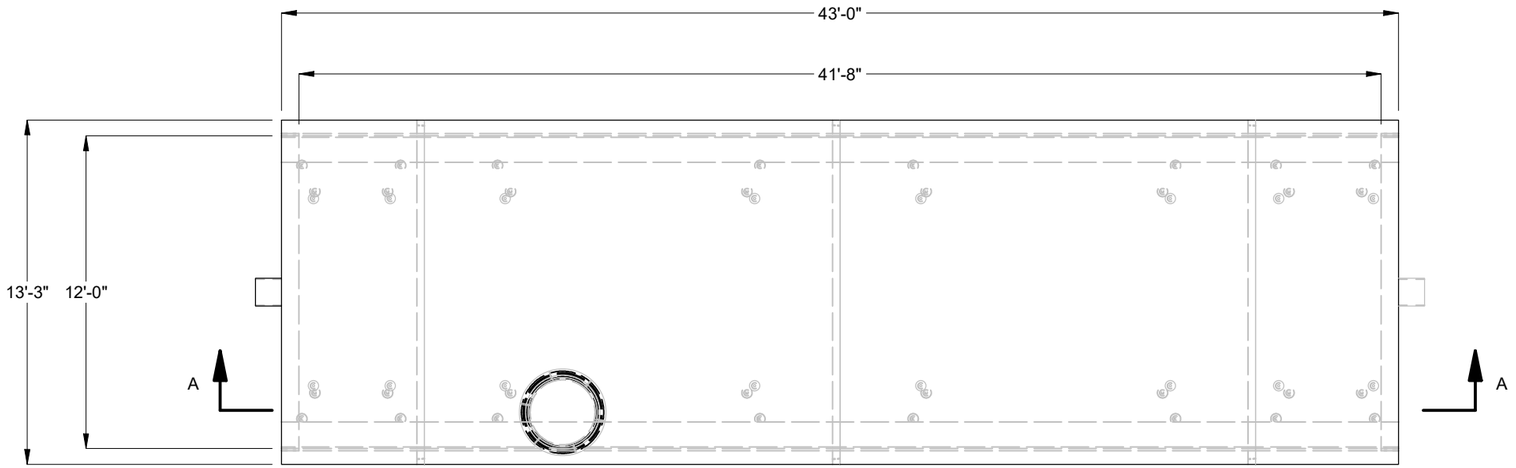
SHEET: 1 OF 2

4th and Mortimer East Vault.idw

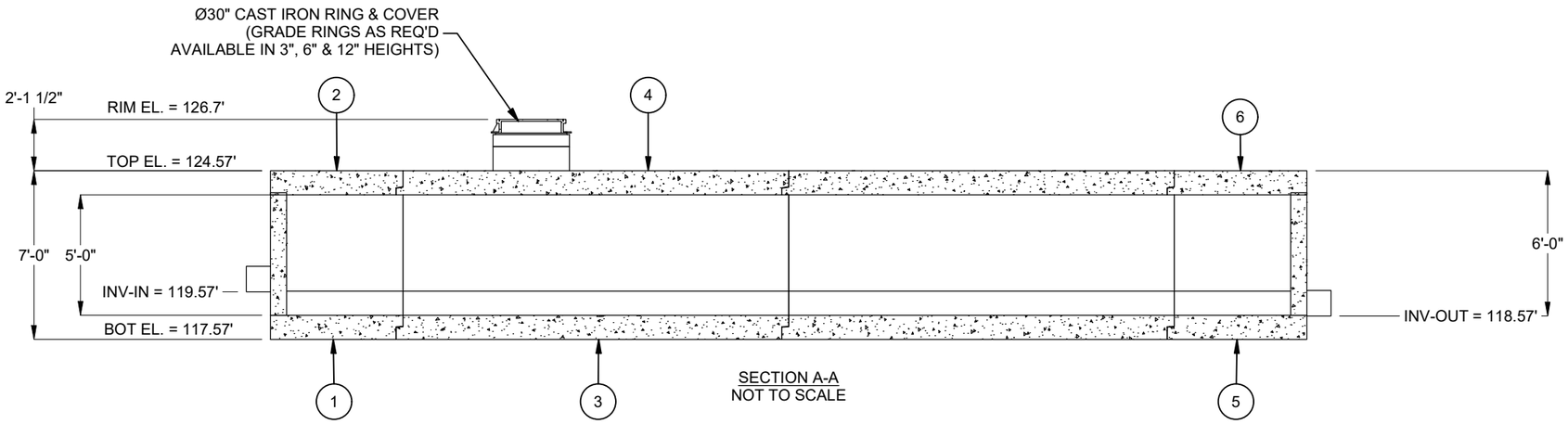
PRELIMINARY DRAWING
NOT FOR CONSTRUCTION

THICKNESSES, NUMBER OF PIECES, AND TYPES OF PIECES COULD CHANGE

BILL OF MATERIALS			
ITEM	QTY	DESCRIPTION	MASS [LBS]
1	1	BOTTOM START SECTION 12'W X 5'H X 6'L	13553
2	1	TOP START SECTION 12'W X 5'H X 6'L	10671
3	2	BOTTOM CENTER SECTION 12'W X 5'H X 16'L	40237
4	2	TOP CENTER SECTION 12'W X 5'H X 16'L	31568
5	1	BOTTOM END SECTION 12'W X 5'H X 6'L	14071
6	1	TOP END SECTION 12'W X 5'H X 6'L	11012



PLAN VIEW
NOT TO SCALE



SECTION A-A
NOT TO SCALE

MATERIALS:
1. ALL PRECAST CONCRETE MATERIALS AND MANUFACTURING METHODS SHALL CONFORM TO ALL CURRENT AND APPLICABLE ASTM, AASHTO, AND NPCA STANDARDS AND SPECIFICATIONS.
2. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH F'c = 5,000-psi AT 28-DAYS.

DESIGN NOTES:
1. DESIGNED FOR H-20 PARKING LOT LOADING.
2. ALL DIMENSIONS AND THICKNESS ARE PRELIMINARY AND TO BE VERIFIED AFTER COMPLETION OF STRUCTURAL DESIGN.
3. STRUCTURES ARE NOT SUITABLE FOR ADDITIONAL LOADING CONDITIONS, SUCH AS BUT NOT LIMITED TO, FOOTING LOADS, FOUNDATION LOADS, ETC.
4. GROUNDWATER TABLE ASSUMED TO BE BELOW STRUCTURE.
5. BURY DEPTH IS ASSUMED TO BE BETWEEN 1-FT TO 3-FT TO TOP OF STRUCTURE.

INSTALLATION NOTES:
1. CONTRACTOR TO VERIFY ALL DIMENSIONS AND ELEVATIONS IN FIELD PRIOR TO INSTALLATION.
2. PRECAST CONCRETE JOINTS TO BE SEALED USING BUTYL RUBBER COMPOUND SUPPLIED BY JENSEN PRECAST. CUSTOMER RESPONSIBLE TO INSTALL.
3. JENSEN PRECAST TO PROVIDE EXTERIOR JOINT WRAP. CUSTOMER RESPONSIBLE FOR INSTALLATION.
4. CONTRACTOR TO GROUT ALL PIPE PENETRATIONS IN PRECAST CONCRETE OPENINGS IN FIELD AS NECESSARY.
5. CONTRACTOR TO ADJUST ELEVATION OF FRAMES, COVERS AND HATCHES IN FIELD AS NECESSARY.

GENERAL NOTES:
1. INLET AND OUTLET PIPE LAYOUT TO BE DETERMINED UPON FINAL DESIGN.
2. ACCESS OPENINGS SHOWN FOR CONCEPT ONLY, WILL BE DECIDED UPON FINAL DESIGN
3. FOUNDATION, SUBGRADE, AND BACKFILL TO BE DESIGNED BY OTHERS.
4. ALL PRECAST CONCRETE MATERIALS AND MANUFACTURING METHODS SHALL CONFORM TO ALL CURRENT AND APPLICABLE ASTM STANDARDS AND SPECIFICATIONS.
5. ALL PRECAST CONCRETE COMPONENTS TO BE MANUFACTURED IN AN NPCA CERTIFIED PLANT.
6. JENSEN PRECAST TO PROVIDE ALL MATERIALS AS SHOWN, UNLESS OTHERWISE NOTED.
7. FOR COMPLETE DESIGN AND PRODUCT INFORMATION, OR CUSTOM DESIGN CONDITIONS, CONTACT JENSEN PRECAST.

4th and Mortimer East Vault.idw

DISCLAIMERS, INCLUDING BUT NOT LIMITED TO:
1.) All precast concrete materials and manufacturing methods shall conform to all current and applicable ASTM, AASHTO and NPCA standards and specifications.
2.) All precast concrete components to be manufactured in an NPCA certified plant.
3.) All elevations have been provided by others, and have not been verified by Jensen Precast. Contractor to verify all dimensions and elevations prior to installation.
4.) These layout drawings are intended to show overall system design only. All concrete component thicknesses, dimensions, lengths and joint orientations may vary across Jensen Precast's manufacturing facilities and are subject to change pending final design. Contractor to confirm all information prior to installation.
5.) System design criteria has been provided to Jensen Precast. Others are responsible for verification that system meets the intended application.
6.) Foundation, subgrade and backfill to be designed by others.
7.) For complete design and product information, or custom design conditions, please conctact Jensen Precast.

JENSEN STORMWATER SYSTEMS
521 DUNN CIRCLE, SPARKS, NV 89431
www.jensenwaterresources.com
(855) 468-5600

DESCRIPTION: 4th & Mortimer West Vault MECHANICAL DETAIL			REV:
PART NUMBER: 4th and Mortimer West Vault		DRAWN BY: Lloyd S.	SHEET: 2 OF 2
CREATED:		MODIFIED: 7/20/2022	

APPENDIX A

SUPPORTING CALCULATIONS

Storm Water Quality Design Calculations

10/19/2022

Drainage Area Name / DMA	BMP ID, Feature or Land Use Type	Total Drainage Area (ft^2)	Total Drainage Area (acres)	Total Pervious Area (ft^2)	Calculated % impervious	Runoff Coefficient	Design Storm Depth (in)	Average or Estimated Tc (min)	Rainfall Intensity (in/hr)	Simple Method DCV (ft^3)	Q_{Design} (cfs)
Total Site											
DMA A1	INFIL	61,986.0	1.423	5,230.0	91.6%	0.837	0.75	5	0.26	**3,242.6**	**0.310**

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	2.715	acres
3	What type of BMP is proposed?	Underground Infiltration Gallery		
4	What is the infiltrating surface area of the proposed BMP?	DMA A1 A_{BMP}	820	sq-ft
5	What land use activities are present in the tributary area (list all) *High Density Residential and Commercial*			
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):			
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: *Historically deep groundwater. Not encountered up to 40 feet below ground surface in geotechnical explorations.*			
10	What is separation from the infiltrating surface to seasonally high groundwater?	SHGWT	>10	ft
11	What is separation from the infiltrating surface to mounded seasonally high groundwater?	Mounded SHGWT	>10	ft
12	Describe assumptions and methods used for mounding analysis:			

Worksheet I: Summary of Groundwater-related Feasibility Criteria

13	Is the site within a plume protection boundary (See Figure VIII.2)?	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: *One former Leaking Underground Storage Tank (LUST) site has been identified within 250 feet of the project site. Talin Tire Inc. cleanup is complete, RB Case #: 083002444T. See location of LUST in map below.*			
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?		**Y** N	
Provide rationale for feasibility determination:				

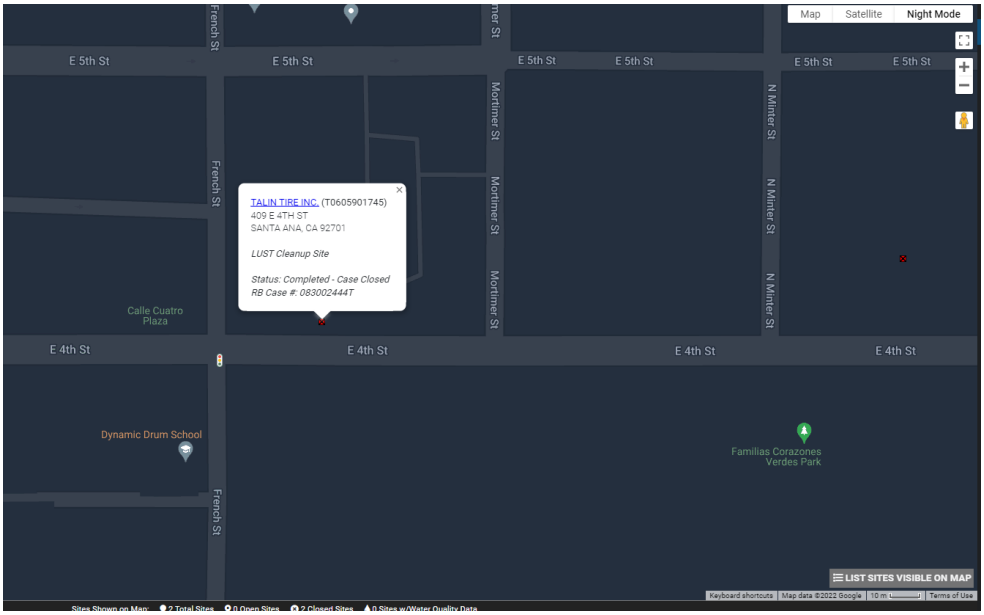


Table VIII.1: Recommendations/Requirements for BMP Selection to Minimize Groundwater Quality Impacts

Tributary Area Risk Category	Narrative Description of Category	Example Land Use Activities	BMP Selection Requirements
Low Runoff Contamination Potential	BMP receives runoff from a mix of land covers that are expected to have relatively clean runoff; significant spills in tributary area are unlikely.	▪ Rooftops with roofing material and downspouts free of copper and zinc ▪ Patios, sidewalks, and other pedestrian areas ▪ Mixed residential land uses with applicable source controls ▪ Institutional land uses with applicable source controls ▪ Driveways and minor streets	▪ Any infiltration BMP type may be used ▪ Pretreatment for sediment is strongly recommended, as applicable, to mitigate clogging
Moderate Runoff Contamination Potential	BMP receives runoff from a mix of land covers, more than 10 percent of which have the potential to generate stormwater pollutants at levels that could potentially contaminate groundwater; there is potential for minor spills in the tributary area.	▪ Roadways greater than 5,000 ADT but less than 25,000 ADT ▪ Commercial and institutional parking lots ▪ Commercial land uses ▪ Light industrial that does not include usage of chemicals that ▪ are mobile in stormwater and groundwater ▪ Trash storage areas	▪ Any infiltration BMP type may be used ▪ Pretreatment shall be used ▪ The type of pretreatment shall be selected to address potential groundwater contaminants potentially found in stormwater runoff.
High Runoff Contamination Potential	BMP receives runoff from a mix of land covers, more than 10 percent of which have significant unavoidable potential to generate stormwater pollutants in quantities that could be detrimental to groundwater quality; and/or there is significant potential for major spills that could drain to BMPs.	▪ Roads greater than 25,000 ADT ▪ Heavy and light industrial pollutant source areas, including areas with exposed industrial activity and high use industrial truck traffic, and any areas that cannot be isolated these areas. Does not include lower risk source sources areas within industrial zones (e.g., roofs, offices, and parking areas) that are hydrologically isolated from industrial pollutant source areas ▪ Automotive repair shops ▪ Car washes ▪ Fleet storage areas ▪ Nurseries, agriculture, and heavily managed landscape areas with extensive use of fertilizer ▪ Fueling stations (infiltration prohibited under all conditions)	Infiltration is prohibited unless advanced pretreatment and spill isolation can be feasibly used and enhanced monitoring and inspection are implemented. Large projects* must evaluate feasibility of advanced pretreatment and spill isolation. Small projects may consider infiltration to be infeasible with narrative discussion

* See Table VII.2 for definition of “Large” and “Small” projects.

Table VIII.2: Definition of Project Site Categories

	Residential	Commercial, Institutional	Industrial
Small Projects	Less than 10 acres and less than 30 DU	Less than 5 acres and less than 50,000 SF	Less than 2 acres and less than 20,000 SF
Large Projects	Greater than 10 acres or greater than 30 DU	Greater than 5 acres or greater than 50,000 SF	Greater than 2 acres or greater than 20,000 SF

VIII.2. Depth to Groundwater and Mounding Potential

Minimum separation between the infiltrating surface (bottom of infiltration facility) and seasonally high mounded groundwater shall be observed in the design of infiltration BMPs, depending on BMP type.

- If the depth to unmounded seasonally high groundwater is greater than 15 feet, the depth to groundwater does not constrain infiltration
- If separation to unmounded seasonally high groundwater is greater than 10-feet and the infiltration area is less than 2,000 sq-ft, the depth to groundwater does not constrain infiltration.
- The separation between the infiltrating surface and the seasonally high mounded groundwater table shall not be less than 5 feet for all BMP types. BMPs for which 5-foot minimum separation applies include:
    - Rain gardens and dispersion trenches (small, residential applications)
    - Bioretention and planters
    - Permeable Pavement
    - Similar BMPs infiltrating over an extensive surface area and providing robust pretreatment or embedded treatment processes.

- Separation to mounded seasonally high groundwater shall be at least 10 feet for infiltration devices that inject water below the subsurface and surface infiltration BMPs with tributary area and land use activities that are considered to pose a more significant risk to groundwater quality. BMPs for which the 10-foot separation applies include:
    - Dry wells
    - Subsurface infiltration galleries or vaults
    - Surface Infiltration Basins
    - Infiltration Trenches
    - Other functionally similar devices or BMPs.

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: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
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: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
3	Would infiltration of the DCV from drainage area **violate downstream water rights**?		X
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

	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: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
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: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
6	Would **reduction of over predeveloped 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: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
7	Would **an increase in infiltration over predeveloped 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: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

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: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.	
9	If any answer from row 1-3 is yes: infiltration of any volume is **not feasible** within the DMA or equivalent. Provide basis: Summarize findings of infeasibility screening	
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: Summarize findings of infeasibility screening	
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.	X

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet

Project: 4th & Mortimer - Block A

10/19/2022

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominate soil type	0.25	1	0.25
		Site soil variability	0.25	2	0.5
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.25
B	Design	Tributary area size	0.25	1	0.25
		Level of pretreatment/ expected sediment loads	0.25	2	0.5
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	2	0.5
		Design Assessment Safety Factor, $S_B = \Sigma p$			2
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					2.50
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					13.68
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_M / S_{TOT}$					5.47
Supporting Data					
Briefly describe infiltration test and provide reference to test forms: *See Appendix F for geotechnical engineer recommendations for drywell design for this preliminary phase of hte project. Although the locations tested differ slightly than the currently proposed infiltration BMPs, the infiltration rates are anticipated to be similar throughout the site. During the final deisgn, infiltration rates and safety factors may be adjusted after any additional testing be conducted on-site. Any changes will be reflected in the Final WQMP.*					

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

For all high concerns, assign a factor value of 3, for medium concerns, assign a factor value of 2, and for low concerns assign a factor value of 1.

Table VII.3: Suitability Assessment Related considerations for Infiltration Facility Safety Factors

Consideration	High Concern	Medium Concern	Low Concern
Assessment methods (see explanation below)	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates	Direct measurement of ≥ 20 percent of infiltration area with localized infiltration measurement methods (e.g., infiltrometer)	Direct measurement of ≥ 50 percent of infiltration area with localized infiltration measurement methods or Use of extensive test pit infiltration measurement methods
Texture Class	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site soil variability	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment	Soil borings/test pits indicate moderately homogeneous soils	Multiple soil borings/test pits indicate relatively homogeneous soils
Depth to groundwater/ impervious layer	<5 ft below facility bottom	5-10 ft below facility bottom	>10 below facility bottom

Table VII.4: Design Related Considerations for Infiltration Facility Safety Factors

Consideration	High Concern	Medium Concern	Low Concern
Tributary area size	Greater than 10 acres.	Greater than 2 acres but less than 10 acres.	2 acres or less.
Level of pretreatment/ expected influent sediment loads	Pretreatment from gross solids removal devices only, such as hydrodynamic separators, racks and screens AND tributary area includes landscaped areas, steep slopes, high traffic areas, or any other areas expected to produce high sediment, trash, or debris loads.	Good pretreatment with BMPs that mitigate coarse sediments such as vegetated swales AND influent sediment loads from the tributary area are expected to be relatively low (e.g., low traffic, mild slopes, disconnected impervious areas, etc.).	Excellent pretreatment with BMPs that mitigate fine sediments such as bioretention or media filtration OR sedimentation or facility only treats runoff from relatively clean surfaces, such as rooftops.
Redundancy of treatment	No redundancy in BMP treatment train.	Medium redundancy, other BMPs available in treatment train to maintain at least 50% of function of facility in event of failure.	High redundancy, multiple components capable of operating independently and in parallel, maintaining at least 90% of facility functionality in event of failure.
Compaction during construction	Construction of facility on a compacted site or elevated probability of unintended/ indirect compaction.	Medium probability of unintended/ indirect compaction.	Heavy equipment actively prohibited from infiltration areas during construction and low probability of unintended/ indirect compaction.

Worksheet B: Simple Design Capture Volume Sizing Method

Project: 4th & Mortimer

Date: 10/19/2022

		DMA =	DMA A1			
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=	0.75			inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0			inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.75			inches
Step 2: Calculate the DCV						
1	Enter Project area tributary to BMP(s), *A* (acres)	A=	1.42			acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	92%			%
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.837			
4	Calculate runoff volume, $V_{design} = (C \times d_{remainder} \times A \times 43560 \times (1/12))$	V_{design}=	3,242.6			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)	$K_{measured}$=	13.68			
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	2.50			
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	5.47			
Step 3b: Determine minimum BMP footprint						
4	Enter drawdown time, *T* (max 48 hours)	T=	*See attached drywell calcualtions*			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

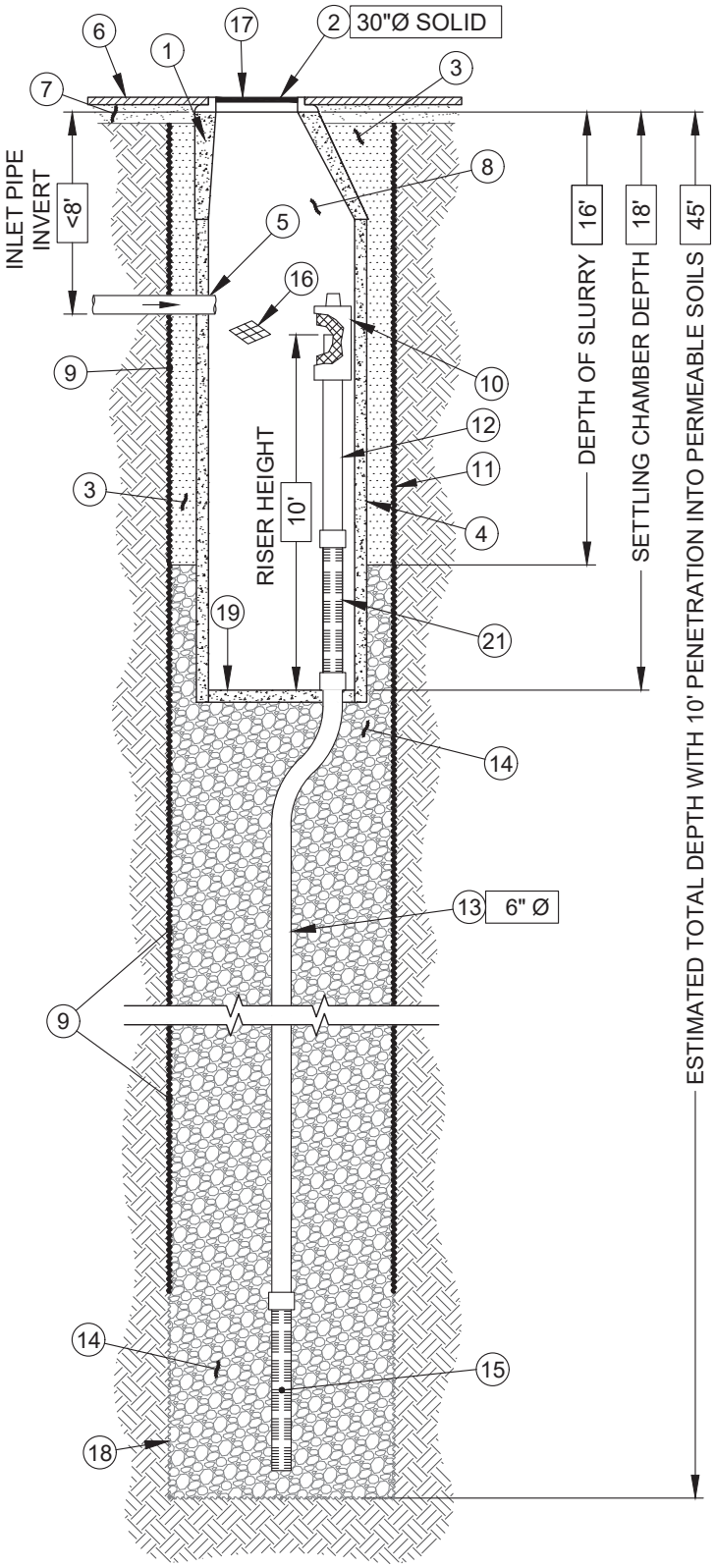
Lincoln BMP employed 2' effective depth and total area provided for BMP is 450 sf resulting in a BMP capacity

The MaxWell® IV

DRAINAGE SYSTEM DETAILS AND SPECIFICATIONS

East 4th and Mortimer

Santa Ana, CA



AZ Lic. ROC070465 A, ROC047067 B-4, ADWR 363
CA Lic. 886759, C-42, C-57, HAZ.
Also licensed in the following states: MT, NM, NV, OR, TX, UT, and WA.

ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **BOLTED RING & COVER** - DIAMETER & TYPE AS SHOWN. CLEAN CAST IRON PRESSURIZED COVER WITH GASKET (NEENAH R-6462-HH). BOLTED. RIM ELEVATIONÂ±0.02' OF PLANS.
3. **STABILIZED BACKFILL** - TWO-SACK SLURRY MIX FROM BOTTOM OF SLURRY TO 5' BELOW GRADE AROUND CHAMBER. SIX-SACK SLURRY MIX FROM 5' BELOW GRADE TO GRADE AROUND CHAMBER.
4. **PRE-CAST LINER -** 4000 PSI CONCRETE 48" ID. X 54" OD. **CENTER IN HOLE** AND ALIGN SECTIONS **TO MAXIMIZE BEARING SURFACE.**
5. **INLET PIPE (BY OTHERS).** SEE SEPARATE PLAN FOR INVERT ELEVATIONS.
6. **GRADED BASIN OR PAVING** (BY OTHERS).
7. **COMPACTED BASE MATERIAL**, IF REQUIRED (BY OTHERS).
8. **FREEBOARD DEPTH VARIES** WITH INLET PIPE ELEVATION. INCREASE SETTLING CHAMBER DEPTH AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE RISER PIPE.
9. **NON-WOVEN GEOTEXTILE SLEEVE** - MIRAFI 140 NL. MIN. 6 FT Ø. HELD APPROX. 10 FEET OFF THE BOTTOM OF EXCAVATION.
10. **PUREFLO® DEBRIS SHIELD** - ROLLED 16 GA. STEEL X 24" LENGTH WITH VENTED ANTI-SIPHON AND INTERNAL 0.265" MAX. SWO FLATTENED EXPANDED STEEL SCREEN X 12" LENGTH. **FUSION BONDED EPOXY COATED**.
11. **MIN. 6' Ø DRILLED SHAFT.**
12. **RISER PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
13. **DRAINAGE PIPE** - ADS HIGHWAY GRADE OR SCH. 40 PVC WITH TRI-A COUPLER. SUSPEND PIPE DURING BACKFILL OPERATIONS. DIAMETER AS NOTED.
14. **ROCK** - WASHED, SIZED BETWEEN 3/8" AND 1-1/2".
15. **FLOFAST® DRAINAGE SCREEN** - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. OVERALL LENGTH VARIES, UP TO 120" WITH TRI-B COUPLER.
16. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY. TYPICAL, 2 PER CHAMBER.
17. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER** AT PROJECT COMPLETION. GRATED ONLY.
18. **MIN 6' Ø DRILLED SHAFT.**
19. **BASE SEAL** - SIX-SACK SLURRY.
21. **DRAIN DOWN INTAKE SCREEN** - 6" Ø SCH. 40 PVC 0.120" MODIFIED SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. WRAPPED WITH NON-WOVEN GEOTEXTILE FABRIC. 48" OVERALL LENGTH WITH TRI-B COUPLER.

DETAIL : IV-6-SS-OC	REVISED BY: RJA		
DRAWN ON: 08-28-19	REVISED DATE: 07-13-22	SCALE: N.T.S	

Manufactured and Installed by
TORRENT® RESOURCES
An evolution of McGuckin Drilling
www.torrentresources.com
CALIFORNIA 909-829-0740
ARIZONA 602-268-0785

Maxwell® IV Drainage System Calculations Prepared on July 13, 2022
Project: **E 4th and Mortimer / DMA A1 - Santa Ana, CA**
Contact: Josh Ruiz at Fuscoe - Irvine, CA

Given:

Design Infiltration Rate	5.47	in/hr
Mitigated Volume	3,405	ft^3
Required Drawdown Time	48	hours
Depth to Emergency Overflow	0	ft
Min. Depth to Infiltration	15	ft
Groundwater Depth for Design	55	ft

Proposed:

Drywell Rock Shaft Diameter	6	ft
Drywell Chamber Depth	18	ft
Rock Porosity	40	%
Depth to Infiltration	16	ft
Drywell Bottom Depth	45	ft

Convert Design Rate from in/hr to ft/sec.

$5.47 \frac{in}{hr} \times \frac{1\ ft}{12\ in} \times \frac{1\ hr}{3600\ sec} = 0.000127 \frac{ft}{sec}$

A 6 foot diameter drywell provides 18.85 SF of infiltration area per foot of depth, plus 28.27 SF at the bottom.

For a 45 foot deep drywell, infiltration occurs between 16 feet and 45 feet below grade. This provides 29 feet of infiltration depth in addition to the bottom area. Infiltration area per drywell is calculated below.

$29\ ft \times 18.85 \frac{ft^2}{ft} + 28.27\ ft^2 = 575\ ft^2$

Combine design rate with infiltration area to get flow (disposal) rate for each drywell.

$0.000127 \frac{ft}{sec} \times 575\ ft^2 = 0.07280 \frac{ft^3}{sec}$

Volume of disposal for each drywell based on various time frames are included below.

48 hrs: 0.0728 CFS x 48 hours x $\frac{3600\ sec}{1\ hr}$ = 12,579 cubic feet of retained water disposed of.

13 hrs: 0.0728 CFS x 13 hours x $\frac{3600\ sec}{1\ hr}$ = 3,407 cubic feet of retained water disposed of.

Chamber diameter = 4 feet. Drywell rock shaft diameter = 6 feet.
Volume provided in each drywell with chamber depth of 18 feet.

$18\ ft \times 12.57\ ft^2 + 27\ ft \times 28.27\ ft^2 \times 40\ \% = 532\ ft^3$

The MaxWell System is composed of 1 drywell(s) .

Total volume provided = $532\ ft^3$
Total 13 hour infiltration volume = $3{,}407\ ft^3$
Total 48 hour infiltration volume = $12{,}579\ ft^3$
Total infiltration flowrate = $0.07280 \frac{ft^3}{sec}$

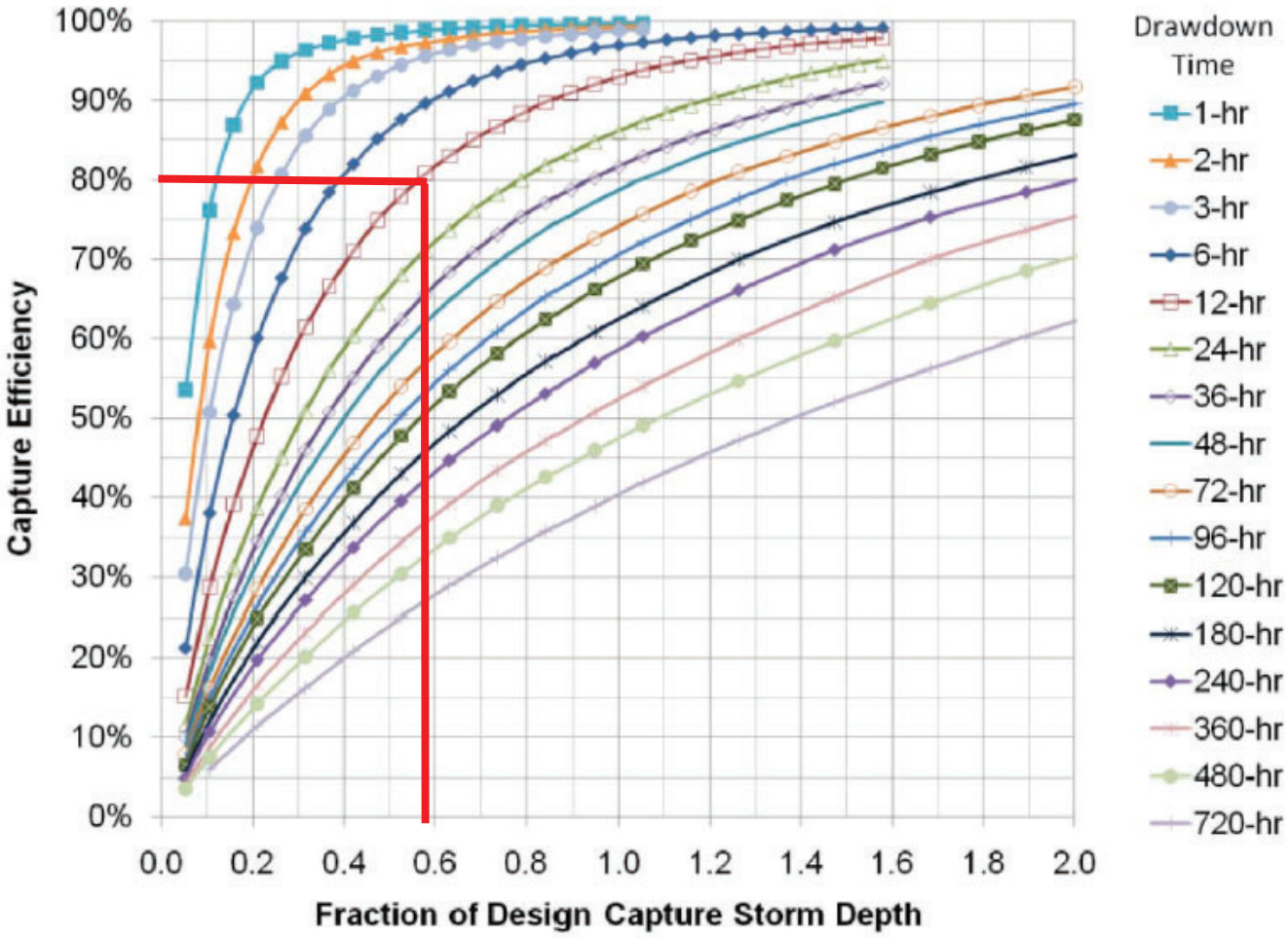
Based on the total mitigated volume of 3405 CF, the actual drawdown time is only 13 hours. Using the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs, the DCV fraction , X1, is 0.57. Taking the DCV multiplied by 0.57 = 1941 CF. The storage provided in the drywell is 532 CF therefore the remaining storage requirement is 1409 CF.

For any questions, please contact Ryan Adaya at 951-202-1037 or via email at RAdaya@TorrentResources.com

Torrent Resources (CA) Incorporated
9950 Alder Avenue
Bloomington, CA 92316
Phone 909-829-0740

E 4th and Mortimer - A1

Santa Ana, CA



1-HR	0.12	***13-HR***	0.57	***25-HR***	0.79	***37-HR***	0.96
2-HR	0.20	***14-HR***	0.59	***26-HR***	0.81	***38-HR***	0.97
3-HR	0.25	***15-HR***	0.61	***27-HR***	0.82	***39-HR***	0.97
4-HR	0.29	***16-HR***	0.63	***28-HR***	0.84	***40-HR***	0.98
5-HR	0.33	***17-HR***	0.65	***29-HR***	0.85	***41-HR***	0.99
6-HR	0.37	***18-HR***	0.67	***30-HR***	0.87	***42-HR***	1.00
7-HR	0.40	***19-HR***	0.68	***31-HR***	0.88	***43-HR***	1.00
8-HR	0.43	***20-HR***	0.70	***32-HR***	0.89	***44-HR***	1.01
9-HR	0.46	***21-HR***	0.72	***33-HR***	0.91	***45-HR***	1.02
10-HR	0.49	***22-HR***	0.74	***34-HR***	0.92	***46-HR***	1.03
11-HR	0.52	***23-HR***	0.76	***35-HR***	0.94	***47-HR***	1.03
12-HR	0.55	***24-HR***	0.78	***36-HR***	0.95	***48-HR***	1.04

Appendix B

Notice of Transfer of Responsibility

NOTICE OF TRANSFER OF RESPONSIBILITY

WATER QUALITY MANAGEMENT PLAN

4th and Mortimer – Block A
APN: 398-325-01

Submission of this Notice Of Transfer of Responsibility constitutes notice to the City of Santa Ana 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 described below.

I. Previous Owner/ Previous Responsible Party Information

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

II. Information about Site Transferred

Name of Project (if applicable):	
Title of WQMP Applicable to site:	
Street Address of Site (if applicable):	
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):	

III. New Owner/ New Responsible Party Information

Company/ Individual Name:		Contact Person:	
Street Address:		Title:	
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 no 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 as "Previously Transferred".

V. Purpose of Notice of Transfer

The purposes 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 Order 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:	Date:

APPENDIX C

EDUCATIONAL MATERIALS

Sewage Spill Regulatory Requirements

Allowing sewage to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up efforts.

Here are the pertinent codes, fines, and agency contact information that apply.

Orange County Stormwater Program
24 Hour Water Pollution Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

- County and city water quality ordinances prohibit discharges containing pollutants.

Orange County Health Care Agency Environmental Health
(714) 433-6419

California Health and Safety Code, Sections 5410-5416

- No person shall discharge raw or treated sewage or other waste in a manner that results in contamination, pollution or a nuisance.
- Any person who causes or permits a sewage discharge to any state waters:
  - must immediately notify the local health agency of the discharge.
  - shall reimburse the local health agency for services that protect the public's health and safety (water-contact receiving waters).
  - who fails to provide the required notice to the local health agency is guilty of a misdemeanor and shall be punished by a fine (between $500–$1,000) and/or imprisonment for less than one year.

Regional Water Quality Control Board
Santa Ana Region (951) 782-4130
San Diego Region (858) 467-2952

- Requires the prevention, mitigation, response to and reporting of sewage spills.

California Office of Emergency Services
(800) 852-7550

California Water Code, Article 4, Chapter 4, Sections 13268-13271
California Code of Regulations, Title 23, Division 3, Chapter 9.2, Article 2, Sections 2250-2260

- Any person who causes or permits sewage in excess of 1,000 gallons to be discharged to state waters **shall immediately notify the Office of Emergency Services.**
- Any person who fails to provide the notice required by this section is **guilty of a misdemeanor** and shall be punished by a fine (less than $20,000) and/or imprisonment for not more than one year.

DTP113 Rev 4/06
printed on recycled paper

Sewage Spill
Reference Guide

Your Responsibilities as a Private Property Owner

Residences
Businesses
Homeowner/Condominium Associations
Federal and State Complexes
Military Facilities

Orange County Sanitation District

Health Care Agency
Environmental Health

PROJECT Pollution PREVENTION
www.ocwatersheds.com

This brochure was designed courtesy of the Orange County Sanitation District (OCSD). For additional information, call (714) 962-2411, or visit their website at www.ocsd.com

What is a Sewage Spill?

Sewage spills occur when the wastewater being transported via underground pipes overflows through a manhole, cleanout or broken pipe. Sewage spills can cause health hazards, damage to homes and businesses, and threaten the environment, local waterways and beaches.

Common Causes of Sewage Spills

Grease builds up inside and eventually blocks sewer pipes. Grease gets into the sewer from food establishments, household drains, as well as from poorly maintained commercial grease traps and interceptors.

Structure problems caused by tree roots in the lines, broken/cracked pipes, missing or broken cleanout caps or undersized sewers can cause blockages.

Infiltration and inflow (I/I) impacts pipe capacity and is caused when groundwater or rainwater enters the sewer system through pipe defects and illegal connections.

You Are Responsible for a Sewage Spill Caused by a Blockage or Break in Your Sewer Lines!

Time is of the essence in dealing with sewage spills. You are required to **immediately**:

Control and minimize the spill. Keep spills contained on private property and out of gutters, storm drains and public waterways by shutting off or not using the water.

Use sandbags, dirt and/or plastic sheeting to prevent sewage from entering the storm drain system.

Clear the sewer blockage. Always wear gloves and wash your hands. It is recommended that a plumbing professional be called for clearing blockages and making necessary repairs.

Always notify your city sewer/public works department or public sewer district of sewage spills. If the spill enters the storm drains also notify the Health Care Agency. In addition, if it exceeds 1,000 gallons notify the Office of Emergency Services. Refer to the numbers listed in this brochure.

Overflowing cleanout pipe located on private property

You Could Be Liable

Allowing sewage from your home, business or property to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up and enforcement efforts. See Regulatory Codes & Fines section for pertinent codes and fines that apply.

What to Look For

Sewage spills can be a very noticeable gushing of water from a manhole or a slow water leak that may take time to be noticed. Don't dismiss unaccounted-for wet areas.

Look for:

- Drain backups inside the building.
- Wet ground and water leaking around manhole lids onto your street.
- Leaking water from cleanouts or outside drains.
- Unusual odorous wet areas: sidewalks, external walls or ground/landscape around a building.

Caution

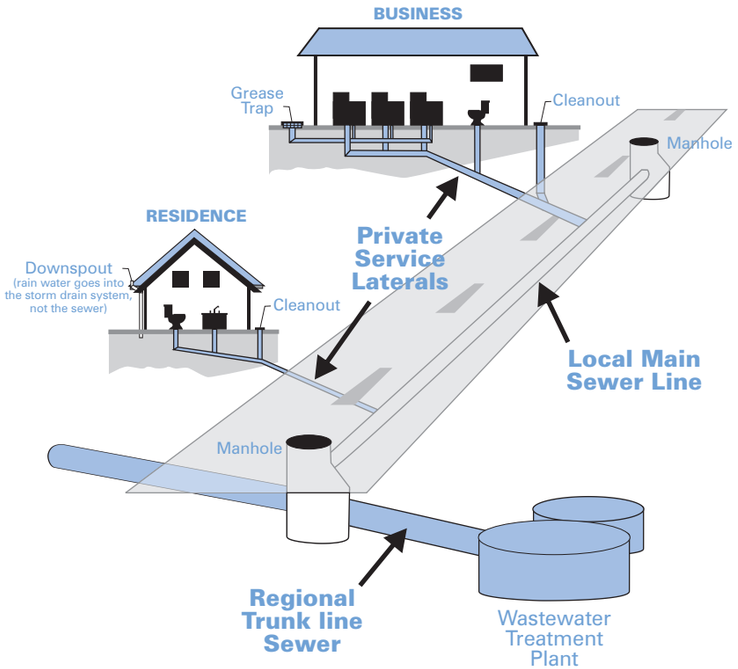
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

If You See a Sewage Spill Occurring, Notify Your City Sewer/Public Works Department or Public Sewer District IMMEDIATELY!

How a Sewer System Works

A property owner's sewer pipes are called service laterals and are connected to larger local main and regional trunk lines. Service laterals run from the connection at the home to the connection with the public sewer (including the area under the street). These laterals are the responsibility of the property owner and must be maintained by the property owner. Many city agencies have adopted ordinances requiring maintenance of service laterals. Check with your city sewer/local public works department for more information.

Operation and maintenance of **local and regional sewer lines** are the responsibility of the city sewer/public works departments and public sewer districts.



How You Can Prevent Sewage Spills

1. **Never put grease down garbage disposals, drains or toilets.**
2. **Perform periodic cleaning to eliminate grease, debris and roots in your service laterals.**
3. **Repair any structural problems in your sewer system and eliminate any rainwater infiltration/inflow leaks into your service laterals.**

Preventing Grease Blockages

The drain is not a dump! Recycle or dispose of grease properly and never pour grease down the drain.

Homeowners should mix fats, oils and grease with absorbent waste materials such as paper, coffee grounds, or kitty litter and place it in the trash. Wipe food scraps from plates and pans and dump them in the trash.

Restaurants and commercial food service establishments should always use "Kitchen Best Management Practices." These include:

- Collecting all cooking grease and liquid oil from pots, pans and fryers in covered grease containers for recycling.
- Scraping or dry-wiping excess food and grease from dishes, pots, pans and fryers into the trash.
- Installing drain screens on all kitchen drains.
- Having spill kits readily available for cleaning up spills.
- Properly maintaining grease traps or interceptors by having them serviced regularly. Check your local city codes.

Orange County Agency Responsibilites

- **City Sewer/Public Works Departments—** Responsible for protecting city property and streets, the local storm drain system, sewage collection system and other public areas.
- **Public Sewer/Sanitation District—** Responsible for collecting, treating and disposing of wastewater.
- **County of Orange Health Care Agency—** Responsible for protecting public health by closing ocean/bay waters and may close food-service businesses if a spill poses a threat to public health.
- **Regional Water Quality Control Boards—** Responsible for protecting State waters.
- **Orange County Stormwater Program—** Responsible for preventing harmful pollutants from being discharged or washed by stormwater runoff into the municipal storm drain system, creeks, bays and the ocean.

You Could Be Liable for Not Protecting the Environment

Local and state agencies have legal jurisdiction and enforcement authority to ensure that sewage spills are remedied.

They may respond and assist with containment, relieving pipe blockages, and/or clean-up of the sewage spill, especially if the spill is flowing into storm drains or onto public property.

