WQ XX-XXXX

County of Orange/Santa Ana Region Priority Project Final Water Quality Management Plan (WQMP)

Project Name:

TR 19337, LOT 1

2020 E. First Street, Santa Ana, California 92705

APN: 402-191-03

Prepared for:

Meritage Homes, Inc.

5 Peters Canyon Road, Suite 310

Irvine, California 92606

(951) 299-3824 T

Prepared by:

Ryan J. Bittner, P.E./ C&V Consulting, Inc.

Joy Hendricks, Project Manager

9830 Irvine Center Drive

Irvine, California 92618

(949) 916-3800 / rbittner@cvc-inc.net

Prepared: May 2025

Project Owner's Certification			
Planning Application No. (If applicable)	P0115242	Grading Permit No.	TBD
Tract/Parcel Map and Lot(s) No.	TR 19337, Lot 1	Building Permit No.	TBD
Address of Project Site and APN (If no address, specify Tract/Parcel Map and Lot Numbers)			2020 E. First Street A.P.N. 402-191-03

This Final Water Quality Management Plan (WQMP) has been prepared for Meritage Homes, Inc. by C&V Consulting, Inc. The WQMP is intended to comply with the requirements of the City of Santa Ana and 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.

Owner: Louisa Feletto			
Title	Forward Planning Manager		
Company	Meritage Homes, Inc.		
Address	5 Peters Canyon Road, Suite 310, Irvine, California 92606		
Email	Louisa.feletto@meritagehomes.com		
Telephone #	(951) 299-3824		
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): Ryan J. Bittner, P.E.			
Title	CEO	PE Registration #	68167
Company	C&V Consulting, Inc.		
Address	9830 Irvine Center Drive, Irvine, California 92618		
Email	rbittner@cvc-inc.com		
Telephone #	(949) 916-3800		
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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Attachments

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

Project Infomation			
Permit/Application No. (If applicable)	P0115242	Grading or Building Permit No. (If applicable)	TBD
Address of Project Site (or Tract Map and Lot Number if no address) and APN	VTTM 19337, Lot 1 2020 E. First Street, Santa Ana, CA 92705 A.P.N. 402-191-03		
Water Quality Conditions of Approval or Issuance			
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim.)	Water Quality Conditions of Approval have not been provided at this time		
Conceptual WQMP			
Was a Conceptual Water Quality Management Plan previously approved for this project?	Yes		
Watershed-Based Plan Conditions			
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	N/A		

Section II Project Description

II.1 Project Description

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td>Development Category (From Model WQMP, Table 7.11-2; or -3):</td><td colspan="4">All significant redevelopment projects, where significant redevelopment is defined as projects that include the addition or replacement of 5,000 square feet or more of impervious surface on a 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.

If the redevelopment results in the addition or replacement of less than 50 percent of the impervious area on-site and the existing development was not subject to WQMP requirement, the numeric sizing criteria discussed in Section 7.II-2.0 only applies to the addition or the replacement area. If the addition or replacement accounts for 50 percent or more of the impervious area, the Project WQMP requirements apply to the entire development.

Parking lots 5,000 square feet or more, or parking lots with 15 parking spaces or more, including associated drive aisle, and potentially exposed to urban stormwater runoff. A parking lot is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.</td></tr>
<tr><td>Project Area (ft²): 160,130*</td><td colspan="2">Number of Dwelling Units: 86</td><td colspan="2">SIC Code: N/A</td></tr>
<tr><td rowspan="2">Project Area</td><td colspan="2">Pervious</td><td colspan="2">Impervious</td></tr>
<tr><td>Area (acres or sq. ft)</td><td>Percentage</td><td>Area (acres or sq. ft)</td><td>Percentage</td></tr>
<tr><td>Pre-Project Conditions</td><td>0.37 ac</td><td>10%</td><td>3.35</td><td>90%</td></tr>
<tr><td>*Post-Project Conditions</td><td>0.49 ac</td><td>13%</td><td>3.18</td><td>87%</td></tr>
<tr><td>Drainage Patterns/Connections</td><td colspan="4">The existing site is generally flat and primarily sheet flows southwesterly through the site via curb and gutter along the boundaries. Majority of the existing site sheet flows overland to the southwesterly corner of the existing parking lot. Tributary flows from the offsite adjacent development are mitigated through the private drive aisle and routes to an onsite existing longitudinal</td></tr>
</table>

	gutter and continues south to an existing 5′ wide curb and gutter and then west to an existing offsite catch basin located southwest corner of the project boundary. In addition, the offsite School drainage also confluence with the offsite development at the existing 5′ wide curb and gutter onsite prior from discharging at the existing offsite catch basin. Storm water runoff from the site converges with the Southwest-Tustin Channel, an Orange County Flood Control District facility located on the west of the project site. Ultimately, all flows are conveyed to an existing offsite catch basin located near the southwest corner of the project boundary. From this catch basin flows continue to an existing channel (Southwest-Tustin Channel) located west of the project site. The proposed project for the most part will be designed to match existing drainage conditions as surface flow and onsite catch basins and/or area drain systems will infiltrate treatment volumes. Any overflow will be conveyed to the existing catch basin adjacent to the project site which ultimately reach the existing Southwest-Tustin Channel. The catch basins and/or area drain system will be designed during final engineering. * The proposed conditions overall acreage is less than the existing conditions due to the 0.04 acres of the proposed 8′ right-of-way dedication along E. First Street which has been excluded as part of the proposed conditions calculations.
Narrative Project Description: (Use as much space as necessary.)	The total project area consists of approximately 3.68 acres located at 2020 E. First Street, in the City of Santa Ana, California. In the existing condition, the site is currently occupied by an existing medical building with an associated parking lot of asphalt paving, concrete walkways, as well as asphalt and concrete related to the drive aisle. Existing fencing is located on-site, including chain link fencing along the east, west and south boundaries dividing the parking lot from the adjacent development. The site is bounded by the public right-of-way of E. First Street and commercial/ multi-family to the north, soccer field to the west, a school to the south, and a multi-story building development to the east. The proposed development will consist of 86 units (80 townhome units and 6 mixed use live-work units) with private drive aisle, private garage, open parking areas, trash enclosures and common open space area. The proposed site covered private garage and open parking areas. Each unit will have separate domestic water and sanitary sewer services. The trash enclosures will be serviced by a Waste Management Company contracted by Meritage Homes, Inc. and managed an appointed Homeowner's Association (HOA). The development proposes private drive aisles surrounding the buildings, parking areas, hardscaping and landscaping and one (1) primary entrance from E. First Street and three (3) entrances for Emergency Vehicle Access will be provided through the easterly neighboring property via a proposed access agreement. Drive aisles and parking areas will consist of asphalt concrete pavement and sidewalk comprised of Portland concrete cement (PCC).

	Landscaping, including vegetation and trees, will be incorporated in open space areas. Open space areas and landscape areas will be maintained by an appointed property management company. Long-term maintenance will be managed by Meritage Homes, Inc. until an appointed Homeowner's Association (HOA) is selected. The storm water runoff will be collected and conveyed via street surface flow directed towards proposed onsite curb/grate inlet catch basins equipped with Oldcastle Flogard catch basin insert filters for pretreatment. These catch basins convey storm water runoff to an onsite storm drain system which will convey storm water to an onsite detention system prior to entering an onsite Maxwell IV Drywell System for infiltration. Flows exceeding the design capture volume will overflow at the lowest catch basin and continue to flow to the existing offsite storm drain system, matching the existing historic drainage pattern. Refer to WQMP Exhibit in Attachment B of this report for drywell locations. Refer to the separately prepared Hydrology Study by C&V Consulting, Inc. for additional information related to existing conditions.

II.2 Potential Stormwater Pollutants

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 ☐	Tributary by Attached Residential and Commercial Developments per Table 2.1 of the TGD.
Nutrients	E ☒	N ☐	Tributary by Attached Residential and Commercial Developments per Table 2.1 of the TGD.
Heavy Metals	E ☒	N ☐	Tributary by Parking Lots (Parking Structure) per Table 2.1 of the TGD
Pathogens (Bacteria/Virus)	E ☒	N ☐	Tributary by Attached Residential and Commercial Development per Table 2.1 of the TGD.
Pesticides	E ☒	N ☐	Tributary by Attached Residential and Commercial Development per Table 2.1 of the TGD.
Oil and Grease	E ☒	N ☐	Tributary by Attached Residential and Commercial Development per Table 2.1 of the TGD.
Toxic Organic Compounds	E ☒	N ☐	Tributary by Commercial Development per Table 2.1 of the TGD.
Trash and Debris	E ☒	N ☐	Tributary by Attached Residential and Commercial Development per Table 2.1 of the TGD.

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).*

Per Section 5.3.1 of the Technical Guidance, the following calculations were developed:

1. $(V_{2\text{-year, post}} / V_{2\text{-year, pre}}) \leq 1.05$

   (21,899 cf / 23,000 cf) = 0.95 ≤ 1.05 ✓ *

2. $(Tc_{2\text{-year, pre}} / Tc_{2\text{-year, post}}) \leq 1.05$

   (11.96 min/11.26 min) = 1.06 ≤ 1.05 X *

As the difference in Tc values isn't within the 5% threshold, the Tc of the proposed condition will need to be reevaluated with BMP implementation. Section IV.2 in Appendix IV of the TGD manual indicates the lag time component of the Tc associated with the implemented BMP can be calculated by determining the BMP volume and the time on the 2-year Hydrograph at which the cumulative volume exceeds this calculated volume. Based on this, the effective time of concentration with BMP included then results to 14.5 hours.

* Reference Attachment D of this report for supporting hydrology calculations for the pre- and post-developed conditions.

The 2-year Volume and Time of Concentration calculations were analyzed utilizing methods per the Orange County Hydrology Manual, Orange County TGD, and Model WQMP.

Refer to Attachment A of this report for a copy of the TGD Figure XVI-3d, Susceptibility Analysis of Newport Bay-Newport Coastal Streams, HCOC Map dated February 2013. The proposed drainage path of travel has been indicated by arrows on the map.

Per Section 2.2.3 of the Technical Guidance, HCOC's are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts and either the post-development runoff volume and/ or peak flow rate exceeds the pre-development condition or time of concentration of the post-development runoff is less than the pre-development condition for the 2-yr, 24-hr storm event. Since the post-development 2-year storm event volume and peak flow decreased and the time of concentration is equal to the pre-developed conditions, therefore no HCOC's are required for this site.

Due to the decreased site area, increased pervious coverage and proposed detention storage of the overall runoff volume, HCOC's associated with the 2-yr, 2-hr storm event shall have no significant impact to the downstream water bodies. In addition, Infiltration BMPs will be incorporated onsite to collect and retain storm water runoff onsite prior to overflowing/ discharging offsite. Infiltration on the site is not occurring in the existing condition, as the site is primarily impervious, therefore, by incorporating onsite proposed

detention and Infiltration BMPs, the proposed development is providing onsite retention and mitigating any potential hydromodification impacts downstream.

II.4 Post Development Drainage Characteristics

The proposed site will not totally utilize the historical path of travel of conveying all flows to either E. First Street or the offsite catch basin located near the southwest corner of the project site. Rather, storm water will be collected and conveyed by a series of area drains, curb opening catch basins, and drop inlets via surface flow into an onsite Maxwell IV Drywell System for infiltration. Flows exceeding the required design capture volume from larger storm events will overflow at the lowest catch basin and continue flowing to the existing offsite catch basin prior to entry to the Southwest-Tustin Channel.

II.5 Property Ownership/Management

The proposed project will be maintained by the Developer, Meritage Homes, Inc., until an appointed Homeowner's Association (HOA)is selected. The Owner/HOA will be responsible for BMP Maintenance and regular inspections on all the post construction BMPs. Refer to Section V for additional maintenance information.

Meritage Homes, Inc.

5 Peters Canyon Road, Suite 310

Irvine, California 92606

(951) 299-3824

Section III Site Description

III.1 Physical Setting

Name of Planned Community/Planning Area (if applicable)	N/A
Location/Address	2020 E. First Street, Santa Ana
	Santa Ana, California 92705
General Plan Land Use Designation	District Center (DC)
Zoning	Existing Zone: General Commercial (C2) with the Metro East Mixed-Use (MEMU) Overlay Zone District Center (DC) Active Urban District Land Use Proposed Zone: General Commercial (C2) with the Metro East Mixed-Use (MEMU) Overlay Zone District Center (DC) Active Urban District Land Use
Acreage of Project Site	3.68 ac
Predominant Soil Type	Soil Type B

III.2 Site Characteristics

Site Characteristics	
Precipitation Zone	0.75" (Refer to Figure XVI-1 of the TGD located in Attachment A of this report for reference of rainfall zone.)
Topography	The site is generally flat with elevations above sea level as high as 138.3 in the northern portion of the site to as low as 131.0 near the southwesterly corner of the site. The site is approximately over 90% impervious with a single existing building (commercial building), asphalt paving, concrete paving, and associated parking lot.
Drainage Patterns/Connections	The existing site is generally flat and primarily sheet flows southwesterly through the site via curb and gutter along the boundaries. Majority of the existing site sheet flows overland to the southwesterly corner of the existing parking lot. Tributary flows from the offsite adjacent development are mitigated through the private drive aisle and routes to an onsite existing longitudinal gutter and continues south to an existing 5' wide curb and gutter and then west to an existing offsite catch basin located southwest corner of the project boundary. In addition, the offsite School drainage also confluence with the offsite development at the existing 5' wide curb and gutter onsite prior from discharging at the existing offsite catch basin. Storm water runoff from the site converges with the Southwest-Tustin Channel, an Orange County Flood Control District facility located on the west of the project site. Ultimately, all flows are conveyed to an existing offsite catch basin located near the southwest corner of the project boundary. From this catch basin flows continue to an existing channel (Southwest-Tustin Channel) located west of the project site.
Soil Type, Geology, and Infiltration Properties	Per the "Geotechnical Due Diligence Study and Preliminary Geotechnical Recommendations" by SA Geotechnical dated February 23, 2024, the following subsurface soil conditions were encountered: "The subject site is underlain by native alluvium generally composed of interlayered silty/clayey sand, sandy silt, and sandy/silty clay. Per the "Addendum Geotechnical Report, Supplemental Exploration and Percolation Testing" by SA Geotechnical dated June 12, 2024, the following subsurface soil conditions were encountered: "Percolation testing was performed in Borings P-1 and P-2 on May 21, 2024, in general accordance with the County of Orange WQMP Technical Guidance Document (TGD) (2013). The Percolation Test Method was utilized

as outlined in the County of Orange WQMP TGD. Two-inch diameter slotted well pipe and #3 select sand backfill (annular space) were constructed within the hollow stem auger to prevent caving of the sandy soils during auger extraction and percolation testing. The borings were presoaked and tested to confirm onsite soils fell under the "Sandy Soil" criteria as defined in the guidance documents. Test results were tabulated, and final measurements were used to calculate the infiltration rate per the WQMP TGD.

The County of Orange TGD does not include calculation adjustments to account for the presence of the annular backfill material described above, which, in our experience, overestimates infiltration rates. We have used a correction factor to account for the volume loss due to the annular material, based on the porosity of the select material (#3 sand), the pipe diameter, and the boring diameter. The correction factor (0.4) is noted on the percolation test data sheets (Appendix D).

The calculated infiltration rates are provided below, which include the correction factor discussed above; however, the rates below do not include a factor of safety reduction. A discussion of the design infiltration rates, including required factory of safety, is provided in the following Conclusion and Recommendations Section. The infiltration test results are considered representative of the location and depths the tests were performed.

Table 1 – Percolation Test Results

Boring No.	Tested Depth (bgs)	Calculated Infiltration Rate (in/hr)
P-1	38.75 to 45′	0.63
P-2	40 to 50′	75.0

The percolation test results and calculated infiltration rates were found to vary widely with depth of testing. Borings H-1 and P-2 encountered clean sands with gravel (SP, SP-GP) between depths of 45 and 60 feet bgs, resulting in a very high infiltration rate while Boring P-2 encountered fine grained soils to nearly the total depth (44 feet bgs)."

Infiltration testing will be conducted in exact location during final engineering to verify infiltration rates.

Refer to the project-specific Soils Report located within Attachment E of this report.

Hydrogeologic (Groundwater) Conditions	Per the "Addendum Geotechnical Report, Supplemental Exploration and Percolation Testing" by SA Geotechnical dated June 12, 2024, for the following groundwater evaluation: "Groundwater was not encountered during this or prior subsurface

exploration to a maximum depth of 66.5 feet. Historic high groundwater mapping indicates that groundwater has remained deep below the site, in excess of 40 feet (CDMG, 1998). We have also reviewed groundwater data available through the GeoTracker database for several sites near the subject site. The data indicates groundwater in the vicinity of the site ranges from 63 to 89 feet bgs for monitoring periods between 2002 to 2013. A summary table of the nearby sites reviewed on GeoTracker website/database is provided below."

Site Address	Distance from Subject Site (mi)	Monitoring Period	Depth to Groundwater Range (feet bgs)
320 N. Tustin Ave	0.25	2002-2003	83.4 to 85.5
325 N. Tustin Ave	0.30	2003-2006	76.9 to 86.3
401 N. Tustin Ave	0.32	2005-2013	73.3 to 89.0
1601 E. First Street	0.51	2001-2007	63.4 to 78.2
396 W. First Street	0.58	2002-2010	66.9 to 81.2

"Based on our subsurface exploration and review of the prior geotechnical reports and existing groundwater data for the vicinity, the groundwater is anticipated to be more than 65 feet bgs at the site. Proposed infiltration systems will need to meet the required minimum separation from high groundwater (10 feet) per the County of Orange WQMP TGD. Thus, stormwater infiltration should not be performed deeper than 55 feet bgs."

No LUST or Cleanup Program sites are present within 250 feet of the site per the Addendum Geotechnical Report, dated June 12, 2024 provided by SA Geotechnical.

Refer to the project-specific Soils Report located within Attachment E of this report.

Per the TGD Figure XVI-2d, North Orange County Mapped Depth to First Groundwater Exhibit located within Attachment A, the groundwater is 30 feet deep.

Geotechnical Conditions (relevant to infiltration)	Per the "Addendum Geotechnical Report, Supplemental Exploration and Percolation Testing" by SA Geotechnical dated June 12, 2024, the following geotechnical conditions relevant to infiltration were encountered: "Based on our evaluation and analysis as described herein, we conclude that

	onsite stormwater infiltration is geotechnically feasible with deep drywell systems. We recommend using the infiltration data obtained from Boring P-2 test location, which is consistent with the soil data obtained from Boring H-1, for drywalls within the southwestern portion of the site that are 50 to 55 feet deep. Considering the variability of onsite soils, we recommend a factor-of-safety of 10 be applied to the calculated rate. The project civil engineer should determine if additional factors-of safety are appropriate; however, this should be collaborated with SA GEO during design. Assuming a factor-of-safety of 10 is applied, a design infiltration rate of 7 inches per hour may be used for design of infiltration systems (drywalls) that are 50 to 55 feet deep and installed within the southwestern portion of the site (near the test location Boring P-2). Infiltration systems should be constructed per the recommendations outlined in the County of Orange WQMP TGD. Special care should be taken to limit disturbance to native soils utilized as the infiltration surface such that the infiltration performance is not adversely impacted. We recommend that the infiltration systems have a minimum setback of 10 feet from any building foundations. Proper and routine maintenance should be provided for the infiltration systems in accordance with the TGD and manufacturer's recommendations. Proposed stormwater infiltration systems should be reviewed by the geotechnical consultant during design to verify conformance with the recommendations provided herein. SA GEO should also observe and evaluate the subsurface soil conditions during excavation for installation devices to confirm the subsurface soil conditions. Additionally, the drywell systems should be tested after installation to verify that the design infiltration rate is achieved." Refer to the project-specific Soils Report located within Attachment E of this report.
Off-Site Drainage	The proposed project will design to mitigate off-site drainage from the adjacent school upstream of the property through an onsite channel. Overflow from the offsite easterly developments will be mitigated through the onsite curb and gutter when the adjacent properties detention storages meet their full capacity. Additional offsite stage-storage for the offsite drainage analysis will be provided during final engineering
Utility and Infrastructure Information	There is no existing storm drain systems along the project frontage of E. First Street. There is however an existing catch basin located along E. First Street west of the project site as well as an existing catch basin located within the adjacent property of the southwest boundary corner of the project site. Storm drain, domestic water, fire water, and sewer will be proposed for the site. Domestic/ Fire water will reutilized existing connection points to the existing public water main on E. First Street. Sewer will utilize a new

	connection to the existing OCSD trunk sewer system located onsite. All utilities are proposed to be underground and will have adequate clearance from the proposed Maxwell IV Drywell Systems.