A property owner may be charged for costs incurred by these agencies responding to spills from private properties.

Report Sewage Spills!

City Sewer/Public Works Departments

Aliso Viejo	(949) 425-2500
Anaheim	(714) 765-6860
Brea	(714) 990-7691
Buena Park	(714) 562-3655
Costa Mesa	(949) 645-8400
Cypress	(714) 229-6760
Dana Point	(949) 248-3562
Fountain Valley	(714) 593-4600
Fullerton	(714) 738-6897
Garden Grove	(714) 741-5375
Huntington Beach	(714) 536-5921
Irvine	(949) 453-5300
Laguna Beach	(949) 497-0765
Laguna Hills	(949) 707-2650
Laguna Niguel	(949) 362-4337
Laguna Woods	(949) 639-0500
La Habra	(562) 905-9792
Lake Forest	(949) 461-3480
La Palma	(714) 690-3310
Los Alamitos	(562) 431-3538
Mission Viejo	(949) 831-2500
Newport Beach	(949) 644-3011
Orange	(714) 532-6480
Orange County	(714) 567-6363
Placentia	(714) 993-8245
Rancho Santa Margarita	(949) 635-1800
San Clemente	(949) 366-1553
San Juan Capistrano	(949) 443-6363
Santa Ana	(714) 647-3380
Seal Beach	(562) 431-2527
Stanton	(714) 379-9222
Tustin	(714) 962-2411
Villa Park	(714) 998-1500
Westminster	(714) 893-3553
Yorba Linda	(714) 961-7170

Public Sewer/Water Districts

Costa Mesa Sanitary District	(714) 393-4433/ (949) 645-8400
El Toro Water District	(949) 837-0660
Emerald Bay Service District	(949) 494-8571
Garden Grove Sanitary District	(714) 741-5375
Irvine Ranch Water District	(949) 453-5300
Los Alamitos/Rossmoor Sewer District	(562) 431-2223
Midway City Sanitary District (Westminster)	(714) 893-3553
Moulton Niguel Water District	(949) 831-2500
Orange County Sanitation District	(714) 962-2411
Santa Margarita Water District	(949) 459-6420
South Coast Water District	(949) 499-4555
South Orange County Wastewater Authority	(949) 234-5400
Sunset Beach Sanitary District	(562) 493-9932
Trabuco Canyon Sanitary District	(949) 858-0277
Yorba Linda Water District	(714) 777-3018

Other Agencies

Orange County Health Care Agency	(714) 433-6419
Office of Emergency Services	(800) 852-7550

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Fertilizers, pesticides and other chemicals that are left on yards or driveways can be blown or washed into storm drains that flow to the ocean. Overwatering lawns can also send materials into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour gardening products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

UCCE Master Gardener Hotline:
(714) 708-1646

To report a spill,
call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while landscaping or gardening. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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Help Prevent Ocean Pollution:

Tips for Landscape & Gardening

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Tips for Landscape & Gardening

Never allow gardening products or polluted water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers, and pesticide applied to the landscape.

- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.

- Use slow-release fertilizers to minimize leaching, and use organic fertilizers.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.

- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting. For more information, visit **www.ipm.ucdavis.edu**.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Hazardous Waste Collection Center to be recycled. Locations are provided below.

Household Hazardous Waste Collection Centers

Anaheim:	1071 N. Blue Gum St.
Huntington Beach:	17121 Nichols St.
Irvine:	6411 Oak Canyon
San Juan Capistrano:	32250 La Pata Ave.

For more information, call (714) 834-6752 or visit www.oclandfills.com

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Pet waste and pet care products can be washed into the storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never put pet waste or pet care products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while caring for your pet. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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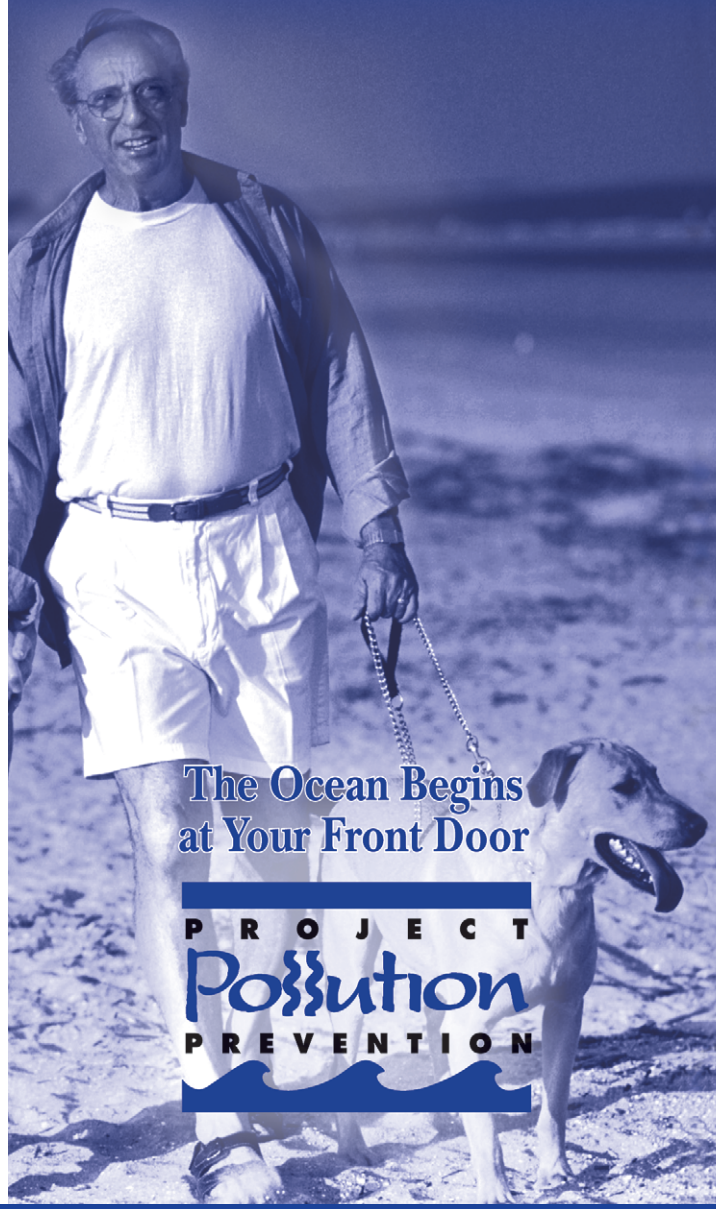
Help Prevent Ocean Pollution:

Tips for Pet Care



Tips for Pet Care

Never let any pet care products or washwater run off your yard and into the street, gutter or storm drain.

Washing Your Pets

Even biodegradable soaps and shampoos can be harmful to marine life and the environment.

- If possible, bathe your pets indoors using less-toxic shampoos or have your pet professionally groomed. Follow instructions on the products and clean up spills.

- If you bathe your pet outside, wash it on your lawn or another absorbent/ permeable surface to keep the washwater from running into the street, gutter or storm drain.

Flea Control

- Consider using oral or topical flea control products.

- If you use flea control products such as shampoos, sprays or collars, make sure to dispose of any unused products at a Household Hazardous Waste Collection Center. For location information, call **(714) 834-6752**.

Why You Should Pick Up After Your Pet

It's the law! Every city has an ordinance requiring you to pick up after your pet. Besides being a nuisance, pet waste can lead to water pollution, even if you live inland. During rainfall, pet waste left outdoors can wash into storm drains. This waste flows directly into our waterways and the ocean where it can harm human health, marine life and the environment.

As it decomposes, pet waste demands a high level of oxygen from water. This decomposition can contribute to killing marine life by reducing the amount of dissolved oxygen available to them.

Have fun with your pets, but please be a responsible pet owner by taking care of them and the environment.

- Take a bag with you on walks to pick up after your pet.

- Dispose of the waste in the trash or in a toilet.

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays, and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Swimming pools and spas are common in Orange County, but they must be maintained properly to guarantee that chemicals aren't allowed to enter the street, where they can flow into the storm drains and then into the waterways. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump pool chemicals into the ocean, so don't let it enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

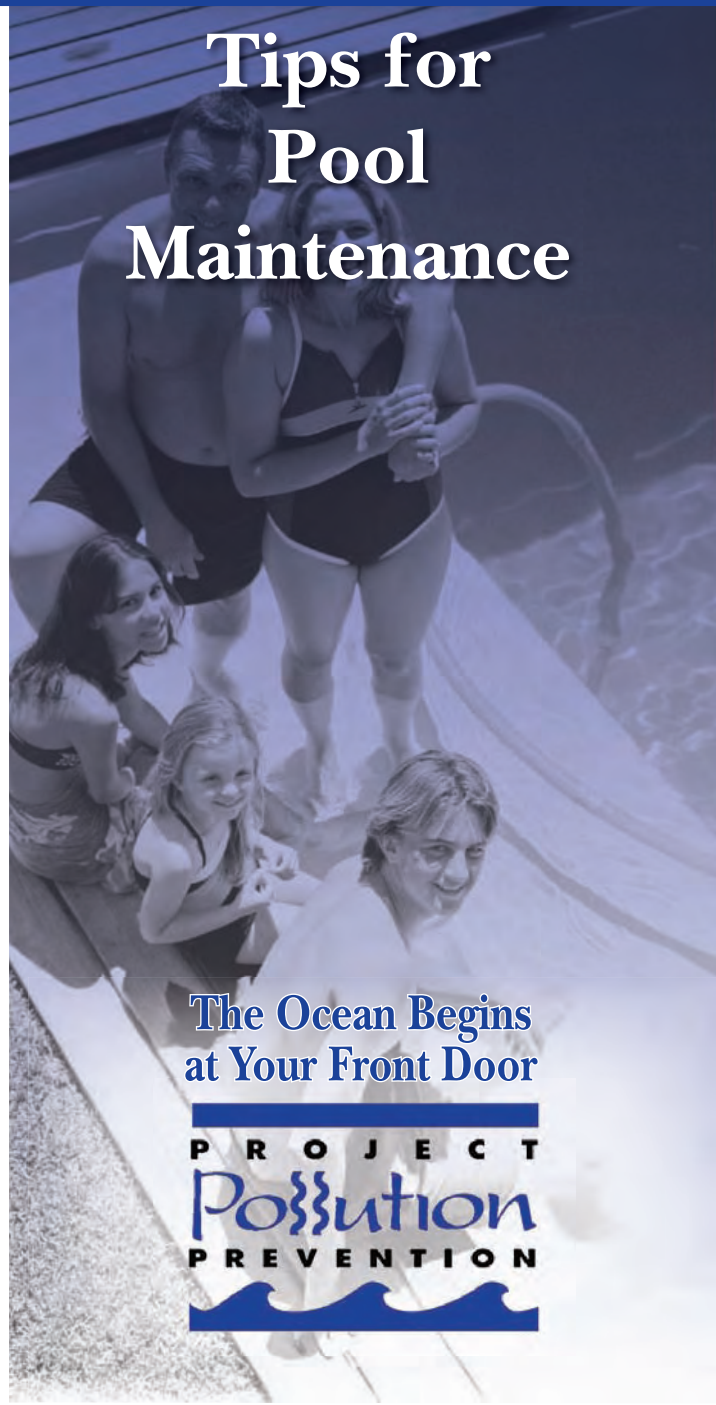
To report a spill,
call the
Orange County 24-Hour
Water Pollution Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while maintaining your pool. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

Help Prevent Ocean Pollution:

Tips for Pool Maintenance



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Tips for Pool Maintenance

Many pools are plumbed to allow the pool to drain directly to the sanitary sewer. If yours is not, follow these instructions for disposing of pool and spa water.

Acceptable and Preferred Method of Disposal

When you cannot dispose of pool water in the sanitary sewer, the release of dechlorinated swimming pool water is allowed if all of these tips are followed:

- The residual chlorine does not exceed 0.1 mg/l (parts per million).
- The pH is between 6.5 and 8.5.
- The water is free of any unusual coloration, dirt or algae.
- There is no discharge of filter media.
- There is no discharge of acid cleaning wastes.
- Some cities may have ordinances that do not allow pool water to be disposed into a storm drain. Check with your city.

How to Know if You're Following the Standards

You can find out how much chlorine is in your water by using a pool testing kit. Excess chlorine can be removed by discontinuing the use of chlorine for a few days prior to discharge or by purchasing dechlorinating chemicals from a local pool supply company. Always make sure to follow the instructions that come with any products you use.

Doing Your Part

By complying with these guidelines, you will make a significant contribution toward keeping pollutants out of Orange County's creeks, streams, rivers, bays and the ocean. This helps to protect organisms that are sensitive to pool chemicals, and helps to maintain the health of our environment.

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, if we are not careful, our daily activities can lead directly to water pollution problems. Water that drains through your watershed can pick up pollutants which are then transported to our waterways and beautiful ocean.

You can prevent water pollution by taking personal action and by working with members of your watershed community to prevent urban runoff from entering your waterway.

For more information, please call the **Orange County Stormwater Program** at **1.877.89.SPILL** or visit **www.ocwatersheds.com**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** at **1.877.89.SPILL**.

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help protect your watershed. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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Help Prevent Ocean Pollution: Tips For Protecting Your Watershed

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Tips for Protecting Your Watershed

My Watershed. Our Ocean.

Water + shed, *noun: A region of land within which water flows down into a specified water body, such as a river, lake, sea, or ocean; a drainage basin or catchment basin.*

Orange County is comprised of 11 major watersheds into which most of our water flows, connecting all of Orange County to the Pacific Ocean.

As water from rain (stormwater) or sprinklers and hoses (urban runoff) runs down your driveway and into your neighborhood streets, sidewalks and gutters, it flows into storm drains that lead to waterways within your watershed. The waterways from other cities merge as they make their way through our watersheds until all the runoff water in Orange County meets at the Pacific Ocean. The water that reaches our ocean is not pure. As it flows through the watershed, it picks up pollutants such as litter, cigarette butts, fertilizer, pesticides, pet waste, motor oil and lawn clippings. Unlike water that enters the sewer (from sinks and toilets), water that enters the storm drain is not treated before it flows, ultimately, to the ocean.

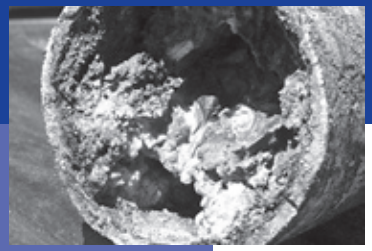
Water quality can be improved by "Adopting Your Watershed." Through this effort, we are challenging citizens and organizations to join the Orange County Stormwater Program and others who are working to protect and restore our creeks, rivers, bays and ocean.

There are many opportunities to get involved:

- Appreciate your watershed - explore the creeks, trails and ocean and make observations about its conditions. If you see anything abnormal (such as dead fish, oil spills, leaking barrels, and other pollution) contact the Orange County 24-hour water pollution problem reporting hotline at 1.877.89.SPILL to report the problem.
- Research your watershed. Learn about what watershed you live in by visiting www.ocwatersheds.com.
- Find a watershed organization in your community and volunteer to help. If there are no active groups, consider starting your own.
- Visit EPA's Adopt Your Watershed's Catalog of Watershed Groups at www.epa.gov/adopt to locate groups in your community.
- Organize or join in a creek, river, bay or ocean cleanup event such as Coastal & Inner Coastal Cleanup Day that takes place the 3rd Saturday of every September. For more information visit www.coast4u.org.

Follow these simple tips to protect the water quality of your watershed:

- **Sweep up debris and dispose of it in the trash. Do not hose down driveways or sidewalks into the street or gutter.**
- **Use dry cleanup methods such as cat litter to absorb spills and sweep up residue.**
- **Set your irrigation systems to reflect seasonal water needs or use weather-based controllers. Inspect for runoff regularly.**
- **Cover trashcans securely.**
- **Take hazardous waste to a household hazardous waste collection center. (For example, paint, batteries and petroleum products)**
- **Pick up after your pet.**
- **Follow application and disposal directions for pesticides and fertilizers.**
- **If you wash your car at home, wash it on your lawn or divert the runoff onto a landscaped area. Consider taking your car to a commercial car wash, where the water is reclaimed or recycled.**
- **Keep your car well maintained.**
- **Never pour oil or antifreeze in the street, gutter or storm drain.**



Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. Fats, oils and grease from restaurants and food service facilities can cause sewer line blockages that may result in sewage overflow into your facility and into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways and should never contain washwater, trash, grease or other materials.

You would never dump oil and trash into the ocean, so don't let it enter the storm drains. Follow these tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

Report sewage spills and
discharges that are not
contained to your site to the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
at **1-877-89-SPILL** (1-877-897-7455)

For emergencies, dial 911.

CALIFORNIA Restaurant ASSOCIATION SINCE 1906

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Help Prevent Ocean Pollution:

Tips for the Food Service Industry

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Best Kitchen Practices

Food Waste Disposal

- Scrape food waste off of plates, utensils, pots, food preparation and cooking areas and dispose of it in the trash.
- Never put food waste down the drain. Food scraps often contain grease, which can clog sewer pipes and result in sewage backups and overflows.

Grease & Oil Disposal

- Never put oil or grease down the drain. Contain grease and oil by using covered grease storage containers or installing a grease interceptor.
- Never overfill your grease storage container or transport it without a cover.
- Grease control devices must be emptied and cleaned by permitted companies.
- Keep maintenance records on site.

- For a list of oil/grease recycling companies, contact the CIWMB at **www.ciwmb.ca.gov/foodwaste/render.htm** or contact your local sanitation district.

Minor Spill Cleanup

- Always use dry cleanup methods, such as a rag, damp mop or broom.
- Never hose a spill into the street, gutter or storm drain.

Major Spill Cleanup

- Have spill containment and clean-up kits readily available, and train all employees on how to use them.
- Immediately contain and clean the spill using dry methods.
- If the spill leaves your site, call **(714) 567-6363**.

Dumpster Cleanup

- Pick up all debris around the dumpster.
- Always keep the lid on the dumpster closed.

- Never pour liquids into the dumpster or hose it out.

Floor Mat Cleaning

- Sweep the floor mats regularly, discarding the debris into the trash.
- Hose off the mats in a mop sink, at a floor drain, or in an outdoor area that can contain the water.

- Never hose the mats in an area where the wastewater can flow to the street, gutter or storm drain.

Washwater Disposal

- Dispose of washwater in a mop sink or an area with a floor drain.
- Never dispose of washwater in the street, gutter or storm drain.

PROJECT Pollution PREVENTION

Preventing water pollution at your commercial/industrial site

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many landscape and building maintenance activities can lead to water pollution if you're not careful. Paint, chemicals, plant clippings and other materials can be blown or washed into storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour soap or fertilizers into the ocean, so why would you let them enter the storm drains? Follow these easy tips to help prevent water pollution.

Some types of industrial facilities are required to obtain coverage under the State General Industrial Permit. For more information visit: **www.swrcb.ca.gov/stormwater/industrial.html**

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit **www.ocwatersheds.com**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** at **1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

RECYCLE USED OIL

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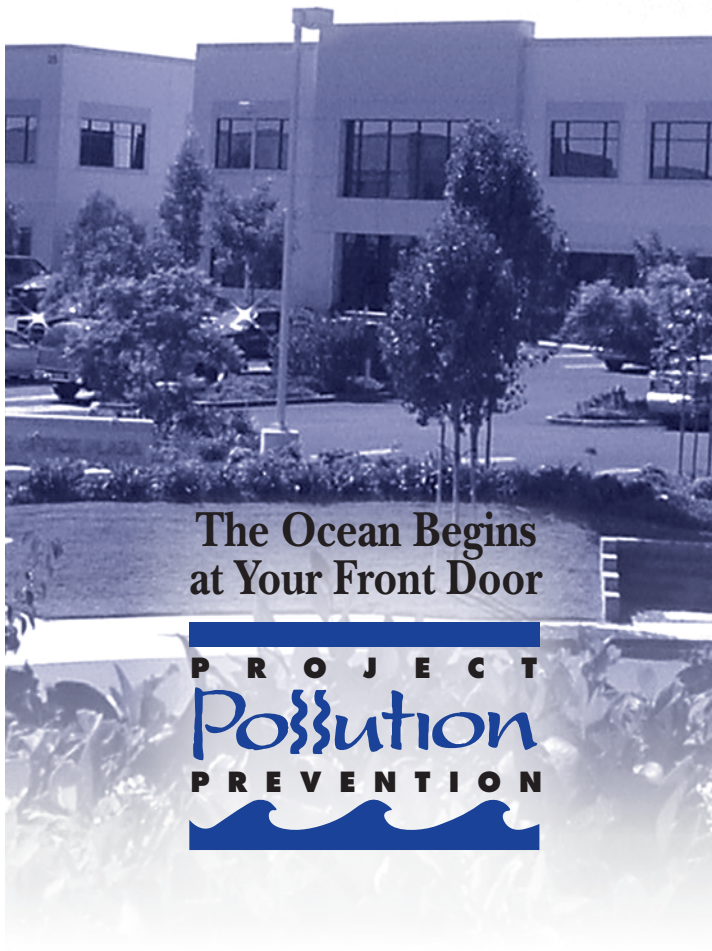
Help Prevent Ocean Pollution:

Proper Maintenance Practices for Your Business



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Proper Maintenance Practices for your Business

Landscape Maintenance

- Compost grass clippings, leaves, sticks and other vegetation, or dispose of it at a permitted landfill or in green waste containers. Do not dispose of these materials in the street, gutter or storm drain.
- Irrigate slowly and inspect the system for leaks, overspraying and runoff. Adjust automatic timers to avoid overwatering.
- Follow label directions for the use and disposal of fertilizers and pesticides.
- Do not apply pesticides or fertilizers if rain is expected within 48 hours or if wind speeds are above 5 mph.
- Do not spray pesticides within 100 feet of waterways.
- Fertilizers should be worked into the soil rather than dumped onto the surface.
- If fertilizer is spilled on the pavement or sidewalk, sweep it up immediately and place it back in the container.

Building Maintenance

- Never allow washwater, sweepings or sediment to enter the storm drain.
- Sweep up dry spills and use cat litter, towels or similar materials to absorb wet spills. Dispose of it in the trash.
- If you wash your building, sidewalk or parking lot, you **must** contain the water. Use a shop vac to collect the water and contact your city or sanitation agency for proper disposal information. Do not let water enter the street, gutter or storm drain.
- Use drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of materials in the trash.
- Use a ground cloth or oversized tub for mixing paint and cleaning tools.
- Use a damp mop or broom to clean floors.
- Cover dumpsters to keep insects, animals, rainwater and sand from entering. Keep the area around the dumpster clear of trash and debris. Do not overfill the dumpster.
- Call your trash hauler to replace leaking dumpsters.
- Do not dump any toxic substance or liquid waste on the pavement, the ground, or near a storm drain. Even materials that seem harmless such as latex paint or biodegradable cleaners can damage the environment.

Never Dispose of Anything in the Storm Drain.

- Recycle paints, solvents and other materials. For more information about recycling and collection centers, visit **www.oclandfills.com**.
- Store materials indoors or under cover and away from storm drains.
- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry, carpet, plastic, pipes, drywall, rocks, dirt, and green waste. For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**
- Properly label materials. Familiarize employees with Material Safety Data Sheets.

PROJECT Pollution PREVENTION

DF-1
DRAINAGE FACILITY OPERATION AND MAINTENANCE

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and storm water that may contain certain pollutants. Consequently these pollutants may accumulate in the system and must be removed periodically. In addition, the systems must also be maintained to function properly hydraulically to avoid flooding. Maintaining the system may involve the following activities:

1. Inspection and Cleaning of Stormwater Conveyance Structures
2. Controlling Illicit Connections and Discharges
3. Controlling Illegal Dumping

This list of Model Maintenance Procedures can be utilized as an inspection checklist to determine where better compliance with Designated Minimum Best Management Practices (notated with checkmarks and capital letters) is needed, and to recommend Additional Best Management Practices (notated with bullet points and lower case letters) that may be applicable under certain circumstances, especially where there are certain Pollutant Constituents of Concern. BMPs applicable to certain constituents are notated as:

Bacteria (BACT) *Sediment (SED)* *Nutrients (NUT)* *Oil and Grease (O&G)* *Pesticides (PEST)*
OtherToxic Compounds (TOX) *Trash (TRASH)* *Hydrological Impacts (HYD)* *Any/All or General (ANY)*

Program/Facility Being Inspected: _____

Date: _____ Inspector Name: _____

When completed, the checklist should be attached to the General Inspection Form Cover Sheet and copies should be provided to the Supervisor of the Facility/Program being inspected.

MAINTENANCE PROCEDURES:

1. Inspection and Cleaning of Drainage Facilities

Unsatisfactory	OK	General Guidelines
☐ _____	☐	T 1A. Annually inspect and clean drainage structures as needed.
☐ _____	☐	T 1B. Maintain appropriate records of cleaning and inspections.
☐ _____	☐	T 1C. Properly dispose of removed materials at a landfill or recycling facility.
☐ _____	☐	T 1D. Conduct intermittent supplemental visual inspections during the wet season to determine if there are problem inlets where sediment/trash or other pollutants accumulate, and provide for additional cleanouts as appropriate.
☐ _____	☐	T 1E. Prevent or clean up any discharges that may occur during the course of maintenance and cleaning procedures.
☐ _____	☐	T 1F. Verify that appropriate employees or subcontractors are trained in proper conductance of maintenance activities, including record keeping and disposal.
☐ _____	☐	T 1G. Annually inspect and clean v-ditches as needed, prior to the wet season. On shrub-covered slopes, vegetative debris may be placed on the downhill side of the ditch. Trash should be bagged and disposed at a landfill.

Unsatisfactory	OK
☐	☐
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General Guidelines (cont.)

- 1a. Remove trash or debris as needed from open channels. It should be noted that major vegetative debris removal may require other regulatory permits prior to completing the work. (TRASH)
- 1b. Consider retrofitting energy dissipaters (e.g. riprap) below culvert outfalls to minimize potential for erosion. (SED)
- 1c. Repair any v-ditches that have cracked or displaced in a manner that accelerates erosion. (SED)
- 1d. If suspicious conditions appear to exist, test selected samples of the removed wastes for compliance with hazardous waste regulations prior to disposal. (TOX)
- 1e. Consider more frequent regular cleaning of selected drainage structures to help address ongoing specific impairments. (SED, BACT, NUT, TRASH)
- 1f. Consider structural retrofits to the MS4 to help address ongoing specific impairments (SED, BACT, NUT, TRASH, O&G)
- 1g. Consider cleaning out pipes at gradient breaks or other in-pipe debris accumulation points as identified/needed. (ANY, BACT, NUT, TRASH)

Storm Drain Flushing

- 1h. Flushing of storm drains or storm drain inlets should only be done when critically necessary and no other solution is practical. (SED, BACT, TRASH).
- 1i. If flushed, to the extent practical the material should be collected (vacuumed), treated with an appropriate filtering device to remove sand and debris and disposed of properly. (SED)

Waste Management

T 1H. Store wastes collected from cleaning activities of the drainage facilities in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.

- 1j. Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device to remove the sand and debris prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not permitted, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream. (SED, TRASH)
- 1k. Provide for laboratory analysis of at least one randomly collected sediment (less the debris) sample per year from the storm drain inlet leaning program to ensure that it does not meet the EPA criteria for hazardous waste. If the sample is determined to be hazardous, the sediment must be disposed of as hazardous waste and the source should be investigated. (TOX).

2. Controlling Illicit Connections and Discharges

Unsatisfactory	OK	General Guidelines
☐	☐	T 2A. Report prohibited discharges such as dumping, paint spills, abandoned oil containers, etc. observed during the course of normal daily activities so they can be investigated, contained, and cleaned up.
☐	☐	T 2B. Where field observations and/or monitoring data indicate significant problems, conduct field investigations to detect and eliminate existing illicit connections and improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)). (Refer to Appendices A-10 and A-11.)
☐	☐	T 2C. Report all observed illicit connections and discharges to the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐	☐	T 2D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.
		Storm Drain Stenciling ("No Dumping—Drains to Ocean")
☐	☐	T 2E. Implement and maintain a storm drain stenciling program.
☐	☐	• 2a. Consider adding the hotline number to the storm drain stencils (BACT, TOX, TRASH).

3. Controlling Illegal Dumping

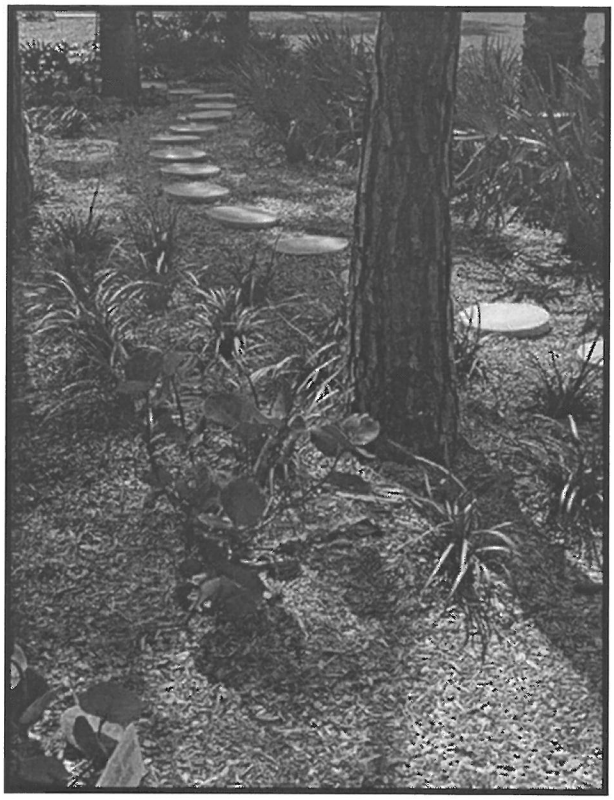
		Field Investigation
☐	☐	T 3A. Report prohibited discharges such as dumpings observed during the course of normal daily activities so they can be investigated, contained and cleaned up.
☐	☐	T 3B. Conduct field investigations to detect and eliminate improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)).
☐	☐	T 3C. Report all observed illegal dumping to the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐	☐	T 3D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.
☐	☐	T 3E. If perpetrator can be identified, take appropriate enforcement action.
☐	☐	• 3a. Consider posting "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs could also indicate fines and penalties for illegal dumping. (ANY)

Unsatisfactory	OK	Training/Education/Outreach
☐ _____	☐	T 3F. Verify that appropriate employees and subcontractors are trained to recognize and report illegal dumping.
☐ _____	☐	T 3G. Encourage public reporting of illegal dumping by advertising the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐ _____	☐	• 3b. Take extra steps to educate the public in neighborhoods where illegal dumping has occurred to inform them why illegal dumping is a problem, and that illegal dumping carries a significant financial penalty. (ANY)

LIMITATIONS:

Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

Site Design & Landscape Planning SD-10



Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Roof Runoff Controls SD-11

Rain Garden

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

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barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

The Ocean Begins at Your Front Door

Even if you live miles from the Pacific Ocean, you may be unknowingly polluting it.

Did You Know?

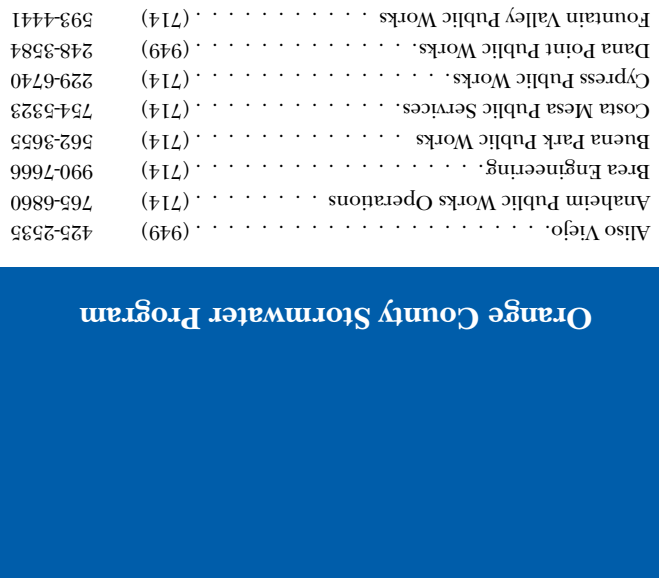
- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact, the largest source of water pollution comes from city streets, neighborhoods, construction sites and parking lots. This type of pollution is sometimes called “non-point source” pollution.
- There are two types of non-point source pollution: stormwater and urban runoff pollution.
- Stormwater runoff results from rainfall. When rainstorms cause large volumes of water to rinse the urban landscape, picking up pollutants along the way.
- Urban runoff can happen any time of the year when excessive water use from irrigation, vehicle washing and other sources carries trash, lawn clippings and other urban pollutants into storm drains.

Where Does It Go?

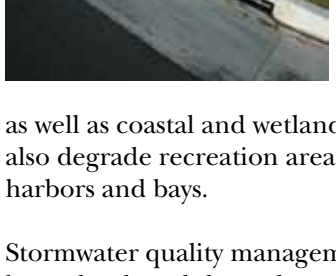
- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers and cleaners – can be blown or washed into storm drains.
- A little water from a garden hose or rain can also send materials into storm drains.
- Storm drains are separate from our sanitary sewer systems; unlike water in sanitary sewers (from sinks or toilets), water in storm drains is not treated before entering our waterways.

Sources of Non-Point Source Pollution

- Automotive leaks and spills.
- Improper disposal of used oil and other engine fluids.
- Metals found in vehicle exhaust, weathered paint, rust, metal plating and tires.
- Pesticides and fertilizers from lawns, gardens and farms.
- Improper disposal of cleaners, paint and paint removers.
- Soil erosion and dust debris from landscape and construction activities.
- Litter, lawn clippings, animal waste, and other organic matter.
- Oil stains on parking lots and paved surfaces.



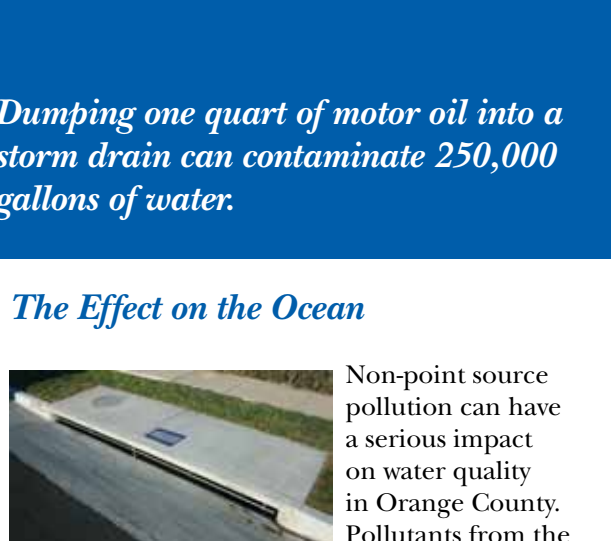
The Effect on the Ocean



Non-point source pollution can have a serious impact on water quality in Orange County. Pollutants from the storm drain system can harm marine life as well as coastal and wetland habitats. They can also degrade recreation areas such as beaches, harbors and bays.

Stormwater quality management programs have been developed throughout Orange County to educate and encourage the public to protect water quality, monitor runoff in the storm drain system, investigate illegal dumping and maintain storm drains.

Support from Orange County residents and businesses is needed to improve water quality and reduce urban runoff pollution. Proper use and disposal of materials will help stop pollution before it reaches the storm drain and the ocean.



Dumping one quart of motor oil into a storm drain can contaminate 250,000 gallons of water.

For More Information

California Environmental Protection Agency
www.calepa.ca.gov

- **Air Resources Board**
  www.arb.ca.gov
- **Department of Pesticide Regulation**
  www.cdpr.ca.gov
- **Department of Toxic Substances Control**
  www.dtsc.ca.gov
- **Integrated Waste Management Board**
  www.ciwmb.ca.gov
- **Office of Environmental Health Hazard Assessment**
  www.oehha.ca.gov
- **State Water Resources Control Board**
  www.waterboards.ca.gov

Earth 911 - Community-Specific Environmental Information 1-800-cleanup or visit www.1800cleanup.org

Health Care Agency’s Ocean and Bay Water Closure and Posting Hotline
(714) 433-6400 or visit www.ocbeachinfo.com

Integrated Waste Management Dept. of Orange County (714) 834-6752 or visit www.oclandfills.com for information on household hazardous waste collection centers, recycling centers and solid waste collection

O.C. Agriculture Commissioner
(714) 447-7100 or visit www.ocagcomm.com

Stormwater Best Management Practice Handbook
Visit www.cabmphandbooks.com

UC Master Gardener Hotline
(714) 708-1646 or visit www.uccemg.com

The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements. To join the list, please send an email to ocstormwaterinfo-join@list.ocwatersheds.com

Aliso Viejo	(949)	425-2535
Anaheim Public Works Operations	(714)	765-6860
Brea Engineering	(714)	990-7666
Buena Park Public Works	(714)	562-3655
Costa Mesa Public Services	(714)	754-5323
Cypress Public Works	(714)	229-6740
Dana Point Public Works	(949)	248-3584
Fountain Valley Public Works	(714)	593-4441
Fullerton Engineering Dept.	(714)	738-6853
Garden Grove Public Works	(714)	741-5956
Huntington Beach Public Works	(714)	536-5431
Irvine Public Works	(949)	724-6315
La Habra Public Services	(562)	905-9792
La Palma Public Works	(714)	690-3310
Laguna Beach Water Quality	(949)	497-0378
Laguna Hills Public Services	(949)	707-2650
Laguna Niguel Public Works	(949)	362-4337
Laguna Woods Public Works	(949)	639-0500
Lake Forest Public Works	(949)	461-3480
Los Alamitos Community Dev.	(562)	431-3538
Mission Viejo Public Works	(949)	470-3056
Newport Beach, Code & Water Quality Enforcement	(949)	644-3215
Orange Public Works	(714)	532-6480
Placentia Public Works	(714)	993-8245
Rancho Santa Margarita	(949)	635-1800
San Clemente Environmental Programs	(949)	361-6143
San Juan Capistrano Engineering	(949)	234-4413
Santa Ana Public Works	(714)	647-3380
Seal Beach Engineering	(562)	431-2527 x317
Stanton Public Works	(714)	379-9222 x204
Tustin Public Works/Engineering	(714)	573-3150
Villa Park Engineering	(714)	998-1500
Westminster Public Works/Engineering	(714)	898-3311 x446
Yorba Linda Engineering	(714)	961-7138
Orange County Stormwater Program	(877)	897-7455

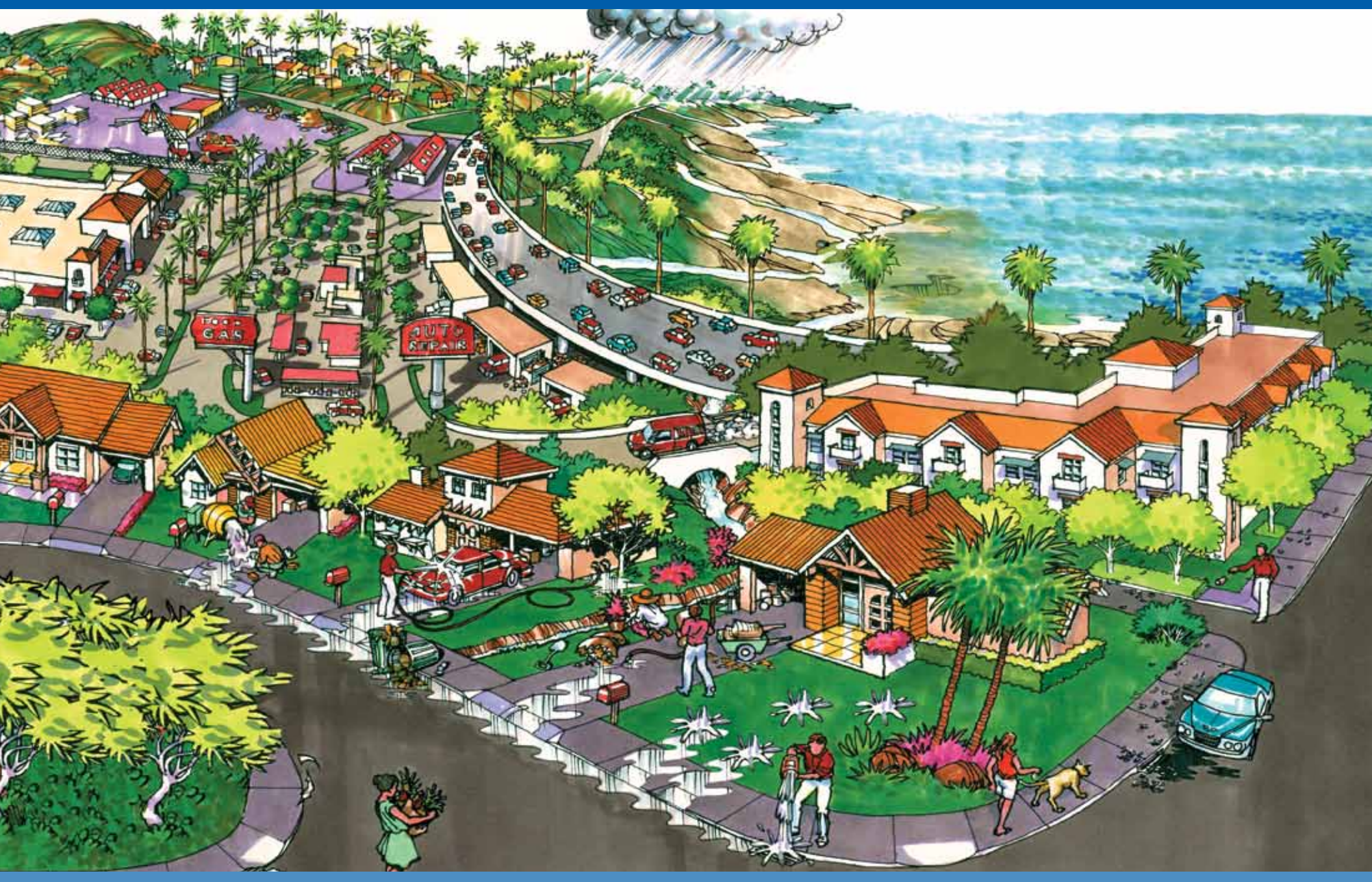
Orange County 24-Hour
Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

On-line Water Pollution Problem Reporting Form
www.ocwatersheds.com

Printed on Recycled Paper

Orange County Stormwater Program

The Ocean Begins at Your Front Door



Never allow pollutants to enter the street, gutter or storm drain!

Follow these simple steps to help reduce water pollution:

Household Activities

- Do not rinse spills with water. Use dry cleanup methods such as applying cat litter or another absorbent material, sweep and dispose of in the trash. Take items such as used or excess batteries, oven cleaners, automotive fluids, painting products and cathode ray tubes, like TVs and computer monitors, to a Household Hazardous Waste Collection Center (HHWCC).
- For a HHWCC near you call (714) 834-6752 or visit www.oclandfills.com.
- Do not hose down your driveway, sidewalk or patio to the street, gutter or storm drain. Sweep up debris and dispose of it in the trash.

Automotive

- Take your vehicle to a commercial car wash whenever possible. If you wash your vehicle at home, choose soaps, cleaners, or detergents labeled non-toxic, phosphate- free or biodegradable. Vegetable and citrus-based products are typically safest for the environment.
- Do not allow washwater from vehicle washing to drain into the street, gutter or storm drain. Excess washwater should be disposed of in the sanitary sewer (through a sink or toilet) or onto an absorbent surface like your lawn.
- Monitor your vehicles for leaks and place a pan under leaks. Keep your vehicles well maintained to stop and prevent leaks.
- Never pour oil or antifreeze in the street, gutter or storm drain. Recycle these substances at a service station, a waste oil collection center or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.1800cleanup.org.

Pool Maintenance

- Pool and spa water must be dechlorinated and free of excess acid, alkali or color to be allowed in the street, gutter or storm drain.
- When it is not raining, drain dechlorinated pool and spa water directly into the sanitary sewer.
- Some cities may have ordinances that do not allow pool water to be disposed of in the storm drain. Check with your city.

Landscape and Gardening

- Do not over-water. Water your lawn and garden by hand to control the amount of water you use or set irrigation systems to reflect seasonal water needs. If water flows off your yard onto your driveway or sidewalk, your system is over-watering. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of waste by composting, hauling it to a permitted landfill, or as green waste through your city's recycling program.
- Follow directions on pesticides and fertilizer, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Take unwanted pesticides to a HHWCC to be recycled. For locations and hours of HHWCC, call (714) 834-6752 or visit www.oclandfills.com.

Trash

- Place trash and litter that cannot be recycled in securely covered trash cans.
- Whenever possible, buy recycled products.
- Remember: Reduce, Reuse, Recycle.

Pet Care

- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash. Pet waste, if left outdoors, can wash into the street, gutter or storm drain.
- If possible, bathe your pets indoors. If you must bathe your pet outside, wash it on your lawn or another absorbent/permeable surface to keep the washwater from entering the street, gutter or storm drain.
- Follow directions for use of pet care products and dispose of any unused products at a HHWCC.

Common Pollutants

Home Maintenance

- Detergents, cleaners and solvents
- Oil and latex paint
- Swimming pool chemicals
- Outdoor trash and litter

Lawn and Garden

- Pet and animal waste
- Pesticides
- Clippings, leaves and soil
- Fertilizer

Automobile

- Oil and grease
- Radiator fluids and antifreeze
- Cleaning chemicals
- Brake pad dust

The Pollution Solution

Several residential activities can result in water pollution. Among these activities are car washing and hosing off driveways and sidewalks. Both activities can waste water and result in excess runoff. Water conservation methods described in this pamphlet can prevent considerable amounts of runoff and conserve water. By taking your car to a commercial car wash and by sweeping driveways and sidewalks, you can further prevent the transport of pollutants to Orange County waterways. Here are some of the common pollutants for which you can be part of the solution:

1 Pesticides and Fertilizer

- **Pollution:** The same pesticides that are designed to be toxic to pests can have an equally lethal impact on our marine life. The same fertilizer that promotes plant growth in lawns and gardens can also create nuisance algae blooms, which remove oxygen from the water and clog waterways when it decomposes.