III.3 Watershed Description

Receiving Waters	Southwest-Tustin Channel, Santa Ana-Santa Fe Channel, Peters Canyon Channel; San Diego Creek Reach 1; San Diego Creek Reach 2; Upper Newport Bay, Lower Newport Bay
303(d) Listed Impairments	Peter Canyon Channel is listed for: Pesticides (DDT and Toxaphene), Fecal Indicator Bacteria (Indicator Bacteria), and pH. San Diego Creek Reach 1 is listed for: Fecal Indicator Bacteria (Fecal Coliform), Nutrients (Nutrients), Pesticides (Pesticides and Toxaphene), Sediment (Sedimentation/Siltation), and Metals (Selenium) San Diego Creek Reach 2 is listed for: Fecal Indicator Bacteria (Indicator Bacteria), Nutrients (Nutrients), Sediment (Sedimentation/Siltation), and Toxicity (Unknown Toxicity) Upper Newport Bay is listed for: Pesticides (Chlordane, DDT, and Pesticides), Metals (Copper and Metals), Fecal Indicator Bacteria (Indicator Bacteria), Nutrients (Nutrients), Other Organics (PCBs), Toxicity (Sediment Toxicity), and Sediment (Sedimentation/Siltation) Lower Newport Bay is listed for: Pesticides (Chlordane, DDT, and Pesticides), Metals (Copper), Fecal Indicator Bacteria (Indicator Bacteria), Nutrients (Nutrients), Other Organics (PCBs), and Toxicity (Sediment Toxicity).
Applicable TMDLs	Nutrients, Pesticides, Sediment, Toxicity, Pathogens (Bacteria/Virus)
Pollutants of Concern for the Project	Suspended Solid/Sediments, Nutrients, Pathogens (Bacteria/Virus), Pesticides, Toxic Organic Compounds
Environmentally Sensitive and Special Biological Significant Areas	The project is not located within any known Environmentally Sensitive Areas (ESA) or Areas of Special Biological Significance (ASBS).

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?		YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	n/a		

Project Performance Criteria	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	Per 7.II-2.4.2.2 of the MWQMP, HCOC exists for when the post-construction time of concentration decreases beyond 5% of a 2-year storm event and volume of storm water increases beyond 5% of a 2-year storm event thus potentially increasing the downstream erosion and adversely impacts on physical structure, aquatic, and riparian habitat. However, a site that infiltrates at least the runoff from a two-year storm event does not have an HCOC If the excess volume cannot feasibly be retained, then retain the excess volume from the two-year runoff event to the maximum extent possible and implement on-site hydromodification controls such that post development runoff two-year peak flow rate is not 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)	According to Section 7.II-2.4.3 of the MWQMP, the available LID Treatment BMPs to be utilized in reducing the post-development impacts include infiltration, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile of a 24-hour storm event.
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	Per 7.II-3.2.2 of the Model WQMP, if the LID performance criteria is not feasibly met by retention and/or biotreatment, then sizing of onsite treatment control BMPs are required. Sizing of these treatment control BMPs will include, if applicable any Water Quality credits as calculated per the Technical Guidance Document. If the additional required volume cannot be met, however has a medium to high effectiveness, then a waiver application and participation in an alternative program may be not required. If the cost of providing treatment control BMPs greatly outweighs the pollution control benefits, a waiver of treatment control and LID requirements can be requested.
Calculate LID design storm capture volume for Project.	Refer to Worksheet B in Attachment A of this report for Design Capture Volume (DCV) calculations for each DMA.

IV.2. Site Design and Drainage

The storm water runoff will be collected and conveyed by a series of area drains in open space areas. Street surface flow will be conveyed to either curb inlet catch basins and/or drop inlets located within the private drives onsite. Each catch basin will contain an Oldcastle Flogard catch basin insert filter for pretreatment of storm water runoff.

The area drain system designed for the project will be determined during final engineering. From there, all flows will be directed to a proposed detention pipe prior to entry to the proposed Maxwell IV Drywell Plus Systems.

The Maxwell IV Drywell System is equipped to pre-treat and infiltrate captured runoff. Infiltration will occur below the Settling Chamber. Runoff will enter the Settling Chamber equipped with an absorbent pillow that will contain the pollutants, then routes through the FloFas Drainage Screen to the drywell below. A proposed underground detention will provide additional storage in addition to capturing the required design capture volume prior to entry into the Maxwell IV Drywell System. The Maxwell IV Drywell System will be sized to retain the required DCV for only a 48-hour timeframe. During larger storm events greater than the water quality requirements, stormwater will flow overland to one of the adjacent entrances then on to the existing offsite storm drain systems or directly to the Southwest-Tustin Channel located southwest of the project then following the historic drainage path of travel offsite.

The site will utilize one (1) Design Management Area (DMA) of the 3.68 acre site.

Refer to Attachment D for hydrology calculations regarding 2-year pre and post volumes and time of concentration.

Refer to BMP Exhibit in Attachment B for depiction of the project site and DMA.

Drainage Management Areas (DMA) Table:

Drainage Area No. (DMA)	Area (ac)	Design Capture Volume (cf)	Proposed BMPs
A-1	3.68	7,998	INF-5: Drywell

Refer to Worksheet B in Attachment A of this report.

IV.3 LID BMP Selection and Project Conformance Analysis

IV.3.1 Hydrologic Source Controls (HSCs)

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)	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐

The proposed development and site conditions were evaluated in order to select the most feasible BMP implementation for the project. The HSC BMP Selection process was determined by the following:

HSC-1 Localized On-Lot Infiltration: On-Lot infiltration is not feasible for this project due to the potential flooding which may occur as most open space areas available for localized infiltration are in proximity of the proposed building site.

HSC-2 Impervious Area Dispersion: Impervious area will not be utilized for the proposed building in areas where downspouts are adjacent to landscaping areas. Instead, roof runoff will be collected in a series of roof downspouts with direct connection via area drains to catch basins.

HSC-3 Street Trees: Street Trees will not be utilized as number and size or if any are proposed have not been determined in the preliminary stage.

HSC-4 Green/Brown Roofs: Green and Brown Roof BMPs are not feasible for multi-family residential projects and are not sustainable in Southern California climates.

HSC-5 Blue Roofs: Blue Roof BMPs are not feasible for multi-family residential projects and are not sustainable in Southern California climates.

Conclusion: Since the project proposes infiltration of the full DCV, HSCs were considered but are not necessary for this project. Refer to Section IV.3.2 of this report for information on the sizing and selection of Infiltration BMPs.

IV.3.2 Infiltration BMPs

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

The proposed development will utilize one (1) Maxwell IV Drywell System and UrbanPond Detention System to treat and retain the required Design Capture Volume. The Drywell System is a single chamber system that collects, pre-treats, stores and directs stormwater runoff underground to promote infiltration and soil percolation in order to re-charge the groundwater. The Settling Chamber will pre-treat the site runoff which will collect pollutants such as sediment/ silt to settle, oil/grease, nutrients, pathogens and phosphorus. It will also collect larger trash/debris. Clean runoff is then routed to the drywell. The settling chamber is cast-in-place concrete with perforated holes located in the lower 4 feet to maximize infiltration. An underground detention system will be connected to the drywell to provide storage. Runoff enters the detention system prior to entry into the Maxwell IV Drywell System.

In the event the drywell system is full, stormwater runoff will back up within the system into the detention pipe system. When both the detention pipe and drywell reach capacity, also known as an emergency overflow, runoff will back up through the lowest adjacent grated inlet catch basin and flow into the existing offsite catch basin located near the southwesterly corner of the site to finally enter the Southwest-Tustin Channel.

Refer to Attachment C of this report for additional Maxwell IV Drywell System information.

Drywell Calculations:

Per the "Addendum Geotechnical Report, Supplemental Exploration and Percolation Testing" by SA Geotechnical dated June 12, 2024, the percolation testing yielded measured infiltration rates of 75.0 in/hr at depths 40-50' below grade. Refer to Attachment E for a copy of the report and a map of percolation testing locations.

Per geotechnical recommendations, an increased Factor of Safety of 10 is being applied, over and beyond Worksheet H per the Technical Guidance Document, resulting design infiltration rates for proposed site is 7.50 in/hr.

Per the "Addendum Geotechnical Report, Supplemental Exploration and Percolation Testing" by SA Geotechnical dated June 12, 2024, "Groundwater was not encountered during this or prior subsurface exploration to a maximum depth of 66.5 feet. Historic high groundwater mapping indicates that groundwater has remained deep below the site, in excess of 40 feet (CDMG, 1998). We have also reviewed groundwater data available through the GeoTracker database for several sites near the subject site. The data indicates groundwater in the vicinity of the site ranges from 63 to 89 feet bgs for monitoring periods between 2002 to 2013."

Refer to Attachment E of this report for copies of the geotechnical information.

DMA A

K_{DESIGN} = 75.0 / 10 = 7.50 in/hr

DCV = 7,998 cf

One (1) 20' Primary Settling Chamber at 4' diameter with 30' Drywell Chamber at 6' diameter

$V_{SETTLING} = \pi(2^2)(20)$ = 251 cf

$V_{DRYWELL} = \pi(3^2)(30)(0.40)$ = 339 cf, where Void Ratio is n=0.40

$\sum$ Storage Volume per Drywell System = **591 cf**

Infiltration Chamber Depth, d (ft) = 30'

$V_{INFILTRATION}$ = (Infiltration Surface Area, sf)(K_{DESIGN}, in/hr)(T, hr)(1 ft/ 12 in),

Where T = 48 hour Drawdown Timeframe

$V_{INFILTRATION}$ @ 48 hrs = $[\pi(3^2) + 2\pi(3)(30ft)](7.50)(48)(1/12)$ = **20,075 cf > DCV = 7,998 cf ✓**

Storage Calculations:

Required Amount of Storage in addition to Drywell Volume = DCV - Drywell System Storage

$V_{STORAGE}$ = 7,998 – 591 cf = 7,407 cf

16 units of 8' depth UrbanPond (485 cf per unit)

Detention System = 16(485 cf) = **7,760 cf > 7,407 cf ✓**

Conclusion:

The combination of the drywell and detention systems will be more than sufficient to capture, treat, and

retain the required design capture volume to support this development.

Drywell Location GIS:

DMA A1

Drywell-1: 33.743676, -117.837924

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

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

Refer to Section IV.3.1 of this report for additional information regarding the BMP Selection.

IV.3.4 Biotreatment BMPs

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	☐
Other:	☐
Other:	☐

The entire DCV is being treated by Infiltration BMPs. Biotreatment BMPs are not proposed.

IV.3.5 Hydromodification Control BMPs

Hydromodification Control BMPs	
BMP Name	**BMP Description**
n/a	

IV.3.6 Regional/Sub-Regional LID BMPs

Regional/Sub-Regional LID BMPs
Not applicable for this project.

IV.3.7 Treatment Control BMPs

Treatment Control BMPs	
BMP Name	**BMP Description**
CPS: Connector Pipe Screen	Connector Pipe Screen (CPS) devices will be utilized on each catch basin provide full trash capture requirements prior to infiltration downstream.

IV.3.8 Non-structural Source Control BMPs

Non-Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Proposed residential project. Not Applicable
N6	Local Industrial Permit Compliance	☐	☒	Proposed residential project
N7	Spill Contingency Plan	☐	☒	Proposed residential project. Not Applicable
N8	Underground Storage Tank Compliance	☐	☒	No proposed underground storage tanks.
N9	Hazardous Materials Disclosure Compliance	☐	☒	No proposed hazardous materials
N10	Uniform Fire Code Implementation	☐	☒	Proposed residential project. Not Applicable
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	No proposed loading docks.
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	No proposed gas outlets.

A detailed narrative of the "included" non-structural source control BMPs will be provided during final engineering.

IV.3.9 Structural Source Control BMPs

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 proposed outdoor storage areas.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	No proposed slopes/channels to be protected.
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☐	☒	N/A
S6	Dock areas	☐	☒	No proposed dock areas.
S7	Maintenance bays	☐	☒	No proposed maintenance bays.
S8	Vehicle wash areas	☐	☒	No proposed vehicle wash areas.
S9	Outdoor processing areas	☐	☒	No proposed vehicle wash areas.
S10	Equipment wash areas	☐	☒	No proposed equipment wash areas.
S11	Fueling areas	☐	☒	No proposed fueling areas.
S12	Hillside landscaping	☐	☒	Project not located within hillside area.
S13	Wash water control for food preparation areas	☐	☒	No proposed wash control for food preparation areas.
S14	Community car wash racks	☐	☒	No proposed community car washing area.

IV.4 Alternative Compliance Plan (If Applicable)

IV.4.1 Water Quality Credits

<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">The entire DCV for the project site is being treated by LID BMPs. Water quality credits will not be used.</td></tr>
</table>

IV.4.2 Alternative Compliance Plan Information

N/A

Section V Inspection/Maintenance Responsibility for BMPs

The property is currently owned by Meritage Homes, Inc. The Owner will be responsible for the long-term maintenance of the project's storm water facilities and conformance to this WQMP after construction is complete.

A Notice of Transfer of Responsibility is in Attachment G of this report and should be executed as part of any ownership transfer after construction is complete.

The owner will appoint a Property Management Company to provide long term BMP maintenance for the proposed development upon completion of construction.

Owner/ Developer:
Meritage Homes, Inc.
5 Peters Canyon Road, Suite 310
Irvine, CA 92606
(951) 299-3824
Louisa Feletto, Forward Planning Manager

Homeowner's Association (HOA)
To be determined

The owner is aware of the maintenance responsibilities of the proposed BMPs. A funding mechanism is in place to maintain the BMPs at the frequency stated in the WQMP.

The following BMP Inspection/ Maintenance table will be completed as part of the final engineering. This table will include BMP description, responsible party(ies), required inspection/ maintenance routine and frequency.

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N1: Education for Property Owners, Tenants, Occupants & Employees	Meritage Homes, Inc. and/or Homeowner's Association (HOA)	Information to be provided to property owners, tenants, occupants and employees by Meritage Homes, Inc. and/or Homeowner's	As needed.

		Association (HOA)	
N2: Activity Restrictions	Meritage Homes, Inc. and/or Homeowner's Association (HOA)	Employees notified of activities that are prohibited by both employees and tenants.	Restrictions identified in Employee Manual and reviewed yearly by employees.
N3: Common Area Landscape Management	Meritage Homes, Inc. and/or Homeowner's Association (HOA)	Meritage Homes, Inc. and/or Homeowner's Association (HOA) to hire professional landscaper to properly maintain landscaping common areas.	Landscape maintenance is required in on a weekly basis or as needed per agreement between Meritage Homes, Inc. and/or Homeowner's Association (HOA) with professional landscaper.
N11: Common Area Litter Control	Meritage Homes, Inc. and/or Homeowner's Association (HOA)	Provide litter removal of site parking lot/structure and landscape areas.	Once per week.
N14: Common Area Catch Basin Inspections	Meritage Homes, Inc. and/or Homeowner's Association (HOA)	Meritage Homes, Inc. and/or Homeowner's Association (HOA) to provide maintenance and to inspect for obstruction and build-up within catch basins and wear of catch basin stencilling.	Implement as needed. Inspection/Cleaning to be performed at minimum once per year before the start of the rainy season prior to any significant storm event.
S1: Storm Drain System Stencilling & Signage	Meritage Homes, Inc. LLC (Owner)/ Homeowner's Association (HOA)	Meritage Homes, Inc. LLC and/or Homeowner's Association (HOA) to inspect and repair as needed all onsite storm drain stencilling & signage.	Inspection should occur at minimum twice per year.

N15: Private Drive Aisle & Parking Lot Street Sweeping	Meritage Homes, Inc. and/or Homeowner's Association (HOA)	Meritage Homes, Inc. and/or Homeowner's Association (HOA) to hire professional street sweeping service.	Once per week.
S3: Trash Enclosures	Meritage Homes, Inc. and/or Homeowner's Association (HOA)	Meritage Homes, Inc. and/or Homeowner's Association (HOA) to hire professional trash service to empty trash bins on a regular basis. Meritage Homes, Inc. and/or Homeowner's Association (HOA) to remove and clean trash enclosure areas and trash rooms as needed.	Trash bins to be serviced once per week. Trash Enclosures and Trash rooms shall be inspected once per week and all trash/ debris removed.
S4: Efficient Irrigation & Landscape Planning	Meritage Homes, Inc. and/or Homeowner's Association (HOA)	Meritage Homes, Inc. and/or Homeowner's Association (HOA) to provide maintenance of systems or appoint a professional. Refer to Attachment C for additional information.	Regular maintenance prior to, during, and following the rainy season. Service a minimum of once per year or as necessary. Refer to Attachment F for additional information.
INF-5: Maxwell IV Drywell Systems	Meritage Homes, Inc. and/or Homeowner's Association (HOA)	Meritage Homes, Inc. and/or Homeowner's Association (HOA) to provide maintenance of drywell systems as suggested by the manufacturer. Remove trash debris, sediment accumulation and any standing water within chambers after storm	Regular maintenance once per week and monthly inspection to determine deficiencies and/or damage. Inspect, clean and remove any standing water after storm events and/ or during inspections.

		events.	
Oldcastle FloGard Plus Catch Basin Filter Insert	Meritage Homes, Inc. and/or Homeowner's Association (HOA)	Meritage Homes, Inc. and/or HOA will be required to hire a professional maintenance company to provide regular inspection, repairs, and cleaning per manufacturer's specifications. All trash/ debris and loose sediment/ silt shall be removed and screen replacement per manufacturer's specifications.	Inspections/ Cleanings should occur at least two times per year and before the start of the rainy season (October 1st). Refer to Attachment C for additional information and manufacturer's specifications.
UrbanPond (Detention System)	Meritage Homes, Inc. and/or Homeowner's Association (HOA)	Meritage Homes, Inc. and/or Homeowner's Association (HOA) to conduct regular inspections and schedule cleanings.	Inspections should occur at least once per year and after major rain events. Cleanings should be conducted at the inspector's discretion. Refer to Attachment C for additional information and manufacturer's specifications.

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
- 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.