- **Solution:** Never use pesticides or fertilizer within 48 hours of an anticipated rainstorm. Use only as much as is directed on the label and keep it off driveways and sidewalks.

2 Dirt and Sediment

- **Pollution:** Dirt or sediment can impede the flow of the stormwater and negatively impact stream habitat as it travels through waterways and deposits downstream. Pollutants can attach to sediment, which can then be transported through our waterways.

- **Solution:** Protect dirt stockpiles by covering them with tarps or secure plastic sheets to prevent wind or rain from allowing dirt or sediment to enter the storm drain system.

3 Metals

- **Pollution:** Metals and other toxins present in car wash water can harm important plankton, which forms the base of the aquatic food chain.

- **Solution:** Take your car to a commercial car wash where the wash water is captured and treated at a local wastewater treatment plant.

DID YOU KNOW?

Did you know that most of the pollution found in our waterways is not from a single source, but from a "non-point" source meaning the accumulation of pollution from residents and businesses throughout the community

4 Pet Waste

- **Pollution:** Pet waste carries bacteria through our watersheds and eventually will be washed out to the ocean. This can pose a health risk to swimmers and surfers.

- **Solution:** Pick up after your pets!

5 Trash and Debris

- **Pollution:** Trash and debris can enter waterways by wind, littering and careless maintenance of trash receptacles. Street sweeping collects some of this trash; however, much of what isn't captured ends up in our storm drain system where it flows untreated out to the ocean.

- **Solution:** Don't litter and make sure trash containers are properly covered. It is far more expensive to clean up the litter and trash that ends up in our waterways than it is to prevent it in the first place. Come out to one of Orange County's many locations for Coastal and Inner-Coastal Cleanup Day, which is held in September.

6 Motor Oil / Vehicle Fluids

- **Pollution:** Oil and petroleum products from our vehicles are toxic to people, wildlife and plants.

- **Solution:** Fix any leaks from your vehicle and keep the maintenance up on your car. Use absorbent material such as cat litter on oil spills, then sweep it up and dispose of it in the trash. Recycle used motor oil at a local Household Hazardous Waste Collection Center.

A TEAM EFFORT

The Orange County Stormwater Program has teamed with the Municipal Water District of Orange County (MWDOC) and the University of California Cooperative Extension Program (UCCE) to develop this pamphlet.

Low Impact Development (LID) and sustainable water use prevents water pollution and conserves water for drinking and reuse. Reducing your water use and the amount of water flowing from your home protects the environment and saves you money.

Thank you for making water protection a priority!

For more information, please visit www.ocwatersheds.com/publiced/

www.mwdoc.com

www.uccemg.com

To report a spill, call the Orange County 24-Hour Water Pollution Prevention Reporting Hotline at 1-877-89-SPILL \(1-877-897-7455)

Special Thanks to
The City of Los Angeles Stormwater Program for the use of its artwork

The Metropolitan Water District of Southern California for the use of the California-Friendly Plant and Native Habitat photos

Homeowners Guide for Sustainable Water Use

Low Impact Development, Water Conservation & Pollution Prevention

The Ocean Begins at Your Front Door

RUNOFF, RAINWATER AND REUSE

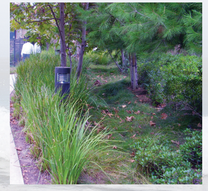
Where Does Water Runoff Go?

Stormwater, or water from rainfall events, and runoff from outdoor water use such as sprinklers and hoses flows from homes directly into catch basins and the storm drain system. After entering the storm drain, the water flows untreated into streams, rivers, bays and ultimately the Pacific Ocean. Runoff can come from lawns, gardens, driveways, sidewalks and roofs. As it flows over hard, impervious surfaces, it picks up pollutants. Some pollutants carried by the water runoff include trash, pet waste, pesticides, fertilizer, motor oil and more.

Water Conservation

Pollution not only impairs the water quality for habitat and recreation, it can also reduce the water available for reuse. Runoff allowed to soak into the ground is cleaned as it percolates through the soil, replenishing depleted groundwater supplies. Groundwater provides at least 50% of the total water for drinking and other indoor household activities in north and central Orange County. When land is covered with roads, parking lots, homes, etc., there is less land to take in the water and more hard surfaces over which the water can flow.

In Orange County, 60-70% of water used by residents and businesses goes to irrigation and other outdoor uses. Reusing rainwater to irrigate our lawn not only reduces the impact of water pollution from runoff, but it also is a great way to conserve our precious water resources and replenish our groundwater basin.



What is Low Impact Development (LID)?

Low Impact Development (LID) is a method of development that seeks to maintain the natural hydrologic character of an area. LID provides a more sustainable and pollution-preventative approach to water management.

New water quality regulations require implementation of LID in larger new developments and encourage implementation of LID and other sustainable practices in existing residential areas. Implementing modifications to your lawn or garden can reduce pollution in our environment, conserve water and reduce your water bill.

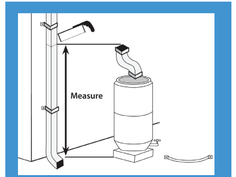
Permeable pavement allows water runoff to infiltrate through the soil and prevents most pollutants from reaching the storm drain system.

OPTIONS FOR RAINWATER HARVESTING AND REUSE

Rainwater harvesting is a great way to save money, prevent pollution and reduce potable water use. To harvest your rainwater, simply redirect the runoff from roofs and downspouts to rain barrels. Rain gardens are another option; these reduce runoff as well as encourage infiltration.

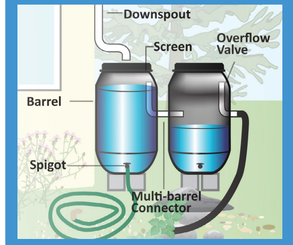
Downspout Disconnection/Redirection

Disconnecting downspouts from pipes running to the gutter prevents runoff from transporting pollutants to the storm drain. Once disconnected, downspouts can be redirected to rain gardens or other vegetated areas, or be connected to a rain barrel.



Rain Barrels

Rain barrels capture rainwater flow from roofs for reuse in landscape irrigation. Capacity of rain barrels needed for your home will depend on the amount of roof area and rainfall received. When purchasing your rain barrel, make sure it includes a screen, a spigot to siphon water for use, an overflow tube to allow for excess water to run out and a connector if you wish to connect multiple barrels to add capacity of water storage.

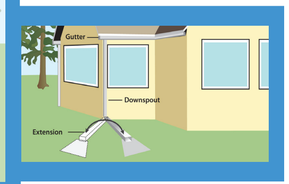


Mosquito growth prevention is very important when installing a rain barrel. The best way to prevent mosquito breeding is to eliminate entry points by ensuring all openings are sealed tightly. If these methods are unsuccessful, products are available to kill mosquito larvae, but that are harmless to animals and humans. Regular application of these products is essential. Please visit the Orange County Vector Control website for more information at www.ocvcd.org/mosquitoes3.php.

Rain Gardens

Rain gardens allow runoff to be directed from your roof downspout into a landscaped area. Vegetation and rocks in the garden will slow the flow of water to allow for infiltration into the soil. Plants and soil particles will absorb pollutants from the roof runoff. By utilizing a native plant palate, rain gardens can be maintained all year with minimal additional irrigation. These plants are adapted to the semi-arid climate of Southern California, require less water and can reduce your water bill.

Before modifying your yard to install a rain garden, please consult your local building and/or planning departments to ensure your garden plan follows pertinent building codes and ordinances. Besides codes and ordinances, some home owner associations also have guidelines for yard modifications. If your property is in hill areas or includes engineered slopes, please seek professional advice before proceeding with changes.



For information on how to disconnect a downspout or to install and maintain a rain barrel or rain garden at your home, please see the Los Angeles Rainwater Harvesting Program, A Homeowner's "How-To" Guide, November 2009 at www.larainwaterharvesting.org/

OTHER WATER CONSERVATION AND POLLUTION PREVENTION TECHNIQUES

Native Vegetation and Maintenance

"California Friendly" plants or native vegetation can significantly reduce water use. These plants often require far less fertilizers and pesticides, which are two significant pollutants found in Orange County waterways. Replacing water "thirsty" plants and grass types with water efficient natives is a great way to save water and reduce the need for potentially harmful pesticides and fertilizer.

Please see the California Friendly Garden Guide produced by the Metropolitan Water District of Southern California and associated Southern California Water Agencies for a catalog of California friendly plants and other garden resources at www.bewaterwise.com/Gardensoft.

Weed Free Yards

Weeds are water thieves. They often reproduce quickly and rob your yard of both water and nutrients. Weed your yard by hand if possible. If you use herbicides to control the weeds, use only the amount recommended on the label and never use it if rain is forecast within the next 48 hours.

Soil Amendments

Soil amendments such as green waste (e.g. grass clippings, compost, etc.) can be a significant source of nutrients and can help keep the soil near the roots of plants moist. However, they can cause algal booms if they get into our waterways, which reduces the amount of oxygen in the water and impacts most aquatic organisms. It is important to apply soil amendments more than 48 hours prior to predicted rainfall.

IRRIGATE EFFICIENTLY

Water runoff from sprinklers left on too long will carry pollutants into our waterways.

Smart Irrigation Controllers

Smart Irrigation Controllers have internal clocks as well as sensors that will turn off the sprinklers in response to environmental changes. If it is raining, too windy or too cold, the smart irrigation control sprinklers will automatically shut off.

Check with your local water agency for available rebates on irrigation controllers and smart timers.

- Aim your sprinklers at your lawn, not the sidewalk – By simply adjusting the direction of your sprinklers you can save water, prevent water pollution from runoff, keep your lawn healthy and save money.
- **Set a timer for your sprinklers** – lawns absorb the water they need to stay healthy within a few minutes of turning on the sprinklers. Time your sprinklers; when water begins running off your lawn, you can turn them off. Your timer can be set to water your lawn for this duration every time.
- **Water at Sunrise** – Watering early in the morning will reduce water loss due to evaporation. Additionally, winds tend to die down in the early morning so the water will get to the lawn as intended.
- **Water by hand** – Instead of using sprinklers, consider watering your yard by hand. Hand-watering ensures that all plants get the proper amount of water and you will prevent any water runoff, which wastes water and carries pollutants into our waterways.
- **Fix leaks** - Nationwide, households waste one trillion gallons of water a year to leaks – that is enough water to serve the entire state of Texas for a year. If your garden hose is leaking, replace the nylon or rubber hose washer and ensure a tight connection. Fix broken sprinklers immediately.

Do your part to prevent water pollution in our creeks, rivers, bays and ocean.

Clean beaches and healthy creeks, rivers, bays, and ocean are important to Orange County. However, many common household activities can lead to water pollution if you're not careful.

Remember the Water in Your Storm Drain is Not Treated BEFORE It Enters Our Waterways

Litter, oil, chemicals and other substances that are left on your yard or driveway can be blown or washed into storm drains that flow to the ocean. Over-watering your lawn and washing your car can also flush materials into the storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated.

You would never pour soap, fertilizers or oil into the ocean, so don't let them enter streets, gutters or storm drains. Follow the easy tips in this brochure to help prevent water pollution.

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit **www.ocwatersheds.com**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline 1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while performing everyday household activities. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

GENUINE RECYCLED PAPER
50% PRE-CONSUMER AND 15% POST-CONSUMER

RECYCLE USED OIL

Help Prevent Ocean Pollution:

Household Tips

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Pollution Prevention

Household Activities

- **Do not rinse spills with water!** Sweep outdoor spills and dispose of in the trash. For wet spills like oil, apply cat litter or another absorbent material, then sweep and bring to a household hazardous waste collection center (HHWCC).
- Securely cover trash cans.
- Take household hazardous waste to a household hazardous waste collection center.
- Store household hazardous waste in closed, labeled containers inside or under a cover.
- Do not hose down your driveway, sidewalk or patio. Sweep up debris and dispose of in trash.
- Always pick up after your pet. Flush waste down the toilet or dispose of in the trash.
- Bathe pets indoors or have them professionally groomed.

Household Hazardous Wastes include:

- ▲ **Batteries**
- ▲ **Paint thinners, paint strippers and removers**
- ▲ **Adhesives**
- ▲ **Drain openers**
- ▲ **Oven cleaners**
- ▲ **Wood and metal cleaners and polishes**
- ▲ **Herbicides and pesticides**
- ▲ **Fungicides/wood preservatives**
- ▲ **Automotive fluids and products**
- ▲ **Grease and rust solvents**
- ▲ **Thermometers and other products containing mercury**
- ▲ **Fluorescent lamps**
- ▲ **Cathode ray tubes, e.g. TVs, computer monitors**
- ▲ **Pool and spa chemicals**

Gardening Activities

- Follow directions on pesticides and fertilizers, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Water your lawn and garden by hand to control the amount of water you use. Set irrigation systems to reflect seasonal water needs. If water flows off your yard and onto your driveway or sidewalk, your system is over-watering.
- Mulch clippings or leave them on the lawn. If necessary, dispose in a green waste container.
- Cultivate your garden often to control weeds.

Washing and Maintaining Your Car

- Take your car to a commercial car wash whenever possible.
- Choose soaps, cleaners, or detergents labeled "non-toxic," "phosphate free" or "biodegradable." Vegetable and citrus-based products are typically safest for the environment, **but even these should not be allowed into the storm drain.**
- Shake floor mats into a trash can or vacuum to clean.
- Do not use acid-based wheel cleaners and "hose off" engine degreasers at home. They can be used at a commercial facility, which can properly process the washwater.
- **Do not dump washwater onto your driveway, sidewalk, street, gutter or storm drain.** Excess washwater should be disposed of in the sanitary sewers (through a sink, or toilet) or onto an absorbent surface like your lawn.
- Use a nozzle to turn off water when not actively washing down automobile.
- Monitor vehicles for leaks and place pans under leaks. Keep your car well maintained to stop and prevent leaks.
- Use cat litter or other absorbents and sweep to remove any materials deposited by vehicles. Contain sweepings and dispose of at a HHWCC.
- Perform automobile repair and maintenance under a covered area and use drip pans or plastic sheeting to keep spills and waste material from reaching storm drains.
- **Never pour oil or antifreeze in the street, gutter or storm drains.** Recycle these substances at a service station, HHWCC, or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.ciwmb.ca.gov/UsedOil.

For locations and hours of Household Hazardous Waste Collection Centers in Anaheim, Huntington Beach, Irvine and San Juan Capistrano, call (714)834-6752 or visit www.oclandfills.com.

Do your part to prevent water pollution in our creeks, rivers, bays and ocean.

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, not properly disposing of household hazardous waste can lead to water pollution. Batteries, electronics, paint, oil, gardening chemicals, cleaners and other hazardous materials cannot be thrown in the trash. They also must never be poured or thrown into yards, sidewalks, driveways, gutters or streets. Rain or other water could wash the materials into the storm drain and eventually into our waterways and the ocean. In addition, hazardous waste must not be poured in the sanitary sewers (sinks and toilets).

NEVER DISPOSE OF HOUSEHOLD HAZARDOUS WASTE IN THE TRASH, STREET, GUTTER, STORM DRAIN OR SEWER.

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit **www.ocwatersheds.com**

To Report Illegal Dumping of Household Hazardous Waste call 1-800-69-TOXIC

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline 1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

RECYCLE USED OIL

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Help Prevent Ocean Pollution:

Proper Disposal of Household Hazardous Waste

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

ORANGE COUNTY

Pollution Prevention

Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered to be "household hazardous waste" or "HHW." HHW can be found throughout your home, including the bathroom, kitchen, laundry room and garage.

WHEN POSSIBLE, USE NON-HAZARDOUS OR LESS-HAZARDOUS PRODUCTS.

Disposal of HHW down the drain, on the ground, into storm drains, or in the trash is illegal and unsafe.

Proper disposal of HHW is actually easy. Simply drop them off at a Household Hazardous Waste Collection Center (HHWCC) for free disposal and recycling. Many materials including anti-freeze, latex-based paint, motor oil and batteries can be recycled. Some centers have a "Stop & Swap" program that lets you take partially used home, garden, and automobile products free of charge. There are four HHWCCs in Orange County:

Anaheim:.....1071 N. Blue Gum St
Huntington Beach:.....17121 Nichols St
Irvine:..... 6411 Oak Canyon
San Juan Capistrano:... 32250 La Pata Ave

Centers are open Tuesday-Saturday, 9 a.m.-3 p.m. Centers are closed on rainy days and major holidays. For more information, call **(714) 834-6752** or visit **www.oclandfills.com.**

Common household hazardous wastes

- Batteries
- Paint and paint products
- Adhesives
- Drain openers
- Household cleaning products
- Wood and metal cleaners and polishes
- Pesticides
- Fungicides/wood preservatives
- Automotive products (antifreeze, motor oil, fluids)
- Grease and rust solvents
- Fluorescent lamps
- Mercury (thermometers & thermostats)
- All forms of electronic waste including computers and microwaves
- Pool & spa chemicals
- Cleaners
- Medications
- Propane (camping & BBQ)
- Mercury-containing lamps
- Television & monitors (CRTs, flatscreens)

Tips for household hazardous waste

- Never dispose of HHW in the trash, street, gutter, storm drain or sewer.
- Keep these materials in closed, labeled containers and store materials indoors or under a cover.
- When possible, use non-hazardous products.
- Reuse products whenever possible or share with family and friends.
- Purchase only as much of a product as you'll need. Empty containers may be disposed of in the trash.
- HHW can be harmful to humans, pets and the environment. Report emergencies to 911.

Did you know that just one quart of oil can pollute 250,000 gallons of water?

A clean ocean and healthy creeks, rivers, bays and beaches are important to Orange County. However, not properly disposing of used oil can lead to water pollution. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering the ocean. Help prevent water pollution by taking your used oil to a used oil collection center.

Included in this brochure is a list of locations that will accept up to five gallons of used motor oil at no cost. Many also accept used oil filters. Please contact the facility before delivering your used oil. This listing of companies is for your reference and does not constitute a recommendation or endorsement of the company.

Please note that used oil filters may not be disposed of with regular household trash. They must be taken to a household hazardous waste collection or recycling center in Anaheim, Huntington Beach, Irvine or San Juan Capistrano. For information about these centers, visit www.oclandfills.com.

Please do not mix your oil with other substances!

For more information, please call the Orange County Stormwater Program at 1-877-89-SPILL (1-877-897-7455) or visit www.watersheds.com.

For information about the proper disposal of household hazardous waste, call the Household Waste Hotline at (714) 834-6752 or visit www.oclandfills.com.

RECYCLE USED OIL

For additional information about the nearest oil recycling center, call the Used Oil Program at 1-800-CLEANUP or visit www.cleanup.org.

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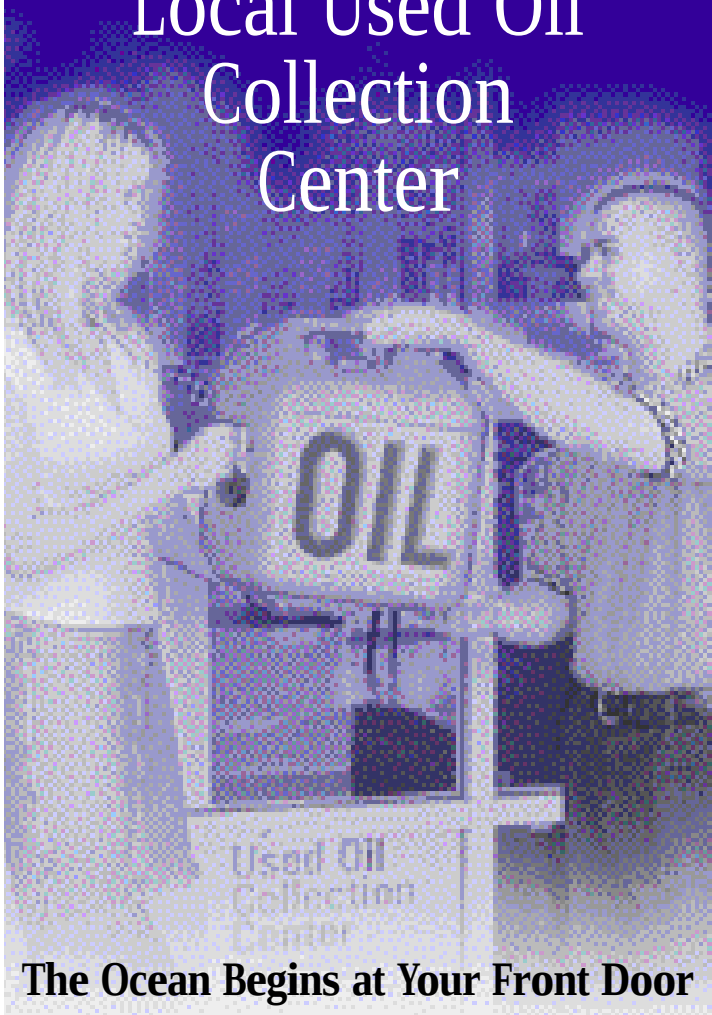
Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

CENTRAL COUNTY

Used Oil Collection Centers

Balboa

Hill's Boat Service
814 E Bay Ave., Balboa, CA 92661
(949)675-0740( )
CIWMB#: 30-C-03538

Balboa Island

Island Marine Fuel
406 S Bay Front, Balboa Island, CA 92662
(949)673-1103( )
CIWMB#: 30-C-03728

Corona Del Mar

Corona Del Mar 76
2201 E. Pacific Coast Hwy., Corona Del Mar, CA 92625
(949)673-3320( )
CIWMB#: 30-C-06620

Corona Del Mar Chevron
2546 E. Coast Hwy., Corona Del Mar, CA 92625
(949)495-0774(14)
CIWMB#: 30-C-06424

Mobil (Harbor View)
2500 San Joaquin Hills Rd., Corona Del Mar, CA 92625
(949)640-4759( )
CIWMB#: 30-C-03363

Costa Mesa

AutoZone #5520
744 W. 19th St., Costa Mesa, CA 92627
(901)495-7159( )
CIWMB#: 30-C-05992

Big O Tires #5571
3181 Harbor Blvd., Costa Mesa, CA 92626
(949)443-4155( )
CIWMB#: 30-C-04676

Big O Tires #694
322 E. 17th St., Costa Mesa, CA 92627
(949)642-4131( )
CIWMB#: 30-C-05811

Coast General Performance
2855 Harbor Blvd., Costa Mesa, CA 92626
(714)540-5710( )
CIWMB#: 30-C-05916

Connell Chevrolet
2828 Harbor Blvd., Costa Mesa, CA 92626
(714)546-1200( )
CIWMB#: 30-C-06286

EZ Lube Inc #15
3599 Harbor Blvd., Costa Mesa, CA 92626
(714)966-1647( )
CIWMB#: 30-C-03137

EZ Lube Inc #46
400 E 17th St., Costa Mesa, CA 92627
(714)556-1312( )
CIWMB#: 30-C-05779

EZ Lube Inc. #44
2248 Harbor Blvd., Costa Mesa, CA 92627
(714)556-1312( )
CIWMB#: 30-C-05737

Firestone Store #71T7
475 E 17th St., Costa Mesa, CA 92627
(949)646-2444( )
CIWMB#: 30-C-02120

Jiffy Lube #1969
300 E 17th St., Costa Mesa, CA 92627
(949)548-2505( )
CIWMB#: 30-C-05553

Jiffy Lube #1970
2175 Newport Blvd., Costa Mesa, CA 92627
(949)548-4150( )
CIWMB#: 30-C-05554

Jiffy Lube #607
2255 Fairview Rd., Costa Mesa, CA 92627
(949)650-5823( )
CIWMB#: 30-C-05551

Jiffy Lube #861
375 Bristol St., Costa Mesa, CA 92626
(714)557-5823( )
CIWMB#: 30-C-05552

Kragen Auto Parts #0725
1739 Superior Ave., Costa Mesa, CA 92627
(949)642-3384( )
CIWMB#: 30-C-02624

Kragen Auto Parts #0796
1175 Baker Blvd., Unit E, Costa Mesa, CA 92626
(714)662-2005( )
CIWMB#: 30-C-02664

Nabers Cadillac
2600 Harbor Blvd., Costa Mesa, CA 92626
(714)444-5200( )
CIWMB#: 30-C-05051

Oil Stop Inc.
Oil Stop Inc. Costa Mesa, CA 92626
(714)434-8350( )
CIWMB#: 30-C-06293

Pep Boys #660
2946 Bristol St., Costa Mesa, CA 92626
(714)549-1533( )
CIWMB#: 30-C-03416

Plaza Chevron Service Center
3048 Bristol Costa Mesa, CA 92626
(714)545-4257( )
CIWMB#: 30-C-01123

Scher Tire Inc #15 dba Goodyear Tire
1596 Newport Blvd., Costa Mesa, CA 92627
(949)548-9384( )
CIWMB#: 30-C-03034

Fountain Valley

Firestone Store #7147
17975 Magnolia Ave., Fountain Valley, CA 92708
(714)842-3341( )
CIWMB#: 30-C-01219

Golden Shell
8520 Warner Ave., Fountain Valley, CA 92708
(714)842-7150( )
CIWMB#: 30-P-05002

Kragen Auto Parts #0734
9880 Warner Ave., Fountain Valley, CA 92708
(714)964-6427( )
CIWMB#: 30-C-02609

Kragen Auto Parts #1505
16147 Harbor Blvd., Fountain Valley, CA 92708
(714)531-8525( )
CIWMB#: 30-C-04125

Oil Can Henry's
9525 Warner Ave., Fountain Valley, CA 92708
(714)473-7705( )
CIWMB#: 30-C-05843

Purrfect Auto Service #10
16780 Harbor Blvd., Fountain Valley, CA 92708
(714)839-3899( )
CIWMB#: 30-C-01380

Huntington Beach

AutoZone #5528
6800 Warner Ave., Huntington Beach, CA 92647
(714)891-8211( )
CIWMB#: 30-C-04777

Bella Terra Car Wash
16061 Beach Blvd., Huntington Beach, CA 92647
(714)847-4924( )
CIWMB#: 30-C-06195

Big O Tires #553
19411 Beach Blvd., Huntington Beach, CA 92648
(714)536-7571( )
CIWMB#: 30-C-00970

Econo Lube N' Tune #26
19961 Beach Blvd., Huntington Beach, CA 92648
(714)536-6519( )
CIWMB#: 30-C-06117

Expertec Automotive
7680 Talbert Ave Suite A & B, Huntington Beach, CA 92648
(714)848-9222( )
CIWMB#: 30-C-05914

EZ Lube Inc #16
7361 Edinger Ave., Huntington Beach, CA 92647
(714)899-3600( )
CIWMB#: 30-C-03289

EZ Lube Inc. #79
9862 Adams St., Huntington Beach, CA 92647
(714)556-1312( )
CIWMB#: 30-C-06547

Firestone Store #71T5
16171 Beach Blvd., Huntington Beach, CA 92647
(714)847-6081( )
CIWMB#: 30-C-02118

Huntington Beach Car Wash
18971 Beach Blvd., Huntington Beach, CA 92648
(714)847-4924( )
CIWMB#: 30-C-05303

Jiffy Lube #1857
8971 Warner Ave., Huntington Beach, CA 92647
(714)596-7213( )
CIWMB#: 30-C-05053

Kragen Auto Parts #1468
10072 Adams Ave., Huntington Beach, CA 92646
(714)593-6156( )
CIWMB#: 30-C-04284

Kragen Auto Parts #1511
7171 Warner Ave., Huntington Beach, CA 92647
(714)842-4531( )
CIWMB#: 30-C-04129

Kragen Auto Parts #1633
18888 Beach Blvd., Huntington Beach, CA 92648
(714)965-2353( )
CIWMB#: 30-C-02645

Oilmax 10 Minute Lube/Wash
9862 Adams Ave., Huntington Beach, CA 92646
(714)964-7110( )
CIWMB#: 30-C-03219

Pep Boys #799
19122 Brookhurst St., Huntington Beach, CA 92646
(714)964-0777( )
CIWMB#: 30-C-03439

Quik Change Lube & Oil
5841 Warner Ave., Huntington Beach, CA 92649
(714)840-2331( )
CIWMB#: 30-C-03208

R Kids Tire and Service #6
5062 Warner Ave., Huntington Beach, CA 92647
(714)846-1189( )
CIWMB#: 30-C-05691

Saturn of Huntington Beach
18801 Beach Blvd., Huntington Beach, CA 92648
(714)841-5428( )
CIWMB#: 30-C-05221

USA Express Tire & Service Inc
7232 Edinger Ave., Huntington Beach, CA 92647
(714)842-0717( )
CIWMB#: 30-C-04429

Zito's Auto Care
19002 Magnolia St., Huntington Beach, CA 92646
(714)968-8788( )
CIWMB#: 30-C-03251

Irvine

Firestone Store #71W4
51 Auto Center Dr., Irvine, CA 92618
(949)829-8710( )
CIWMB#: 30-C-03689

Irvine City Auto Parts
14427 Culver Dr., Irvine, CA 92604
(949)551-5588( )
CIWMB#: 30-C-02186

Jiffy Lube #1856 Irvine Spectrum
8777 Irvine Center Dr., Irvine, CA 92618
(949)753-0485( )
CIWMB#: 30-C-06094

Jiffy Lube #1988
3080 Main St., Irvine, CA 92614
(714)961-5491(27)
CIWMB#: 30-C-04450

Kragen Auto Parts #4174
15315 Culver Dr., Ste.#170, Irvine, CA 92604
(602)631-7115( )
CIWMB#: 30-C-06417

Newport Beach

Jiffy Lube #2811
1520 W Coast Hwy., Newport Beach, CA 92663
(949)764-9255( )
CIWMB#: 30-C-05629

Newport Landing Fuel Dock
503 E Edgewater Newport Beach, CA 92661
(949)673-7878( )
CIWMB#: 30-C-03628

Orange

AutoZone #5942
1330 N. Glassell Orange, CA 92867
(714)538-4551( )
CIWMB#: 30-C-04553

Big O Tires #570
1825 E Katella Ave., Orange, CA 92867
(714)538-0016( )
CIWMB#: 30-C-00974

David Wilsons Ford of Orange
1350 W Katella Ave., Orange, CA 92867
(714)633-6731( )
CIWMB#: 30-C-02341

EZ Lube #74
3232 Chapman Ave. #E, Orange, CA 92869
(714)556-1312(106)
CIWMB#: 30-C-06627

Firestone Store #7185
1690 N Tustin Ave., Orange, CA 92867
(714)282-8144( )
CIWMB#: 30-C-0122

Jiffy Lube #1457
433 W. Katella Ave., Orange, CA 92867
(714)720-5757( )
CIWMB#: 30-C-06280

Kragen Auto Parts #1764
910 Tustin St., Orange, CA 92867
(714)771-3000( )
CIWMB#: 30-C-02625

Managed Mobile, Inc.
1030 N Batavia St., #B, Orange, CA 92867
(714)400-0250( )
CIWMB#: 30-C-05776

Pep Boys #806
215 E Katella Ave., Orange, CA 92867
(714)997-1540( )
CIWMB#: 30-C-01759

Santiago Hills Car Care
8544 East Chapman Ave., Orange, CA 92869
(714)919-1060( )
CIWMB#: 30-C-05622

Scher Tire #33
1821 E. Katella Ave., Orange, CA 92867
(909)343-3100( )
CIWMB#: 30-C-06324

Tabassi Shell Service Station
830 E Katella Ave., Orange, CA 92867
(714)771-6990( )
CIWMB#: 30-C-00552

The Tune-up Center
193 S Main St., Orange, CA 92868
(714)633-1876( )
CIWMB#: 30-C-02091

Tony's Fuel and Towing
1650 W La Veta Ave., Orange, CA 92868
(714)953-7676( )
CIWMB#: 30-C-00868

Truck Lubrication Company
143 S. Pixley Orange, CA 92868
(714)997-7730( )
CIWMB#: 30-C-06001

Santa Ana

All Phase Environmental
910 E. Fourth St., Santa Ana, CA 92701
(714)731-5995( )
CIWMB#: 30-C-06116

Archie's Tire & Towing
4518 Westminster Ave., Santa Ana, CA 92703
(714)636-4518( )
CIWMB#: 30-C-02058

AutoZone #3320
2007 S. Main St., Santa Ana, CA 92707
(901)495-7217( )
CIWMB#: 30-C-06508

AutoZone #5232
430 W 17th Santa Ana, CA 92706
(714)547-7003( )
CIWMB#: 30-C-04609

AutoZone #5538
1101 S Bristol Santa Ana, CA 92704
(714)241-0335( )
CIWMB#: 30-C-00829

Big O Tires
1211 W. Warner Ave., Santa Ana, CA 92707
(714)540-8646( )
CIWMB#: 30-C-04679

Big O Tires #712
1302 E. 17th St., Santa Ana, CA 92705
(714)541-6811( )
CIWMB#: 30-C-05813

Firestone Store #7175
3733 S Bristol Santa Ana, CA 92704
(714)549-4015( )
CIWMB#: 30-C-01223

Firestone Store #71TA
101 S Main St., Santa Ana, CA 92701
(714)542-8857( )
CIWMB#: 30-C-02123

Firestone Store #71W6
2005 N Tustin Ave., Ste A, Santa Ana, CA 92705
(714)541-7977( )
CIWMB#: 30-C-03688

Guaranty Chevrolet Motors Inc.
711 E 17th St., Santa Ana, CA 92701
(714)973-1711(277)
CIWMB#: 30-C-06506

Jiffy Lube #1303
2025 N. Tustin Santa Ana, CA 92701
(714)720-5757( )
CIWMB#: 30-C-06283

John's Mobil
1465 S Main St., Santa Ana, CA 92707
(714)835-3266( )
CIWMB#: 30-C-00578

Kragen Auto Parts #0736
1302 E 17th St., Santa Ana, CA 92705
(714)953-6061( )
CIWMB#: 30-C-02610

Kragen Auto Parts #1253
1400 W Edinger Ave., Santa Ana, CA 92704
(714)754-1432( )
CIWMB#: 30-C-02627

Kragen Auto Parts #1376
521 W 17th St., Santa Ana, CA 92706
(714)543-4492( )
CIWMB#: 30-C-03901

Kragen Auto Parts #1516
2337 S Bristol Ave., Santa Ana, CA 92704
(714)557-0787( )
CIWMB#: 30-C-04106

Kragen Auto Parts #1648
1015 S Main St., Santa Ana, CA 92701
(714)568-1570( )
CIWMB#: 30-C-05664

Pep Boys #609
120 E 1st St., Santa Ana, CA 92701
(714)547-7477( )
CIWMB#: 30-C-01738

Pep Boys #802
1107 S Harbor Blvd., Santa Ana, CA 92704
(714)775-0828( )
CIWMB#: 30-C-01739

Purrfect Auto Service
2519 S Main St., Santa Ana, CA 92707
(714)549-7900( )
CIWMB#: 30-C-02085

Saturn of Santa Ana
1350 Auto Mall Dr., Santa Ana, CA 92705
(714)648-2444( )
CIWMB#: 30-C-05222

Scher Tire #28
1805 N Grand Ave., Santa Ana, CA 92705
(714)558-8644( )
CIWMB#: 30-C-03225

Tustin

Big O Tires #555
131 E 1st St., Tustin, CA 92780
(714)544-9431( )
CIWMB#: 30-C-00972

EZ Lube #42
12972 Newport Ave., Tustin, CA 92780
(714)556-1312( )
CIWMB#: 30-C-06408

Jiffy Lube #1406
3087 Edinger Ave., Tustin, CA 92780
(949)651-8814( )
CIWMB#: 30-C-03778

Kragen Auto Parts #1533
502 B E 1st St., Tustin, CA 92780
(714)544-9249( )
CIWMB#: 30-C-04128

Scher Tire Inc #17 dba Goodyear Tire
14511 Redhill Ave., Tustin, CA 92780
(714)832-6011( )
CIWMB#: 30-C-03035

Villa Park

Phil's Villa Park 76
17771 Santiago Blvd., Villa Park, CA 92861
(714)637-0854( )
CIWMB#: 30-C-06579

This information was provided by the County of Orange Integrated Waste Management Department and the California Integrated Waste Management Board (CIWMB).

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as pest control can lead to water pollution if you're not careful. Pesticide treatments must be planned and applied properly to ensure that pesticides do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump pesticides into the ocean, so don't let it enter the storm drains. Pesticides can cause significant damage to our environment if used improperly. If you are thinking of using a pesticide to control a pest, there are some important things to consider.

For more information,
please call
University of California Cooperative
Extension Master Gardeners at
(714) 708-1646
or visit these Web sites:
www.uccemg.org
www.ipm.ucdavis.edu

For instructions on collecting a specimen sample visit the Orange County Agriculture Commissioner's website at:
http://www.ocagcomm.com/ser_lab.asp

To report a spill, call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
at 1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

Information From:
Cheryl Wilen, Area IPM Advisor; Darren Haver, Watershed Management Advisor; Mary Louise Flint, IPM Education and Publication Director; Pamela M. Geisel, Environmental Horticulture Advisor; Carolyn L. Unruh, University of California Cooperative Extension staff writer. Photos courtesy of the UC Statewide IPM Program and Darren Haver.

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Help Prevent Ocean Pollution:

Responsible Pest Control

Tips for Pest Control

Key Steps to Follow:

Step 1: Correctly identify the pest (insect, weed, rodent, or disease) and verify that it is actually causing the problem.

Three life stages of the common lady beetle, a beneficial insect.

This is important because beneficial insects are often mistaken for pests and sprayed with pesticides needlessly.

Consult with a Certified Nursery Professional at a local nursery or garden center or send a sample of the pest to the Orange County Agricultural Commissioner's Office.

Determine if the pest is still present – even though you see damage, the pest may have left.

Step 2: Determine how many pests are present and causing damage.

Small pest populations may be controlled more safely using non-pesticide techniques. These include removing food sources, washing off leaves with a strong stream of water, blocking entry into the home using caulking and replacing problem plants with ones less susceptible to pests.

Integrated Pest Management (IPM) usually combines several least toxic pest control methods for long-term prevention and management of pest problems without harming you, your family, or the environment.

UC CE University of California Cooperative Extension

Step 3: If a pesticide must be used, choose the least toxic chemical.

Obtain information on the least toxic pesticides that are effective at controlling the target pest from the UC Statewide Integrated Pest Management (IPM) Program's Web site at www.ipm.ucdavis.edu.

Seek out the assistance of a Certified Nursery Professional at a local nursery or garden center when selecting a pesticide. Purchase the smallest amount of pesticide available.

Apply the pesticide to the pest during its most vulnerable life stage. This information can be found on the pesticide label.

Step 4: Wear appropriate protective clothing.

Follow pesticide labels regarding specific types of protective equipment you should wear. Protective clothing should always be washed separately from other clothing.

Step 5: Continuously monitor external conditions when applying pesticides such as weather, irrigation, and the presence of children and animals.

Never apply pesticides when rain is predicted within the next 48 hours. Also, do not water after applying pesticides unless the directions say it is necessary.

Apply pesticides when the air is still; breezy conditions may cause the spray or dust to drift away from your targeted area.

In case of an emergency call 911 and/or the regional poison control number at (714) 634-5988 or (800) 544-4404 (CA only).

For general questions you may also visit www.calpoison.org.

Step 6: In the event of accidental spills, sweep up or use an absorbent agent to remove any excess pesticides. Avoid the use of water.

Be prepared. Have a broom, dust pan, or dry absorbent material, such as cat litter, newspapers or paper towels, ready to assist in cleaning up spills.

Contain and clean up the spill right away. Place contaminated materials in a doubled plastic bag. All materials used to clean up the spill should be properly disposed of according to your local Household Hazardous Waste Disposal site.

Step 7: Properly store and dispose of unused pesticides.

Purchase Ready-To-Use (RTU) products to avoid storing large concentrated quantities of pesticides.

Store unused chemicals in a locked cabinet.

Unused pesticide chemicals may be disposed of at a Household Hazardous Waste Collection Center.

Empty pesticide containers should be triple rinsed prior to disposing of them in the trash.

Household Hazardous Waste Collection Center
(714) 834-6752
www.oclandfills.com

PROJECT Pollution PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Home improvement projects and work sites must be maintained to ensure that building materials do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump building materials into the ocean, so don't let them enter the storm drains. Follow these tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

To report a spill,
call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
at **1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while performing home improvement projects. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

Printed on Recycled Paper

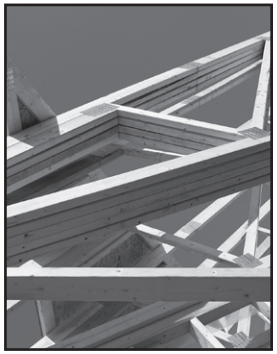
Help Prevent Ocean Pollution:

Tips for Home Improvement Projects

Tips for Home Improvement Projects

Home improvement projects can cause significant damage to the environment. Whether you hire a contractor or work on the house yourself, it is important to follow these simple tips while renovating, remodeling or improving your home:

General Construction



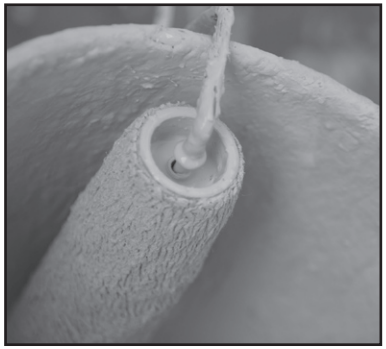
- Schedule projects for dry weather.
- Keep all construction debris away from the street, gutter and storm drain.
- Store materials under cover with temporary roofs or plastic sheets to eliminate or reduce the possibility that rainfall, runoff or wind will carry materials from the project site to the street, storm drain or adjacent properties.

Building Materials

- Never hose materials into a street, gutter or storm drain.
- Exposed piles of construction material should not be stored on the street or sidewalk.
- Minimize waste by ordering only the amount of materials needed to complete the job.
- Do not mix more fresh concrete than is needed for each project.
- Wash concrete mixers and equipment in a designated washout area where the water can flow into a containment area or onto dirt.
- Dispose of small amounts of dry excess materials in the trash. Powdery waste, such as dry concrete, must be properly contained within a box or bag prior to disposal. Call your local trash hauler for weight and size limits.

Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Place the lid on firmly and store the paint can upside-down in a dry location away from the elements.
- Tools such as brushes, buckets and rags should never be washed where excess water can drain into the street, gutter or storm drain. All tools should be rinsed in a sink connected to the sanitary sewer.
- When disposing of paint, never put wet paint in the trash.
- Dispose of water-based paint by removing the lid and letting it dry in the can. Large amounts must be taken to a Household Hazardous Waste Collection Center (HHWCC).



- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.
- For HHWCC locations and hours, call **(714) 834-6752** or visit **www.oclandfills.com**.

Erosion Control

- Schedule grading and excavation projects for dry weather.
- When temporarily removing soil, pile it in a contained, covered area where it cannot spill into the street, or obtain the required temporary encroachment or street closure permit and follow the conditions instructed by the permit.
- When permanently removing large quantities of soil, a disposal location must be found prior to excavation. Numerous businesses are available to handle disposal needs. For disposal options, visit **www.ciwmb.ca.gov/SWIS**.
- Prevent erosion by planting fast-growing annual and perennial grasses. They will shield and bind the soil.

Recycle

- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry (bricks, concrete, etc.), carpet, plastic, pipes (plastic, metal and clay), drywall, rocks, dirt and green waste.

- For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**

Spills

- Clean up spills immediately by using an absorbent material such as cat litter, then sweep it up and dispose of it in the trash.
- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at **(714) 567-6363** or visit **www.ocwatersheds.com** to fill out an incident reporting form.