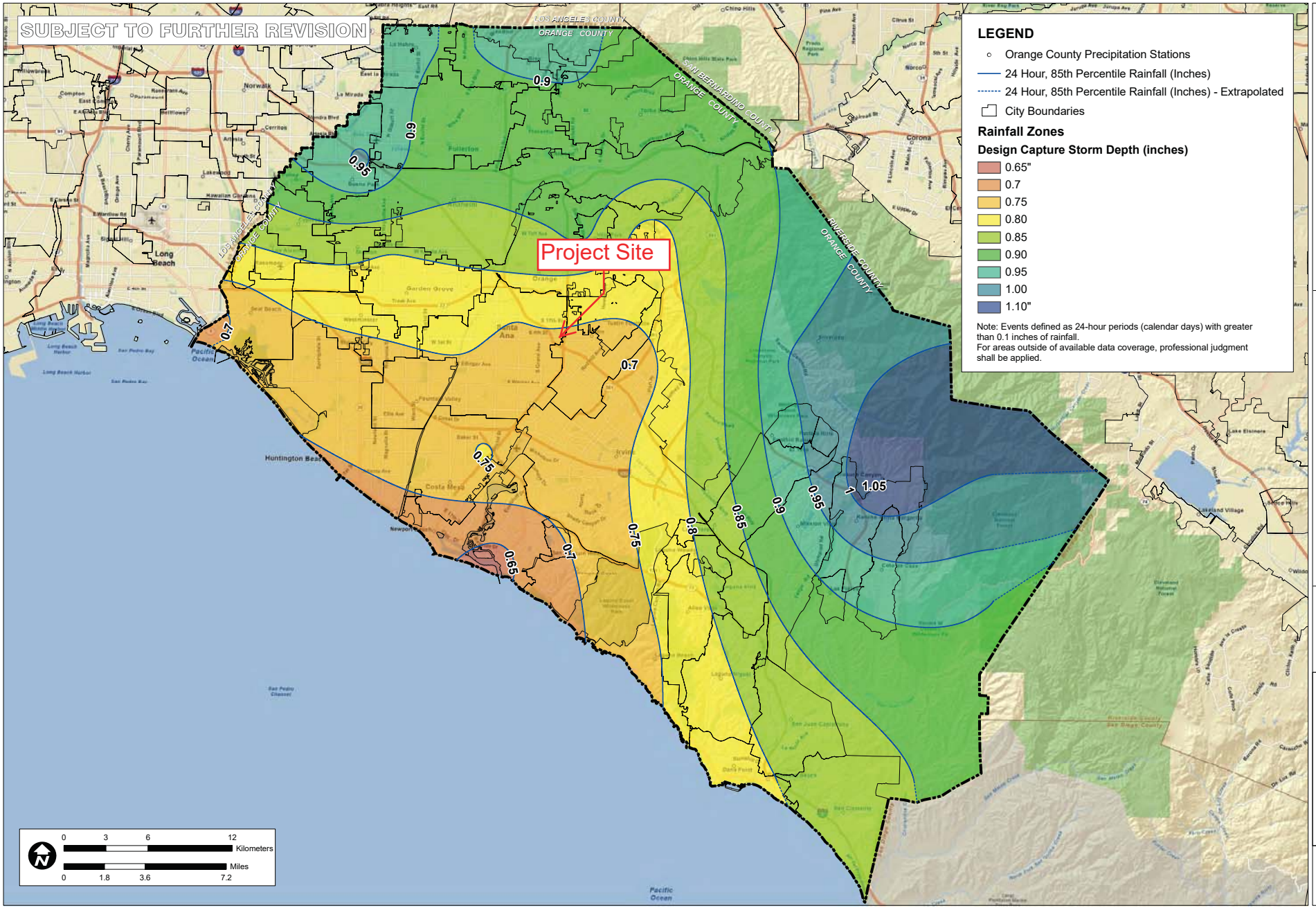
Section VII Educational Materials

Refer to the Orange County Stormwater Program (www.ocwatersheds.com) for a library of educational materials available.

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

ATTACHMENT A

Technical Guidance Documents & Worksheets



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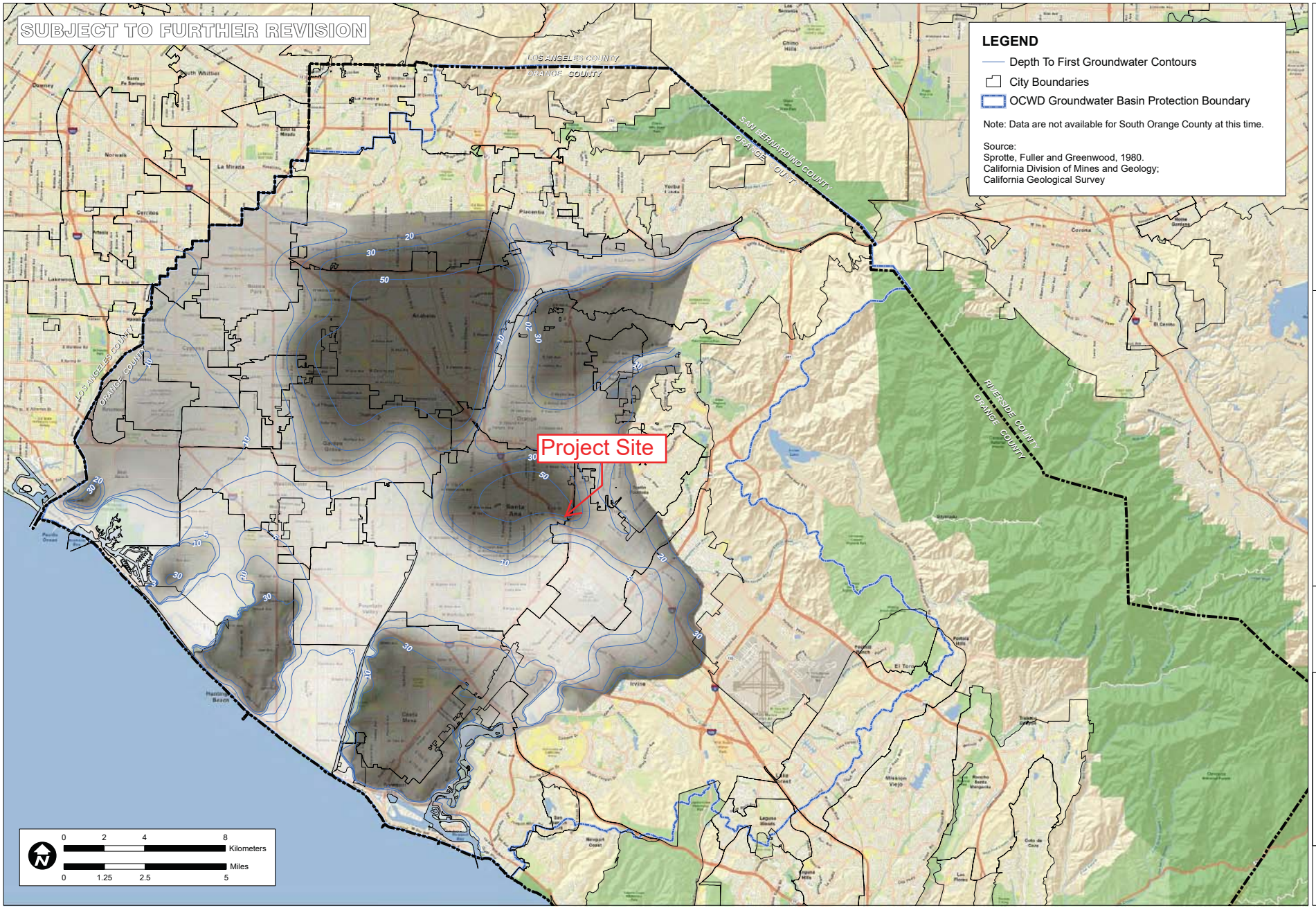
TITLE
RAINFALL ZONES

JOB
ORANGE COUNTY
TECHNICAL GUIDANCE
DOCUMENT
ORANGE CO. CA

SCALE	1" = 1.6 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-1



TITLE
NORTH ORANGE COUNTY
MAPPED DEPTH TO FIRST
GROUNDWATER

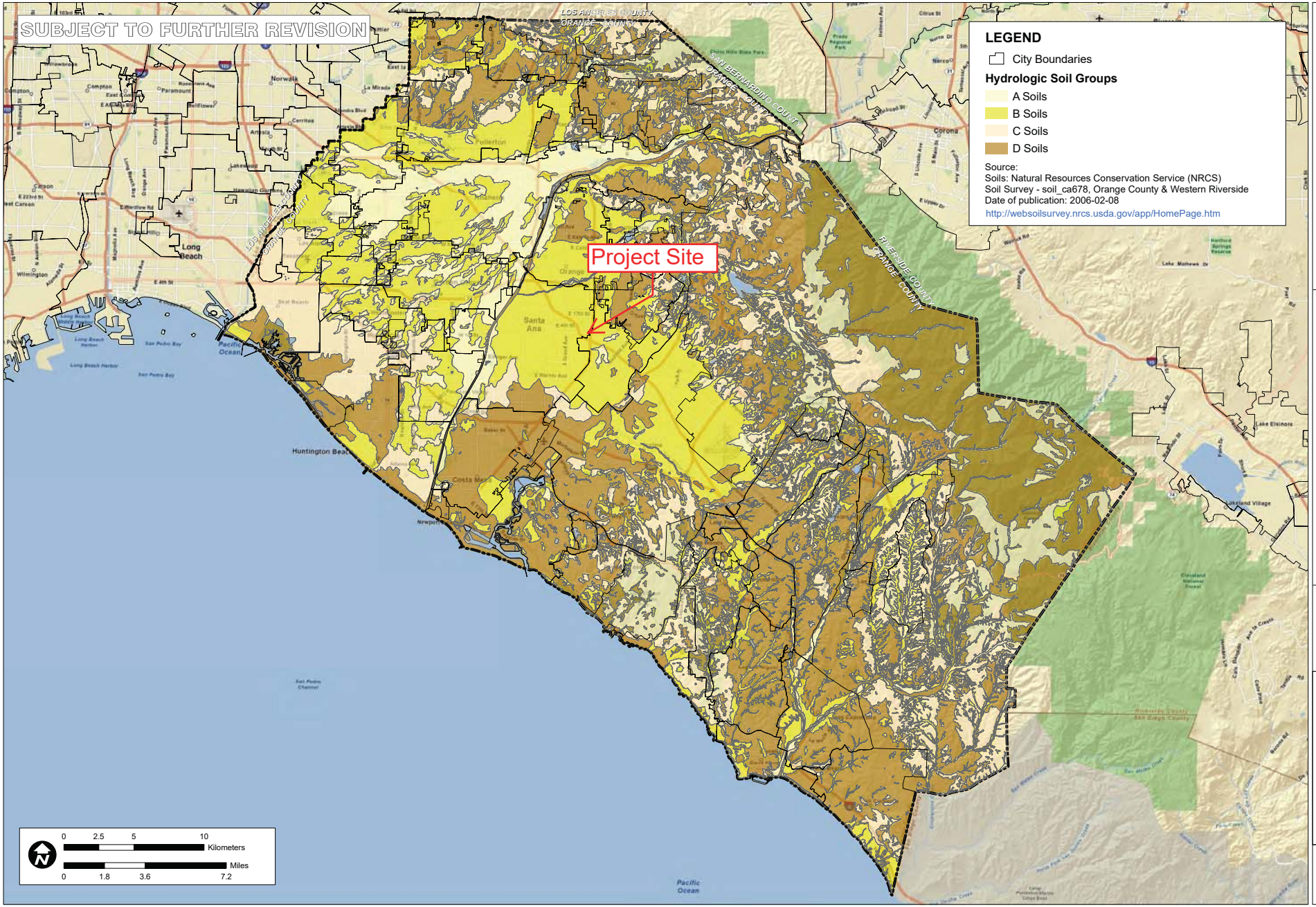
JOB
ORANGE COUNTY
INFILTRATION STUDY
ORANGE CO. CA

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\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2d_DepthToGroundwaterOverview_20110215.mxd



TITLE
NRCS HYDROLOGIC SOILS GROUPS

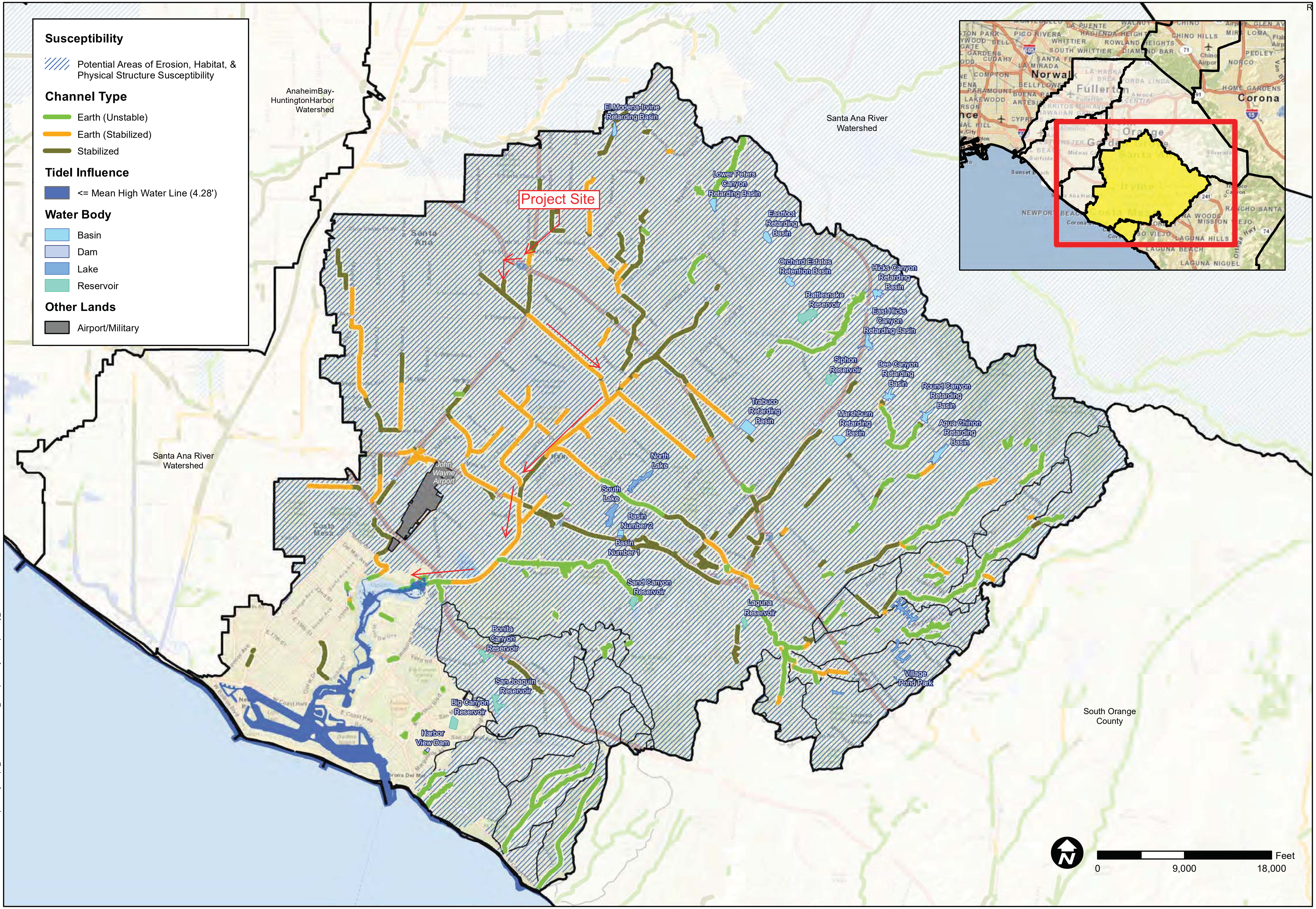
JOB
ORANGE COUNTY INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.6 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2a

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



SUSCEPTIBILITY ANALYIS
NEWPORT BAY-
NEWPORT COASTAL STREAMS

ORANGE COUNTY
WATERSHED
MASTER PLANNING

ORANGE CO.
CA

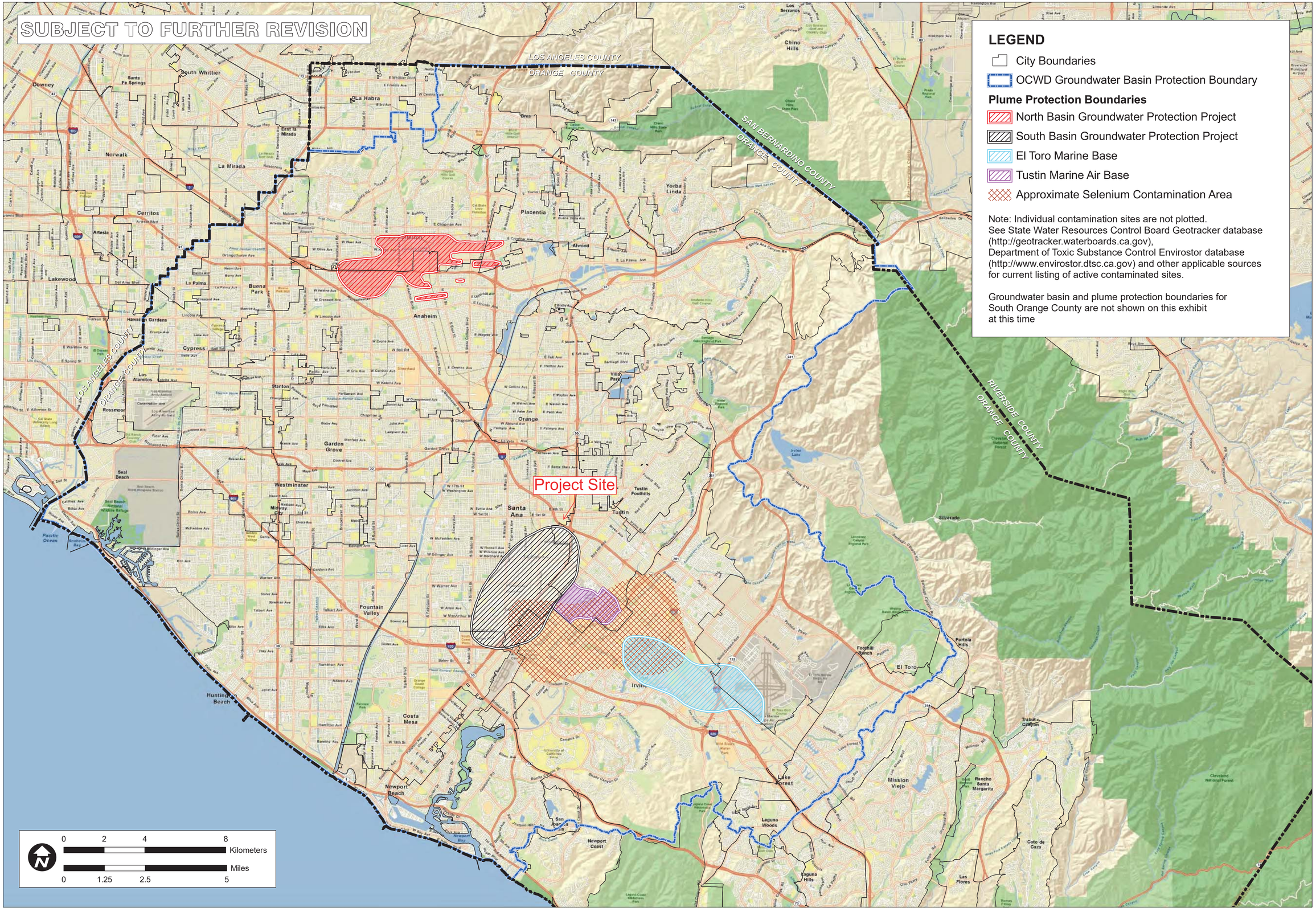
SCALE	1" = 12000'
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/30/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
4

P:\9526E\6-GIS\Mxds\SuceptabilityMaps_20100505\9526E_NewportBaySusceptibility_20100430.mxd

SUBJECT TO FURTHER REVISION



LEGEND

- City Boundaries
- OCWD Groundwater Basin Protection Boundary

Plume Protection Boundaries

- North Basin Groundwater Protection Project
- South Basin Groundwater Protection Project
- El Toro Marine Base
- Tustin Marine Air Base
- Approximate Selenium Contamination Area

Note: Individual contamination sites are not plotted.
See State Water Resources Control Board Geotracker database (http://geotracker.waterboards.ca.gov), Department of Toxic Substance Control Envirostor database (http://www.envirostor.dtsc.ca.gov) and other applicable sources for current listing of active contaminated sites.