PROJECT Pollution PREVENTION

APPENDIX D

BMP MAINTENANCE SUPPLEMENT / O&M PLAN

OPERATIONS AND MAINTENANCE (O&M) PLAN

Water Quality Management Plan

For

4th & Mortimer – Block A

409 East 4th Street
Santa Ana, CA 92701

APN: 398-325-01

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BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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 to tenants, including brochures and restrictions to reduce pollutants from reaching the storm drain system. Examples include tips for pet care, household tips, and proper household hazardous waste disposal.	Educational materials will be provided to tenants annually. Materials to be distributed are found in Appendix C of this WQMP. Tenants will be provided these materials by the Property Management prior to occupancy and annually thereafter. Frequency: Annually	Red Oak Investment, LLC
Yes	N2. Activity Restrictions The owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution.	The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Restrictions include, but are not limited to, prohibiting vehicle maintenance or vehicle washing. Frequency: Ongoing	Red Oak Investment, LLC

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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** The Owner shall be responsible for ongoing maintenance and management of landscaped areas on the project site, consistent with OC DAMP Section 5.5, Management Guidelines for Use of Fertilizers as well as City standards. Program includes how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices, ongoing trimming and other landscape maintenance activities and proper disposal of landscape wastes by the owner and/or contractors.	Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (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 to prevent exposure of erodible surfaces. Trimmings, clippings, and other landscape wastes shall be properly disposed of in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and storm drains inlets. Frequency: Monthly	Red Oak Investment, LLC
Yes	**N4. BMP Maintenance** The Owner will be responsible for the implementation and maintenance of each applicable LID and structural BMP prescribed for the project. Inspection and maintenance will be carried out by property management staff and/or contractors.	Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be kept by the Owner and shall be available for review upon request. Frequency: Ongoing	Red Oak Investment, LLC
No	**N5. Title 22 CCR Compliance (How development will comply)**	Not Applicable	
No	**N6. Local Industrial Permit Compliance**	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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	
No	N8. Underground Storage Tank Compliance	Not Applicable	
No	N9. Hazardous Materials Disclosure Compliance	Not Applicable	
No	N10. Uniform Fire Code Implementation	Not Applicable	
Yes	N11. Common Area Litter Control The property management will be responsible for performing trash pickup and sweeping of littered common areas as needed, and weekly at a minimum. Any trash/debris waste collected shall be properly disposed of in accordance with local regulations. Responsibilities will also include noting improper disposal of materials and reporting such violations for further investigation.	Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities. Frequency: Weekly	Red Oak Investment, LLC

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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	**N12. Employee Training** All employees of the property owner/management and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, and housekeeping practices.	The Owner shall educate all new employees/managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Materials that may be utilized on BMP maintenance are included in Appendix D. Frequency: Within 6 Months of Hire & Annually Thereafter	Red Oak Investment, LLC
Yes	**N13. Housekeeping of Loading Docks** Housekeeping measures will be implemented by the Owner to keep the proposed loading dock and delivery areas clean and orderly condition. Includes sweeping, removal of trash & debris on a weekly basis, and use of dry methods for cleanup (e.g., sweeping).	Sweep area routinely and before October 1 each year. Keep area clean of trash and debris at all times. Spills shall be cleaned up immediately using dry methods. Frequency: Weekly	Red Oak Investment, LLC
Yes	**N14. Common Area Catch Basin Inspection**	Catch basin inlets shall be inspected and, if necessary, cleaned prior to the storm season by October 1st each year. Frequency: Annually	Red Oak Investment, LLC
Yes	**N15. Street Sweeping Private Streets and Parking Lots**	Parking lots must be swept at least quarterly (every 3 months), including prior to the start of the rainy season (October 1st). Frequency: Quarterly	Red Oak Investment, LLC
No	**N16. Retail Gasoline Outlets**	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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** The phrase "NO DUMPING! DRAINS TO OCEAN", or an equally effective phrase approved by the City, will be stenciled on all major storm drain inlets within the project site to alert the public to the destination of pollutants discharged into storm water. Stencils shall be in place prior to release of certificate of occupancy.	Stenciling shall be inspected for legibility no later than the beginning of the rainy season on October 1st of each year. Stenciling must be re-stenciled to maintain legibility as necessary and when deemed necessary by the local inspecting agency. Frequency: Annually	Red Oak Investment, LLC
No	**S2. Design and construct outdoor material storage areas to reduce pollution introduction**	Not Applicable	
No	**S3. Design and construct trash and waste storage areas to reduce pollution introduction**	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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 & landscape design, water conservation, smart controllers, and source control** The Owner will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. Includes implementation of efficient irrigation systems for common area landscaping including, but not limited to, provisions for water sensors and programmable irrigation cycles. This includes smart timers, rain sensors, and moisture shut-off valves.	In conjunction with routine maintenance, verify that landscape design continues to function properly by adjusting systems to eliminate overspray to hardscape areas and to verify that irrigation timing and cycle lengths are adjusted in accordance to water demands, given the time of year, weather, and day or nighttime temperatures. System testing shall occur twice per year. Water from testing/flushing shall be collected and properly disposed to the sewer system and shall not discharge to the storm drain system. Frequency: Monthly	Red Oak Investment, LLC
No	**S5. Protect slopes and channels and provide energy dissipation**	Not Applicable	
Yes	**S6. Dock areas**	Sweep area routinely and before October 1 each year. Keep area clean of trash and debris at all times. Spills shall be cleaned up immediately. See also BMP N13. Frequency: Weekly	Red Oak Investment, LLC
No	**S7. Maintenance bays**	Not Applicable	
No	**S8. Vehicle wash areas**	Not Applicable	
No	**S9. Outdoor processing areas**	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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	S10. Equipment wash areas	Not Applicable	
No	S11. Fueling areas	Not Applicable	
No	S12. Hillside landscaping	Not Applicable	
Yes	S13. Wash water control for food preparation areas	Adequate signs shall be provided and appropriately placed stating the prohibition of discharging wash water to the storm drain system. Employees shall be trained in discharge and safety requirements outlined in State Health & Safety Code 27520. All cooking utensils shall be cleaned in appropriate wash stations. Frequency: Ongoing	Red Oak Investment, LLC
No	S14. Community car wash racks	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
LOW IMPACT DEVELOPMENT BMPs		
Infiltration BMP #1: Underground Detention System	The underground detention system shall be inspected annually and after major storm events, and cleaned at a minimum of once per year, prior to the start of the rainy season (October 1st). Cleaning and maintenance will be performed per manufacturer specifications and will typically include removal of any trash and debris and excess sediment within the pipes. Sediment shall be removed when deposits approach within 6 inches of the invert heights of the structures. See Appendix D for additional maintenance information provided by the manufacturer. Frequency: Annually	Red Oak Investment, LLC

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
Infiltration BMP #2: INF-5 Drywell	Performed in accordance with manufacturer specifications. Typical maintenance includes conducting routine inspections for accumulation and cleaning /pollutant removal as necessary from the pre-treatment settling chamber. Quarterly inspections will help maintain optimal performance and to determine typical accumulation levels during both dry-weather and wet-weather flows. The pretreatment settling chamber shall be cleaned when sediment accumulation is at or above the "cleanout line" marked inside of the chamber, and at a minimum of once per year, prior to the start of the storm season. Care should be taken to prevent spills during pollutant removal and cleaning. Oil and other hydrocarbons shall be cleaned out of the settling chamber as needed, once per year at a minimum. See Appendix D for additional maintenance information provided by the manufacturer. <u>Frequency: Quarterly Inspections, Annual Cleanout</u>	Red Oak Investment, LLC

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
Biotreatment BMPs: Modular Wetland System The primary BMPs proposed for the project include Proprietary Bioretention Units (Modular Wetlands). Modular Wetlands by Modular Wetlands Systems, Inc. are proprietary biotreatment systems that utilize multi-stage treatment processes including screening media filtration, settling, and biofiltration. The pre-treatment chamber contains the first three stages of treatment, and includes a catch basin inlet filter to capture trash, debris, gross solids and sediments, a settling chamber for separating out larger solids, and a media filter cartridge for capturing fine TSS, metals, nutrients, and bacteria. Runoff then flows through the wetland chamber where treatment is achieved through a variety of physical, chemical, and biological processes. As storm water passes down through the planting soil, pollutants are filtered, adsorbed, biodegrated and sequestered by the soil and plants, functioning similar to bioretention systems. The discharge chamber at the end of the unit collects treated flows and discharges back into the storm drain system.	Maintained in accordance with manufacturer's specifications. The system shall be inspected at a minimum of once every six months, prior to the start of the rainy season (October 1) and after major storm events. Typical maintenance includes removing trash & debris from the catch basin screening filter (by hand), removal of sediment and solids in the settlement chamber (vacuum truck), replacement of the BioMediaGREEN™ filter cartridge, and replacement of the BioMediaGREEN™ drain down filter (if equipped). Plants within the wetland chamber will require trimming as needed in conjunction with routine landscape maintenance. No fertilizer shall be used in this chamber. Chamber should be inspected during rain events to verify flow through the system. If little to no flow is observed from the lower valve or orifice plate, the wetland media may require replacement. If prior treatment stages are properly maintained, the life of the wetland media can be up to 20 years. Frequency: 2x per year	Red Oak Investment, LLC

Required Permits

Permits are not required for the implementation, operation, and maintenance of the 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.

Waste Management

Any waste generated from maintenance activities will be disposed of properly. Wash water and other waste from maintenance activities is not to be discharged or disposed of into the storm drain system. Clippings from landscape maintenance (i.e. prunings) will be collected and disposed of properly off-site, and will not be washed into the streets, local area drains/conveyances, or catch basin inlets.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

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

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

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

OPERATIONS AND MAINTENANCE

Jensen Precast High Velocity Interceptor/Horizontal Flow Clarifier (JPHV)

There are no moving or mechanical parts in the ***JPHV*** Stormwater Interceptors, so there is nothing that needs to be done operationally once the unit has been installed and hooked-up. There are, however, several very important maintenance functions that must be performed periodically to insure efficient operation of the interceptor.

STORMWATER SYSTEM MAINTENANCE RECOMENDATIONS

Each site will experience differences in sediment and pollutant loads that can lead to a variation in inspection intervals and cleaning schedules. Generally, the unit should be inspected at least twice (2x) per year and cleaned out as necessary. Regular cleaning at prescribed intervals is necessary to maintain the efficiency of the interceptor. ***JPHV*** stormwater interceptors are designed to be cleaned using a vacuum truck. ***JPHV*** maintenance procedures should be in accordance with the guidelines stated below and as set forth by the owner and regulators.

The time span of when each interceptor will need to be pumped will vary from interceptor to interceptor, and will also depend on the frequency and volume of stormwater flowing through the interceptor. Generally, the interceptor should be cleaned whenever the solids in the first compartment build up to a level approaching the midpoint of the distance between the floor and the bottom of the first baffle, which is around 12”.

This level can be determined by removing the inlet side access opening, and using a probe to determine the depth of solids build up. The dimensional drawing of your interceptor should be kept for reference when determining the depth of the solid build up.

Once a frequency of pumping is determined, it should remain constant relative to the number of storms since the last cleaning. It is very important that the interceptor be maintained so that new storms do not flush material out of the interceptor.

JENSEN PRECAST STORMWATER INTERCEPTOR OPERATION AND MAINTENANCE GUIDELINES.

After the accumulated sand/oil and waste materials have been removed, the interceptor should be checked thoroughly to make certain that the inlet, outlet, and air relief ports (if available) are clear of obstructions. Accumulated sand/oil and debris may impair the performance of the interceptor by reducing the internal volume of the interceptor thereby reducing detention time

and increase flow through velocity. Deferred maintenance could produce a hydraulic condition in which some materials may be re-suspended in subsequent storms.

The maintenance frequency should be reevaluated on any system that has become clogged. Storm water interceptors are subject to variable flow rates and changes in influent quality. Consequently, reevaluations of maintenance frequencies are common practice for stormwater mitigation systems.

RECOMMENDED INTERCEPTOR MAINTENANCE PROCEDURE:

Observation and maintenance procedures are outlined below:

1. Record sediment depth from several locations in each chamber. Accumulated floating debris and sediments should be removed as required. The greatest amount of debris and sediments should collect in the first chamber. The sediment level can be determined by using a probe to determine the depth of solids build up. It may be unnecessary to remove the entire water volume from the interceptor. "Jetting" or removal of the bottom sediments and floating debris is required to maintain an effectively operating interceptor.

2. Jensen Precast recommends that a professional pumping contractor trained and licensed to remove and dispose of captured sediment material shall perform this task. Sand, oil, and other waste material that has been removed from the interceptor should not be introduced into any drain, sewer, or natural body of water. All material should be disposed of according to applicable regulations.

3. Observe hydrocarbon absorbent mats. The Jensen Precast ***JPHV*** stormwater interceptor is equipped with Rubberizer®, a Sorbent Solidifier™ that transforms spilled hydrocarbons into a rubber-like solid upon contact. Rubberizer® sorbent pillows or mats should be observed for color change. These units will be solid white when they are initially installed and will darken as they absorb oils. They are capable of retaining up to five times their weight in hydrocarbons; therefore, as they absorb oil they will darken in color from the bottom up. When the mats or pillows are floating low in the water and are solid dark brown or black they need to be replaced. Refer to Rubberizer's maintenance guidelines for further information. Often the mats will collect some sediments and dust. By pulling on the attachment lanyard and dunking the mats in the water, it can be observed if the mats are dirty or are saturated with oil and grease.

4. To remove the mats or pillows, find the lanyards attached underneath the access cover or pull the mats out utilizing a "sewer hook" or similar rod. Care should be taken while removing the saturated mats out of the access way as they may weigh up to five times the

replacement mats. Many state and local agencies have their own regulations regarding used oil and oil containing devices. Any material determined to be hazardous waste must be disposed of per applicable EPA Regulatory Citation, Statutory Citation (RCRA) requirements. Replacement mats or pillows can be obtained from the nearest Jensen Precast office.

WARNING: Entry into the vault is not recommended or required for normal maintenance. If entry is necessary, follow all OSHA confined space entry procedures.

Appendix A

Annual Record of Operations & Maintenance

And

Clean Out Sketch

JENSEN STORMWATER BMP/LID SYSTEMS

JPHV

ANNUAL RECORD OF OPERATION AND MAINTENANCE

OWNER _____

ADDRESS _____

OWNER REPRESENTATIVE _____ **PHONE** _____

JPHV INSTALLATION:

MODEL DESIGNATION _____ **DATE** _____

SITE LOCATION _____

DEPTH FROM COVER TO BOTTOM OF SUMP (SUMP INVERT) _____

VOLUME OF SUMP _____ **CUYD** **VOLUME/INCH DEPTH** _____ **CUFT**

VOLUME/FOOT DEPTH _____ **CUYD**

INSPECTIONS:

DATE/INSPECTOR	SCREEN/INLET INTEGRITY	FLOATABLES DEPTH	DEPTH TO SEDIMENT (inches)	SEDIMENT VOLUME* (CUYDS)	SORBENT DISCOLORATION

***Calculate Sediment Volume = (Depth to Sump Invert – Depth to Sediment)*(Volume/inch)**

OBSERVATIONS OF FUNCTION: _____

_____

_____

_____

CLEANOUT:

DATE	VOLUME FLOATABLES	VOLUME SEDIMENTS	METHOD OF DISPOSAL OF FLOATABLES, SEDIMENTS, DECANT AND SORBENTS

OBSERVATIONS:

_____

_____

_____

_____

SEDIMENT CHAMBER MAINTENANCE:

DATE OF POWER WASHING, INSPECTION AND OBSERVATIONS:

_____

_____

CERTIFICATION: _____ **TITLE:** _____ **DATE:** _____

Appendix B

Site Location Plans

Appendix C

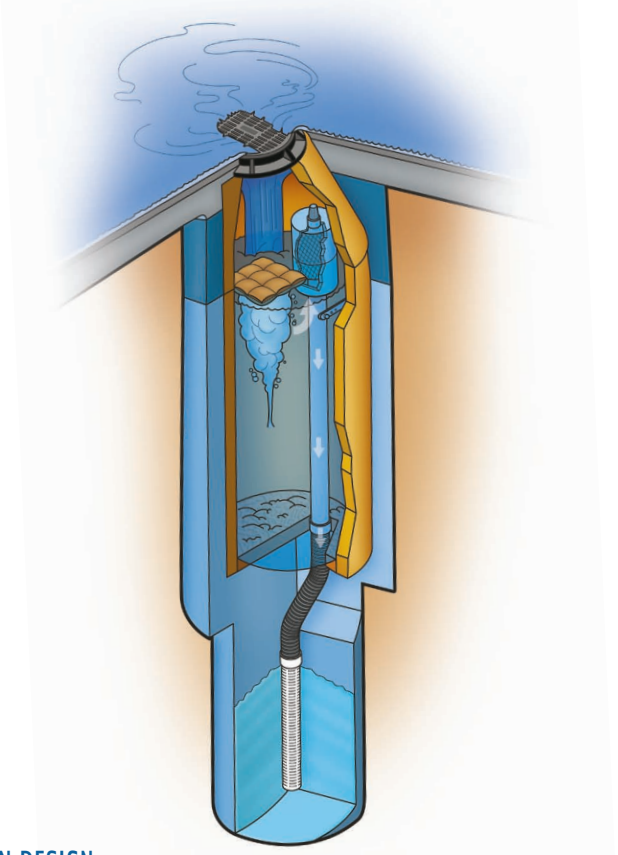
Plan & Profile Drawings

MaxWell® IV DRAINAGE SYSTEM

Product Information and Design Features

TORRENT® RESOURCES

The ***MaxWell® IV,*** as manufactured and installed exclusively by Torrent Resources Incorporated, is the industry standard for draining landscaped developments and paved areas. This patented system incorporates the latest refinements in pre-treatment technology.



PROVEN DESIGN

Since 1974, nearly 65,000 MaxWell® Systems have proven their value as a cost-effective solution in a wide variety of drainage applications. They are accepted by state and municipal agencies and are a standard detail in numerous drainage manuals.

ADVANCED PRE-TREATMENT

Industry research, together with Torrent Resources' own experience, have shown that initial storm drainage flows have the greatest impact on system performance. This "first flush" occurs during the first few minutes of runoff, and carries the majority of sediment and debris. This results in the need for effective processing of runoff from landscaped and paved surfaces. In the ***MaxWell® IV,*** preliminary treatment is provided through collection and separation in a deep, large-volume chamber where silt and other heavy particles settle to the bottom. The standard MaxWell IV System has over 1,500 gallons of capacity to contain sediment and debris carried by incoming water. Floating trash, paper, pavement oil, etc. are effectively stopped by the **PureFlo®** Debris Shield on top of the overflow pipe. Water is drained from the system by rising up to the top of the overflow pipe and under the Debris Shield. The solid metal shields are equipped with an internal screen to filter suspended matter and are vented to prevent siphoning of floating surface debris. The drainage assembly returns the cleaned water into the surrounding soil through the **FloFast®** Drainage Screen.

ABSORBENT TECHNOLOGY

The MaxWell IV settling chamber is equipped with an absorbent sponge to provide prompt removal of pavement oils. These floating pillow-like devices are 100% water repellent and literally wick petrochemical compounds from the water. Each sponge has a capacity of up to 128 ounces to accommodate effective, long-term treatment. The absorbent is completely inert and will safely remove runoff constituents down to rainbow sheens that are typically no more than one molecule thick.

SECURITY FEATURES

MaxWell IV Systems include bolted, theft-deterrent, cast iron gratings and covers as standard security features. Special inset castings that are resistant to loosening from accidental impact are available for use in landscaped applications. Machined mating surfaces and "Storm Water Only" wording are standard.

THE MAXWELL FIVE-YEAR WARRANTY

Innovative engineering, quality materials and exacting construction are standard with every MaxWell System designed, manufactured and installed by Torrent Resources Incorporated. The MaxWell Drainage System Warranty is the best in the industry and guarantees against failures due to workmanship or materials for a period of five years from date of completion.

Manufactured and Installed Exclusively by Torrent Resources Incorporated

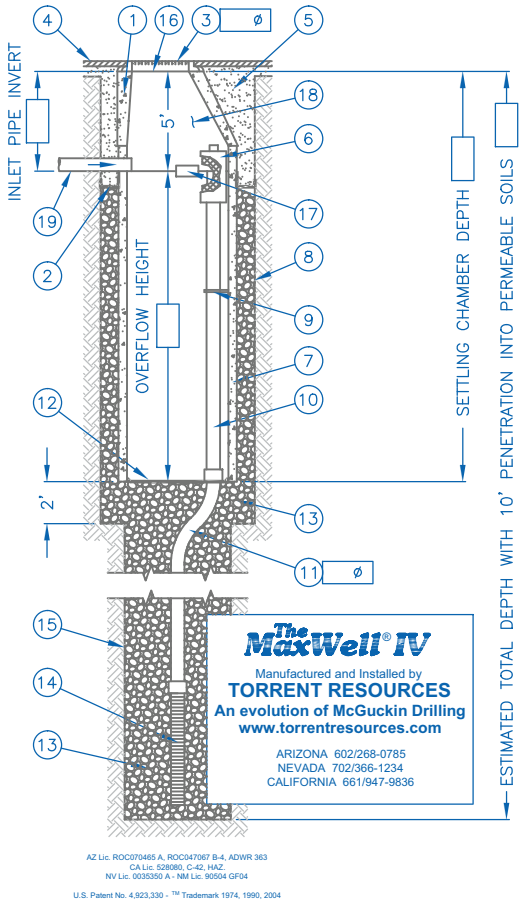
Please see reverse side for additional information

U.S. Patent No. 4,923,330

MAXWELL® IV DRAINAGE SYSTEM DETAIL AND SPECIFICATIONS

ITEM NUMBERS

1. **Manhole Cone** - Modified Flat Bottom.
2. **Moisture Membrane** - 6 Mil. Plastic. Applies only when native material is used for backfill. Place membrane securely against eccentric cone and hole sidewall.
3. **Bolted Ring & Grate** - Diameter as shown. Clean cast iron with wording **"Storm Water Only"** in raised letters. **Bolted in 2 locations** and secured to cone with mortar. Rim elevation ±0.02' of plans.
4. **Graded Basin or Paving** (by Others).
5. **Compacted Base Material** - 1-Sack Slurry except in landscaped installtions with no pipe connections.
6. **PureFlo® Debris Shield** - Rolled 16 ga. steel X 24" length with vented anti-siphon and Internal .265" Max. SWO flattened expanded steel screen X 12" length. **Fusion bonded epoxy coated.**
7. **Pre-cast Liner** - 4000 PSI concrete 48" ID. X 54" OD. **Center in hole** and align sections **to maximize bearing surface.**
8. **Min. 6' Ø Drilled Shaft.**
9. **Support Bracket** - Formed 12 Ga. steel. **Fusion bonded epoxy coated.**
10. **Overflow Pipe** - Sch. 40 PVC mated to drainage pipe at base seal.
11. **Drainage Pipe** - ADS highway grade with TRI-A coupler. **Suspend pipe** during backfill operations to prevent buckling or breakage. Diameter as noted.
12. **Base Seal** - Geotextile or concrete slurry.
13. **Rock** - Washed, sized between 3/8" and 1-1/2" to **best complement soil conditions.**
14. **FloFast® Drainage Screen** - Sch. 40 PVC 0.120" slotted well screen with 32 slots per row/ft.Diameter varies 120" overall length with TRI-B coupler.
15. **Min. 4' Ø Shaft** - Drilled to **maintain permeability** of drainage soils.
16. **Fabric Seal** - U.V. resistant geotextile - **to be removed by customer** at project completion.
17. **Absorbent** – Hydrophobic Petrochemical Sponge. Min. to 128 oz. capacity.
18. **Freeboard Depth** Varies with inlet pipe elevation. Increase settling chamber depth as needed to maintain all inlet pipe elevations above overflow pipe inlet.
19. **Optional Inlet Pipe** (Maximum 4", by Others). Extend moisture membrane and compacted base material or 1 sack slurry backfill below pipe invert.



AZ Lic. ROC070465 A, ROC047067 B-4, ADWR 363
CA Lic. 528080, C-42, HAZ.
NV Lic. 0035350 A - NM Lic. 90504 GF04

U.S. Patent No. 4,923,330 - ™ Trademark 1974, 1990, 2004

The referenced drawing and specifications are available on CAD either through our office or web site. This detail is copyrighted (2004) but may be used as is in construction plans without further release. For information on product application, individual project specifications or site evaluation, contact our Design Staff for no-charge assistance in any phase of your planning.

CALCULATING MAXWELL IV REQUIREMENTS

The type of property, soil permeability, rainfall intensity and local drainage ordinances determine the number and design of MaxWell Systems. For general applications draining retained stormwater, use one standard **MaxWell IV** per the instructions below for up to 3 acres of landscaped contributory area, and up to 1 acre of paved surface. For larger paved surfaces, subdivision drainage, nuisance water drainage, connecting pipes larger than 4" Ø from catch basins or underground storage, or other demanding applications, refer to our **MaxWell® Plus** System. For industrial drainage, including gasoline service stations, our **Envibro® System** may be recommended. For additional considerations, please refer to **"Design Suggestions For Retention And Drainage Systems"** or consult our Design Staff.

COMPLETING THE MAXWELL IV DRAWING

To apply the **MaxWell IV** drawing to your specific project, simply fill in the blue boxes per instructions below. For assistance, please consult our Design Staff.

' ESTIMATED TOTAL DEPTH

The Estimated Total Depth is the approximate depth required to achieve 10 continuous feet of penetration into permeable soils. Torrent utilizes specialized **"crowd"** equipped drill rigs to penetrate difficult, cemented soils and to reach permeable materials at depths up to **180 feet.** Our extensive database of drilling logs and soils information is available for use as a reference. Please contact our Design Staff for site-specific information on your project.

' SETTLING CHAMBER DEPTH

On MaxWell IV Systems of over 30 feet overall depth and up to 0.25cfs design rate, the **standard** Settling Chamber Depth is **18 feet.** For systems exposed to greater contributory area than noted above, extreme service conditions, or that require higher design rates, chamber depths up to 25 feet are recommended.

' OVERFLOW HEIGHT

The Overflow Height and Settling Chamber Depth determine the effectiveness of the settling process. The higher the overflow pipe, the deeper the chamber, the greater the settling capacity. For normal drainage applications, an overflow height of **13 feet** is used with the standard settling chamber depth of **18 feet**. Sites with higher design rates than noted above, heavy debris loading or unusual service conditions require greater settling capacities

"Ø DRAINAGE PIPE

This dimension also applies to the **PureFlo®** Debris Shield, the **FloFast®** Drainage Screen, and fittings. The size selected is based upon system design rates, soil conditions, and the need for adequate venting. Choices are 6", 8", or 12" diameter. Refer to "Design Suggestions for Retention and Drainage Systems" for recommendations on which size best matches your application.

"Ø BOLTED RING & GRATE

Standard models are quality cast iron and available to fit 24" Ø or 30" Ø manhole openings. All units are bolted in two locations with wording "Storm Water Only" in raised letters. For other surface treatments, please refer to "Design Suggestions for Retention and Drainage Systems."

"Ø INLET PIPE INVERT

Pipes up to 4" in diameter from catch basins, underground storage, etc. may be connected into the settling chamber. Inverts deeper than 5 feet will require additional settling chamber depth to maintain effective overflow height.

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TORRENT RESOURCES (CA) INCORPORATED
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www.TorrentResources.com
An evolution of McGuckin Drilling

The watermark for drainage solutions.®

TORRENT® RESOURCES

APPENDIX E

CONDITIONS OF APPROVAL (PENDING ISSUANCE)

APPENDIX F

GEOTECHNICAL REPORT

GEOTECHNICAL INVESTIGATION

PROPOSED MIXED-USE DEVELOPMENT
EAST 4TH STREET AND MORTIMER STREET
SANTA ANA, CALIFORNIA

APN: 398-325-01, 398-330-01 to 398-330-10

GEOCON WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

RED OAK INVESTMENTS, LLC
IRVINE, CALIFORNIA

PROJECT NO. A9799-88-01

JUNE 7, 2022

Project No. A9799-88-01
June 7, 2022

Mr. Andrew Nelson
Red Oak Investments, LLC
4199 Campus Drive, #200
Irvine, California 92612

Subject: GEOTECHNICAL INVESTIGATION
PROPOSED MIXED-USE DEVELOPMENT
EAST 4th STREET AND MORTIMER STREET
SANTA ANA, CALIFORNIA
APN: 398-325-01, 398-330-01 to 398-330-10

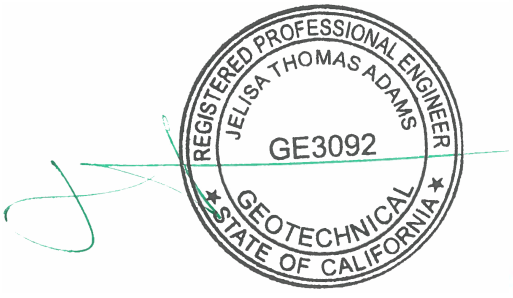
Dear Mr. Nelson:

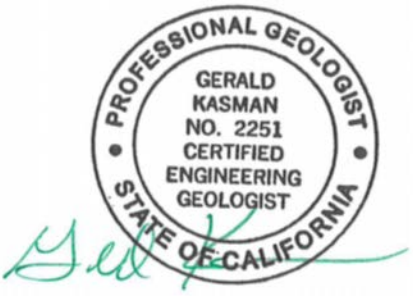
In accordance with your authorization of our proposals dated April 3, 2018 and March 7, 2022, we have prepared this geotechnical investigation for the proposed mixed-use development located on two blocks along East 4th Street between French Street and North Minter Street in the City of Santa Ana, California. The accompanying report presents the findings of our study, and our conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction. Based on the results of our investigation, it is our opinion that the site can be developed as proposed, provided the recommendations of this report are followed and implemented during design and construction.

If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Very truly yours,

GEOCON WEST, INC.





Petrina Zen
PE 87489

Jelisa Thomas Adams
GE 3092

Gerald A. Kasman
CEG 2251

(EMAIL) Addressee

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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation of the proposed mixed-use development located on two blocks along East 4th Street between French Street and North Minter Street in the City of Santa Ana, California (see Vicinity Map, Figure 1). The purpose of the investigation was to evaluate subsurface soil and geologic conditions underlying the site and, based on conditions encountered, to provide conclusions and recommendations pertaining to the geotechnical aspects of design and construction.

The scope of this investigation included a site reconnaissance, field exploration, laboratory testing, engineering analysis, and the preparation of this report. The site was initially explored on May 29, 2018 by excavating eight 8-inch diameter borings to depths between 10 and 40½ feet below the existing ground surface using a truck-mounted hollow-stem auger drilling machine. Additional site exploration was performed on March 20, 2022 by excavating four 8-inch diameter borings to depths between 45½ and 55½ feet below the ground surface for the purpose of percolation testing. The approximate locations of the exploratory borings are depicted on the Site Plan (see Figure 2A). A detailed discussion of the field investigation, including boring logs, is presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to determine pertinent physical and chemical soil properties. Appendix B presents a summary of the laboratory test results.

The recommendations presented herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions. References reviewed to prepare this report are provided in the *List of References* section.

If project details vary significantly from those described herein, Geocon should be contacted to determine the necessity for review and possible revision of this report.

2. SITE AND PROJECT DESCRIPTION

The subject site is located on two blocks on the north side of East 4th Street between French Street and North Minter Street in the City of Santa Ana, California. Block A is occupied by a market building and associated parking lot; Block B is occupied by several single-story commercial structures and a vacant lot that was being used as a laydown yard for a nearby construction project at the time of our work. The overall site is bounded by East 5th Street to the north, by East 4th Street to the south, by North Minter Street to east, and by French Street to the west; the two parcels are separated by Mortimer Street. The site is relatively level with no pronounced highs or lows. Surface water drainage at the site appears to be by sheet flow along the existing ground contours to the city streets. Vegetation onsite consists of grasses, bushes and trees generally confined to planter areas.

It is our understanding that the proposed development on the west block will consist of a five- to seven-story mixed-use structure constructed around a four-story parking structure. The proposed development on the east block will consist of a five-story multi-family residential structure constructed around a three- to four-story parking structure. All structures will be constructed at or near the existing site grade. The proposed development is shown on the Site Plan and Cross Sections (see Figures 2A and 2B).

Based on information provided by the project structural engineer, DCI Engineers, anticipated loads (dead + live) for the proposed new footings are:

- Parking Structures: between 203 kips and 405 kips;
- 7-Story Mixed-Use Structure: up to 683 kips;
- 5-Story Residential Structure: between 0.8 and 5.9 kips per linear foot.

Once the design phase and foundation loading configuration proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Any changes in the design, location or elevation of any structure, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

3. GEOLOGIC SETTING

The subject site is situated at the south-central portion of the Orange County Coastal Plain, a relatively flat-lying alluviated surface with an average slope of less than 20 feet per mile. The lowland surface is bounded by hills and mountains on the north and east and by the Pacific Ocean to the south and southwest (Department of Water Resources, 1967). Prominent structural features within the Orange County Coastal Plain include the central lowland plain, the northwest trending line of low hills and mesas underlain by the Newport-Inglewood fault zone along the coast (Newport Mesa, Huntington Beach Mesa, Bolsa Chica Mesa, and Landing Hill), and the San Joaquin Hills to the southeast (Department of Water Resources, 1967).

4. SOIL AND GEOLOGIC CONDITIONS

Based on our field exploration and published geologic maps of the area, the site is underlain by young (Holocene age) alluvial fan deposits consisting predominantly of silty sand and sandy silt (USGS, 1999). Detailed stratigraphic profiles are provided on the boring logs in Appendix A.

4.1 Artificial Fill

Artificial fill was encountered in our field explorations to a maximum depth of 5 feet below existing ground surface. The artificial fill generally consists of brown to dark brown silty sand. The artificial fill is characterized as dry to slightly moist and medium dense with trace brick fragments. The fill is likely the result of past grading or construction activities at the site. Deeper fill may exist between excavations and in other portions of the site that were not directly explored.

4.2 Alluvium

Holocene age alluvial deposits were encountered beneath the fill. As exposed in our borings, the upper 20 feet of alluvium consists of loose to medium-dense silty sand and poorly graded sand. These sediments are underlain by soft to firm silt and clay, in turn underlain by medium dense to dense gravely sand with cobbles.

5. GROUNDWATER

The depth to first groundwater, as presented on Figure XVI.2d within the Orange County Technical Guidance Document (2013), is reported to be greater than 50 feet below the existing ground surface. The data depicted on this map is indicated as taken from Sprotte (1980) which indicates that the data is "biased towards the shallowest reported observations of groundwater".

For the purpose of identifying a seasonally high groundwater level for infiltration design, we have reviewed publicly available data from https://geotracker.waterboards.ca.gov/. The closest site with groundwater monitoring data is located approximately 1,000 feet to the southwest, near the intersection of Spurgeon and 1st Street. The site included 6 monitoring wells with groundwater measurements from 2002 to 2013, after which the wells were abandoned. The monitoring well readings indicate that groundwater has generally been at or below a depth of 55 feet from the ground surface during this time period.

Groundwater was not encountered in our borings, drilled to a maximum depth of 55½ feet below the existing ground surface. Considering the depth of proposed construction, lack of groundwater in our borings, and the historic high groundwater level in the area (in excess of 40 feet deep), static groundwater is neither expected to be encountered during construction, nor to have a detrimental effect on the project. It is not uncommon for groundwater levels to vary seasonally or for perched groundwater conditions to develop where none previously existed, especially in impermeable fine-grained soils which are subjected to irrigation or precipitation. In addition, recent requirements for stormwater infiltration could result in shallower seepage conditions in the region. Proper surface drainage of irrigation and precipitation will be critical to future performance of the project. Recommendations for drainage are provided in the S*urface Drainage* section of this report (see Section 7.20).

6. GEOLOGIC HAZARDS

6.1 Surface Fault Rupture

The numerous faults in Southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Geological Survey (CGS, formerly known as CDMG) for the Alquist-Priolo Earthquake Fault Zone Program (CGS, 2018a). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,700 years). A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years) but has had no known Holocene movement. Faults that have not moved in the last 1.6 million years are considered inactive.

The site is not within a state-designated Alquist-Priolo Earthquake Fault Zone (CGS, 2018b; CGS, 2014) for surface fault rupture hazards. No active or potentially active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low. However, the site is located in the seismically active Southern California region, and could be subjected to moderate to strong ground shaking in the event of an earthquake on one of the many active Southern California faults. The faults in the vicinity of the site are shown in Figure 3, Regional Fault Map.

The closest trace of an active fault to the site is the Newport-Inglewood Fault Zone located approximately 9.6 miles to the southwest (Ziony and Jones, 1989). Other nearby active faults are the Whittier Fault, the Elsinore Fault, the offshore segment of the Palos Verdes Fault Zone, and the Chino Fault located approximately 9.8 miles northeast, 13 miles northeast, 18 miles southwest, and 18.5 miles northeast of the site, respectively (Ziony and Jones, 1989). The active San Andreas Fault Zone is located approximately 42 miles northeast of the site.

Several buried thrust faults, commonly referred to as blind thrusts, underlie the Los Angeles Basin (including the Orange County Coastal Plain) at depth. These faults are not exposed at the ground surface and are typically identified at depths greater than 3.0 kilometers. The October 1, 1987, M_w 5.9 Whittier Narrows earthquake and the January 17, 1994, M_w 6.7 Northridge earthquake were a result of movement on the Puente Hills Blind Thrust and the Northridge Thrust, respectively. These thrust faults and others in the greater Los Angeles area are not exposed at the surface and do not present a potential surface fault rupture hazard at the site; however, these deep thrust faults are considered active features capable of generating future earthquakes that could result in moderate to significant ground shaking at the site.

6.2 Seismicity

As with all of Southern California, the site has experienced historic earthquakes from various regional faults. The seismicity of the region surrounding the site was formulated based on research of an electronic database of earthquake data. The epicenters of recorded earthquakes with magnitudes equal to or greater than 5.0 in the site vicinity are depicted on Figure 4, Regional Seismicity Map. A partial list of moderate to major magnitude earthquakes that have occurred in the Southern California area within the last 100 years is included in the following table.

LIST OF HISTORIC EARTHQUAKES

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (Miles)	Direction to Epicenter
Near Redlands	July 23, 1923	6.3	39	ENE
Long Beach	March 10, 1933	6.4	11	SW
Tehachapi	July 21, 1952	7.5	108	NW
San Fernando	February 9, 1971	6.6	55	NW
Whittier Narrows	October 1, 1987	5.9	25	NW
Sierra Madre	June 28, 1991	5.8	36	NNW
Landers	June 28, 1992	7.3	87	ENE
Big Bear	June 28, 1992	6.4	67	ENE
Northridge	January 17, 1994	6.7	50	NW
Hector Mine	October 16, 1999	7.1	108	ENE
Ridgecrest	July 5, 2019	7.1	140	N

The site could be subjected to strong ground shaking in the event of an earthquake. However, this hazard is common in Southern California and the effects of ground shaking can be mitigated if the proposed structures are designed and constructed in conformance with current building codes and engineering practices.

6.3 Seismic Design Criteria

The following table summarizes the site-specific design criteria obtained from the 2019 California Building Code (CBC; Based on the 2018 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The data was calculated using the online application *Seismic Design Maps*, provided by OSHPD. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2019 CBC and Table 20.3-1 of ASCE 7-16. The values presented below are for the risk-targeted maximum considered earthquake (MCE_R).

2019 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2019 CBC Reference
Site Class	D	Section 1613.2.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.29g	Figure 1613.2.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.46g	Figure 1613.2.1(2)
Site Coefficient, F_A	1	Table 1613.2.3(1)
Site Coefficient, F_V	1.84*	Table 1613.2.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.29g	Section 1613.2.3 (Eqn 16-36)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.846g*	Section 1613.2.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.86g	Section 1613.2.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.564g*	Section 1613.2.4 (Eqn 16-39)
Note: *Per Section 11.4.8 of ASCE/SEI 7-16, a ground motion hazard analysis shall be performed for projects for Site Class "E" sites with Ss greater than or equal to 1.0g and for Site Class "D" and "E" sites with S1 greater than 0.2g. Section 11.4.8 also provides exceptions which indicates that the ground motion hazard analysis may be waived provided the exceptions are followed. Using the code based values presented in the table above, in lieu of a performing a ground motion hazard analysis, requires the exceptions outlined in ASCE 7-16 Section 11.4.8 be followed.		

The table below presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.543g	Figure 22-9
Site Coefficient, F_{PGA}	1.1	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.598g	Section 11.8.3 (Eqn 11.8-1)

The Maximum Considered Earthquake Ground Motion (MCE) is the level of ground motion that has a 2 percent chance of exceedance in 50 years, with a statistical return period of 2,475 years. According to the 2019 California Building Code and NEHRP-2015, the MCE is to be utilized for the evaluation of liquefaction, lateral spreading, seismic settlements, and it is our understanding that the intent of the Building code is to maintain "Life Safety" during a MCE event. The Design Earthquake Ground Motion (DE) is the level of ground motion that has a 10 percent chance of exceedance in 50 years, with a statistical return period of 475 years.

Deaggregation of the MCE peak ground acceleration was performed using the USGS online Unified Hazard Tool, 2014 Conterminous U.S. Dynamic edition (v4.2.0). The result of the deaggregation analysis indicates that the predominant earthquake contributing to the MCE peak ground acceleration is characterized as a 6.67 magnitude event occurring at a hypocentral distance of 15.03 kilometers from the site.

Deaggregation was also performed for the Design Earthquake (DE) peak ground acceleration, and the result of the analysis indicates that the predominant earthquake contributing to the DE peak ground acceleration is characterized as a 6.61 magnitude occurring at a hypocentral distance of 21.16 kilometers from the site.

Conformance to the criteria in the above tables for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

6.4 Liquefaction Potential

Liquefaction is a phenomenon in which loose, saturated, relatively cohesionless soil deposits lose shear strength during strong ground motions. Primary factors controlling liquefaction include intensity and duration of ground motion, gradation characteristics of the subsurface soils, in-situ stress conditions, and the depth to groundwater. Liquefaction is typified by a loss of shear strength in the liquefied layers due to rapid increases in pore water pressure generated by earthquake accelerations.

The current standard of practice, as outlined in the "Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California" and "Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California" requires liquefaction analysis to a depth of 50 feet below the lowest portion of the proposed structure. Liquefaction typically occurs in areas where the soils below the water table are composed of poorly consolidated, fine to medium-grained, primarily sandy soil. In addition to the requisite soil conditions, the ground acceleration and duration of the earthquake must also be of a sufficient level to induce liquefaction.

A review of the State of California Seismic Hazard Zone Map for the Tustin Quadrangle (CGS, 2001) indicates that the site is not located in an area designated as "liquefiable". A review of the Safety Element of the General Plan for the City of Santa Ana indicates that the site is located in an area designated as having the 'Potential for Liquefaction' (City of Santa Ana, 2010). However, as stated previously, the historic high groundwater level is reported to be in excess of 40 feet below the existing ground surface. Based on these considerations, it is our opinion that the potential for liquefaction at the site is low.

6.5 Slope Stability

The topography at the site is relatively level and the site is not within an area identified as having a potential for slope stability hazards (City of Santa Ana, 2010) or seismic slope instability hazards (CDMG, 2001). No landslides have been identified at the site or in close proximity to the site. Also, the site is not in the path of any known or potential landslides. Therefore, the potential for slope stability hazards to adversely affect the proposed development is considered low.

6.6 Earthquake-Induced Flooding

Earthquake-induced flooding is inundation caused by failure of dams or other water-retaining structures due to earthquakes. A review of the Safety Element of the Orange County General Plan (2004) and the City of Santa Ana Seismic Safety Element (2010) indicates that the site is not located within the inundation boundaries of upgradient dams, rivers, creeks, or reservoirs. The probability of earthquake-induced flooding is considered very low.

6.7 Tsunamis, Seiches and Flooding

The site is not located within a coastal area. Therefore, tsunamis, seismic sea waves, are not considered a significant hazard at the site.

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Flooding from a seismically-induced seiche is considered unlikely.

The site is in located within an area of minimal flooding potential (Zone X) as defined by the Federal Emergency Management Agency (FEMA, 2022).

6.8 Oil Fields & Methane Potential

Based on a review of the California Geologic Energy Management Division (CalGEM, 2022), the site is not located near the boundary of an oil field and no oil wells are located in the immediate vicinity of the site. Due to the voluntary nature of record reporting by the oil well drilling companies, wells may be improperly located or not shown on the well location map. Undocumented wells could be encountered during construction. Any wells encountered will need to be properly abandoned in accordance with the current requirements of the CalGEM.

Since the site is not located within the boundaries of a known oil field, the potential for the presence of methane gas at the site is considered low. However, should it be determined that a methane study is required for the proposed development it is recommended that a qualified methane consultant be retained to perform the study and provide mitigation measures as necessary.

6.9 Subsidence

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. Soils that are particularly subject to subsidence include those with high silt or clay content. The site is not located within an area of known ground subsidence. No large-scale extraction of groundwater, gas, oil, or geothermal energy is occurring or planned at the site. There appears to be little or no potential for ground subsidence due to withdrawal of fluids or gases at the site.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 It is our opinion that neither soil nor geologic conditions were encountered during the investigation that would preclude the construction of the proposed development provided the recommendations presented herein are followed and implemented during design and construction.

7.1.2 Up to 5 feet of existing artificial fill was encountered during the site investigation. The existing fill encountered is believed to be the result of past grading and construction activities at the site. Deeper fill may exist in other areas of the site that were not directly explored. It is our opinion that the existing fill, in its present condition, is not suitable for direct support of proposed foundations or slabs. The existing fill and site soils are suitable for re-use as engineered fill provided the recommendations in the *Grading* section of this report are followed (see Section 7.4).

7.1.3 Based on these considerations, it is recommended that the upper 5 feet of existing earth materials within the building footprint areas be excavated and properly compacted for foundation and slab support. Deeper excavations should be conducted as needed to remove any encountered fill or soft soils as necessary at the direction of the Geotechnical Engineer (a representative of Geocon). The limits of existing fill and/or soft soil removal will be verified by the Geocon representative during site grading activities. The excavation should extend laterally a minimum distance of three feet beyond the building footprint areas, including building appurtenances, or a distance equal to the depth of fill below the foundation, whichever is greater. Where the recommended lateral over-excavation cannot be performed, such as adjacent to a property line, foundations should be deepened as necessary to derive support in the undisturbed alluvial soils found at and below a depth of 5 feet. Recommendations for earthwork are provided in the *Grading* section of this report (see Section 7.4).

7.1.4 All excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon). Prior to placing any fill, the upper 12 inches of the excavation bottom must be scarified, moistened, and proof-rolled with heavy equipment in the presence of the Geotechnical Engineer (a representative of Geocon West, Inc.).

7.1.5 Subsequent to the recommended grading, the proposed structures may be supported on a conventional shallow spread foundation system deriving support in newly placed engineered fill and/or the competent alluvial soils found at and below a depth of 5 feet. It is the intent of the Geotechnical Engineer to allow building foundations to derive support in both engineered fill and competent alluvial soils for this project if conditions warrant such an occurrence. Any exposed soft soils should be compacted to a dense state or penetrated by proposed foundations at the direction of the Geotechnical Engineer (a representative of Geocon West, Inc.).

7.1.6 Where miscellaneous subterranean improvements are planned (Elevator Pits), the structures may be supported on a conventional foundation system deriving support in the undisturbed alluvial soils found at and below a depth of 5 feet. If necessary, these miscellaneous improvements may derive support in a combination of newly placed engineered fill and competent alluvium found at and below a depth of 5 feet. It is the intent of the Geotechnical Engineer to allow miscellaneous subterranean structures to derive support in both engineered fill and alluvium if project conditions warrant such an occurrence. Recommendations for elevator pit design are provided in Section 7.15.

7.1.7 It is anticipated that stable excavations for the recommended grading associated with the proposed structures can be achieved with sloping measures. However, if excavations in close proximity to an adjacent property line and/or structure are required, special excavation measures may be necessary in order to maintain lateral support of offsite improvements. Excavation recommendations are provided in the *Temporary Excavations* section of this report (Section 7.17).