Groundwater basin and plume protection boundaries for South Orange County are not shown on this exhibit at this time

0 2 4 8 Kilometers
0 1.25 2.5 5 Miles

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2f_NorthOCGroundwaterProtectionAreasStreetMap_20110215.mxd

TITLE
NORTH ORANGE COUNTY
GROUNDWATER PROTECTION
AREAS

ORANGE COUNTY
INFILTRATION STUDY

JOB
ORANGE CO. CA

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

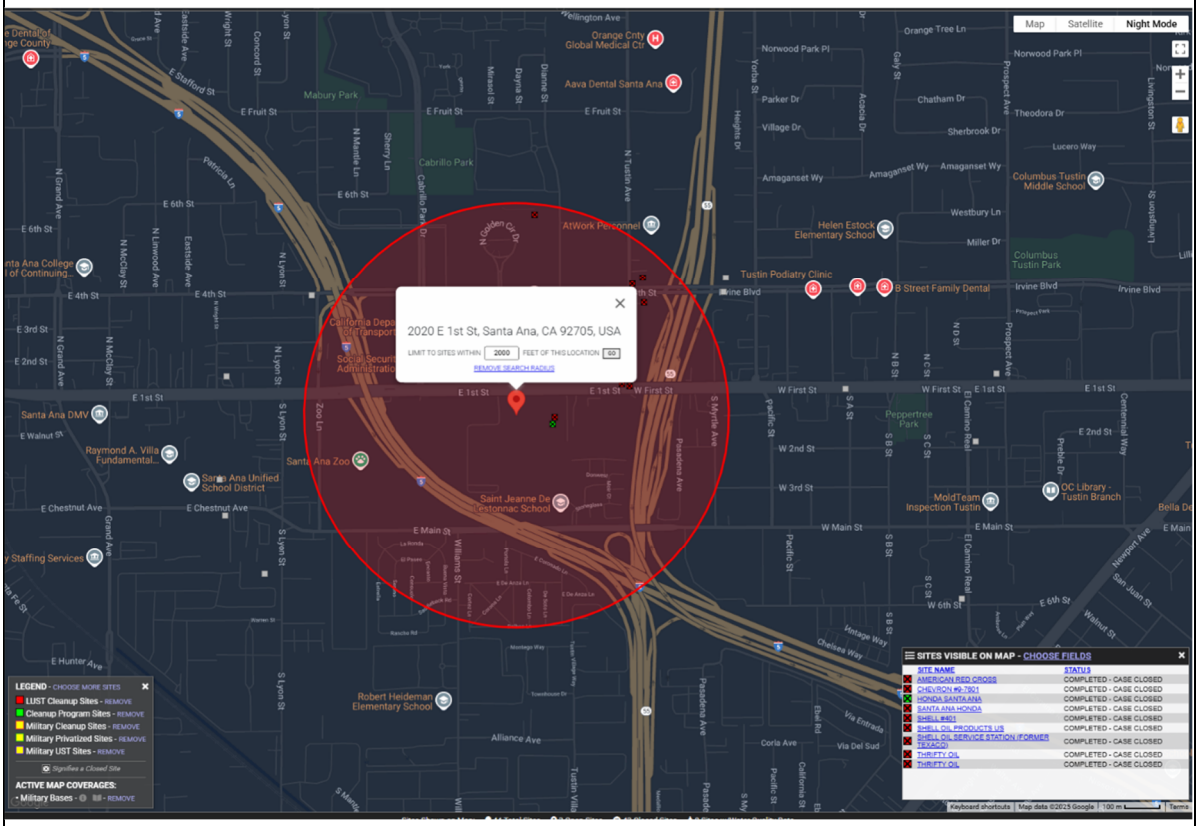
PACE
Advanced Water Engineering

FIGURE
XVI-2f

Form A – Focused Infiltration BMP for Groundwater Agency Review

Primary Groundwater Agency Review Items			
1	**Project Name**	VTTM 19337	
2	**Project Site Address**	2020 E. First Street Santa Ana, CA	
3	**Existing and Historical Land Use(s)**	Land Use (*add rows as necessary*) *Existing:* *Agriculture (orchards)* *Commercial/ Industrial*	Time Period 1946 1966
4	**Proposed Land Use** (From Table VIII.1 of TGD)	*Proposed:* *Residential*	Pollutant Risk Level: HIGH MOD **LOW**
5	**BMP Type** (Focused Infiltration is defined as all infiltration BMPs except for permeable pavement, bioretention and self-treating areas.)	Focused Infiltration ☒ Drywell ☐ Underground Infiltration Gallery ☐ Other – Infiltration	Quantity 1
6	**Depth to Groundwater (ft)**	>50 feet Groundwater was not encountered during the prior explorations to a maximum depth of 51.5 feet bgs. Historic high groundwater mapping indicates high groundwater is greater than 40 feet bgs (CDMG, 1998). Groundwater well data available on the State of California Water Resources Control Board database ("GeoTracker") shows depth to groundwater in the vicinity is greater than 60 feet bgs. Groundwater is anticipated to fluctuate both seasonally and annually.	
7	**Historical contamination within 250 feet of proposed infiltration BMP(s)**	☐ Yes ☒ No Known contaminates: *The project site is not within 250 feet of a plume protection boundary/ landfill/ plume from a Geotracker site/ etc.*	
8	**Proximity to any contamination (non-aqueous phase liquid/soil/vadose zone/groundwater) Plume/Contamination/Cleanup Sites (include a radius of 2,000 feet)** *The project site is not within 250 feet of a plume protection boundary/ landfill/ plume from a Geotracker site/ etc.* *There are ten closed Geotracker-listed LUST cleanup site within 2,000 feet of the infiltration BMPs proposed for the project. The cases were all closed.* *RB Case #: 083000845T American Red Cross, 1999* *RB Case #: 083003914TChevron #9-7601, 2006* *Loc Case #: 97IC053 Honda Santa Ana, 1998* *RB Case #: 083002758T Santa Ana Honda, 1996* *RB Case #: 083000867T Shell #401, 1991* *RB Case #: 08303690T Shell Oil Product US, 2013* *RB Case #: 083003978T Shell Oil Service Station (Former Texaco), 2005* *Loc Case #: 88UT169 Thrifty Oil, 1991* *RB Case #: 083001069T Thrifty Oil, 1991*		

2000 feet



Additional Review Items if Available

These items must be implemented by applicant to obtain WQMP approval and therefore the City's plan checker will ensure requirements are met. If not provided in first submittal of this form, groundwater agency may request this information from subsequent WQMP submittals once information is available and provided by the applicant.

9	**Measured Infiltration Rate (inches/hour)**	*The calculated infiltration rates are provided below, which include the correction factor discussed above; however, the rates below do not include a factor of safety reduction. A discussion of the design infiltration rates, including required factory of safety, is provided in the following Conclusion and Recommendations Section. The infiltration test results are considered representative of the location and depths the tests were performed.* *TABLE 1 – PERCOLATION TEST RESULTS* *Boring No.* | *Tested Depth (Below Ground Surface)* | *Calculated Infiltration Rate (in./hr.)* *P-1* | *38.75 to 45* | *0.63* *P-2* | *40 to 50* | *75.0* *The percolation test results and calculated infiltration rates were found to vary widely with depth of testing. Borings H-1 and P-2 encountered clean sands with gravel (SP, SP-GP) between depths of 45 and 60 feet bgs, resulting in a very high infiltration rate while Boring P-2 encountered fine grained soils to nearly the total depth (44 feet bgs).*

10	**Pretreatment BMP for Infiltration BMP (if any)**	☐ Biotreatment ☒ Media Filter ☐ Hydrodynamic Separator ☒ Filter Insert ☐ Other - Forebay	Description Oldcastle FloGard Catch Basin Insert Filters
11	**Design Capture Volume DCV (cu-ft)**	*7998 cft*	
12	**Depth to Groundwater below BMP Bottom (ft)**	*>10 ft* *Groundwater was not encountered during the prior explorations to a maximum depth of 51.5 feet bgs. Historic high groundwater mapping indicates high groundwater is greater than 40 feet bgs (CDMG, 1998). Groundwater well data available on the State of California Water Resources Control Board database ("GeoTracker") shows depth to groundwater in the vicinity is greater than 60 feet bgs. Groundwater is anticipated to fluctuate both seasonally and annually.*	

Worksheets from Orange County Technical Guidance Document (5-19-2011)

See TGD for instructions and/or examples related to these worksheets:
www.ocwatersheds.com/WQMP.aspx

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.75	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=	3.68	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.87	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.75	
4	Calculate runoff volume, V_{design}= *(C x* $d_{remainder}$ *x A x 43560 x (1/12))*	V_{design}=	7,998	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)	$K_{measured}$=	75.0	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	10.0	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	7.50	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=		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

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet – DMA A

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
		Predominant soil texture	0.25	3	0.75
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.50
B	Design	Tributary area size	0.25	2	0.50
		Level of pretreatment/ expected sediment loads	0.25	1	0.25
		Redundancy	0.25	2	0.50
		Compaction during construction	0.25	2	0.50
		Design Safety Factor, $S_B = \Sigma p$			2.0

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	3.00 (utilizing 10 per geotechnical recommendations)
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	75.0
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_M / S_{TOT}$	7.50

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Per the "Geotechnical Due Diligence Study and Preliminary Geotechnical Recommendations" by SA Geotechnical dated February 23, 2024, the percolation test was conducted in accordance with the County of Orange WQMP Technical Guidance Document (2013) as follows:

"Percolation testing was performed in Borings P-1 and P-2 on May 21, 2024, in general accordance with the County of Orange WQMP Technical Guidance Document (TGD) (2013). The Percolation Test Method was utilized as outlined in the County of Orange WQMP TGD. Two-inch diameter slotted well pipe and #3 select sand backfill (annular space) were constructed within the hollow stem auger to prevent caving of the sandy soils during auger extraction and percolation testing. The borings were presoaked and tested to confirm onsite soils fell under the "Sandy Soil" criteria as defined in the guidance documents. Test results were tabulated, and final measurements were used to calculate the infiltration rate per the WQMP TGD.

The County of Orange TGD does not include calculation adjustments to account for the presence of the annular backfill material described above, which, in our experience, overestimates infiltration

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet – DMA A

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v

rates. We have used a correction factor to account for the volume loss due to the annular material, based on the porosity of the select material (#3 sand), the pipe diameter, and the boring diameter. The correction factor (0.4) is noted on the percolation test data sheets (Appendix D).

The calculated infiltration rates are provided below, which include the correction factor discussed above; however, the rates below do not include a factor of safety reduction. A discussion of the design infiltration rates, including required factory of safety, is provided in the following Conclusion and Recommendations Section. The infiltration test results are considered representative of the location and depths the tests were performed.