7.1.8 Foundations for small outlying structures, such as block walls up to 6 feet high, planter walls or trash enclosures, which will not be tied to the proposed structure, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and proper compaction cannot be performed, foundations may derive support directly in the undisturbed alluvial soils, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials. If the soils exposed in the excavation bottom are soft or loose, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved in writing by a Geocon representative.

7.1.9 Where new paving is to be placed, it is recommended that all existing fill soils and soft alluvial soils be excavated and properly compacted for paving support. The client should be aware that excavation and compaction of all existing fill in the area of new paving is not required, however, paving constructed over existing uncertified fill or unsuitable soils may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of soil should be scarified and properly compacted. Paving recommendations are provided in the *Preliminary Pavement Recommendations* section of this report (see Sections 7.11 and 7.12).

7.1.10 Based on the results of percolation testing performed at the site, a stormwater infiltration system is considered feasible for this project. Recommendations for infiltration are provided in the *Stormwater Infiltration* section of this report (see Section 7.19).

7.1.11 Once the design and foundation loading configuration for the proposed structure proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Based on the final foundation loading configurations, the potential for settlement should be reevaluated by this office.

7.1.12 Any changes in the design, location or elevation of improvements, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

7.2 Soil and Excavation Characteristics

7.2.1 The in-situ soils can be excavated with moderate effort using conventional excavation equipment. Caving should be anticipated in unshored excavations, especially where granular soils are encountered.

7.2.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable OSHA rules and regulations to maintain safety and maintain the stability of adjacent existing improvements.

7.2.3 All onsite excavations must be conducted in such a manner that potential surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load. Penetrations below this 1:1 projection will require special excavation measures such as sloping and shoring. Excavation recommendations are provided in the *Temporary Excavations* section of this report (see Section 7.17).

7.2.4 The upper 5 feet of existing site soils encountered during this investigation are considered to have a "very low" expansive potential (EI = 1); and the soils are classified as "non-expansive" based on the 2019 California Building Code (CBC) Section 1803.5.3. The recommendations in this report assume that foundations and slabs will derive support in these materials.

7.3 Minimum Resistivity, pH, and Water-Soluble Sulfate

7.3.1 Potential of Hydrogen (pH) and resistivity testing as well as chloride content testing were performed on representative samples of soil to generally evaluate the corrosion potential to surface utilities. The tests were performed in accordance with California Test Method Nos. 643 and 422 and indicate that the soils are considered "corrosive" with respect to corrosion of buried ferrous metals on site. The results are presented in Appendix B (Figure B9) and should be considered for design of underground structures.

7.3.2 Laboratory tests were performed on representative samples of the site materials to measure the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate tests are presented in Appendix B (Figure B9) and indicate that the on-site materials possess sulfate exposure class of "S0" to concrete structures as defined by 2019 CBC Section 1904 and ACI 318-19 Chapter 19.

7.3.3 Geocon West, Inc. does not practice in the field of corrosion engineering and mitigation. If corrosion sensitive improvements are planned, it is recommended that a corrosion engineer be retained to evaluate corrosion test results and incorporate the necessary precautions to avoid premature corrosion of buried metal pipes and concrete structures in direct contact with the soils.

7.4 Grading

7.4.1 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer and soil engineer in attendance. Special soil handling requirements can be discussed at that time.

7.4.2 Earthwork should be observed, and compacted fill tested by representatives of Geocon West, Inc. The existing fill and alluvial soils encountered during exploration are suitable for reuse as engineered fill, provided any encountered oversize material (greater than 6 inches) and any encountered deleterious debris is removed.

7.4.3 Grading should commence with the removal of all existing vegetation and existing improvements from the area to be graded. Deleterious debris such as wood and root structures should be exported from the site and should not be mixed with the fill soils. Asphalt and concrete should not be mixed with the fill soils unless approved by the Geotechnical Engineer. All existing underground improvements planned for removal should be completely excavated and the resulting depressions properly backfilled in accordance with the procedures described herein. Once a clean excavation bottom has been established it must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

7.4.4 As a minimum, it is recommended that the upper 5 feet of existing earth materials within the proposed building footprint areas be excavated and properly compacted for foundation and slab support. Deeper excavations should be conducted as necessary to remove deeper artificial fill or soft alluvial soil at the direction of the Geotechnical Engineer (a representative of Geocon). The limits of existing fill and/or soft alluvial soils removal will be verified by the Geocon representative during site grading activities. The excavation should extend laterally a minimum distance of 3 feet beyond the building footprint area, including building appurtenances, or a distance equal to the depth of fill below the foundation, whichever is greater. Where the recommended lateral over-excavation cannot be performed, such as adjacent to a property line, foundations should be deepened as necessary to derive support in the undisturbed alluvial soils found at or below a depth of 5 feet.

7.4.5 All excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon). Prior to placing any fill, the upper 12 inches of the excavation bottom must be scarified, moistened, and proof-rolled with heavy equipment in the presence of the Geotechnical Engineer (a representative of Geocon West, Inc.). Any exposed soft soils should be compacted to a dense state or penetrated by proposed foundations at the direction of the Geotechnical Engineer (a representative of Geocon West, Inc.).

7.4.6 All fill and backfill soils should be placed in horizontal loose layers approximately 6 to 8 inches thick, moisture conditioned to near optimum moisture content, and properly compacted to a minimum of 90 percent of the maximum dry density per ASTM D 1557 (latest edition).

7.4.7 It is anticipated that stable excavations for the recommended grading associated with the proposed structures can be achieved with sloping measures. However, if excavations in close proximity to an adjacent property line and/or structure are required, special excavation measures may be necessary in order to maintain lateral support of offsite improvements. Excavation recommendations are provided in the *Temporary Excavations* section of this report (see Section 7.17).

7.4.8. Where new paving is to be placed, it is recommended that all existing fill and soft alluvium be excavated and properly compacted for paving support. As a minimum, the upper 12 inches of soil should be scarified, moisture conditioned to near optimum moisture content, and compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Sections 7.11 and 7.12).

7.4.9 Foundations for small outlying structures, such as block walls up to 6 feet high, planter walls or trash enclosures, which will not be tied to the proposed structure, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and proper compaction cannot be performed, foundations may derive support directly in the undisturbed alluvial soils, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials. If the soils exposed in the excavation bottom are soft or loose, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved in writing by a Geocon representative.

7.4.10 All imported fill shall be observed, tested, and approved by Geocon West, Inc. prior to bringing soil to the site. Rocks larger than 6 inches in diameter shall not be used in the fill. Import soils used as structural fill should have an expansion index less than 20 and corrosivity properties that are equally or less detrimental to that of the existing onsite soils (see Figure B9). Import soils placed in the building area should be placed uniformly across the building pad or in a manner that is approved by the Geotechnical Engineer (a representative of Geocon).

7.4.11 Utility trenches should be properly backfilled in accordance with the following requirements. The pipe should be bedded with clean sands (Sand Equivalent greater than 30) to a depth of at least 1 foot over the pipe, and the bedding material must be inspected and approved in writing by the Geotechnical Engineer (a representative of Geocon). The use of gravel is not acceptable unless used in conjunction with filter fabric to prevent the gravel from having direct contact with soil. The remainder of the trench backfill may be derived from onsite soil or approved import soil, compacted as necessary, until the required compaction is obtained. The use of minimum 2-sack slurry as backfill is also acceptable. Prior to placing any bedding materials or pipes, the trench excavation bottom must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon).

7.4.12 All trench and foundation excavation bottoms must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon), prior to placing bedding sands, fill, steel, gravel, or concrete.

7.5 Shrinkage

7.5.1 Shrinkage results when a volume of material removed at one density is compacted to a higher density. A shrinkage factor of between 10 and 20 percent should be anticipated when excavating and compacting the upper 5 feet of existing earth materials on the site to an average relative compaction of 92 percent.

7.4.2 If import soils will be utilized in the building pads, the soils must be placed uniformly and at equal thickness at the direction of the Geotechnical Engineer (a representative of Geocon West, Inc.). Soils can be borrowed from non-building pad areas and later replaced with imported soils.

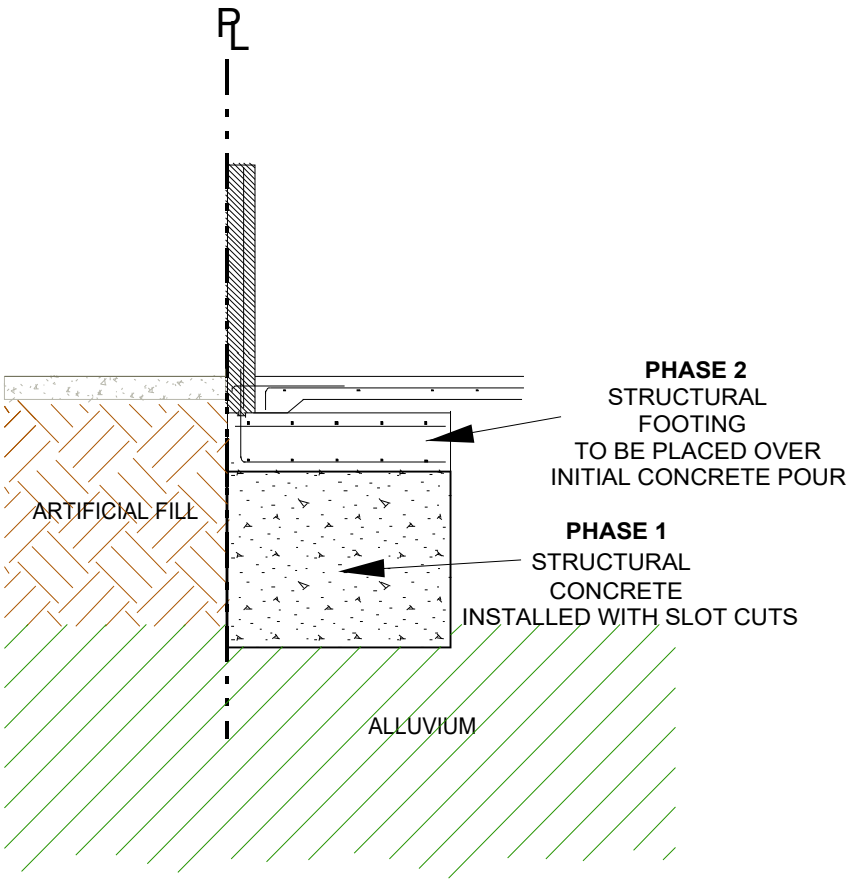
7.6 Foundation Design

7.6.1 Subsequent to the recommended grading, a conventional shallow spread foundation system may be utilized for support of the proposed structures provided foundations derive support in newly placed engineered fill and/or the competent alluvial soils found at and below a depth of 5 feet. It is the intent of the Geotechnical Engineer to allow building foundations to derive support in both engineered fill and competent alluvial soils for this project if conditions warrant such an occurrence. All foundation excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon) prior to placing steel or concrete. Any exposed soft soils should be compacted to a dense state or penetrated by proposed foundations at the direction of the Geotechnical Engineer (a representative of Geocon West, Inc.).

7.6.2 Special excavation measures, such as slot cutting, will be required to construct foundations along the property line. Recommendations for slot cutting are provided in Section 7.18 of this report.

7.6.3 Foundations along the property line may be constructed in two phases using slot cutting to create temporary excavations and quickly restore the majority of the support. It is recommended that this project be mass graded prior to performing any foundation excavations along the property lines.

7.6.4 The first phase of foundation construction will be to excavate a temporary slot-cut excavation. The lower portion of the excavation, once approved by Geocon, can be backfilled with structural concrete up to the desired bottom of foundation depth. The project structural engineer should determine if the Phase 1 concrete pour requires any reinforcing and/or a key between the two pours. The excavation should be backfilled on the same day the excavation is opened. The second phase of the foundation construction will be to place the reinforced structural foundation on top of the previously placed Phase 1 concrete. The two-part foundation construction is illustrated below.



7.6.5 If two-part foundation construction is used, the structural footing will be bounded laterally by artificial fill and, therefore, passive pressure along the sides of the foundations cannot be utilized. Resistance to lateral loads should be provided via structural connections to other portions of the structure.

7.6.6 Continuous footings may be designed for an allowable bearing capacity of 2,500 pounds per square foot (psf), and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing material.

7.6.7 Isolated spread foundations may be designed for an allowable bearing capacity of 3,000 psf, and should be a minimum of 24 inches in width, 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing material.

7.6.8 The allowable soil bearing pressure above may be increased by 250 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 5,000 psf.

7.6.9 The allowable bearing pressures may be increased by one-third for transient loads due to wind or seismic forces.

7.6.10 Continuous footings should be reinforced with a minimum of four No. 4 steel reinforcing bars, two placed near the top of the footing and two near the bottom. The reinforcement for isolated spread footings should be designed by the project structural engineer.

7.6.11 If depth increases are utilized for the exterior wall footings, this office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

7.6.12 No special subgrade presaturation is required prior to placement of concrete. However, the slab and foundation subgrade should be sprinkled as necessary; to maintain a moist condition as would be expected in any concrete placement.

7.6.13 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

7.6.14 This office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

7.7 Foundation Settlement

7.7.1 The maximum expected static settlement for the parking structures supported on a conventional foundation system designed with a maximum bearing pressure of 5,000 psf, and deriving support in the recommended bearing materials is estimated to be less than 1 inch and occur below the heaviest loaded structural element. Settlement of the foundation system is expected to occur on initial application of loading. Differential settlement is not expected to exceed ½ inch over a distance of 20 feet.

7.7.2 The maximum expected static settlement for the seven-story mixed-use structure supported on a conventional foundation system designed with a maximum bearing pressure of 5,000 psf and deriving support in the recommended bearing materials is estimated to be less than 1½ inches and occur below the heaviest loaded structural element. Settlement of the foundation system is expected to occur on initial application of loading. Differential settlement is not expected to exceed ¾ inch over a distance of 20 feet.

7.7.3 The maximum expected static settlement for the five-story residential structure supported on a conventional foundation system designed with a maximum bearing pressure of 5,000 psf and deriving support in the recommended bearing materials is estimated to be less than ½ inch and occur below the heaviest loaded structural element. Settlement of the foundation system is expected to occur on initial application of loading. Differential settlement is not expected to exceed ¼ inch over a distance of 20 feet.

7.7.4 It is recommended that either a seismic separation or flexible connection be utilized where the apartment structures and parking structure may be attached. The design of the connection is at the discretion of the project structural engineer. Additional settlement analyses should be performed once the foundation loading configuration for the proposed structures is finalized to further evaluate the potential for differential settlement between the residential structure and parking structure. The utilization of a lesser bearing value, or increasing the thickness of engineered fill below the foundations, would further reduce the anticipated settlements and could be evaluated once the design becomes more finalized.

7.7.5 It is recommended that flexible utility connections be utilized for all rigid utilities to minimize or prevent damage to utilities from minor differential movements.

7.7.6 Once the design and foundation loading configurations for the proposed structures proceeds to a more finalized plan, the estimated settlements presented in this report should be reviewed and revised, if necessary. If the final foundation loading configurations are greater than the assumed loading conditions, the potential for settlement should be reevaluated by this office.

7.8 Miscellaneous Foundations

7.8.1 Foundations for small outlying structures, such as block walls up to 6 feet in height, planter walls or trash enclosures, which will not be structurally supported by the proposed building, may be supported on conventional foundations deriving support on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed, such as adjacent to property lines, foundations may derive support in the undisturbed alluvial soils, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials.

7.8.2 If the soils exposed in the excavation bottom are loose, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative. Miscellaneous foundations may be designed for a bearing value of 1,500 psf, and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade and 12 inches into the recommended bearing material. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

7.8.3 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated.

7.9 Lateral Design

7.9.1 Resistance to lateral loading may be provided by friction acting at the base of foundations, slabs and by passive earth pressure. An allowable coefficient of friction of 0.35 may be used with the dead load forces in the newly placed engineered fill or undisturbed alluvial soils.

7.9.2 Passive earth pressure for the sides of foundations and slabs poured against newly placed engineered fill or undisturbed alluvial soils may be computed as an equivalent fluid having a density of 230 pounds per cubic foot (pcf) with a maximum earth pressure of 2,300 psf. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third. A one-third increase in the passive value may be used for wind or seismic loads.

7.10 Concrete Slabs-on-Grade

7.10.1 Concrete slabs-on-grade subject to vehicle loading should be designed in accordance with the recommendations in the *Preliminary Pavement Recommendations* section of this report (Section 7.11).

7.10.2 Subsequent to the recommended grading, concrete slabs-on-grade for structures, not subject to vehicle loading, should be a minimum of 4 inches thick and minimum slab reinforcement should consist of No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Steel reinforcing should be positioned vertically near the slab midpoint.

7.10.3 Slabs-on-grade at the ground surface that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder placed directly beneath the slab. The vapor retarder and acceptable permeance should be specified by the project architect or developer based on the type of floor covering that will be installed. The vapor retarder design should be consistent with the guidelines presented in Section 9.3 of the American Concrete Institute's (ACI) Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials (ACI 302.2R-06) and should be installed in general conformance with ASTM E 1643 (latest edition) and the manufacturer's recommendations. A minimum thickness of 15 mils extruded polyolefin plastic is recommended; vapor retarders which contain recycled content or woven materials are not recommended. The vapor retarder should have a permeance of less than 0.01 perms demonstrated by testing before and after mandatory conditioning. The vapor retarder should be installed in direct contact with the concrete slab with proper perimeter seal. If the California Green Building Code requirements apply to this project, the vapor retarder should be underlain by 4 inches of clean aggregate. It is important that the vapor retarder be puncture resistant since it will be in direct contact with angular gravel. As an alternative to the clean aggregate suggested in the Green Building Code, it is our opinion that the concrete slab-on-grade may be underlain by a vapor retarder over 4 inches of clean sand (sand equivalent greater than 30), since the sand will serve a capillary break and will minimize the potential for punctures and damage to the vapor barrier.

7.10.4 For seismic design purposes, a coefficient of friction of 0.35 may be utilized between concrete slabs and subgrade soils without a moisture barrier, and 0.15 for slabs underlain by a moisture barrier.

7.10.5 Exterior slabs for walkways or flatwork, not subject to traffic loads, should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Prior to construction of slabs, the upper 12 inches of subgrade should be moisture conditioned to near optimum moisture content and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Crack control joints should be spaced at intervals not greater than 10 feet and should be constructed using saw-cuts or other methods as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. Construction joints should be designed by the project structural engineer.

7.10.6 The recommendations of this report are intended to reduce the potential for cracking of slabs due to settlement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.11 Preliminary Pavement Recommendations

7.11.1 Where new paving is to be placed, it is recommended that all existing fill and soft alluvium materials be excavated and properly compacted for paving support. The client should be aware that excavation and compaction of all existing artificial fill and soft alluvium in the area of new paving is not required; however, paving constructed over existing uncertified fill or unsuitable alluvium material may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of paving subgrade should be scarified, moisture conditioned to near optimum moisture content, and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

7.11.2 The following pavement sections are based on an assumed R-Value of 20. Once site grading activities are complete an R-Value should be obtained by laboratory testing to confirm the properties of the soils serving as paving subgrade, prior to placing pavement.

7.11.3 The Traffic Indices listed below are estimates. Geocon does not practice in the field of traffic engineering. The actual Traffic Index for each area should be determined by the project civil engineer. If pavement sections for Traffic Indices other than those listed below are required, Geocon should be contacted to provide additional recommendations. Pavement thicknesses were determined following procedures outlined in the *California Highway Design Manual* (Caltrans). It is anticipated that the majority of traffic will consist of automobile and large truck traffic.

PRELIMINARY PAVEMENT DESIGN SECTIONS

Location	Estimated Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Automobile Parking and Driveways	4.0	3.0	4.0
Trash Truck & Fire Lanes	7.0	4.0	12.0

7.11.4 Asphalt concrete should conform to Section 203-6 of the "*Standard Specifications for Public Works Construction"* (Green Book). Class 2 aggregate base materials should conform to Section 26-1.02A of the "*Standard Specifications of the State of California, Department of Transportation"* (Caltrans). The use of Crushed Miscellaneous Base (CMB) in lieu of Class 2 aggregate base is acceptable. Crushed Miscellaneous Base should conform to Section 200-2.4 of the "*Standard Specifications for Public Works Construction"* (Green Book).

7.11.5 Unless specifically designed and evaluated by the project structural engineer, where exterior concrete paving will be utilized for support of vehicles, it is recommended that the concrete be a minimum of 6 inches of concrete reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Concrete paving supporting vehicular traffic should be underlain by a minimum of 4 inches of aggregate base and a properly compacted subgrade. The subgrade and base material should be compacted to 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

7.11.6 The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of pavements. Ponding of water on or adjacent to the pavement will likely result in saturation of the subgrade materials and subsequent cracking, subsidence and pavement distress. If planters are planned adjacent to paving, it is recommended that the perimeter curb be extended at least 12 inches below the bottom of the aggregate base to minimize the introduction of water beneath the paving.

7.12 Vehicular Rated Concrete Paver Recommendations

7.12.1 The following recommendations are based on an assumed R-Value of 20. Once site grading activities are complete and prior to placing pavement, an R-Value should be obtained by laboratory testing to confirm the properties of the soils serving as paving subgrade.

7.12.2 We calculated the paver sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using an estimated Traffic Indices (TI). The project civil engineer and owner should review the pavement designations to determine appropriate locations for pavement thickness. Based on the Interlocking Concrete Pavement Institute (ICPI), the pavers should possess a minimum thickness of 3⅛ inches overlying 1 to 1½ inch of sand. In addition, the pavers should be installed in a pattern acceptable for vehicular traffic. It is anticipated that base materials will be used for the paver underlayment. The pavers are for decorative purposes and will not be installed for stormwater management. The table below presents the recommended concrete-unit paver sections.

RECOMMENDED CONCRETE UNIT PAVER SECTIONS

Location	Traffic Index	Equivalent Paver Asphalt Concrete Thickness** (inches)	Estimated Sand Thickness (inches)	Min. Aggregate Base Thickness (inches)
Automobile Parking and Driveways	4.0	3⅛	1 – 1½	7.0
Trash Truck & Fire Lanes	7.0	3⅛	1 – 1½	13.5

** indicates estimated value

7.12.3 Prior to placing base materials, the subgrade should be scarified to a depth of approximately 12 inches, moisture conditioned to near optimum moisture content, and compacted to a dry density of at least 95 percent of the laboratory maximum dry density as determined by ASTM D 1557. Similarly, the base materials should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density at or slightly above optimum moisture content.

7.12.4 Although the pavers are not intended for stormwater infiltration, consideration should be given to installing a subdrain for the paver sections. The subdrain could be placed at the bottom of the base section below the pavers and the soil subgrade should be graded to allow water to flow to a subdrain. The subdrain should run the distance of the paver area to reduce the potential for water to build up within the paving section. The drain should be connected to an approved drainage device. The drain should consist of a 3-inch diameter perforated Schedule 40, PVC pipe and placed at the bottom of the base materials.

7.12.5 The pavers should be installed and maintained in accordance with the manufacturer's recommendations. Future property owners should be made aware and responsible for the maintenance program. In addition, pavers tend to shift vertically and horizontally during the life of the pavement and should be expected. The pavers normally require a concrete border to prevent lateral movement from traffic. The concrete border surrounding the pavers should be embedded at least 6 inches from finish grade surface to reduce the potential for water migration to the adjacent landscape areas and pavement areas. The pavers should be placed tightly adjacent to each other and the spacing between the paver units should be filled with appropriate filler. A polymer sand (Poly-Sand) can be used on the non-storm water quality paver area to help prevent water infiltration.

7.12.6 The performance of pavement is highly dependent on providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement will likely result in pavement distress and subgrade failure. Drainage from landscaped areas should be directed to controlled drainage structures. Landscape areas adjacent to the edge of asphalt pavements are not recommended due to the potential for surface or irrigation water to infiltrate the underlying permeable aggregate base and cause distress. Where such a condition cannot be avoided, consideration should be given to incorporating measures that will significantly reduce the potential for subsurface water migration into the aggregate base. If planter islands are planned, the perimeter curb should extend at least 6 inches below the level of the base materials.

7.13 Retaining Wall Design

7.13.1 The recommendations presented below are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 5 feet. In the event that walls significantly higher than 5 feet are planned, Geocon should be contacted for additional recommendations.

7.13.2 Retaining wall foundations may be designed in accordance with the recommendations provided in the *Foundation Design* section of this report (see Section 7.6).

7.13.3 Retaining walls with a level backfill surface that are not restrained at the top should be designed utilizing a triangular distribution of pressure (active pressure) of 30 pcf.

7.13.4 Restrained walls are those that are not allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, walls may be designed utilizing a triangular distribution of pressure (at-rest pressure) of 65 pcf.

7.13.5 The wall pressures provided above assume that the proposed retaining walls will support relatively undisturbed alluvial soils or engineered fill derived from onsite soils. If import soil will be used to backfill proposed retaining walls, revised earth pressures may be required to account for the geotechnical properties of the import soil used as engineered fill. This should be evaluated once the use of import soil is established. All imported fill shall be observed, tested, and approved by Geocon West, Inc. prior to bringing soil to the site.

7.13.6 The wall pressures provided above assume that the retaining wall will be properly drained preventing the buildup of hydrostatic pressure. If retaining wall drainage is not implemented, the equivalent fluid pressure to be used in design of undrained walls is 95 pcf. The value includes hydrostatic pressures plus buoyant lateral earth pressures.

7.13.7 Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent structures and should be designed for each condition as the project progresses.

7.14 Retaining Wall Drainage

7.14.1 Retaining walls not designed for hydrostatic pressures should be provided with a drainage system extended at least two-thirds the height of the wall. At the base of the drain system, a subdrain covered with a minimum of 12 inches of gravel should be installed, and a compacted fill blanket or other seal placed at the surface (see Figure 5). The clean bottom and subdrain pipe, behind a retaining wall, should be observed by the Geotechnical Engineer (a representative of Geocon), prior to placement of gravel or compacting backfill.

7.14.2 As an alternative, a plastic drainage composite such as Miradrain or equivalent may be installed in continuous, 4-foot-wide columns along the entire back face of the wall, at 8 feet on center. The top of these drainage composite columns should terminate approximately 18 inches below the ground surface, where either hardscape or a minimum of 18 inches of relatively cohesive material should be placed as a cap (see Figure 6).

7.14.3 Subdrainage pipes at the base of the retaining wall drainage system should outlet to an acceptable location via controlled drainage structures. Drainage should not be allowed to flow uncontrolled over descending slopes.

7.14.4 Moisture affecting below grade walls is one of the most common post-construction complaints. Poorly applied or omitted waterproofing can lead to efflorescence or standing water. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

7.15 Elevator Pit Design

7.15.1 The elevator pit slab and retaining wall should be designed by the project structural engineer. Elevator pit walls may be designed in accordance with the recommendations in the *Foundation Design* and *Retaining Wall Design* sections of this report (see Sections 7.6 and 7.13).

7.15.2 Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent foundations and should be designed for each condition as the project progresses.

7.15.3 If retaining wall drainage is to be provided, the drainage system should be designed in accordance with the *Retaining Wall Drainage* section of this report (see Section 7.14).

7.15.4 It is suggested that the elevator pit walls and slab be waterproofed to prevent excessive moisture inside of the elevator pit. Waterproofing design and installation is not the responsibility of the geotechnical engineer.

7.16 Elevator Piston

7.16.1 If a plunger-type elevator piston is installed for this project, a deep drilled excavation will be required. It is important to verify that the drilled excavation is not situated immediately adjacent to a foundation, or the drilled excavation could compromise the existing foundation, especially if the drilling is performed subsequent to the foundation construction.

7.16.2 Casing may be required if caving is experienced in the drilled excavation. The contractor should be prepared to use casing and should have it readily available at the commencement of drilling activities. Continuous observation of the drilling and installation of the elevator piston by the Geotechnical Engineer (a representative of Geocon West, Inc.) is required.

7.16.3 The annular space between the piston casing and drilled excavation wall should be filled with a minimum of 1½-sack slurry pumped from the bottom up. As an alternative, pea gravel may be utilized. The use of soil to backfill the annular space is not acceptable.

7.17 Temporary Excavations

7.17.1 Excavations up to 5 feet in height may be required during grading and construction operations. The excavations are expected to expose artificial fill and alluvial soils, which are suitable for vertical excavations up to 5 feet in height where loose soils or caving sands are not present, and where not surcharged by adjacent traffic or structures.

7.17.2 Vertical excavations greater than 5 feet or where surcharged by existing structures will require sloping or shoring measures in order to provide a stable excavation. Where sufficient space is available, temporary unsurcharged embankments could be sloped back at a uniform 1:1 slope gradient or flatter up to a maximum height of 10 feet. A uniform slope does not have a vertical portion.

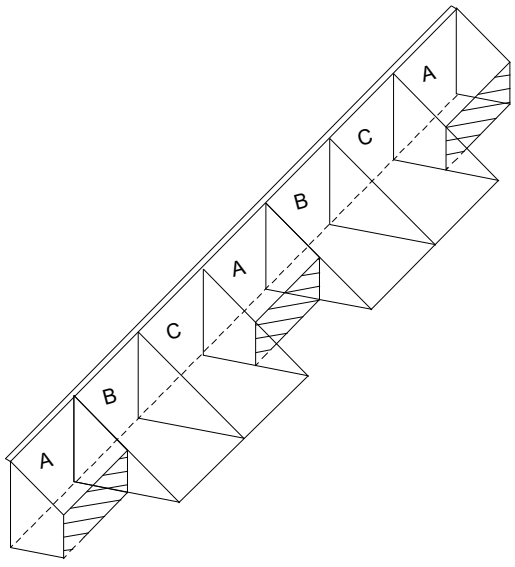
7.17.3 If excavations in close proximity to an adjacent property line and/or structure are required, special excavation measures such as slot-cutting or shoring may be necessary in order to maintain lateral support of offsite improvements. Recommendations for slot cutting are provided in Section 7.18 of this report.

7.17.4 Where temporary construction slopes are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary construction slopes are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces. Geocon personnel should inspect the soils exposed in the cut slopes during excavation so that modifications of the slopes can be made if variations in the soil conditions occur. All excavations should be stabilized within 30 days of initial excavation.

7.18 Slot Cutting

7.18.1 The slot-cutting method employs the earth as a buttress and allows the earth excavation to proceed in phases. Where slot-cutting is used for foundation construction, the proposed construction techniques should be discussed with the structural engineer so that appropriate modifications can be made to the foundation design, such as additional reinforcing or details for doweling.

7.18.2 It is recommended that the initial temporary excavation along the property line be sloped back at a uniform 1:1 (H:V) slope gradient or flatter for excavation of the existing soils to the necessary depth. The temporary excavation should not extend below the surcharge area of any adjacent foundations. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation. The temporary slope may then be excavated using the slot-cutting (see illustration below).



7.18.3 For unsurcharged excavations, alternate "A" slots of 8 feet in width may be worked. The remaining earth buttresses ("B" and "C" slots) should also be 8 feet in width. The wall, foundation, or backfill should be completed in the "A" slots to a point where support of the offsite property and/or any existing structures is restored before the "B" slots are excavated. After completing the wall, foundation, or backfill in the "B" slots, finally the "C" slots may be excavated. Slot-cutting is not recommended for vertical excavations greater than 5 feet in height. A slot-cut calculation is provided in the table on the following page, and assumes no surcharge loads will be acting on the excavation.

Slot Cut Calculation

Input:

Height of Slots	(H)	5.0	feet
Unit Weight of Soils	(γ)	120.0	pcf
Friction Angle of Soils	(ϕ)	29.0	degrees
Cohesion of Soils	(c)	150.0	psf
Factor of Safety	(FS)	1.25	

Factor of Safety = Resistance Force/Driving Force

Design Equations

$b = H/(\tan \alpha)$

$A = 0.5*H*b$

$W = 0.5*H*b*\gamma$ *(per lineal foot of slot width)*

$F_1 = d*W*(\sin \alpha)$

$R_1 = d*[W*(\cos\alpha)*(\tan \phi)+(c*b)]$

$R_2 = 2*[(0.5*H*b)*c]$

FS = Resistance Force/Driving Force

FS = $(R_1+R_2)/(F_1)$

Surcharge Pressure:

Line Load	(q_L)	0.0	plf
Distance Away from Edge of Excavation	(X)	0.0	feet

Failure Angle (α) degrees	Width of Failure Wedge (b) feet	Area of Failure Wedge (A) feet^2	Weight of Failure Wedge (W) lbs/lineal foot	**Driving Force** Wedge + Surcharge per lineal foot of Slot Wdith	**Resisting Force** Failure Wedge per lineal foot of Slot Width	**Resisting Force** Side Resistance Force lbs	**Allowable Width of Slots*** (d) feet
45	5.0	13	1500.0	1060.7	1648.6	3750.0	8.0
46	4.8	12	1448.5	1042.0	1600.4	3621.3	8.0
47	4.7	12	1398.8	1023.0	1554.3	3496.9	8.0
48	4.5	11	1350.6	1003.7	1510.2	3376.5	8.0
49	4.3	11	1303.9	984.1	1467.9	3259.8	8.0
50	4.2	10	1258.6	964.2	1427.5	3146.6	8.0
51	4.0	10	1214.7	944.0	1388.8	3036.7	8.0
52	3.9	10	1171.9	923.5	1351.7	2929.8	8.0
53	3.8	9	1130.3	902.7	1316.2	2825.8	8.0
54	3.6	9	1089.8	881.7	1282.1	2724.5	8.0
55	3.5	9	1050.3	860.4	1249.5	2625.8	8.0
56	3.4	8	1011.8	838.8	1218.3	2529.4	8.0
57	3.2	8	974.1	817.0	1188.4	2435.3	8.0
58	3.1	8	937.3	794.9	1159.7	2343.3	8.0
59	3.0	8	901.3	772.6	1132.3	2253.2	8.0
60	2.9	7	866.0	750.0	1106.0	2165.1	8.0
61	2.8	7	831.5	727.2	1081.0	2078.7	8.0
62	2.7	7	797.6	704.2	1057.0	1993.9	8.0
63	2.5	6	764.3	681.0	1034.1	1910.7	8.0
64	2.4	6	731.6	657.6	1012.2	1829.0	8.0
65	2.3	6	699.5	633.9	991.4	1748.7	8.0
66	2.2	6	667.8	610.1	971.5	1669.6	8.0
67	2.1	5	636.7	586.1	952.7	1591.8	8.0
68	2.0	5	606.0	561.9	934.7	1515.1	8.0
69	1.9	5	575.8	537.6	917.7	1439.5	8.0
70	1.8	5	546.0	513.0	901.6	1364.9	8.0

* Width of Slots to achieve a minimum of 1.25 Factor of Safety, with a Maximum Allowable Slot Width of 8-feet.

Critical Slot Width with Factor of Safety equal or exceeding 1.25:

d_{allow} = 8.0 feet

7.18.4 For surcharged excavations, alternate "A" slots of 3 feet in width may be worked. The remaining earth buttresses ("B" and "C" slots) should also be 3 feet in width. The wall, foundation, or backfill should be completed in the "A" slots to a point where support of the existing structures is restored before the "B" slots are excavated. After completing the wall, foundation, or backfill in the "B" slots, finally the "C" slots may be excavated. Slot-cutting is not recommended for vertical excavations greater than 5 feet in height. A slot-cut calculation is provided on the following page. A surcharge load of 300 pounds per square foot (psf) is included in the slot-cut calculation to account for traffic and pedestrian loads.

Slot Cut Calculation

Input:

Height of Slots	(H)	5.0	feet
Unit Weight of Soils	(γ)	125.0	pcf
Friction Angle of Soils	(ϕ)	29.0	degrees
Cohesion of Soils	(c)	150.0	psf
Factor of Safety	(FS)	1.25	

Factor of Safety = Resistance Force/Driving Force

Design Equations

$b = H/(\tan \alpha)$

$A = 0.5*H*b$

$W = 0.5*H*b*\gamma$ *(per lineal foot of slot width)*

$F_1 = d*W*(\sin \alpha)$

$R_1 = d*[W*(\cos\alpha)*(\tan \phi)+(c*b)]$

$R_2 = 2*[(0.5*H*b)*c]$

FS = Resistance Force/Driving Force

$FS = (R_1+R_2)/(F_1)$

Surcharge Pressure:

Traffic Surcharge	(q)	300.0	psf
Distance Away from Edge of Excavation	(X)	0.0	feet

Failure Angle (α) degrees	Width of Failure Wedge (b) feet	Area of Failure Wedge (A) $feet^2$	Weight of Failure Wedge (W) lbs/lineal foot	**Driving Force** Wedge + Surcharge per lineal foot of Slot Wdith	**Resisting Force** Failure Wedge per lineal foot of Slot Width	**Resisting Force** Side Resistance Force lbs	**Allowable Width of Slots*** (d) feet
45	5.0	13	1562.5	2165.5	1790.7	3750.0	4.1
46	4.8	12	1508.9	2127.4	1739.1	3621.3	3.9
47	4.7	12	1457.1	2088.6	1689.7	3496.9	3.8
48	4.5	11	1406.9	2049.2	1642.3	3376.5	3.7
49	4.3	11	1358.3	2009.2	1596.8	3259.8	3.6
50	4.2	10	1311.1	1968.5	1553.1	3146.6	3.5
51	4.0	10	1265.3	1927.3	1511.1	3036.7	3.4
52	3.9	10	1220.8	1885.5	1470.7	2929.8	3.3
53	3.8	9	1177.4	1843.1	1432.0	2825.8	3.2
54	3.6	9	1135.2	1800.1	1394.7	2724.5	3.2
55	3.5	9	1094.1	1756.6	1358.8	2625.8	3.1
56	3.4	8	1053.9	1712.5	1324.3	2529.4	3.1
57	3.2	8	1014.7	1668.0	1291.2	2435.3	3.1
58	3.1	8	976.4	1622.9	1259.3	2343.3	3.0
59	3.0	8	938.8	1577.3	1228.7	2253.2	3.0
60	2.9	7	902.1	1531.3	1199.2	2165.1	3.0
61	2.8	7	866.1	1484.7	1170.9	2078.7	3.0
62	2.7	7	830.8	1437.8	1143.7	1993.9	3.1
63	2.5	6	796.1	1390.3	1117.6	1910.7	3.1
64	2.4	6	762.1	1342.5	1092.5	1829.0	3.1
65	2.3	6	728.6	1294.3	1068.5	1748.7	3.2
66	2.2	6	695.7	1245.6	1045.5	1669.6	3.3
67	2.1	5	663.2	1196.6	1023.4	1591.8	3.4
68	2.0	5	631.3	1147.2	1002.3	1515.1	3.5
69	1.9	5	599.8	1097.5	982.1	1439.5	3.7
70	1.8	5	568.7	1047.4	962.8	1364.9	3.9

* Width of Slots to achieve a minimum of 1.25 Factor of Safety, with a Maximum Allowable Slot Width of 8-feet.

Critical Slot Width with Factor of Safety equal or exceeding 1.25:

d_{allow} = 3.0 feet

7.19 Stormwater Infiltration

7.19.1 Borings B7 and B8, drilled in May 2018, and borings P2 and P3, drilled in March 2022, were used to perform infiltration testing. The testing was performed in general accordance with the Percolation Test Procedure method outlined in Appendix VII the Orange County Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (December 2013). The field-measured percolation rate has been adjusted to infiltration rates in accordance with TGD requirements. Additional correction factors may be required and should be applied by the engineer in responsible charge of the design of the stormwater infiltration system and based on applicable guidelines. Percolation test data sheets are provided as Figures 7 through 10.

7.19.2 Borings P1 and P4 were conducted with the intention of performing percolation testing; however, the test holes and slotted casing became in-filled with mud during the initial saturation. This was evidenced by the sounder not reaching the bottom of the casing after the introduction of water into the borehole. Thus, testing could not be completed in these boreholes.

Boring	Soil Type	Infiltration Depth (ft)	Average Infiltration Rate (in / hour)
B7	Silty Sand (SM)	10-20½	4.55
B8	Silty Sand (SM)	5 – 10	1.22
P2	Gravelly Sand with Cobbles (SW)	40-45	13.68
P3	Gravelly Sand (SW)	40-45	3.25

7.19.3 The results of the percolation testing indicate that the soils are conductive to infiltration. It is our opinion that the soil zones encountered at the depths and locations as listed in the table above are suitable for infiltration of stormwater.

7.19.4 It is our opinion that the introduction of stormwater at the depth and location indicated above will not induce excessive hydro-consolidation (see Figures B2 through B7), will not create a perched groundwater condition, will not affect soil structure interaction of existing or proposed foundations due to expansive soils, will not saturate soils supported by existing or proposed retaining walls, and will not increase the potential for liquefaction. Resulting settlements are anticipated to be less than ¼ inch, if any.

7.19.5 Where infiltration systems will be utilized, it is recommended that a minimum 10-foot horizontal and vertical setback be maintained from existing or proposed foundations. Additional setbacks may be required by the governing jurisdiction and should be incorporated into the stormwater infiltration system design as necessary.

7.19.6 The drywell contractor should not the presence of cobbles encountered at depth in borings P1 through P4 and be prepared for difficult drilling conditions. The soils at these depths may be prone to caving.

7.19.7 Subsequent to the placement of the infiltration system, it is acceptable to backfill the resulting void space between the excavation sidewalls and the infiltration system with minimum two-sack slurry provided the slurry is not placed in the infiltration zone. It is recommended that pea gravel be utilized adjacent to the infiltration zone so communication of water to the soil is not hindered.

7.19.8 Due to the preliminary nature of the project at this time, the type of stormwater infiltration system and location of the stormwater infiltration systems has not yet been determined. The design drawings should be reviewed and approved by the Geotechnical Engineer. The installation of the stormwater infiltration system should be observed and approved by the Geotechnical Engineer (a representative of Geocon).

7.20 Surface Drainage

7.20.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the original designed engineering properties. Proper drainage should be maintained at all times.

7.20.2 All site drainage should be collected and controlled in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2019 CBC 1804.4 or other applicable standards. In addition, drainage should not be allowed to flow uncontrolled over any descending slope. Discharge from downspouts, roof drains and scuppers are not recommended onto unprotected soils within 5 feet of the building perimeter. Planters which are located adjacent to foundations should be sealed to prevent moisture intrusion into the soils providing foundation support. Landscape irrigation is not recommended within 5 feet of the building perimeter footings except when enclosed in protected planters.

7.20.3 Positive site drainage should be provided away from structures, pavement, and the tops of slopes to swales or other controlled drainage structures. The building pad and pavement areas should be fine graded such that water is not allowed to pond.

7.20.4 Landscaping planters immediately adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Either a subdrain, which collects excess irrigation water and transmits it to drainage structures, or an impervious above-grade planter boxes should be used. In addition, where landscaping is planned adjacent to the pavement, it is recommended that consideration be given to providing a cutoff wall along the edge of the pavement that extends at least 12 inches below the base material.

7.21 Plan Review

7.21.1 Grading and foundation plans should be reviewed by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to finalization to verify that the plans have been prepared in substantial conformance with the recommendations of this report and to provide additional analyses or recommendations.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon West, Inc. should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon West, Inc.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

4. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project Geotechnical Engineer of Record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

LIST OF REFERENCES

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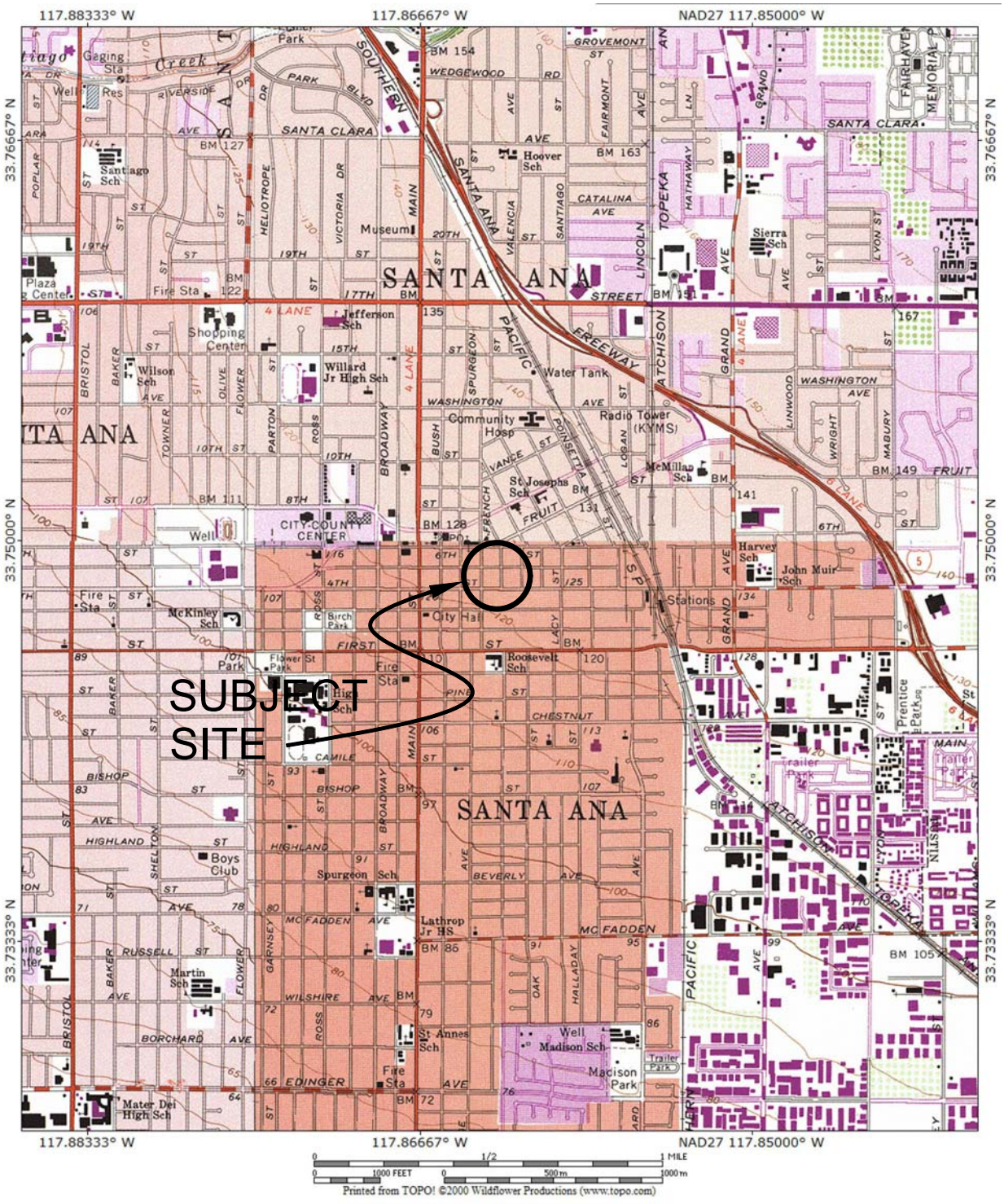

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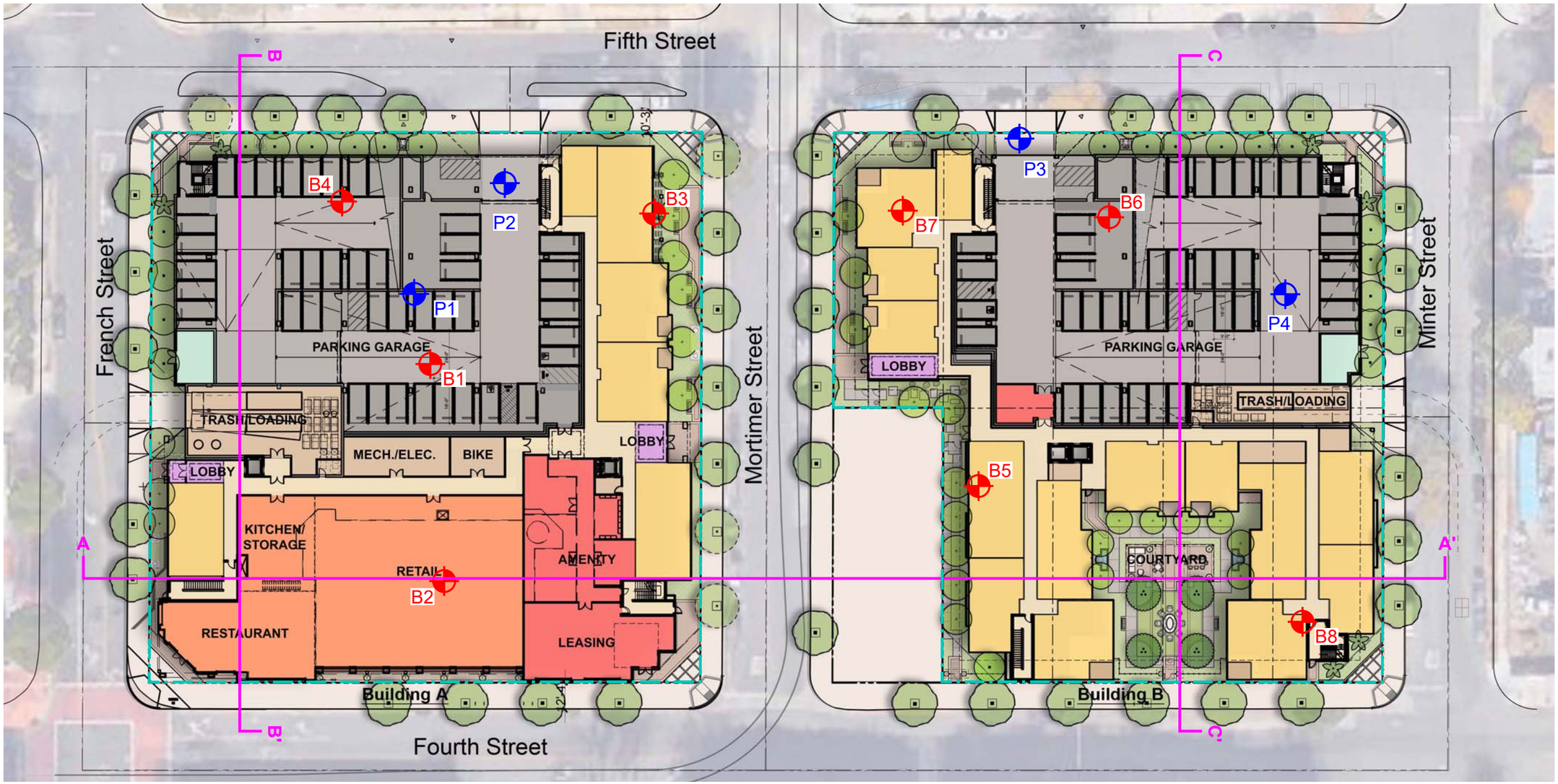
DRAFTED BY: MDS	CHECKED BY: SFK

VICINITY MAP

MIXED-USE DEVELOPMENT

EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022	PROJECT NO. A9799-88-01	FIG. 1



LEGEND

B8 Approximate Location of Boring (2018)

P4 Approximate Location of Percolation Test (2022)

Approximate Location of Property Line

0 50' 100'

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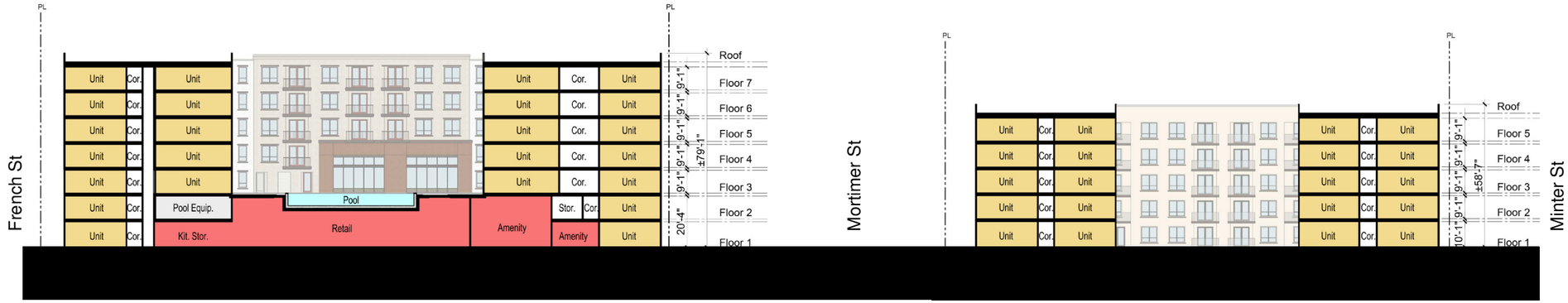
SITE PLAN

MIXED-USE DEVELOPMENT

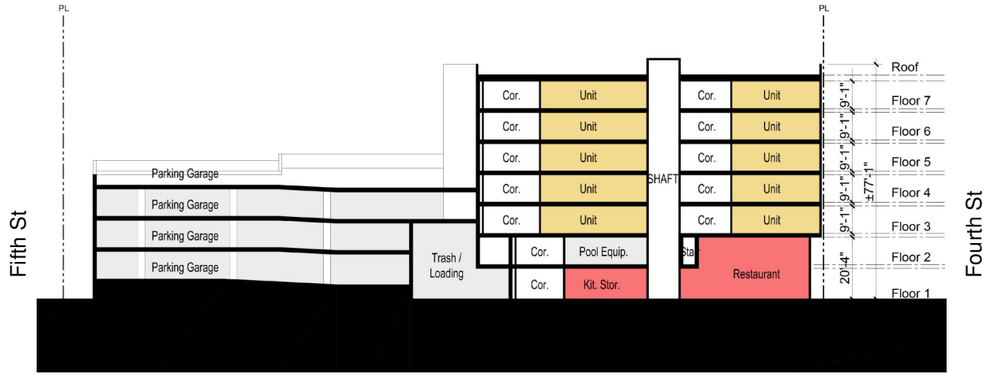
EAST 4TH STREET & MORTIMER STREET

SANTA ANA, CALIFORNIA

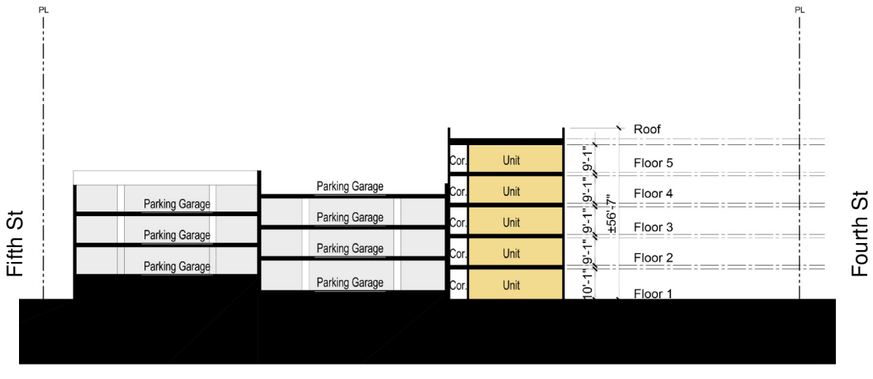
JUNE 2022	PROJECT NO. A9799-88-01	FIG. 2A



SECTION A-A'



SECTION B-B'



SECTION C-C'

0 50' 100'

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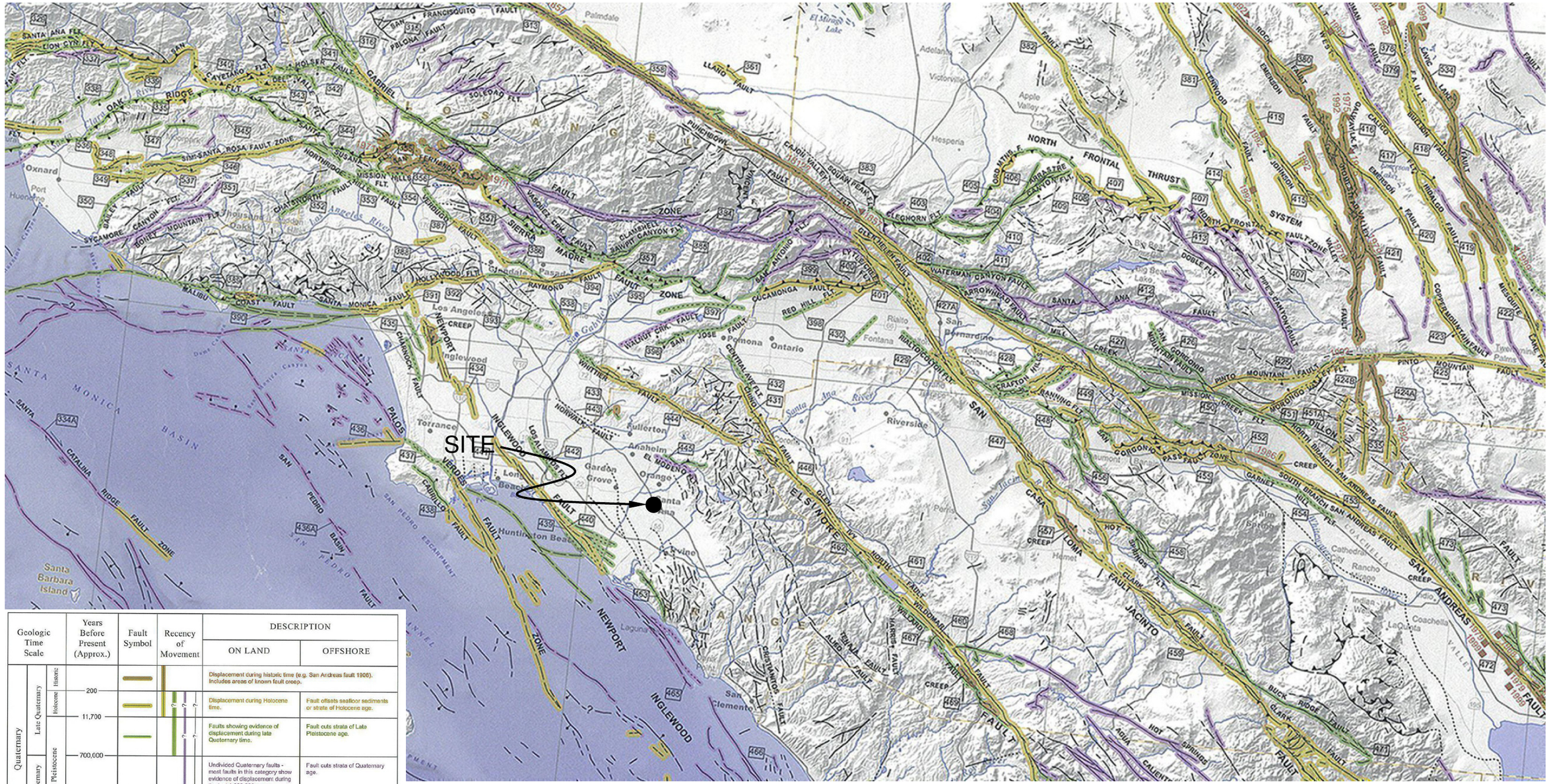
CROSS SECTIONS

MIXED-USE DEVELOPMENT
EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022	PROJECT NO. A9799-88-01	FIG. 2B

Reference: Jennings, C.W. and Bryant, W. A., 2010, Fault Activity Map of California, California Geological Survey Geologic Data Map No. 6.



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION	
						ON LAND	OFFSHORE
Quaternary	Late Quaternary	Historic	200			Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene				Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
		Pleistocene	11,700			Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
	Early Quaternary		700,000			Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age	Fault cuts strata of Quaternary age.
Pre-Quaternary			1,600,000*			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.
			4.5 billion (Age of Earth)				

* Quaternary now recognized as extending to 2.6 Ma (Walker and Geissman, 2009). Quaternary faults in this map were established using the previous 1.6 Ma criterion.

N

0 12 24 Miles

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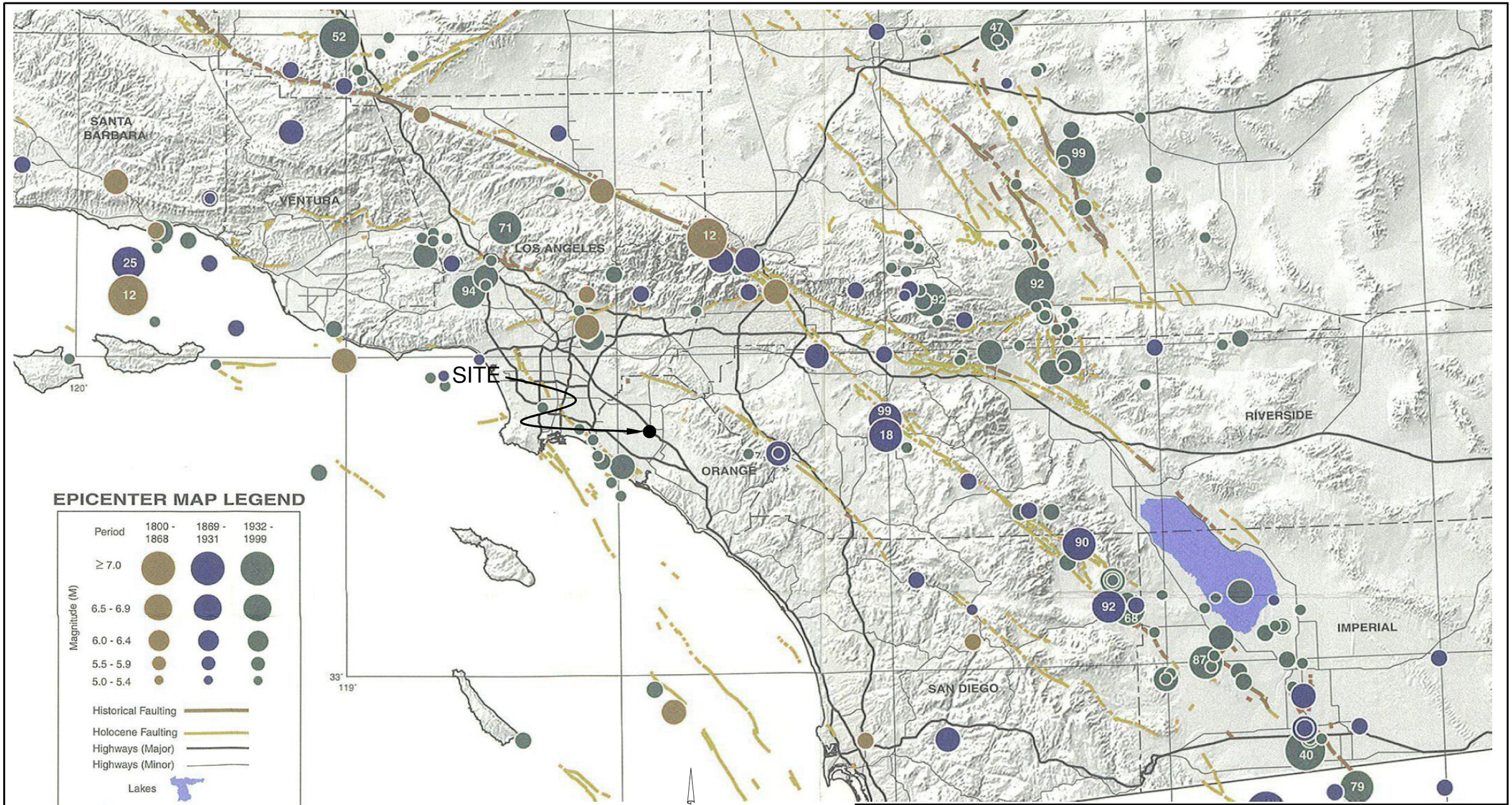
REGIONAL FAULT MAP

MIXED-USE DEVELOPMENT
EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022 | PROJECT NO. A9799-88-01 | FIG. 3



Reference: Toppozada, T., Branum, D., Petersen, M., Hallstrom, C., Cramer, C., and Reichle, M., 2000, Epicenters and Areas Damaged by M≥5 California Earthquakes, 1800 - 1999, California Geological Survey, Map Sheet 49.

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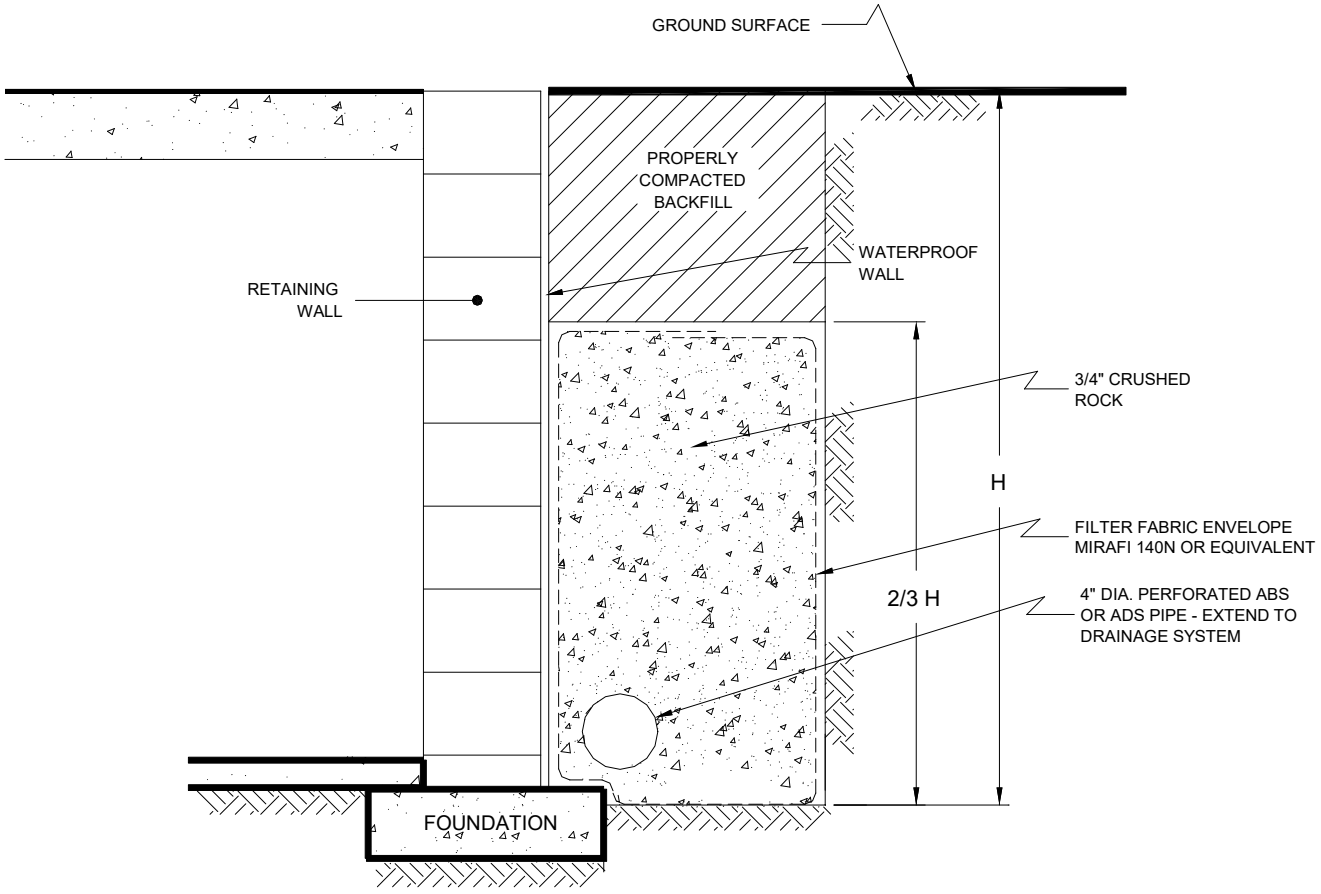
REGIONAL SEISMICITY MAP

MIXED-USE DEVELOPMENT
EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022 | PROJECT NO. A9799-88-01 | FIG. 4



NO SCALE

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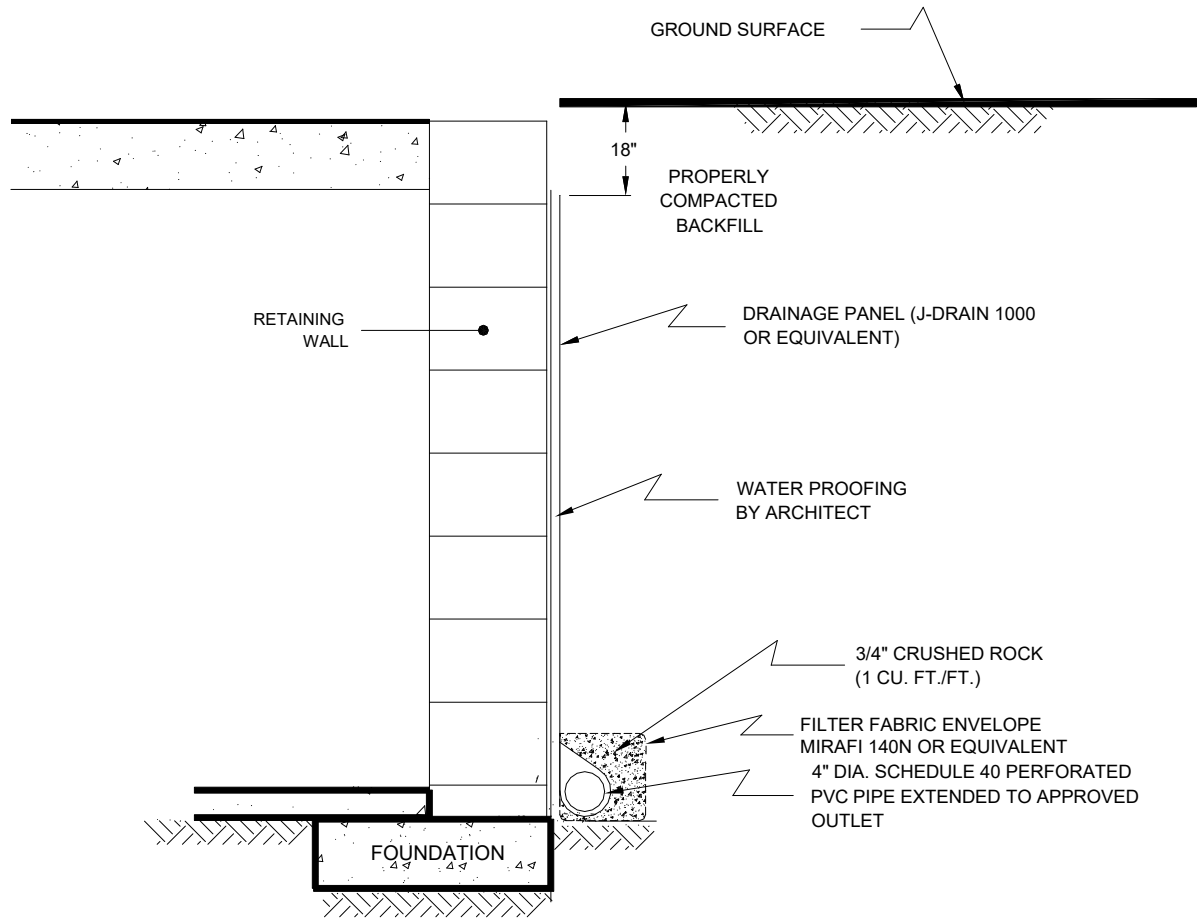
RETAINING WALL DRAIN DETAIL

MIXED-USE DEVELOPMENT

EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022	PROJECT NO. A9799-88-01	FIG. 5



NO SCALE

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PHONE (949) 491-6570

DRAFTED BY: PZ	CHECKED BY: JTA

RETAINING WALL DRAIN DETAIL

MIXED-USE DEVELOPMENT

EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022	PROJECT NO. A9799-88-01	FIG. 6

PERCOLATION TEST DATA SHEET

Project:	4th & Mortimer	Project No:	A9799-88-01	Date:	5/30/2018
Test Hole No:	B7	Tested By:	PZ		
Depth of Test Hole, D_T:	20.5	USCS Soil Classification:	SM		
Test Hole Dimensions (inches)			Length	Width	
Diameter (if round) =	8	Sides (if rectangular) =	---	---	

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Greater than or Equal to 6"? (y/n)
1	10:32	10:57	25	120.0	198.0	78.0	y
2	11:01	11:26	25	120.0	195.6	75.6	y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements, taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Percolation Rate (min/in)
1	11:29	11:39	10	120.0	164.4	44.4	324
2	11:40	11:50	10	120.0	160.8	40.8	353
3	11:52	12:02	10	120.0	162.0	42.0	343
4	12:04	12:14	10	120.0	160.8	40.8	353
5	12:15	12:25	10	120.0	160.8	40.8	353
6	12:27	12:37	10	120.0	160.8	40.8	353
7							
8							

Infiltration Rate Calculation:

Time Interval, Δt =	10	minutes	Ho =	126.0	inches
Final Depth to Water, Df =	160.8	inches	Hf =	85.2	inches
Test Hole Radius, r =	4	inches	ΔH =	40.8	inches
Initial Depth to Water, Do =	120.0	inches	Havg =	105.6	inches
Total Depth of Test Hole, DT =	246.0	inches			

$$I_t = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Infiltration Rate, It = **4.55** inches/hour

FIGURE 7

PERCOLATION TEST DATA SHEET

Project:	4th & Mortimer	Project No:	A9799-88-01	Date:	5/30/2018
Test Hole No:	B8	Tested By:	PZ		
Depth of Test Hole, D_T:	10	USCS Soil Classification:	SM		
Test Hole Dimensions (inches)			Length	Width	
Diameter (if round) =	8	Sides (if rectangular) =	---	---	

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Greater than or Equal to 6"? (y/n)
1	8:30	8:55	25	60.0	114.0	54.0	y
2	8:59	9:24	25	60.0	105.6	45.6	y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements, taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Percolation Rate (min/in)
1	9:29	9:39	10	60.0	67.2	7.2	2000
2	9:43	9:53	10	60.0	68.4	8.4	1714
3	9:54	10:04	10	60.0	67.2	7.2	2000
4	10:05	10:15	10	60.0	66.0	6.0	2400
5	10:19	10:29	10	60.0	66.0	6.0	2400
6	10:33	10:43	10	60.0	66.0	6.0	2400
7							
8							

Infiltration Rate Calculation:

Time Interval, Δt =	10	minutes	Ho =	60.0	inches
Final Depth to Water, Df =	66.0	inches	Hf =	54.0	inches
Test Hole Radius, r =	4	inches	ΔH =	6.0	inches
Initial Depth to Water, Do =	60.0	inches	Havg =	57.0	inches
Total Depth of Test Hole, DT =	120.0	inches			

$$I_t = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Infiltration Rate, It = **1.22** inches/hour

FIGURE 8

PERCOLATION TEST DATA SHEET

Project:	4th & Mortimer	Project No:	A9799-88-01	Date:	3/30/2022
Test Hole No:	P2	Tested By:	JC		
Depth of Test Hole, D_T:	45	USCS Soil Classification:	SP		
Test Hole Dimensions (inches)			Length	Width	
Diameter (if round) =	8	Sides (if rectangular) =	---	---	

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Greater than or Equal to 6"? (y/n)
1	12:32	12:57	25	492.0	537.0	45.0	y
2	12:59	13:24	25	492.0	535.8	43.8	y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements, taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Percolation Rate (min/in)
1	1:27	1:37	10	492.0	529.8	37.8	0.26
2	1:40	1:50	10	492.0	529.2	37.2	0.27
3	1:52	2:02	10	492.0	528.3	36.3	0.28
4	2:04	2:14	10	492.0	528.6	36.6	0.27
5	2:17	2:27	10	492.0	528.6	36.6	0.27
6	2:30	2:40	10	492.0	528.3	36.3	0.28
7							
8							

Infiltration Rate Calculation:

Time Interval, Δt =	10	minutes	Ho =	48.0	inches
Final Depth to Water, Df =	528.3	inches	Hf =	11.7	inches
Test Hole Radius, r =	4	inches	ΔH =	36.3	inches
Initial Depth to Water, Do =	492.0	inches	Havg =	29.9	inches
Total Depth of Test Hole, DT =	540.0	inches			

$$I_t = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Infiltration Rate, It = **13.68** inches/hour

Figure 9

PERCOLATION TEST DATA SHEET

Project:	4th & Mortimer	Project No:	A9799-88-01	Date:	3/31/2022
Test Hole No:	P3	Tested By:	JC		
Depth of Test Hole, D_T:	45	USCS Soil Classification:	SP		
Test Hole Dimensions (inches)			Length	Width	
Diameter (if round) =	8	Sides (if rectangular) =	---	---	

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Greater than or Equal to 6"? (y/n)
1	10:21	10:46	25	484.8	511.2	26.4	y
2	10:47	11:12	25	486.6	511.2	24.6	y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements, taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Percolation Rate (min/in)
1	12:46	12:56	10	484.2	500.1	15.9	0.63
2	12:58	13:08	10	484.8	499.8	15.0	0.67
3	13:13	13:23	10	478.8	498.0	19.2	0.52
4	13:25	13:35	10	479.1	498.6	19.5	0.51
5	13:37	13:47	10	480.0	498.6	18.6	0.54
6	13:49	13:59	10	482.4	499.2	16.8	0.60
7							
8							

Infiltration Rate Calculation:

Time Interval, Δt =	10	minutes	Ho =	55.8	inches
Final Depth to Water, Df =	498.0	inches	Hf =	42.0	inches
Test Hole Radius, r =	4	inches	ΔH =	13.8	inches
Initial Depth to Water, Do =	484.2	inches	Havg =	48.9	inches
Total Depth of Test Hole, DT =	540.0	inches			

$$I_t = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Infiltration Rate, It = **3.25** inches/hour

Figure 10

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The site was initially explored on May 29, 2018 by excavating eight 8-inch diameter borings to depths between 10 and 40½ feet below the existing ground surface using a truck-mounted hollow-stem auger drilling machine. Additional site exploration was performed on March 20, 2022 by excavating four 8-inch diameter borings to depths between 45½ and 55½ feet below the ground surface for the purpose of percolation testing. Representative and relatively undisturbed samples were obtained by driving a 3-inch, O. D., California Modified Sampler into the "undisturbed" soil mass with blows from a 140-pound auto-hammer falling 30 inches. The California Modified Sampler was equipped with 1-inch high by 2$^{3}/_{8}$-inch diameter brass sampler rings to facilitate soil removal and testing. Bulk samples were also obtained.

The soil conditions encountered in the borings were visually examined, classified and logged in general accordance with the Unified Soil Classification System (USCS). The logs of the borings are presented on Figures A1 through A12. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, penetration rates, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the boring logs were revised based on subsequent laboratory testing. The locations of the borings are shown on Figure 2A.

PROJECT NO. A9799-88-01

BORING 1

ELEV. (MSL.) _____ DATE COMPLETED **05/29/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	BULK 0-5'				**ARTIFICIAL FILL** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained, some coarse-grained, trace fine gravel, trace brick fragments.			
6	B1@5'				**ALLUVIUM** Sand with Silt, medium dense, slightly moist, light brown, fine- to medium-grained, trace fine gravel.	25	88.7	5.2
8	B1@7'				- some coarse-grained, brown, no gravel	20	116.0	2.3
10	B1@10'				- light brown, fine- to medium-grained	29	102.8	1.8
12	B1@12'			SP-SM	- fine- to coarse-grained, some fine gravel	19	103.5	2.3
16	B1@15'					25	114.5	3.4
20	B1@20'					39	110.5	2.6
22					Clay, soft, slightly moist, brown.			
26	B1@25'			CL		10	97.4	23.5
28								

A9799-88-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 1** ELEV. (MSL.) _____ DATE COMPLETED **05/29/2018** EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30	B1@30'				- some fine-grained sand	7	106.3	19.3
					Total depth of boring: 30.5 feet. Fill to 5 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Concrete patched. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9799-88-01 BORING LOGS.GPJ

Figure A1,
Log of Boring 1, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9799-88-01

BORING 2

ELEV. (MSL.) _____ DATE COMPLETED **05/29/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ARTIFICIAL FILL** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained, some coarse-grained, some fine gravel, trace brick fragments.			
2								
4								
6	B2@5'				**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained.	20	106.8	7.4
8	B2@7'			SM	- loose, fine-grained, increase in silt content	14	83.5	22.1
10	B2@10'				Sand with Silt, medium dense, slightly moist, light brown, fine-grained.	20	93.4	1.8
12	B2@12'				- loose	17	99.0	8.7
14				SP-SM				
16	B2@15'				- medium dense	32	109.3	1.9
18								
20				SM	Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained.			
	B2@20'					19	112.2	3.8
					Total depth of boring: 20.5 feet. Fill to 5 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Concrete patched. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9799-88-01 BORING LOGS.GPJ

Figure A2,
Log of Boring 2, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

BORING 3

ELEV. (MSL.) _____ DATE COMPLETED **05/29/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ARTIFICIAL FILL** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained, some fine gravel.			
2								
4					**ALLUVIUM** Silty Sand, loose, slightly moist, brown, fine-grained, some medium-grained.			
6	B3@5'			SM		15	83.3	8.0
8	B3@7'				- increase in silt content	13	107.8	9.1
10	B3@10'			SW	Sand, loose, slightly moist, light brown, fine- to coarse-grained, some fine gravel.	17	121.3	1.7
12	B3@12'				Silty Sand, loose, slightly moist, brown, fine-grained.	10	99.6	7.5
14								
16	B3@15'			SM	- decrease in silt content, fine- to medium-grained	13	97.9	6.6
18								
20	B3@20'				Sandy Silt, soft, slightly moist, brown, fine- to medium-grained.	11	102.2	21.7
22								
24				ML				
26	B3@25'				- firm	16	106.1	19.8
28								

A9799-88-01 BORING LOGS.GPJ

Figure A3,
Log of Boring 3, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9799-88-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 3** ELEV. (MSL.) _____ DATE COMPLETED **05/29/2018** EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
30	B3@30'			ML	- increase in sand content	15	107.0	19.8
32								
34								
36	B3@35'					15	100.2	23.1
38								
40	B3@40'					27	117.6	15.5
					Total depth of boring: 40.5 feet. Fill to 5 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Concrete patched. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9799-88-01 BORING LOGS.GPJ

Figure A3,
Log of Boring 3, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9799-88-01

BORING 4

ELEV. (MSL.) _____ DATE COMPLETED **05/29/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ARTIFICIAL FILL** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained, some coarse-grained, trace brick fragments.			
2								
4					**ALLUVIUM** Sand with Silt, medium dense, slightly moist, brown, fine- to medium-grained, trace fine gravel.			
6	B4@5'				- light brown	27	120.6	2.3
8	B4@7'				- fine-grained, loose, no gravel	12	98.0	5.8
10	B4@10'			SP-SM		16	98.2	6.2
12	B4@12'				- medium dense	21	118.8	7.9
14								
16	B4@15'					23	115.9	6.2
18								
20	B4@20'			ML	Sandy Silt, firm, slightly moist, brown, fine-grained.	21	104.8	11.9
					Total depth of boring: 20.5 feet. Fill to 3 feet. No groundwater encountered. Backfilled with soil cutting and tamped. Concrete patched. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9799-88-01 BORING LOGS.GPJ

Figure A4,
Log of Boring 4, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

BORING 5

ELEV. (MSL.) _____ DATE COMPLETED **05/29/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ARTIFICIAL FILL** Silty Sand, medium dense, slightly moist, dark brown, fine- to medium-grained.			
2								
4					**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine-grained, trace medium-grained.			
6	B5@5'					20	112.9	11.1
8	B5@7'					19	109.2	2.6
10	B5@10'			SM	- decrease in silt content, loose - increase in silt content	14	105.7	3.5
12	B5@12'				- medium dense	19	110.4	9.0
14								
16	B5@15'					28	109.6	6.7
18								
20	B5@20'			ML	Sandy Silt, firm, slightly moist, brown, fine-grained.	14	115.9	14.0
					Total depth of boring: 20.5 feet. Fill to 2.5 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Asphalt patched. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9799-88-01 BORING LOGS.GPJ

Figure A5,
Log of Boring 5, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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GEOCON

PROJECT NO. A9799-88-01

BORING 6

ELEV. (MSL.) _____ DATE COMPLETED **05/29/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ARTIFICIAL FILL** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained.			
2					**ALLUVIUM** Silty Sand, loose, slightly moist, brown, fine-grained.			
4				SM				
6	B6@5'					15	84.9	6.3
	B6@7'				Sand, medium dense, slightly moist, brown, fine- to coarse-grained, trace fine gravel.	46	118.6	1.3
8				SW				
10	B6@10'			ML	Sandy Silt, firm, slightly moist, light brown, fine-grained.	21	100.6	9.1
12	B6@12				Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained.	30	112.5	5.3
14								
	B6@15'					32	106.7	5.0
16				SM				
18								
20	B6@20'				- increase in silt content	31	112.3	9.5
					Total depth of boring: 20.5 feet. Fill to 2 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Surface restored. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9799-88-01 BORING LOGS.GPJ

Figure A6,
Log of Boring 6, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

BORING 7

ELEV. (MSL.) _____ DATE COMPLETED **05/29/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ARTIFICIAL FILL** Silty Sand, medium dense, slightly moist, brown, fine- to coarse-grained, fine to coarse gravel.			
2								
4					**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained, some fine gravel.			
6	B7@5'					48	89.2	5.9
8					- decrease in silt content, trace coarse-grained			
10	B7@10'			SM		24	101.5	1.8
12								
14					- increase in silt content, fine-grained			
16	B7@15'					32	111.0	6.3
18								
20	B7@20'					20	--	--
					Total depth of boring: 20.5 feet. Fill to 3 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9799-88-01 BORING LOGS.GPJ

Figure A7,
Log of Boring 7, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

BORING 8

ELEV. (MSL.) _____ DATE COMPLETED **05/29/2018**

EQUIPMENT **HOLLOW STEM AUGER** BY: **PZ**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ARTIFICIAL FILL** Silty Sand, medium dense, slightly moist, brown, fine- to coarse-grained, fine gravel.			
2					**ALLUVIUM**			
	B8@3'			SM	Silty Sand, loose, slightly moist, brown, fine-grained.	16	112.0	8.5
4								
6	B8@6'				- medium dense, fine- to medium-grained	13	116.0	3.5
8								
	B8@9'				- increase in silt content	14	104.3	11.2
10					Total depth of boring: 10 feet. Fill to 1.5 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.			

A9799-88-01 BORING LOGS.GPJ

Figure A8,
Log of Boring 8, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

BORING P1

ELEV. (MSL.) -- DATE COMPLETED **03/30/2022**

EQUIPMENT **HOLLOW STEM AUGER** BY: **JS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**CONCRETE: 4.5" SAND: 2"**			
2					**ARTIFICIAL FILL** Sand with Silt to Silty Sand, medium dense, moist, brown, fine- to medium-grained, some concrete fragments, clay pipe fragments.			
4				SP-SM	**ALLUVIUM** Sand with Silt, loose to medium dense, moist, light brown, very fine- to fine-grained.			
6	P1@5'			SP	Sand, poorly graded, loose, slightly moist, brown, fine- to medium-grained.	4		
8								
10	P1@10'				- medium dense, medium- to coarse-grained	13		
12								
14					Sand, well-graded, medium dense, slightly moist, brown, some fine gravel (to 1/2").			
16	P1@15'			SW		15		
18								
20	P1@20'				Sandy Silty Clay, soft, moist, yellowish brown, fine-grained.	8		
22								
24				CL				
26	P1@25'					4		
28					Silty Clay, soft, moist to wet, yellowish brown.			
30	P1@30'			CL-ML		10		
32								
34								

A9799-88-01 BORING LOGS MARCH 2022.GPJ

Figure A9,
Log of Boring P1, Page 1 of 2

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

BORING P1

ELEV. (MSL.) -- DATE COMPLETED **03/30/2022**

EQUIPMENT **HOLLOW STEM AUGER** BY: **JS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
36	P1@35'			ML	Sandy Silt with Clay, soft, moist, yellowish brown, fine-grained.	4		
38				CL-ML	Silty Clay and Sand, loose to soft, moist.			
40	P1@40'					12		
42					- cobbles and rocks Gravelly Sand with Cobbles, well-graded, medium dense, moist, brown, gravel and cobble fragments (to 2").			
44								
46	P1@45'			SW		46		
48								
50	P1@50'				- cobble fragments (to 3")	50 (5")		
52								
54								
	P1@55'				- increase in medium- to coarse-grained	50 (5")		

Total depth of boring: 55.5 feet.
Fill to 2.5 feet.
No groundwater encountered.
Backfilled to 45 feet.
Percolation testing performed.
Backfilled with soil cuttings and tamped.
Surface patched.

*Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.
NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.

A9799-88-01 BORING LOGS MARCH 2022.GPJ

Figure A9,
Log of Boring P1, Page 2 of 2

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

BORING P2

ELEV. (MSL.) -- DATE COMPLETED **03/30/2022**

EQUIPMENT **HOLLOW STEM AUGER** BY: **JS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**CONCRETE: 6"**			
2					**ARTIFICIAL FILL** Silty Sand, medium dense, moist, brown, fine- to medium-grained.			
4					**ALLUVIUM** Sand with Silt, loose, moist, brown, fine-grained, some medium-grained.			
6	P2@5'			SP-SM	- increase in silt	5		
8								
10	P2@10'			SW	Sand, well-graded, loose, slightly moist, brown, trace fine gravel.	9		
12								
14					Sand and Silt, soft, moist, yellowish brown, fine-grained.			
16	P2@15'					5		
18				SP-SM				
20	P2@20'					7		
22								
24					Silty Clay with Sand, soft, moist, yellowish brown, fine-grained.			
26	P2@25'			CL		5		
28								
30	P2@30'					7		
32								
34								

A9799-88-01 BORING LOGS MARCH 2022.GPJ

Figure A10,
Log of Boring P2, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

BORING P2

ELEV. (MSL.) -- DATE COMPLETED **03/30/2022**

EQUIPMENT **HOLLOW STEM AUGER** BY: **JS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
36	P2@35'			ML	Sandy Silt with Clay, firm, moist, yellowish brown, fine- to medium-grained.	12		
38								
40	P2@40'					19		
42				SW	Gravelly Sand with Cobbles, well-graded, dense, moist, brown, fine- to coarse-grained, gravel.			
44								
	P2@45'					50 (5")		

Total depth of boring: 45.5 feet
Fill to 2.5 feet.
No groundwater encountered.
Percolation testing performed.
Backfilled with soil cuttings and tamped.
Surface patched.

*Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.
NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.

A9799-88-01 BORING LOGS MARCH 2022.GPJ

Figure A10,
Log of Boring P2, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. A9799-88-01

BORING P3

ELEV. (MSL.) -- DATE COMPLETED **03/30/2022**

EQUIPMENT **HOLLOW STEM AUGER** BY: **JS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ARTIFICIAL FILL** Silty Sand, loose to medium dense, slightly moist, light brown, fine- to medium-grained.			
2					**ALLUVIUM** Silty Sand, loose, slightly moist, light brown, fine- to medium-grained.			
4								
6	P3@5'			SM		6		
8					Sand, loose, dry to slightly moist, light brown, fine-grained. - some gravel (to 3")			
10	P3@10'			SP		10		
12								
14					Silty Sand, medium dense, slightly moist, yellowish brown, fine-grained, some medium-grained.			
16	P3@15'			SM		13		
18								
20	P3@20'				Sandy Silt, firm, moist, olive brown, fine- to medium-grained.	10		
22								
24				ML				
26	P3@25'					13		
28								
30	P3@30'					15		
32								
34								

A9799-88-01 BORING LOGS MARCH 2022.GPJ

Figure A11,
Log of Boring P3, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

BORING P3

ELEV. (MSL.) -- DATE COMPLETED **03/30/2022**

EQUIPMENT **HOLLOW STEM AUGER** BY: **JS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
36	P3@35'			ML	- stiff	29		
38								
40	P3@40'				Gravelly Sand, well-graded, dense, slightly moist, brown, fine- to coarse-grained, gravel.	41		
42				SW				
44								
	P3@45'					50 (6")		

Total depth of boring: 45.5 feet
Fill to 2 feet.
No groundwater encountered.
Percolation testing performed.
Backfilled with soil cuttings and tamped.

*Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.
NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.

A9799-88-01 BORING LOGS MARCH 2022.GPJ

Figure A11,
Log of Boring P3, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

BORING P4

ELEV. (MSL.) -- DATE COMPLETED **03/30/2022**

EQUIPMENT **HOLLOW STEM AUGER** BY: **JS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ARTIFICIAL FILL** Silty Sand, medium dense, slightly moist to moist, brown, fine- to medium-grained.			
2								
4					**ALLUVIUM** Silty Sand, loose, slightly moist, brown, fine- to medium-grained.			
6	P4@5'			SM		7		
8								
10	P4@10'				- fine- to medium-grained interbed	6		
12								
14					Sand, well-graded, dense, slightly moist, brown, fine- to coarse-grained, trace fine gravel.			
16	P4@15'					32		
18				SW				
20	P4@20'				- fine to medium gravel	34		
22								
24								
26	P4@25'				Gravelly Sand, well-graded, dense, slightly moist, brown, fine to coarse gravel, some cobbles.	37		
28				SW				
30	P4@30'					35		
32								
34								

A9799-88-01 BORING LOGS MARCH 2022.GPJ

Figure A12,
Log of Boring P4, Page 1 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. A9799-88-01

BORING P4

ELEV. (MSL.) -- DATE COMPLETED **03/30/2022**

EQUIPMENT **HOLLOW STEM AUGER** BY: **JS**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
36	P4@35'			ML	- clay interbed Sandy Silt, soft, moist, yellowish brown, fine- to medium-grained.	7		
38								
40	P4@40'			SM	Silty Sand with Clay, medium dense, moist, yellowish brown, fine- to medium-grained.	19		
42								
44								
46	P4@45'			SP	Sand with Gravel, poorly graded, very dense, moist, light brown, fine- to medium-grained, fine to coarse gravel.	50 (6")		
48								
50	P4@50'				- no recovery	32		
52								
54								
	P4@55'					27		

Total depth of boring: 55.5 feet
Fill to 3 feet.
No groundwater encountered.
Backfilled to 40 feet.
Percolation testing performed.
Backfilled with soil cuttings and tamped.

*Penetration resistance for 140-pound hammer falling 30 inches by auto-hammer.
NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.

A9799-88-01 BORING LOGS MARCH 2022.GPJ

Figure A12,
Log of Boring P4, Page 2 of 2

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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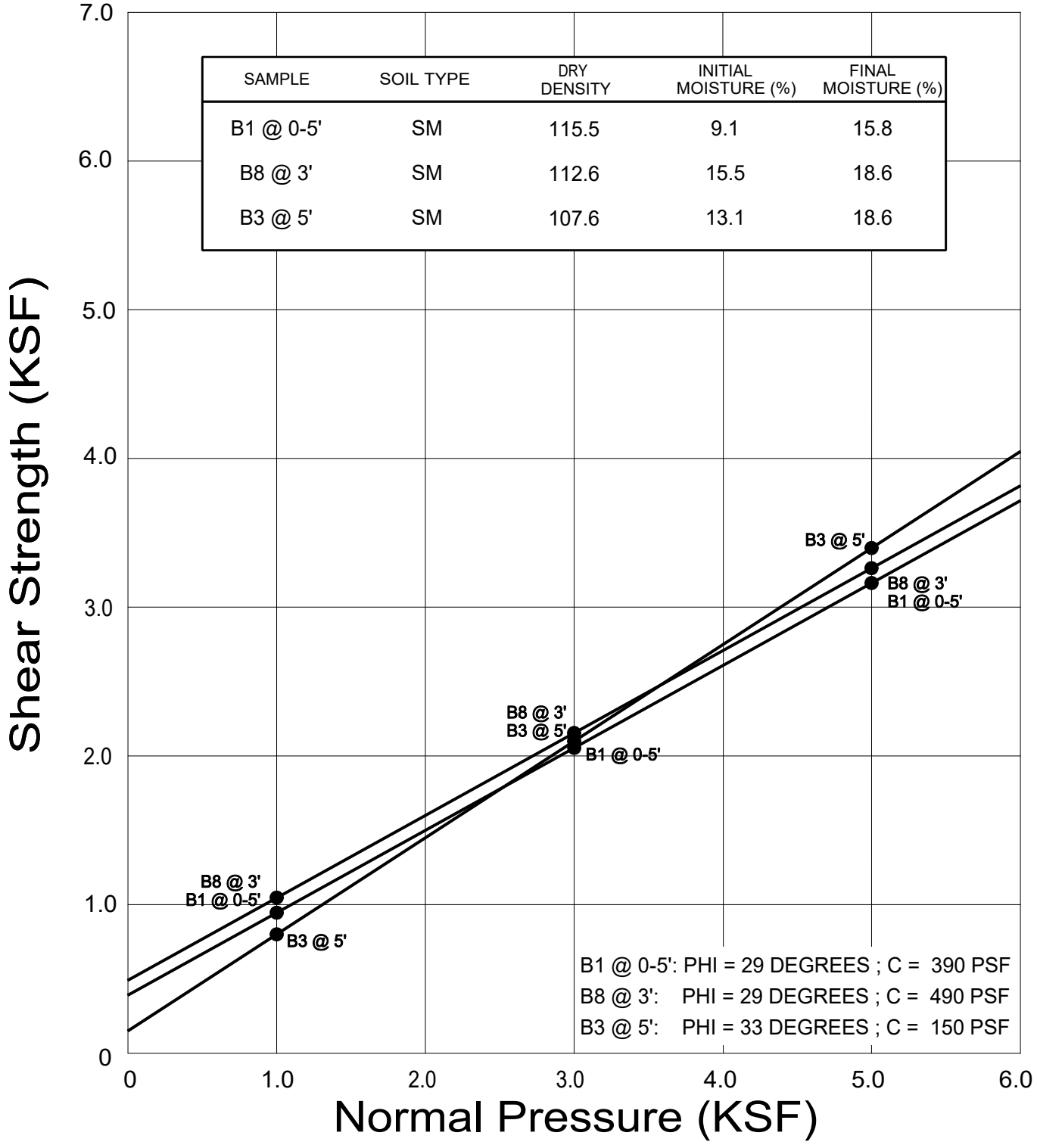
APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the "American Society for Testing and Materials (ASTM)", or other suggested procedures. Selected samples were tested for direct shear strength, consolidation and expansion characteristics, corrosivity, in-place dry density and moisture content. The results of the laboratory tests are summarized in Figures B1 through B9. The in-place dry density and moisture content of the samples tested are presented on the boring logs, Appendix A.

SAMPLE	SOIL TYPE	DRY DENSITY	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1 @ 0-5'	SM	115.5	9.1	15.8
B8 @ 3'	SM	112.6	15.5	18.6
B3 @ 5'	SM	107.6	13.1	18.6



● Direct Shear, Saturated

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ENVIRONMENTAL GEOTECHNICAL MATERIALS
2807 MCGAW AVENUE - IRVINE, CA 92614
PHONE (949) 491-6570

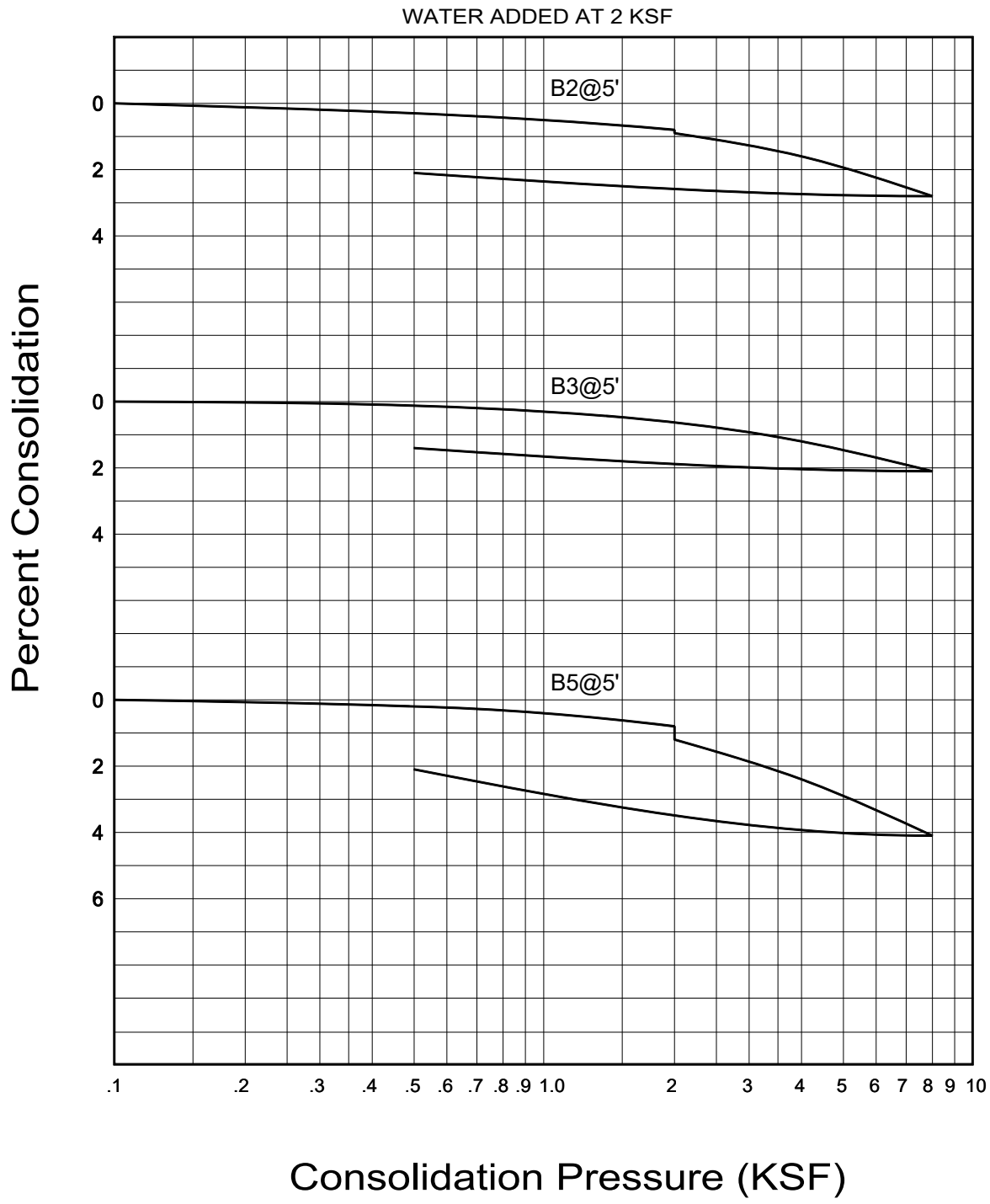
DRAFTED BY: PZ | CHECKED BY: JTA

DIRECT SHEAR TEST RESULTS

MIXED-USE DEVELOPMENT

EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022 | PROJECT NO. A9799-88-01 | FIG. B1



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PHONE (949) 491-6570

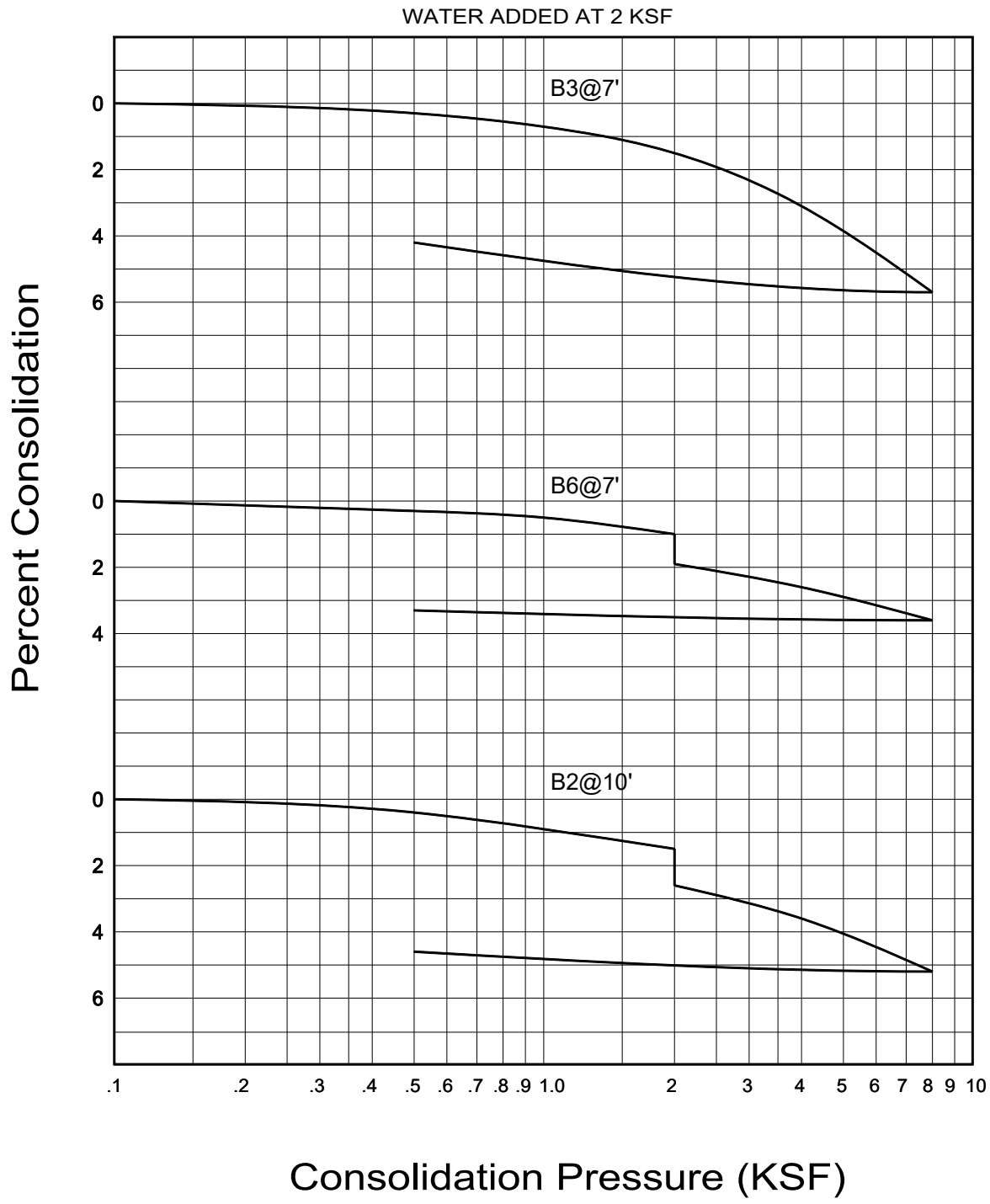
DRAFTED BY: PZ	CHECKED BY: JTA

CONSOLIDATION TEST RESULTS

MIXED-USE DEVELOPMENT

EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022	PROJECT NO. A9799-88-01	FIG. B2



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PHONE (949) 491-6570

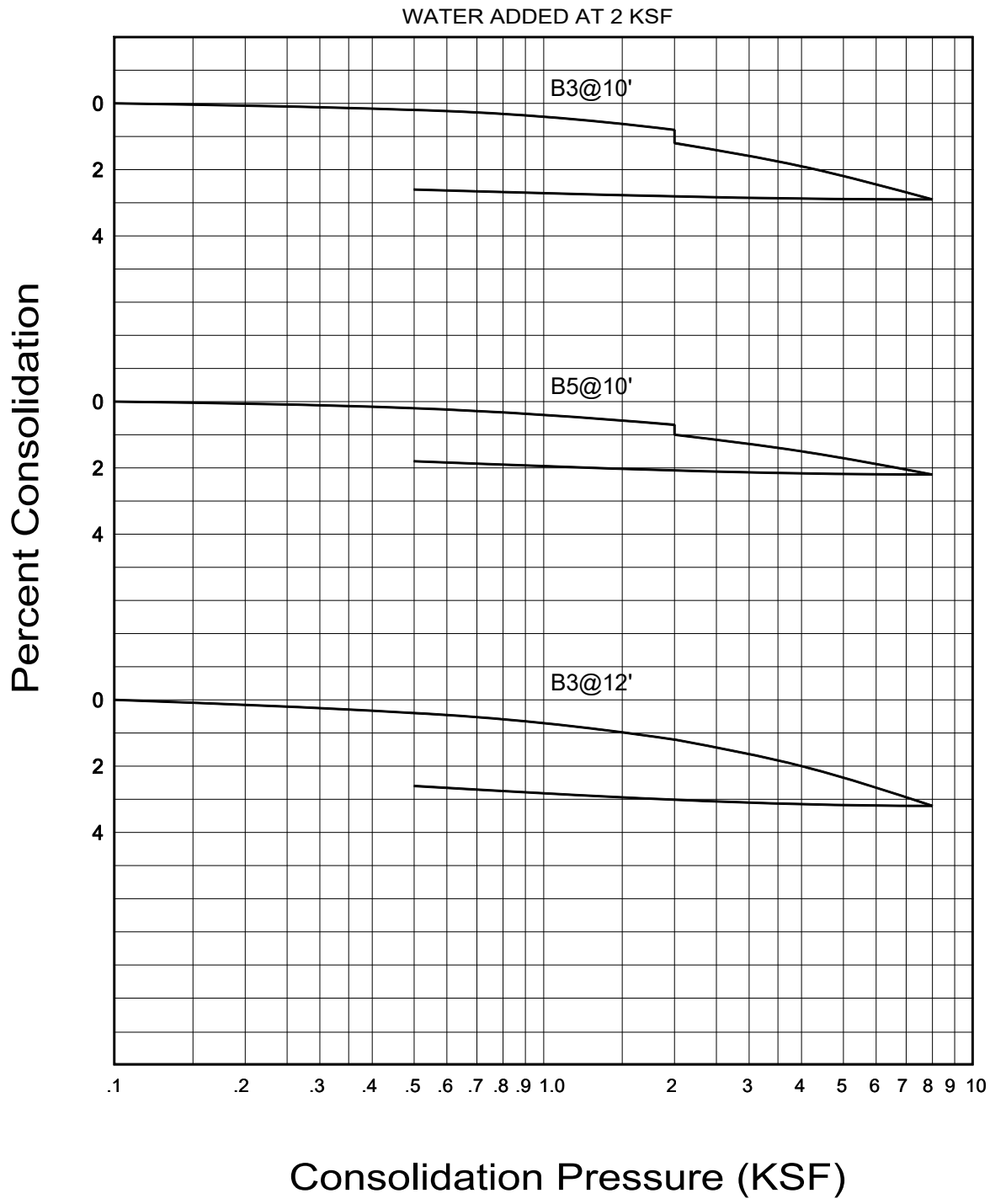
DRAFTED BY: PZ	CHECKED BY: JTA

CONSOLIDATION TEST RESULTS

MIXED-USE DEVELOPMENT

EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022	PROJECT NO. A9799-88-01	FIG. B3



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PHONE (949) 491-6570

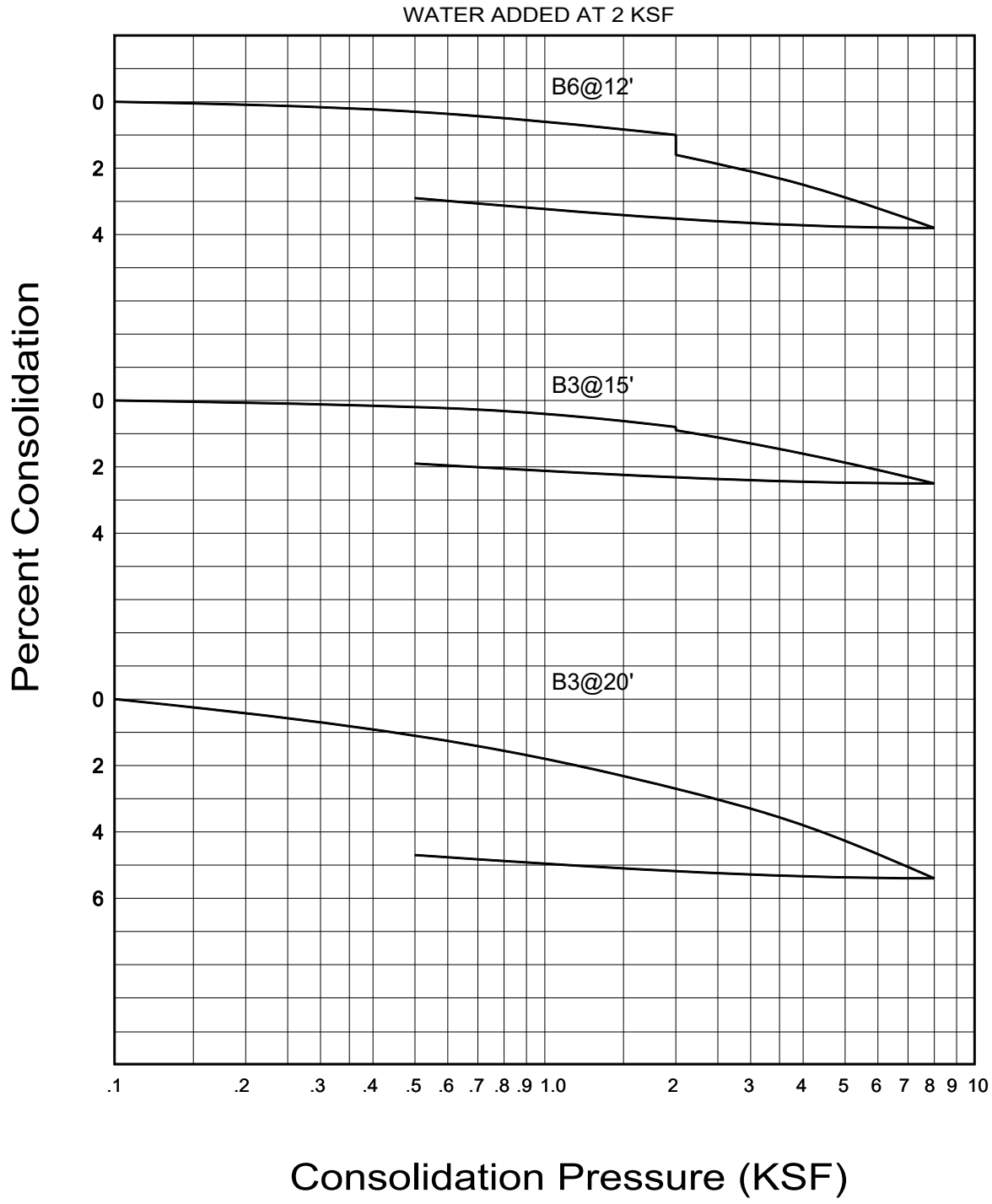
DRAFTED BY: PZ	CHECKED BY: JTA

CONSOLIDATION TEST RESULTS

MIXED-USE DEVELOPMENT

EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022	PROJECT NO. A9799-88-01	FIG. B4



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PHONE (949) 491-6570

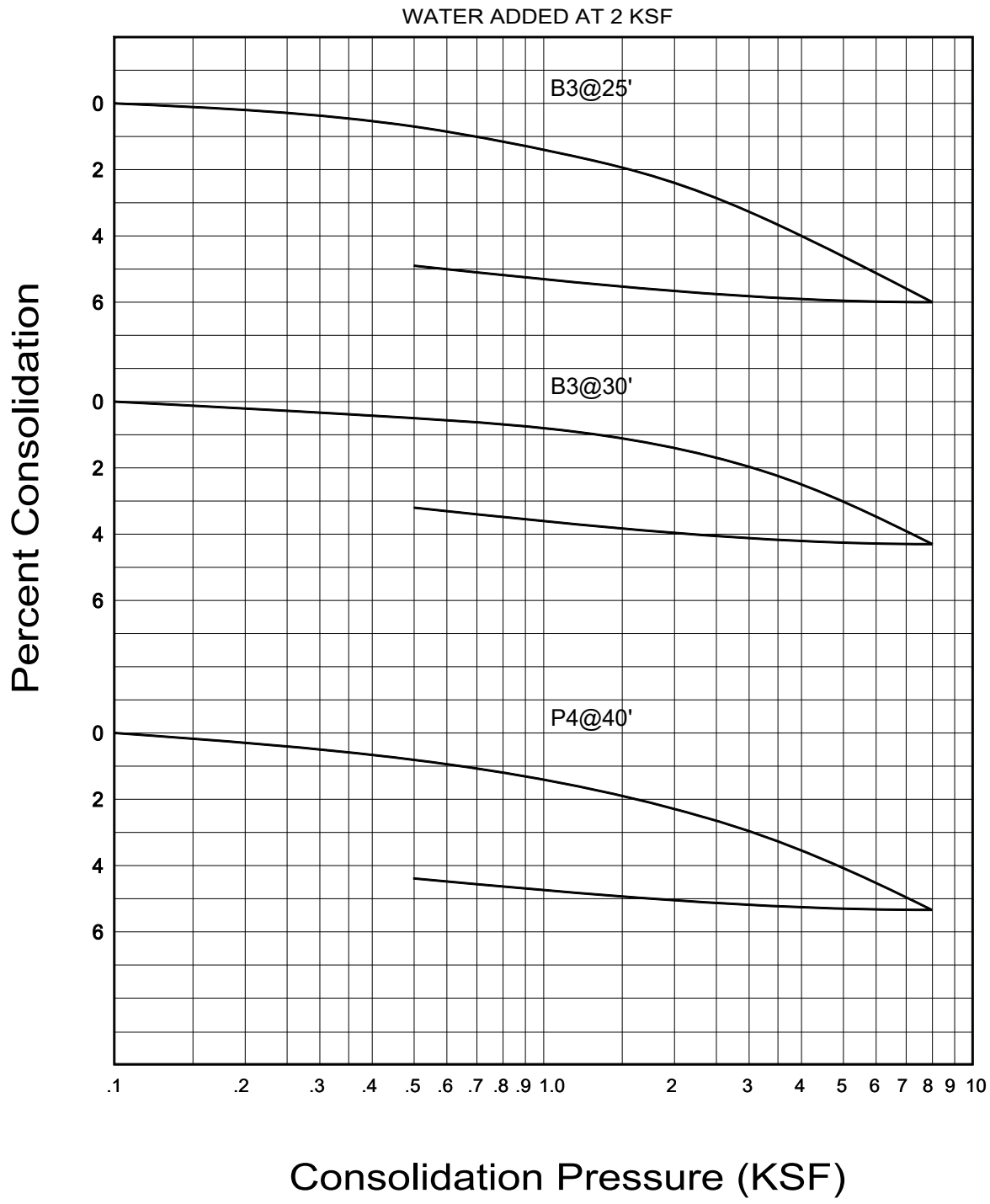
DRAFTED BY: PZ	CHECKED BY: JTA

CONSOLIDATION TEST RESULTS

MIXED-USE DEVELOPMENT

EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022	PROJECT NO. A9799-88-01	FIG. B5



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2807 MCGAW AVENUE - IRVINE, CA 92614
PHONE (949) 491-6570

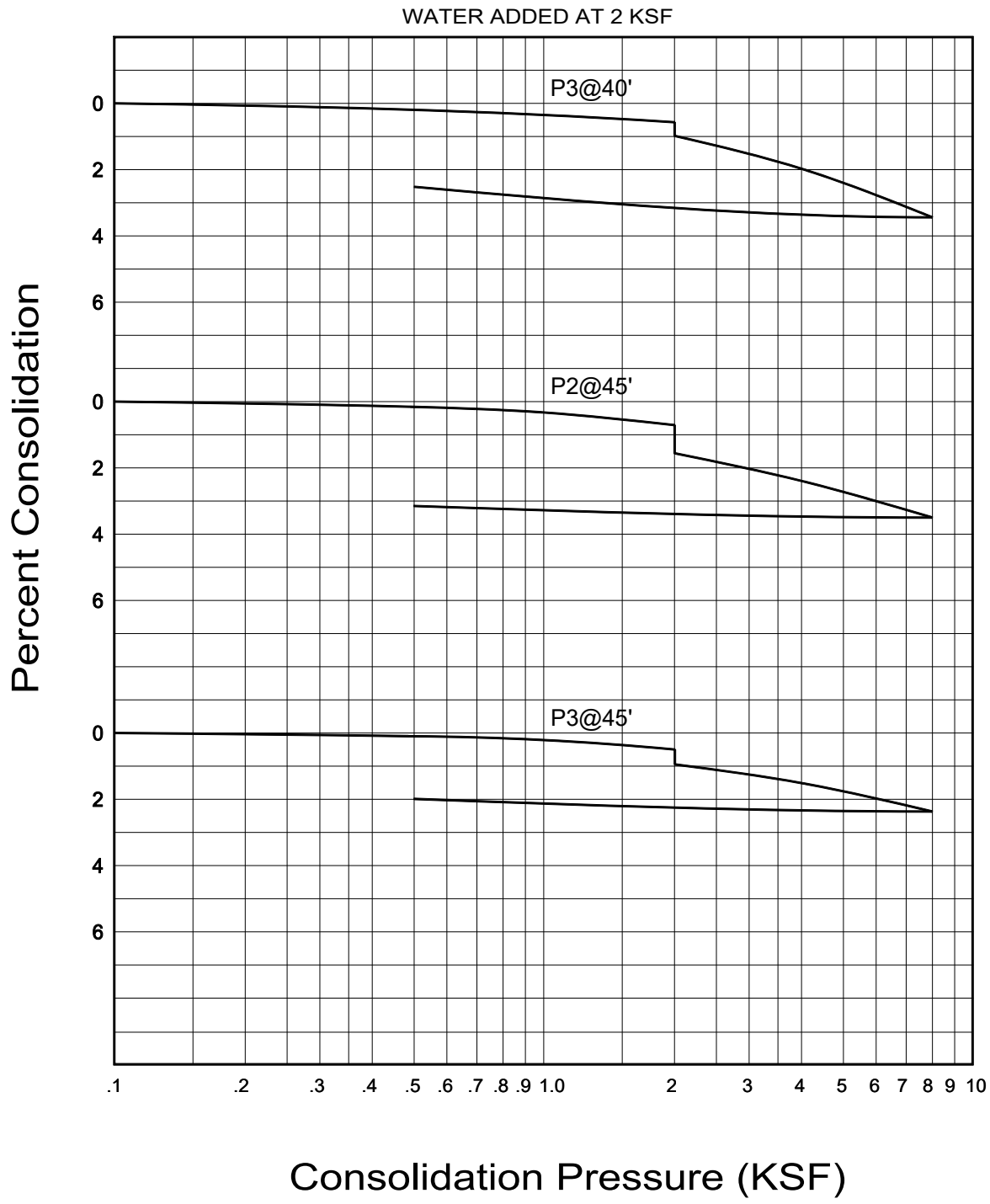
DRAFTED BY: PZ	CHECKED BY: JTA

CONSOLIDATION TEST RESULTS

MIXED-USE DEVELOPMENT

EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022	PROJECT NO. A9799-88-01	FIG. B6



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CONSOLIDATION TEST RESULTS

MIXED-USE DEVELOPMENT

EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022	PROJECT NO. A9799-88-01	FIG. B7

SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829-11

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	*UBC Classification	**CBC Classification
	Before	After				
B1 @ 0-5'	7.8	12.4	117.5	1	Very Low	Non-Expansive

* Reference: 1997 Uniform Building Code, Table 18-I-B.

** Reference: 2019 California Building Code, Section 1803.5.3

SUMMARY OF LABORATORY MAXIMUM DENSITY AND AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-12

Sample No.	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture (%)
B1 @ 0-5'	Brown Silty Sand	130.3	7.4

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LABORATORY TEST RESULTS

MIXED-USE DEVELOPMENT
EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022 | PROJECT NO. A9799-88-01 | FIG. B8

SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (pH) AND RESISTIVITY TEST RESULTS CALIFORNIA TEST NO. 643

Sample No.	pH	Resistivity (ohm centimeters)
B1 @ 0-5'	8.7	1556 (Corrosive)

SUMMARY OF LABORATORY CHLORIDE CONTENT TEST RESULTS EPA NO. 325.3

Sample No.	Chloride Ion Content (%)
B1 @ 0-5'	0.018

SUMMARY OF LABORATORY WATER SOLUBLE SULFATE TEST RESULTS CALIFORNIA TEST NO. 417

Sample No.	Water Soluble Sulfate (% SO_4)	Sulfate Exposure*
B1 @ 0-5'	0.001	S0

* Reference: 2019 California Building Code, Section 1904.3 and ACI 318-19 Chapter 19

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ENVIRONMENTAL GEOTECHNICAL MATERIALS
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PHONE (949) 491-6570

DRAFTED BY: PZ | CHECKED BY: JTA

CORROSIVITY TEST RESULTS

MIXED-USE DEVELOPMENT
EAST 4TH STREET & MORTIMER STREET
SANTA ANA, CALIFORNIA

JUNE 2022 | PROJECT NO. A9799-88-01 | FIG. B9

APPENDIX G

2-YEAR HYDROLOGY CALCULATIONS

```
**************************************************************************
            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 1355

                          Analysis prepared by:

                            fuscoe engineering
                             16795 Von Karman
                                Suite 100
                                Irvine, CA

 ************************ DESCRIPTION OF STUDY ************************
* 4th & Mortimer                                                         *
* Existing Condition Hydrology                                           *
* 2-year storm event                                                     *
 **************************************************************************

  FILE NAME: EX4TH2.DAT
  TIME/DATE OF STUDY: 10:18 07/24/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 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    101.00 TO NODE    102.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    125.00  DOWNSTREAM(FEET) =    123.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.869
```

```
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.629
 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                 B        1.42      0.30     0.100    36    8.87
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.04
 TOTAL AREA(ACRES) =      1.42   PEAK FLOW RATE(CFS) =      2.04

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
 ELEVATION DATA: UPSTREAM(FEET) =    125.80  DOWNSTREAM(FEET) =    123.80

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.586
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.660
 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                 B        0.57      0.30     0.100    36    8.59
 NATURAL GOOD COVER
 "GRASS"                    B        0.31      0.30     1.000    41   26.41
 NATURAL POOR COVER
 "BARREN"                   B        0.41      0.30     1.000    72   14.83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.602
 SUBAREA RUNOFF(CFS) =      1.72
 TOTAL AREA(ACRES) =      1.29   PEAK FLOW RATE(CFS) =      1.72
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        1.3  TC(MIN.) =      8.59
 EFFECTIVE AREA(ACRES) =      1.29  AREA-AVERAGED Fm(INCH/HR)=  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.602
 PEAK FLOW RATE(CFS)   =       1.72
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                          Analysis prepared by:

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**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:                Existing Condition
  4th & Mortimer
  Area A-1 (West Parcel) Hydrograph
  2-year storm event
==========================================================================
*** 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          1.42        10.00        56.(AMC II)      0.300        0.801

    TOTAL AREA (Acres) =      1.42

                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.030

                                  _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.199
==========================================================================

 Problem Descriptions:                Existing Condition
  4th & Mortimer Hydrograph
  Area A-1 (West Parcel) (calibration coefficient = 0.898)
  2-year storm event
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    1.42
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.030
    LOW LOSS FRACTION = 0.199
    TIME OF CONCENTRATION(MIN.) =  8.87
    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
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    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.18
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.06

********************************************************************************
  TIME      VOLUME        Q    0.         2.5        5.0        7.5       10.0
 (HOURS)     (AF)       (CFS)
--------------------------------------------------------------------------------
  0.03      0.0000       0.00  Q          .          .          .          .
  0.18      0.0002       0.03  Q          .          .          .          .
  0.33      0.0006       0.03  Q          .          .          .          .
  0.48      0.0010       0.03  Q          .          .          .          .
  0.63      0.0014       0.03  Q          .          .          .          .
  0.77      0.0018       0.03  Q          .          .          .          .
  0.92      0.0022       0.03  Q          .          .          .          .
  1.07      0.0026       0.03  Q          .          .          .          .
  1.22      0.0031       0.03  Q          .          .          .          .
  1.36      0.0035       0.03  Q          .          .          .          .
  1.51      0.0039       0.03  Q          .          .          .          .
  1.66      0.0043       0.03  Q          .          .          .          .
  1.81      0.0047       0.03  Q          .          .          .          .
  1.96      0.0052       0.04  Q          .          .          .          .
  2.10      0.0056       0.04  Q          .          .          .          .
  2.25      0.0060       0.04  Q          .          .          .          .
  2.40      0.0065       0.04  Q          .          .          .          .
  2.55      0.0069       0.04  Q          .          .          .          .
  2.70      0.0074       0.04  Q          .          .          .          .
  2.84      0.0078       0.04  Q          .          .          .          .
  2.99      0.0083       0.04  Q          .          .          .          .
  3.14      0.0087       0.04  Q          .          .          .          .
  3.29      0.0092       0.04  Q          .          .          .          .
  3.43      0.0096       0.04  Q          .          .          .          .
  3.58      0.0101       0.04  Q          .          .          .          .
  3.73      0.0106       0.04  Q          .          .          .          .
  3.88      0.0110       0.04  Q          .          .          .          .
  4.03      0.0115       0.04  Q          .          .          .          .
  4.17      0.0120       0.04  Q          .          .          .          .
  4.32      0.0125       0.04  Q          .          .          .          .
  4.47      0.0129       0.04  Q          .          .          .          .
  4.62      0.0134       0.04  Q          .          .          .          .
  4.76      0.0139       0.04  Q          .          .          .          .
  4.91      0.0144       0.04  Q          .          .          .          .
  5.06      0.0149       0.04  Q          .          .          .          .
  5.21      0.0154       0.04  Q          .          .          .          .
  5.36      0.0159       0.04  Q          .          .          .          .
  5.50      0.0165       0.04  Q          .          .          .          .
  5.65      0.0170       0.04  Q          .          .          .          .
  5.80      0.0175       0.04  Q          .          .          .          .
  5.95      0.0180       0.04  Q          .          .          .          .
  6.10      0.0186       0.04  Q          .          .          .          .
  6.24      0.0191       0.04  Q          .          .          .          .
  6.39      0.0196       0.04  Q          .          .          .          .
  6.54      0.0202       0.04  Q          .          .          .          .
  6.69      0.0207       0.05  Q          .          .          .          .
  6.83      0.0213       0.05  Q          .          .          .          .
  6.98      0.0219       0.05  Q          .          .          .          .
  7.13      0.0224       0.05  Q          .          .          .          .
  7.28      0.0230       0.05  Q          .          .          .          .
  7.43      0.0236       0.05  Q          .          .          .          .
  7.57      0.0242       0.05  Q          .          .          .          .
```

7.72	0.0248	0.05	Q	.	.	.	.
7.87	0.0254	0.05	Q	.	.	.	.
8.02	0.0260	0.05	Q	.	.	.	.
8.16	0.0266	0.05	Q	.	.	.	.
8.31	0.0272	0.05	Q	.	.	.	.
8.46	0.0278	0.05	Q	.	.	.	.
8.61	0.0285	0.05	Q	.	.	.	.
8.76	0.0291	0.05	Q	.	.	.	.
8.90	0.0298	0.05	Q	.	.	.	.
9.05	0.0304	0.05	Q	.	.	.	.
9.20	0.0311	0.06	Q	.	.	.	.
9.35	0.0318	0.06	Q	.	.	.	.
9.50	0.0325	0.06	Q	.	.	.	.
9.64	0.0332	0.06	Q	.	.	.	.
9.79	0.0339	0.06	Q	.	.	.	.
9.94	0.0346	0.06	Q	.	.	.	.
10.09	0.0353	0.06	Q	.	.	.	.
10.23	0.0361	0.06	Q	.	.	.	.
10.38	0.0368	0.06	Q	.	.	.	.
10.53	0.0376	0.06	Q	.	.	.	.
10.68	0.0383	0.06	Q	.	.	.	.
10.83	0.0391	0.07	Q	.	.	.	.
10.97	0.0399	0.07	Q	.	.	.	.
11.12	0.0408	0.07	Q	.	.	.	.
11.27	0.0416	0.07	Q	.	.	.	.
11.42	0.0424	0.07	Q	.	.	.	.
11.57	0.0433	0.07	Q	.	.	.	.
11.71	0.0442	0.07	Q	.	.	.	.
11.86	0.0451	0.07	Q	.	.	.	.
12.01	0.0460	0.08	Q	.	.	.	.
12.16	0.0470	0.09	Q	.	.	.	.
12.30	0.0482	0.10	Q	.	.	.	.
12.45	0.0494	0.10	Q	.	.	.	.
12.60	0.0506	0.10	Q	.	.	.	.
12.75	0.0518	0.10	Q	.	.	.	.
12.90	0.0531	0.11	Q	.	.	.	.
13.04	0.0544	0.11	Q	.	.	.	.
13.19	0.0558	0.11	Q	.	.	.	.
13.34	0.0572	0.11	Q	.	.	.	.
13.49	0.0586	0.12	Q	.	.	.	.
13.63	0.0601	0.12	Q	.	.	.	.
13.78	0.0616	0.13	Q	.	.	.	.
13.93	0.0632	0.13	Q	.	.	.	.
14.08	0.0648	0.14	Q	.	.	.	.
14.23	0.0665	0.15	Q	.	.	.	.
14.37	0.0684	0.15	Q	.	.	.	.
14.52	0.0703	0.16	Q	.	.	.	.
14.67	0.0724	0.17	Q	.	.	.	.
14.82	0.0745	0.18	Q	.	.	.	.
14.97	0.0769	0.20	Q	.	.	.	.
15.11	0.0795	0.21	Q	.	.	.	.
15.26	0.0823	0.24	Q	.	.	.	.
15.41	0.0854	0.26	.Q	.	.	.	.
15.56	0.0886	0.27	.Q	.	.	.	.
15.70	0.0922	0.31	.Q	.	.	.	.
15.85	0.0970	0.47	.Q	.	.	.	.
16.00	0.1039	0.66	. Q	.	.	.	.
16.15	0.1203	2.04	.	Q	.	.	.
16.30	0.1351	0.37	.Q	.	.	.	.
16.44	0.1389	0.25	.Q	.	.	.	.
16.59	0.1419	0.23	Q	.	.	.	.

16.74	0.1444	0.19	Q	.	.	.	.
16.89	0.1466	0.17	Q	.	.	.	.
17.03	0.1486	0.15	Q	.	.	.	.
17.18	0.1503	0.13	Q	.	.	.	.
17.33	0.1519	0.12	Q	.	.	.	.
17.48	0.1534	0.12	Q	.	.	.	.
17.63	0.1547	0.11	Q	.	.	.	.
17.77	0.1561	0.10	Q	.	.	.	.
17.92	0.1573	0.10	Q	.	.	.	.
18.07	0.1585	0.10	Q	.	.	.	.
18.22	0.1596	0.08	Q	.	.	.	.
18.37	0.1605	0.07	Q	.	.	.	.
18.51	0.1613	0.07	Q	.	.	.	.
18.66	0.1622	0.07	Q	.	.	.	.
18.81	0.1630	0.06	Q	.	.	.	.
18.96	0.1637	0.06	Q	.	.	.	.
19.10	0.1645	0.06	Q	.	.	.	.
19.25	0.1652	0.06	Q	.	.	.	.
19.40	0.1659	0.06	Q	.	.	.	.
19.55	0.1666	0.06	Q	.	.	.	.
19.70	0.1673	0.05	Q	.	.	.	.
19.84	0.1679	0.05	Q	.	.	.	.
19.99	0.1686	0.05	Q	.	.	.	.
20.14	0.1692	0.05	Q	.	.	.	.
20.29	0.1698	0.05	Q	.	.	.	.
20.43	0.1704	0.05	Q	.	.	.	.
20.58	0.1710	0.05	Q	.	.	.	.
20.73	0.1715	0.05	Q	.	.	.	.
20.88	0.1721	0.05	Q	.	.	.	.
21.03	0.1727	0.04	Q	.	.	.	.
21.17	0.1732	0.04	Q	.	.	.	.
21.32	0.1737	0.04	Q	.	.	.	.
21.47	0.1742	0.04	Q	.	.	.	.
21.62	0.1747	0.04	Q	.	.	.	.
21.77	0.1752	0.04	Q	.	.	.	.
21.91	0.1757	0.04	Q	.	.	.	.
22.06	0.1762	0.04	Q	.	.	.	.
22.21	0.1767	0.04	Q	.	.	.	.
22.36	0.1772	0.04	Q	.	.	.	.
22.50	0.1776	0.04	Q	.	.	.	.
22.65	0.1781	0.04	Q	.	.	.	.
22.80	0.1785	0.04	Q	.	.	.	.
22.95	0.1790	0.04	Q	.	.	.	.
23.10	0.1794	0.04	Q	.	.	.	.
23.24	0.1799	0.04	Q	.	.	.	.
23.39	0.1803	0.03	Q	.	.	.	.
23.54	0.1807	0.03	Q	.	.	.	.
23.69	0.1811	0.03	Q	.	.	.	.
23.84	0.1815	0.03	Q	.	.	.	.
23.98	0.1819	0.03	Q	.	.	.	.
24.13	0.1823	0.03	Q	.	.	.	.
24.28	0.1825	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%	1445.8
10%	97.6
20%	26.6
30%	17.7
40%	8.9
50%	8.9
60%	8.9
70%	8.9
80%	8.9
90%	8.9

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**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                          Analysis prepared by:

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                             16795 Von Karman
                                Suite 100
                                Irvine, CA

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:                    Existing Condition
  4th & Mortimer
  Area A-2 (East Parcel) Hydrograph
  2-year storm event
==========================================================================
*** 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         0.57       10.00       56.(AMC II)     0.300        0.801
         2         0.31      100.00       61.(AMC II)     0.300        0.000
         3         0.41      100.00       86.(AMC II)     0.300        0.153

    TOTAL AREA (Acres) =      1.29

                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.181

                                  _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.598
==========================================================================

 Problem Descriptions:
  4th & Mortimer Hydrograph
  Area A-2 (East Parcel) (calibration coefficient = 0.90)
  2-year storm event
--------------------------------------------------------------------------
                          Existing Condition

    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    1.29
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.181
    LOW LOSS FRACTION = 0.598
    TIME OF CONCENTRATION(MIN.) =  8.59
    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) = 0.09
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.13

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.11	0.0001	0.01	Q	.	.	.	.
0.25	0.0002	0.01	Q	.	.	.	.
0.39	0.0004	0.02	Q	.	.	.	.
0.54	0.0006	0.02	Q	.	.	.	.
0.68	0.0008	0.02	Q	.	.	.	.
0.82	0.0010	0.02	Q	.	.	.	.
0.97	0.0011	0.02	Q	.	.	.	.
1.11	0.0013	0.02	Q	.	.	.	.
1.25	0.0015	0.02	Q	.	.	.	.
1.40	0.0017	0.02	Q	.	.	.	.
1.54	0.0019	0.02	Q	.	.	.	.
1.68	0.0021	0.02	Q	.	.	.	.
1.83	0.0023	0.02	Q	.	.	.	.
1.97	0.0025	0.02	Q	.	.	.	.
2.11	0.0026	0.02	Q	.	.	.	.
2.26	0.0028	0.02	Q	.	.	.	.
2.40	0.0030	0.02	Q	.	.	.	.
2.54	0.0032	0.02	Q	.	.	.	.
2.69	0.0034	0.02	Q	.	.	.	.
2.83	0.0036	0.02	Q	.	.	.	.
2.97	0.0038	0.02	Q	.	.	.	.
3.12	0.0040	0.02	Q	.	.	.	.
3.26	0.0042	0.02	Q	.	.	.	.
3.40	0.0044	0.02	Q	.	.	.	.
3.54	0.0046	0.02	Q	.	.	.	.
3.69	0.0048	0.02	Q	.	.	.	.
3.83	0.0050	0.02	Q	.	.	.	.
3.97	0.0052	0.02	Q	.	.	.	.
4.12	0.0055	0.02	Q	.	.	.	.
4.26	0.0057	0.02	Q	.	.	.	.
4.40	0.0059	0.02	Q	.	.	.	.
4.55	0.0061	0.02	Q	.	.	.	.
4.69	0.0063	0.02	Q	.	.	.	.
4.83	0.0065	0.02	Q	.	.	.	.
4.98	0.0068	0.02	Q	.	.	.	.
5.12	0.0070	0.02	Q	.	.	.	.
5.26	0.0072	0.02	Q	.	.	.	.
5.41	0.0074	0.02	Q	.	.	.	.
5.55	0.0077	0.02	Q	.	.	.	.
5.69	0.0079	0.02	Q	.	.	.	.
5.84	0.0081	0.02	Q	.	.	.	.
5.98	0.0084	0.02	Q	.	.	.	.
6.12	0.0086	0.02	Q	.	.	.	.
6.26	0.0088	0.02	Q	.	.	.	.
6.41	0.0091	0.02	Q	.	.	.	.
6.55	0.0093	0.02	Q	.	.	.	.
6.69	0.0096	0.02	Q	.	.	.	.
6.84	0.0098	0.02	Q	.	.	.	.
6.98	0.0101	0.02	Q	.	.	.	.
7.12	0.0103	0.02	Q	.	.	.	.

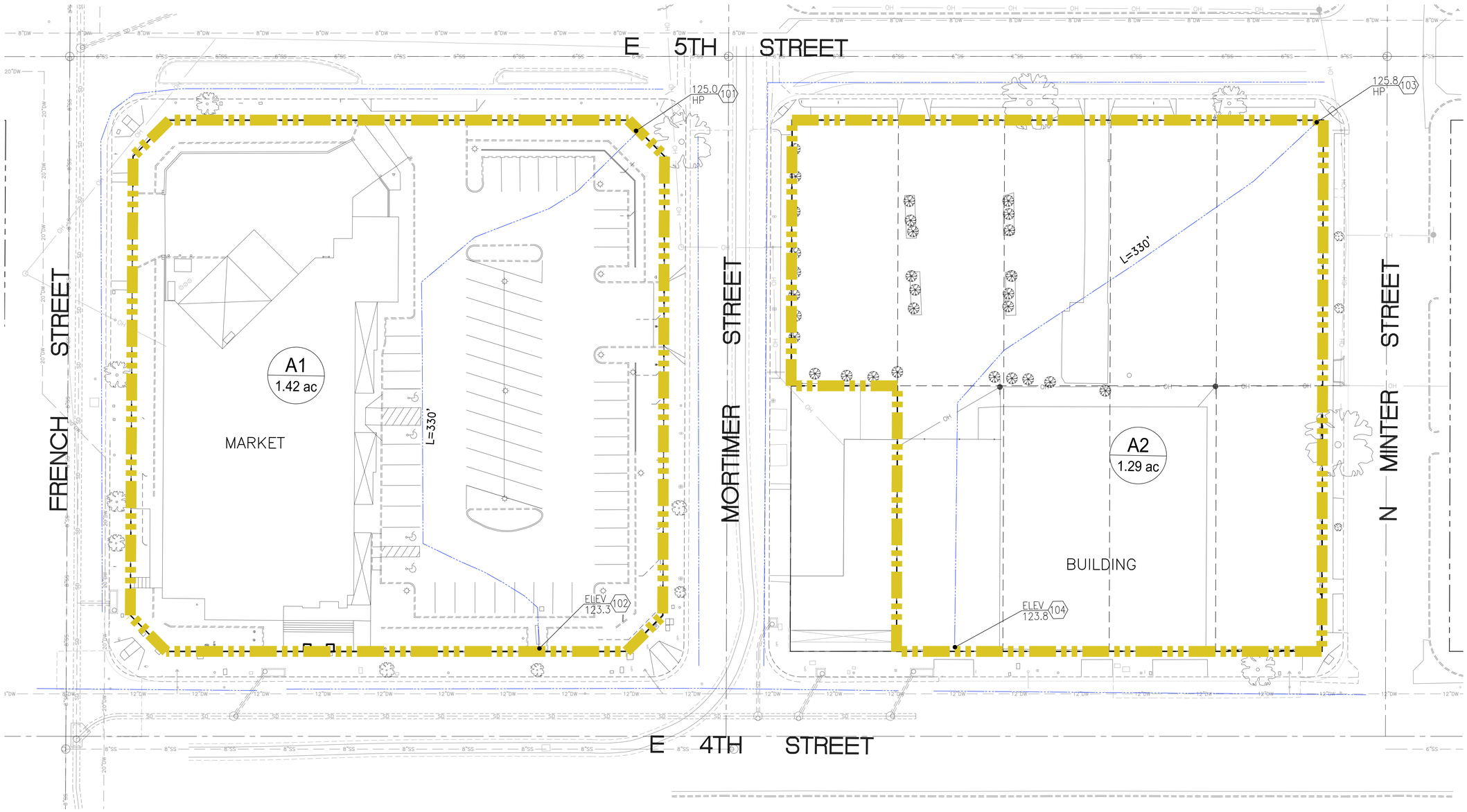
7.27	0.0106	0.02	Q	.	.	.	.
7.41	0.0108	0.02	Q	.	.	.	.
7.55	0.0111	0.02	Q	.	.	.	.
7.70	0.0113	0.02	Q	.	.	.	.
7.84	0.0116	0.02	Q	.	.	.	.
7.98	0.0119	0.02	Q	.	.	.	.
8.13	0.0121	0.02	Q	.	.	.	.
8.27	0.0124	0.02	Q	.	.	.	.
8.41	0.0127	0.02	Q	.	.	.	.
8.56	0.0130	0.02	Q	.	.	.	.
8.70	0.0133	0.02	Q	.	.	.	.
8.84	0.0135	0.02	Q	.	.	.	.
8.98	0.0138	0.02	Q	.	.	.	.
9.13	0.0141	0.02	Q	.	.	.	.
9.27	0.0144	0.03	Q	.	.	.	.
9.41	0.0147	0.03	Q	.	.	.	.
9.56	0.0150	0.03	Q	.	.	.	.
9.70	0.0153	0.03	Q	.	.	.	.
9.84	0.0157	0.03	Q	.	.	.	.
9.99	0.0160	0.03	Q	.	.	.	.
10.13	0.0163	0.03	Q	.	.	.	.
10.27	0.0166	0.03	Q	.	.	.	.
10.42	0.0170	0.03	Q	.	.	.	.
10.56	0.0173	0.03	Q	.	.	.	.
10.70	0.0177	0.03	Q	.	.	.	.
10.85	0.0180	0.03	Q	.	.	.	.
10.99	0.0184	0.03	Q	.	.	.	.
11.13	0.0187	0.03	Q	.	.	.	.
11.28	0.0191	0.03	Q	.	.	.	.
11.42	0.0195	0.03	Q	.	.	.	.
11.56	0.0199	0.03	Q	.	.	.	.
11.70	0.0202	0.03	Q	.	.	.	.
11.85	0.0206	0.03	Q	.	.	.	.
11.99	0.0211	0.03	Q	.	.	.	.
12.13	0.0215	0.04	Q	.	.	.	.
12.28	0.0220	0.04	Q	.	.	.	.
12.42	0.0226	0.05	Q	.	.	.	.
12.56	0.0231	0.05	Q	.	.	.	.
12.71	0.0236	0.05	Q	.	.	.	.
12.85	0.0242	0.05	Q	.	.	.	.
12.99	0.0248	0.05	Q	.	.	.	.
13.14	0.0254	0.05	Q	.	.	.	.
13.28	0.0260	0.05	Q	.	.	.	.
13.42	0.0266	0.05	Q	.	.	.	.
13.57	0.0272	0.06	Q	.	.	.	.
13.71	0.0279	0.06	Q	.	.	.	.
13.85	0.0286	0.06	Q	.	.	.	.
14.00	0.0293	0.06	Q	.	.	.	.
14.14	0.0301	0.07	Q	.	.	.	.
14.28	0.0308	0.07	Q	.	.	.	.
14.43	0.0317	0.07	Q	.	.	.	.
14.57	0.0325	0.07	Q	.	.	.	.
14.71	0.0334	0.08	Q	.	.	.	.
14.85	0.0344	0.08	Q	.	.	.	.
15.00	0.0354	0.09	Q	.	.	.	.
15.14	0.0365	0.09	Q	.	.	.	.
15.28	0.0377	0.11	Q	.	.	.	.
15.43	0.0390	0.11	Q	.	.	.	.
15.57	0.0403	0.12	Q	.	.	.	.
15.71	0.0418	0.13	Q	.	.	.	.
15.86	0.0441	0.26	.Q	.	.	.	.

16.00	0.0482	0.43	.Q	.	.	.	.
16.14	0.0610	1.72	.	Q	.	.	.
16.29	0.0721	0.17	Q	.	.	.	.
16.43	0.0738	0.11	Q	.	.	.	.
16.57	0.0750	0.10	Q	.	.	.	.
16.72	0.0761	0.09	Q	.	.	.	.
16.86	0.0771	0.08	Q	.	.	.	.
17.00	0.0779	0.07	Q	.	.	.	.
17.15	0.0787	0.06	Q	.	.	.	.
17.29	0.0794	0.06	Q	.	.	.	.
17.43	0.0801	0.05	Q	.	.	.	.
17.57	0.0807	0.05	Q	.	.	.	.
17.72	0.0813	0.05	Q	.	.	.	.
17.86	0.0819	0.05	Q	.	.	.	.
18.00	0.0824	0.04	Q	.	.	.	.
18.15	0.0829	0.04	Q	.	.	.	.
18.29	0.0833	0.03	Q	.	.	.	.
18.43	0.0837	0.03	Q	.	.	.	.
18.58	0.0840	0.03	Q	.	.	.	.
18.72	0.0844	0.03	Q	.	.	.	.
18.86	0.0848	0.03	Q	.	.	.	.
19.01	0.0851	0.03	Q	.	.	.	.
19.15	0.0854	0.03	Q	.	.	.	.
19.29	0.0857	0.03	Q	.	.	.	.
19.44	0.0861	0.03	Q	.	.	.	.
19.58	0.0864	0.03	Q	.	.	.	.
19.72	0.0867	0.02	Q	.	.	.	.
19.87	0.0869	0.02	Q	.	.	.	.
20.01	0.0872	0.02	Q	.	.	.	.
20.15	0.0875	0.02	Q	.	.	.	.
20.30	0.0878	0.02	Q	.	.	.	.
20.44	0.0880	0.02	Q	.	.	.	.
20.58	0.0883	0.02	Q	.	.	.	.
20.72	0.0885	0.02	Q	.	.	.	.
20.87	0.0888	0.02	Q	.	.	.	.
21.01	0.0890	0.02	Q	.	.	.	.
21.15	0.0893	0.02	Q	.	.	.	.
21.30	0.0895	0.02	Q	.	.	.	.
21.44	0.0897	0.02	Q	.	.	.	.
21.58	0.0900	0.02	Q	.	.	.	.
21.73	0.0902	0.02	Q	.	.	.	.
21.87	0.0904	0.02	Q	.	.	.	.
22.01	0.0906	0.02	Q	.	.	.	.
22.16	0.0908	0.02	Q	.	.	.	.
22.30	0.0910	0.02	Q	.	.	.	.
22.44	0.0912	0.02	Q	.	.	.	.
22.59	0.0914	0.02	Q	.	.	.	.
22.73	0.0916	0.02	Q	.	.	.	.
22.87	0.0918	0.02	Q	.	.	.	.
23.02	0.0920	0.02	Q	.	.	.	.
23.16	0.0922	0.02	Q	.	.	.	.
23.30	0.0924	0.02	Q	.	.	.	.
23.44	0.0926	0.02	Q	.	.	.	.
23.59	0.0928	0.02	Q	.	.	.	.
23.73	0.0930	0.02	Q	.	.	.	.
23.87	0.0932	0.02	Q	.	.	.	.
24.02	0.0933	0.02	Q	.	.	.	.
24.16	0.0934	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%	1443.1
10%	34.4
20%	17.2
30%	8.6
40%	8.6
50%	8.6
60%	8.6
70%	8.6
80%	8.6
90%	8.6



EXISTING CONDITION 2-YEAR STORM EVENT				
SUB AREA	AREA (AC)	Q (CFS)	T_c (MIN)	VOLUME (AC-FT)
A-1	1.42	2.0	8.87	0.18
A-2	1.29	1.7	8.59	0.09
TOTAL	2.71	3.7	–	0.27

EXISTING CONDITION 25-YEAR STORM EVENT				
SUB AREA	AREA (AC)	Q (CFS)	T_c (MIN)	VOLUME (AC-FT)
A-1	1.42	4.4	8.87	0.43
A-2	1.29	3.9	8.59	0.30
TOTAL	2.71	8.3	–	0.73

ASSESSOR PARCEL NO.

398-325-01 & 398-330-02, 03, 04, 05, 06, 07, 08, 09, 10

SITE ADDRESSES

409 EAST 4TH STREET
509 EAST 4TH STREET
SANTA ANA, CALIFORNIA 92126

DEVELOPER

RED OAK INVESTMENTS
4199 CAMPUS DRIVE, SUITE 200
IRVINE, CALIFORNIA 92612
949.733.2000

CIVIL ENGINEER

FUSCOE ENGINEERING
16795 VON KARMAN, SUITE 100
IRVINE, CALIFORNIA 92606
TEL: 949.474.1960
FAX: 949.474.5315

ABBREVATIONS

AC	ACRE
AC-FT	ACRE-FOOT
CFS	CUBIC FEET PER SECOND
ELEV	ELEVATION
HP	HIGH POINT
L	LENGTH
MIN	MINUTES
Q_2	FLOW RATE
S	SLOPE
T_c	TIME OF CONCENTRATION

LEGEND

- PROJECT DRAINAGE BOUNDARY
- DRAINAGE SUB-BOUNDARY
- XX — NODE
- L=XXX' — TIME OF CONCENTRATION FLOW PATH / FLOW PATH LENGTH
- XX / X.XXac — DRAINAGE BOUNDARY DESIGNATION AND AREA
- ENTIRE SITE – SOIL TYPE "B"

N

20' 0' 10' 20'

SCALE: 1" = 20'

PREPARED BY:
FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 ◦ fax 949.474.5315
www.fuscoe.com

HYDROLOGY MAP
EXISTING CONDITION

E 4TH STREET & MORTIMER STREET
CITY OF SANTA ANA, CALIFORNIA

PROJECT NO. 774.009

SHEET 1 OF 1

PLAN SET: X

CITY OF SANTA ANA - 4TH & MORTIMER
EXISTING HYDROLOGY MAP

2019-07-XX

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****************************************************************************
            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 1355

                          Analysis prepared by:

                            fuscoe engineering
                             16795 Von Karman
                                Suite 100
                                Irvine, CA

 ************************ DESCRIPTION OF STUDY *************************
* 4th & Mortimer                                                        *
* Proposed Condition Hydrology                                          *
* 2-year storm event                                                    *
 ************************************************************************

  FILE NAME: PR4TH2.DAT
  TIME/DATE OF STUDY: 15:30 07/24/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 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    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    125.00  DOWNSTREAM(FEET) =    123.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.869
```

```
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.629
  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                 B        0.71      0.30     0.100    36    8.87
  APARTMENTS                 B        0.71      0.30     0.200    36    9.45
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.150
  SUBAREA RUNOFF(CFS) =      2.02
  TOTAL AREA(ACRES) =      1.42   PEAK FLOW RATE(CFS) =      2.02

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    125.80  DOWNSTREAM(FEET) =    123.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.586
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.660
  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                 B        0.64      0.30     0.100    36    8.59
  APARTMENTS                 B        0.64      0.30     0.200    36    9.15
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.150
  SUBAREA RUNOFF(CFS) =      1.87
  TOTAL AREA(ACRES) =      1.29   PEAK FLOW RATE(CFS) =      1.87
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.3  TC(MIN.) =      8.59
  EFFECTIVE AREA(ACRES) =      1.29  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.150
  PEAK FLOW RATE(CFS)   =       1.87
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1355

                          Analysis prepared by:

                            fuscoe engineering
                             16795 Von Karman
                                Suite 100
                                Irvine, CA

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  4th & Mortimer - Proposed Condition Hydrograph
  Area A-1 (West Parcel)
  2-year storm event
==========================================================================
*** 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         1.42       15.00       56.(AMC II)     0.300       0.756

    TOTAL AREA (Acres) =      1.42

                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045

                                  _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.244
==========================================================================

 Problem Descriptions:
  4th & Mortimer - Proposed Condition Hydrograph
  Area A-1 (West Parcel) (calibration coefficient = 0.895)
  2-year storm event
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.89
    TOTAL CATCHMENT AREA(ACRES) =    1.42
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.244
    TIME OF CONCENTRATION(MIN.) =  8.87
    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) =     0.17
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.07

********************************************************************************
  TIME      VOLUME        Q    0.         2.5        5.0        7.5       10.0
 (HOURS)     (AF)       (CFS)
--------------------------------------------------------------------------------
  0.03      0.0000      0.00  Q          .          .          .          .
  0.18      0.0002      0.03  Q          .          .          .          .
  0.33      0.0006      0.03  Q          .          .          .          .
  0.48      0.0009      0.03  Q          .          .          .          .
  0.63      0.0013      0.03  Q          .          .          .          .
  0.77      0.0017      0.03  Q          .          .          .          .
  0.92      0.0021      0.03  Q          .          .          .          .
  1.07      0.0025      0.03  Q          .          .          .          .
  1.22      0.0029      0.03  Q          .          .          .          .
  1.36      0.0033      0.03  Q          .          .          .          .
  1.51      0.0037      0.03  Q          .          .          .          .
  1.66      0.0041      0.03  Q          .          .          .          .
  1.81      0.0045      0.03  Q          .          .          .          .
  1.96      0.0049      0.03  Q          .          .          .          .
  2.10      0.0053      0.03  Q          .          .          .          .
  2.25      0.0057      0.03  Q          .          .          .          .
  2.40      0.0061      0.03  Q          .          .          .          .
  2.55      0.0065      0.03  Q          .          .          .          .
  2.70      0.0069      0.03  Q          .          .          .          .
  2.84      0.0074      0.03  Q          .          .          .          .
  2.99      0.0078      0.03  Q          .          .          .          .
  3.14      0.0082      0.04  Q          .          .          .          .
  3.29      0.0086      0.04  Q          .          .          .          .
  3.43      0.0091      0.04  Q          .          .          .          .
  3.58      0.0095      0.04  Q          .          .          .          .
  3.73      0.0099      0.04  Q          .          .          .          .
  3.88      0.0104      0.04  Q          .          .          .          .
  4.03      0.0108      0.04  Q          .          .          .          .
  4.17      0.0113      0.04  Q          .          .          .          .
  4.32      0.0117      0.04  Q          .          .          .          .
  4.47      0.0122      0.04  Q          .          .          .          .
  4.62      0.0126      0.04  Q          .          .          .          .
  4.76      0.0131      0.04  Q          .          .          .          .
  4.91      0.0136      0.04  Q          .          .          .          .
  5.06      0.0140      0.04  Q          .          .          .          .
  5.21      0.0145      0.04  Q          .          .          .          .
  5.36      0.0150      0.04  Q          .          .          .          .
  5.50      0.0155      0.04  Q          .          .          .          .
  5.65      0.0160      0.04  Q          .          .          .          .
  5.80      0.0165      0.04  Q          .          .          .          .
  5.95      0.0170      0.04  Q          .          .          .          .
  6.10      0.0175      0.04  Q          .          .          .          .
  6.24      0.0180      0.04  Q          .          .          .          .
  6.39      0.0185      0.04  Q          .          .          .          .
  6.54      0.0190      0.04  Q          .          .          .          .
  6.69      0.0195      0.04  Q          .          .          .          .
  6.83      0.0200      0.04  Q          .          .          .          .
  6.98      0.0206      0.04  Q          .          .          .          .
  7.13      0.0211      0.04  Q          .          .          .          .
  7.28      0.0216      0.04  Q          .          .          .          .
  7.43      0.0222      0.04  Q          .          .          .          .
  7.57      0.0227      0.05  Q          .          .          .          .
```

7.72	0.0233	0.05	Q	.	.	.	.
7.87	0.0239	0.05	Q	.	.	.	.
8.02	0.0244	0.05	Q	.	.	.	.
8.16	0.0250	0.05	Q	.	.	.	.
8.31	0.0256	0.05	Q	.	.	.	.
8.46	0.0262	0.05	Q	.	.	.	.
8.61	0.0268	0.05	Q	.	.	.	.
8.76	0.0274	0.05	Q	.	.	.	.
8.90	0.0280	0.05	Q	.	.	.	.
9.05	0.0286	0.05	Q	.	.	.	.
9.20	0.0293	0.05	Q	.	.	.	.
9.35	0.0299	0.05	Q	.	.	.	.
9.50	0.0305	0.05	Q	.	.	.	.
9.64	0.0312	0.05	Q	.	.	.	.
9.79	0.0319	0.05	Q	.	.	.	.
9.94	0.0325	0.06	Q	.	.	.	.
10.09	0.0332	0.06	Q	.	.	.	.
10.23	0.0339	0.06	Q	.	.	.	.
10.38	0.0346	0.06	Q	.	.	.	.
10.53	0.0353	0.06	Q	.	.	.	.
10.68	0.0361	0.06	Q	.	.	.	.
10.83	0.0368	0.06	Q	.	.	.	.
10.97	0.0376	0.06	Q	.	.	.	.
11.12	0.0383	0.06	Q	.	.	.	.
11.27	0.0391	0.06	Q	.	.	.	.
11.42	0.0399	0.07	Q	.	.	.	.
11.57	0.0407	0.07	Q	.	.	.	.
11.71	0.0416	0.07	Q	.	.	.	.
11.86	0.0424	0.07	Q	.	.	.	.
12.01	0.0433	0.07	Q	.	.	.	.
12.16	0.0442	0.08	Q	.	.	.	.
12.30	0.0453	0.09	Q	.	.	.	.
12.45	0.0464	0.09	Q	.	.	.	.
12.60	0.0476	0.10	Q	.	.	.	.
12.75	0.0488	0.10	Q	.	.	.	.
12.90	0.0500	0.10	Q	.	.	.	.
13.04	0.0512	0.10	Q	.	.	.	.
13.19	0.0525	0.11	Q	.	.	.	.
13.34	0.0538	0.11	Q	.	.	.	.
13.49	0.0551	0.11	Q	.	.	.	.
13.63	0.0565	0.11	Q	.	.	.	.
13.78	0.0579	0.12	Q	.	.	.	.
13.93	0.0594	0.12	Q	.	.	.	.
14.08	0.0610	0.13	Q	.	.	.	.
14.23	0.0626	0.14	Q	.	.	.	.
14.37	0.0643	0.15	Q	.	.	.	.
14.52	0.0661	0.15	Q	.	.	.	.
14.67	0.0680	0.16	Q	.	.	.	.
14.82	0.0700	0.17	Q	.	.	.	.
14.97	0.0722	0.18	Q	.	.	.	.
15.11	0.0745	0.19	Q	.	.	.	.
15.26	0.0770	0.22	Q	.	.	.	.
15.41	0.0799	0.24	Q	.	.	.	.
15.56	0.0829	0.25	.Q	.	.	.	.
15.70	0.0862	0.29	.Q	.	.	.	.
15.85	0.0908	0.45	.Q	.	.	.	.
16.00	0.0974	0.63	. Q	.	.	.	.
16.15	0.1136	2.02	.	Q .	.	.	.
16.30	0.1281	0.35	.Q	.	.	.	.
16.44	0.1316	0.23	Q	.	.	.	.
16.59	0.1343	0.21	Q	.	.	.	.

16.74	0.1367	0.17	Q	.	.	.	.
16.89	0.1387	0.16	Q	.	.	.	.
17.03	0.1405	0.14	Q	.	.	.	.
17.18	0.1421	0.13	Q	.	.	.	.
17.33	0.1436	0.12	Q	.	.	.	.
17.48	0.1450	0.11	Q	.	.	.	.
17.63	0.1463	0.10	Q	.	.	.	.
17.77	0.1475	0.10	Q	.	.	.	.
17.92	0.1487	0.09	Q	.	.	.	.
18.07	0.1498	0.09	Q	.	.	.	.
18.22	0.1508	0.07	Q	.	.	.	.
18.37	0.1517	0.07	Q	.	.	.	.
18.51	0.1525	0.07	Q	.	.	.	.
18.66	0.1533	0.06	Q	.	.	.	.
18.81	0.1540	0.06	Q	.	.	.	.
18.96	0.1548	0.06	Q	.	.	.	.
19.10	0.1555	0.06	Q	.	.	.	.
19.25	0.1562	0.06	Q	.	.	.	.
19.40	0.1568	0.05	Q	.	.	.	.
19.55	0.1575	0.05	Q	.	.	.	.
19.70	0.1581	0.05	Q	.	.	.	.
19.84	0.1587	0.05	Q	.	.	.	.
19.99	0.1593	0.05	Q	.	.	.	.
20.14	0.1599	0.05	Q	.	.	.	.
20.29	0.1605	0.05	Q	.	.	.	.
20.43	0.1610	0.05	Q	.	.	.	.
20.58	0.1616	0.04	Q	.	.	.	.
20.73	0.1621	0.04	Q	.	.	.	.
20.88	0.1626	0.04	Q	.	.	.	.
21.03	0.1631	0.04	Q	.	.	.	.
21.17	0.1637	0.04	Q	.	.	.	.
21.32	0.1641	0.04	Q	.	.	.	.
21.47	0.1646	0.04	Q	.	.	.	.
21.62	0.1651	0.04	Q	.	.	.	.
21.77	0.1656	0.04	Q	.	.	.	.
21.91	0.1660	0.04	Q	.	.	.	.
22.06	0.1665	0.04	Q	.	.	.	.
22.21	0.1670	0.04	Q	.	.	.	.
22.36	0.1674	0.04	Q	.	.	.	.
22.50	0.1678	0.04	Q	.	.	.	.
22.65	0.1683	0.03	Q	.	.	.	.
22.80	0.1687	0.03	Q	.	.	.	.
22.95	0.1691	0.03	Q	.	.	.	.
23.10	0.1695	0.03	Q	.	.	.	.
23.24	0.1699	0.03	Q	.	.	.	.
23.39	0.1703	0.03	Q	.	.	.	.
23.54	0.1707	0.03	Q	.	.	.	.
23.69	0.1711	0.03	Q	.	.	.	.
23.84	0.1715	0.03	Q	.	.	.	.
23.98	0.1719	0.03	Q	.	.	.	.
24.13	0.1723	0.03	Q	.	.	.	.
24.28	0.1724	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%	1445.8
10%	88.7
20%	26.6
30%	17.7
40%	8.9
50%	8.9
60%	8.9
70%	8.9
80%	8.9
90%	8.9

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                          Analysis prepared by:

                            fuscoe engineering
                             16795 Von Karman
                                Suite 100
                                Irvine, CA

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  4th & Mortimer - Proposed Condition Hydrograph
  Area A-2 (East Parcel)
  2-year storm event
==========================================================================
*** 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         1.29       15.00       56.(AMC II)     0.300       0.756

    TOTAL AREA (Acres) =      1.29

                                  _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045

                                  _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.244
==========================================================================

 Problem Descriptions:
  4th & Mortimer - Proposed Condition Hydrograph
  Area A-2 (East Parcel)  (calibration coefficient = 0.895)
  2-year storm event
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.89
    TOTAL CATCHMENT AREA(ACRES) =    1.29
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.244
    TIME OF CONCENTRATION(MIN.) =  8.59
    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) = 0.16
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.06

****

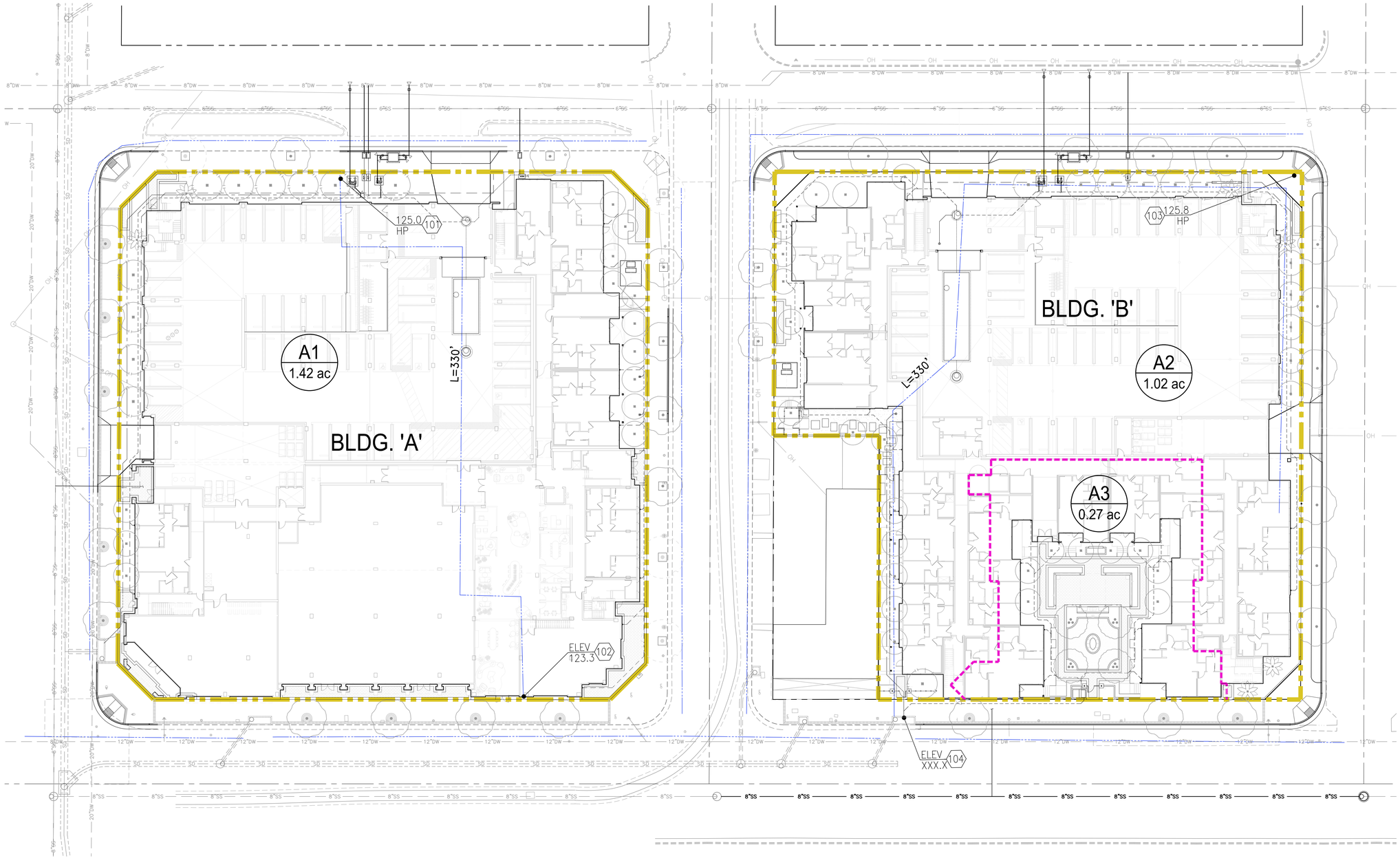
TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.11	0.0001	0.03	Q	.	.	.	.
0.25	0.0005	0.03	Q	.	.	.	.
0.39	0.0008	0.03	Q	.	.	.	.
0.54	0.0011	0.03	Q	.	.	.	.
0.68	0.0015	0.03	Q	.	.	.	.
0.82	0.0018	0.03	Q	.	.	.	.
0.97	0.0021	0.03	Q	.	.	.	.
1.11	0.0025	0.03	Q	.	.	.	.
1.25	0.0028	0.03	Q	.	.	.	.
1.40	0.0032	0.03	Q	.	.	.	.
1.54	0.0035	0.03	Q	.	.	.	.
1.68	0.0039	0.03	Q	.	.	.	.
1.83	0.0042	0.03	Q	.	.	.	.
1.97	0.0046	0.03	Q	.	.	.	.
2.11	0.0049	0.03	Q	.	.	.	.
2.26	0.0053	0.03	Q	.	.	.	.
2.40	0.0057	0.03	Q	.	.	.	.
2.54	0.0060	0.03	Q	.	.	.	.
2.69	0.0064	0.03	Q	.	.	.	.
2.83	0.0068	0.03	Q	.	.	.	.
2.97	0.0071	0.03	Q	.	.	.	.
3.12	0.0075	0.03	Q	.	.	.	.
3.26	0.0079	0.03	Q	.	.	.	.
3.40	0.0083	0.03	Q	.	.	.	.
3.54	0.0087	0.03	Q	.	.	.	.
3.69	0.0090	0.03	Q	.	.	.	.
3.83	0.0094	0.03	Q	.	.	.	.
3.97	0.0098	0.03	Q	.	.	.	.
4.12	0.0102	0.03	Q	.	.	.	.
4.26	0.0106	0.03	Q	.	.	.	.
4.40	0.0110	0.03	Q	.	.	.	.
4.55	0.0114	0.03	Q	.	.	.	.
4.69	0.0118	0.03	Q	.	.	.	.
4.83	0.0122	0.03	Q	.	.	.	.
4.98	0.0126	0.04	Q	.	.	.	.
5.12	0.0131	0.04	Q	.	.	.	.
5.26	0.0135	0.04	Q	.	.	.	.
5.41	0.0139	0.04	Q	.	.	.	.
5.55	0.0143	0.04	Q	.	.	.	.
5.69	0.0148	0.04	Q	.	.	.	.
5.84	0.0152	0.04	Q	.	.	.	.
5.98	0.0156	0.04	Q	.	.	.	.
6.12	0.0161	0.04	Q	.	.	.	.
6.26	0.0165	0.04	Q	.	.	.	.
6.41	0.0170	0.04	Q	.	.	.	.
6.55	0.0174	0.04	Q	.	.	.	.
6.69	0.0179	0.04	Q	.	.	.	.
6.84	0.0183	0.04	Q	.	.	.	.
6.98	0.0188	0.04	Q	.	.	.	.
7.12	0.0193	0.04	Q	.	.	.	.
7.27	0.0197	0.04	Q	.	.	.	.
7.41	0.0202	0.04	Q	.	.	.	.

7.55	0.0207	0.04	Q	.	.	.	.
7.70	0.0212	0.04	Q	.	.	.	.
7.84	0.0217	0.04	Q	.	.	.	.
7.98	0.0222	0.04	Q	.	.	.	.
8.13	0.0227	0.04	Q	.	.	.	.
8.27	0.0232	0.04	Q	.	.	.	.
8.41	0.0237	0.04	Q	.	.	.	.
8.56	0.0243	0.04	Q	.	.	.	.
8.70	0.0248	0.05	Q	.	.	.	.
8.84	0.0253	0.05	Q	.	.	.	.
8.98	0.0259	0.05	Q	.	.	.	.
9.13	0.0264	0.05	Q	.	.	.	.
9.27	0.0270	0.05	Q	.	.	.	.
9.41	0.0275	0.05	Q	.	.	.	.
9.56	0.0281	0.05	Q	.	.	.	.
9.70	0.0287	0.05	Q	.	.	.	.
9.84	0.0293	0.05	Q	.	.	.	.
9.99	0.0299	0.05	Q	.	.	.	.
10.13	0.0305	0.05	Q	.	.	.	.
10.27	0.0311	0.05	Q	.	.	.	.
10.42	0.0317	0.05	Q	.	.	.	.
10.56	0.0324	0.05	Q	.	.	.	.
10.70	0.0330	0.06	Q	.	.	.	.
10.85	0.0337	0.06	Q	.	.	.	.
10.99	0.0343	0.06	Q	.	.	.	.
11.13	0.0350	0.06	Q	.	.	.	.
11.28	0.0357	0.06	Q	.	.	.	.
11.42	0.0364	0.06	Q	.	.	.	.
11.56	0.0371	0.06	Q	.	.	.	.
11.70	0.0379	0.06	Q	.	.	.	.
11.85	0.0386	0.06	Q	.	.	.	.
11.99	0.0394	0.06	Q	.	.	.	.
12.13	0.0402	0.08	Q	.	.	.	.
12.28	0.0412	0.08	Q	.	.	.	.
12.42	0.0422	0.08	Q	.	.	.	.
12.56	0.0432	0.09	Q	.	.	.	.
12.71	0.0442	0.09	Q	.	.	.	.
12.85	0.0453	0.09	Q	.	.	.	.
12.99	0.0463	0.09	Q	.	.	.	.
13.14	0.0475	0.09	Q	.	.	.	.
13.28	0.0486	0.10	Q	.	.	.	.
13.42	0.0498	0.10	Q	.	.	.	.
13.57	0.0510	0.10	Q	.	.	.	.
13.71	0.0522	0.11	Q	.	.	.	.
13.85	0.0535	0.11	Q	.	.	.	.
14.00	0.0548	0.11	Q	.	.	.	.
14.14	0.0562	0.12	Q	.	.	.	.
14.28	0.0577	0.13	Q	.	.	.	.
14.43	0.0592	0.13	Q	.	.	.	.
14.57	0.0609	0.14	Q	.	.	.	.
14.71	0.0625	0.15	Q	.	.	.	.
14.85	0.0643	0.15	Q	.	.	.	.
15.00	0.0663	0.17	Q	.	.	.	.
15.14	0.0683	0.18	Q	.	.	.	.
15.28	0.0706	0.21	Q	.	.	.	.
15.43	0.0732	0.23	Q	.	.	.	.
15.57	0.0759	0.23	Q	.	.	.	.
15.71	0.0789	0.27	.Q	.	.	.	.
15.86	0.0830	0.42	.Q	.	.	.	.
16.00	0.0890	0.59	. Q	.	.	.	.
16.14	0.1035	1.87	.	Q	.	.	.

16.29	0.1165	0.33	.Q	.	.	.	.
16.43	0.1196	0.21	Q	.	.	.	.
16.57	0.1220	0.19	Q	.	.	.	.
16.72	0.1241	0.16	Q	.	.	.	.
16.86	0.1259	0.14	Q	.	.	.	.
17.00	0.1275	0.13	Q	.	.	.	.
17.15	0.1290	0.12	Q	.	.	.	.
17.29	0.1303	0.11	Q	.	.	.	.
17.43	0.1316	0.10	Q	.	.	.	.
17.57	0.1327	0.10	Q	.	.	.	.
17.72	0.1338	0.09	Q	.	.	.	.
17.86	0.1349	0.09	Q	.	.	.	.
18.00	0.1359	0.08	Q	.	.	.	.
18.15	0.1368	0.07	Q	.	.	.	.
18.29	0.1375	0.06	Q	.	.	.	.
18.43	0.1383	0.06	Q	.	.	.	.
18.58	0.1390	0.06	Q	.	.	.	.
18.72	0.1397	0.06	Q	.	.	.	.
18.86	0.1403	0.05	Q	.	.	.	.
19.01	0.1409	0.05	Q	.	.	.	.
19.15	0.1416	0.05	Q	.	.	.	.
19.29	0.1422	0.05	Q	.	.	.	.
19.44	0.1427	0.05	Q	.	.	.	.
19.58	0.1433	0.05	Q	.	.	.	.
19.72	0.1439	0.05	Q	.	.	.	.
19.87	0.1444	0.04	Q	.	.	.	.
20.01	0.1449	0.04	Q	.	.	.	.
20.15	0.1454	0.04	Q	.	.	.	.
20.30	0.1459	0.04	Q	.	.	.	.
20.44	0.1464	0.04	Q	.	.	.	.
20.58	0.1469	0.04	Q	.	.	.	.
20.72	0.1474	0.04	Q	.	.	.	.
20.87	0.1478	0.04	Q	.	.	.	.
21.01	0.1483	0.04	Q	.	.	.	.
21.15	0.1487	0.04	Q	.	.	.	.
21.30	0.1492	0.04	Q	.	.	.	.
21.44	0.1496	0.04	Q	.	.	.	.
21.58	0.1500	0.04	Q	.	.	.	.
21.73	0.1504	0.03	Q	.	.	.	.
21.87	0.1508	0.03	Q	.	.	.	.
22.01	0.1513	0.03	Q	.	.	.	.
22.16	0.1516	0.03	Q	.	.	.	.
22.30	0.1520	0.03	Q	.	.	.	.
22.44	0.1524	0.03	Q	.	.	.	.
22.59	0.1528	0.03	Q	.	.	.	.
22.73	0.1532	0.03	Q	.	.	.	.
22.87	0.1535	0.03	Q	.	.	.	.
23.02	0.1539	0.03	Q	.	.	.	.
23.16	0.1543	0.03	Q	.	.	.	.
23.30	0.1546	0.03	Q	.	.	.	.
23.44	0.1550	0.03	Q	.	.	.	.
23.59	0.1553	0.03	Q	.	.	.	.
23.73	0.1557	0.03	Q	.	.	.	.
23.87	0.1560	0.03	Q	.	.	.	.
24.02	0.1563	0.03	Q	.	.	.	.
24.16	0.1565	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%	1443.1
10%	85.9
20%	25.8
30%	17.2
40%	8.6
50%	8.6
60%	8.6
70%	8.6
80%	8.6
90%	8.6



PROPOSED CONDITION 2-YEAR STORM EVENT				
SUB AREA	AREA (AC)	Q (CFS)	T_C (MIN)	VOLUME (AC-FT)
A-1	1.42	2.0	8.87	0.17
A-2	1.29	1.9	8.59	0.16
TOTAL	2.71	3.9	–	0.33

PROPOSED CONDITION 25-YEAR STORM EVENT				
SUB AREA	AREA (AC)	Q (CFS)	T_C (MIN)	VOLUME (AC-FT)
A-1	1.42	4.4	8.87	0.42
A-2	1.29	4.1	8.59	0.38
TOTAL	2.71	8.5	–	0.80

ASSESSOR PARCEL NO.

398-325-01 & 398-330-02, 03, 04, 05, 06, 07, 08, 09, 10

SITE ADDRESSES

409 EAST 4TH STREET
509 EAST 4TH STREET
SANTA ANA, CALIFORNIA 92126

DEVELOPER

RED OAK INVESTMENTS
4199 CAMPUS DRIVE, SUITE 200
IRVINE, CALIFORNIA 92612
949.733.2000

CIVIL ENGINEER

FUSCOE ENGINEERING
16795 VON KARMAN, SUITE 100
IRVINE, CALIFORNIA 92606
TEL: 949.474.1960
FAX: 949.474.5315

ABBREVATIONS

AC	ACRE
AC-FT	ACRE-FOOT
CFS	CUBIC FEET PER SECOND
ELEV	ELEVATION
HP	HIGH POINT
L	LENGTH
MIN	MINUTES
Q_B	FLOW RATE
S	SLOPE
T_C	TIME OF CONCENTRATION

LEGEND

- PROJECT DRAINAGE BOUNDARY
- DRAINAGE SUB-BOUNDARY
- (XX) NODE
- TIME OF CONCENTRATION FLOW PATH
- L=XXX' FLOW PATH LENGTH
- XX / X.XXac DRAINAGE BOUNDARY DESIGNATION AND AREA

ENTIRE SITE - SOIL TYPE "B"

N

20' 0' 10' 20'
SCALE: 1" = 20'

PREPARED BY:
FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 ◦ fax 949.474.5315
www.fuscoe.com

HYDROLOGY MAP
PROPOSED CONDITION

E 4TH STREET & MORTIMER STREET
CITY OF SANTA ANA, CALIFORNIA

PROJECT NO. 774.009

SHEET 1 OF 1

PLAN SET: X

2019-07-XX

CITY OF SANTA ANA - 4TH & MORTIMER
PROPOSED HYDROLOGY MAP

F:\PROJECTS\774\009_SUPPORT FILES\REPORTS\HYDROLOGY\FINAL DESIGN\SUPPORTING DOCUMENTS\HYDROLOGY MAP\774-009-HYDPR.DWG (07-21-22 10:33:11AM) Plotted by: anovak