Table 1 – Percolation Test Results

Boring No.	Tested Depth (bgs)	Calculated Infiltration Rate (in/hr)
P-1	38.75 to 45′	0.63
P-2	40 to 50′	75.0

The percolation test results and calculated infiltration rates were found to vary widely with depth of testing. Borings H-1 and P-2 encountered clean sands with gravel (SP, SP-GP) between depths of 45 and 60 feet bgs, resulting in a very high infiltration rate while Boring P-2 encountered fine grained soils to nearly the total depth (44 feet bgs)."

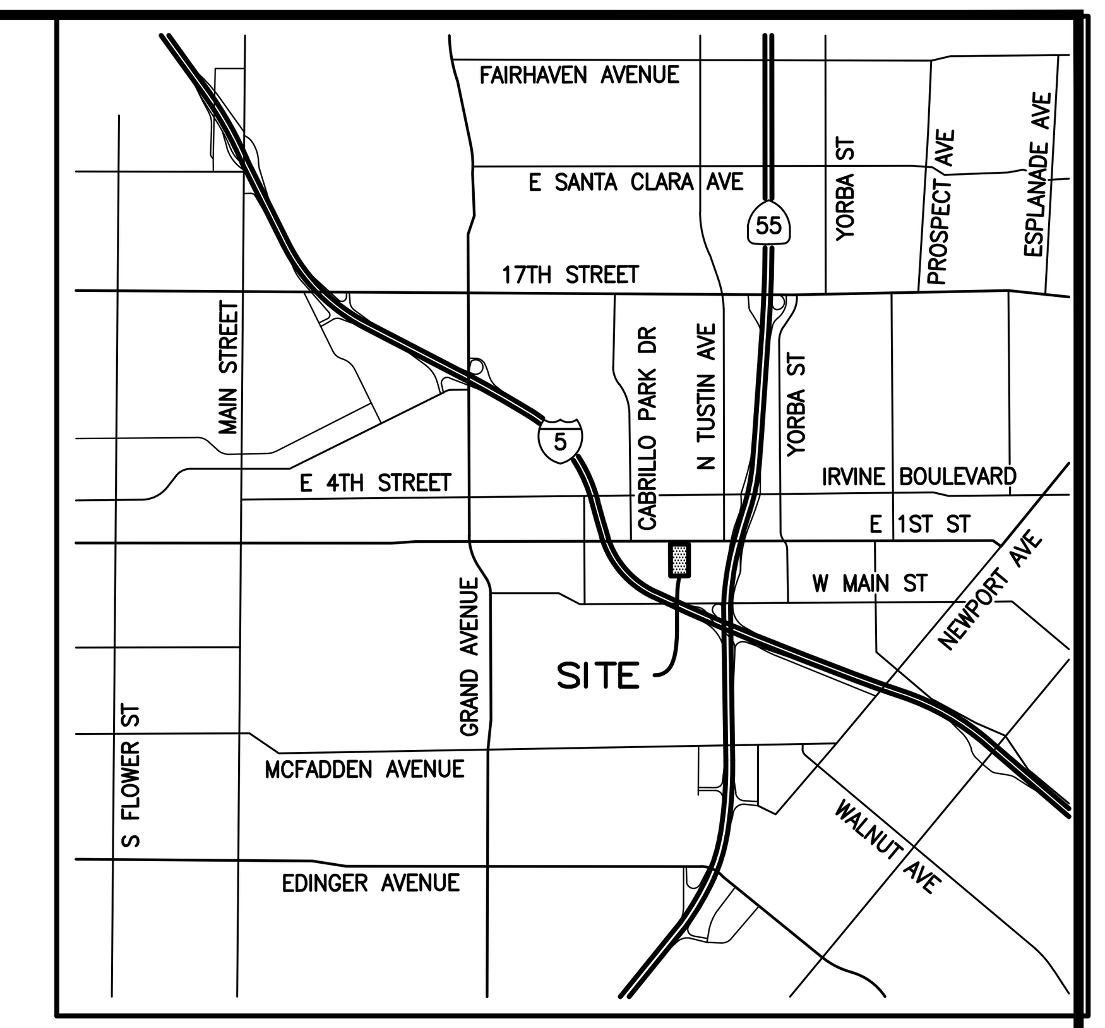
Refer to the project-specific Soils Report located within Attachment E of this report.

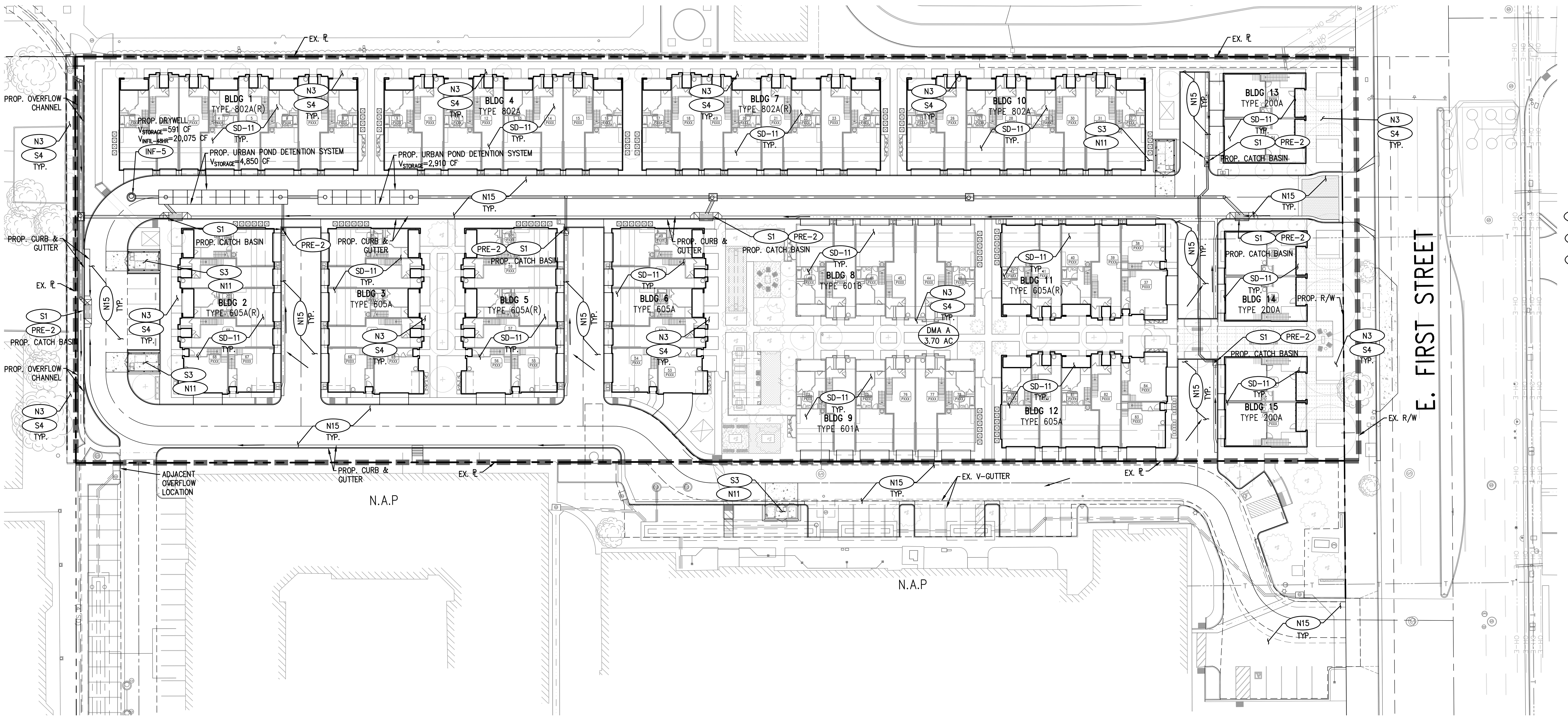
Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

ATTACHMENT B

WQMP Exhibit

WQMP EXHIBIT
TR 19337, LOT 1
2020 E. FIRST STREET
CITY OF SANTA ANA, COUNTY OF ORANGE
STATE OF CALIFORNIA





LEGEND

- EXISTING RIGHT-OF-WAY/ BOUNDARY
- PROPOSED RIGHT-OF-WAY/ BOUNDARY
- DRAINAGE BOUNDARY AREA
- LONGEST FLOW PATH
- PROPOSED STORM DRAIN
- 98 PROPOSED CONTOUR
- FLOW DIRECTION
- XX — DRAINAGE AREA ID
- X.XX AC — DRAINAGE AREA IN ACRES

BEST MANAGEMENT PRACTICES

- SD-11 — ROOF RUNOFF CONTROLS (TYP. ENTIRE PODIUM BUILDING)
- N3, S4 — SITE DESIGN & LANDSCAPE PLANNING/EFFICIENT IRRIGATION
- PRE-2, S1 — CATCH BASIN INSERTS/ STORM DRAIN SIGNAGE
- S3, N11 — TRASH STORAGE AREAS/COMMON AREA LITTER CONTROL
- N15 — STREET SWEEPING & VACUUMING
- INF-5 — MAXWELL DRYWELL SYSTEM (SEE REPORT FOR ADDITIONAL DETAILS)

NOTES:

1. ASSUME ALL SOIL GROUP B
2. SITE IS LOCATED WITHIN THE NEWPORT BAY WATERSHED
3. GENERAL PLAN LAND USE: DISTRICT CENTER (DC)
4. PROPOSED ZONING: GENERAL COMMERCIAL (C2) WITH METRO EAST MIXED-USE (MEMU) OVERLAY ZONE DISTRICT CENTER (DC) ACTIVE URBAN LAND USE
5. DESIGN CAPTURE STORM DEPTH = 0.75"
6. IMPERVIOUS AREA: 138,595 SF (3.18 AC)
   PERVIOUS AREA: 21,535 SF (.49 AC)
7. TOTAL SITE AREA: 161,046 SF (3.68 AC)

1" = 30'

0 15 30 60

REVISIONS

NUMBER	DATE	INITIALS	DESCRIPTION	APPROVED	INSTALLED

PLANS PREPARED BY:

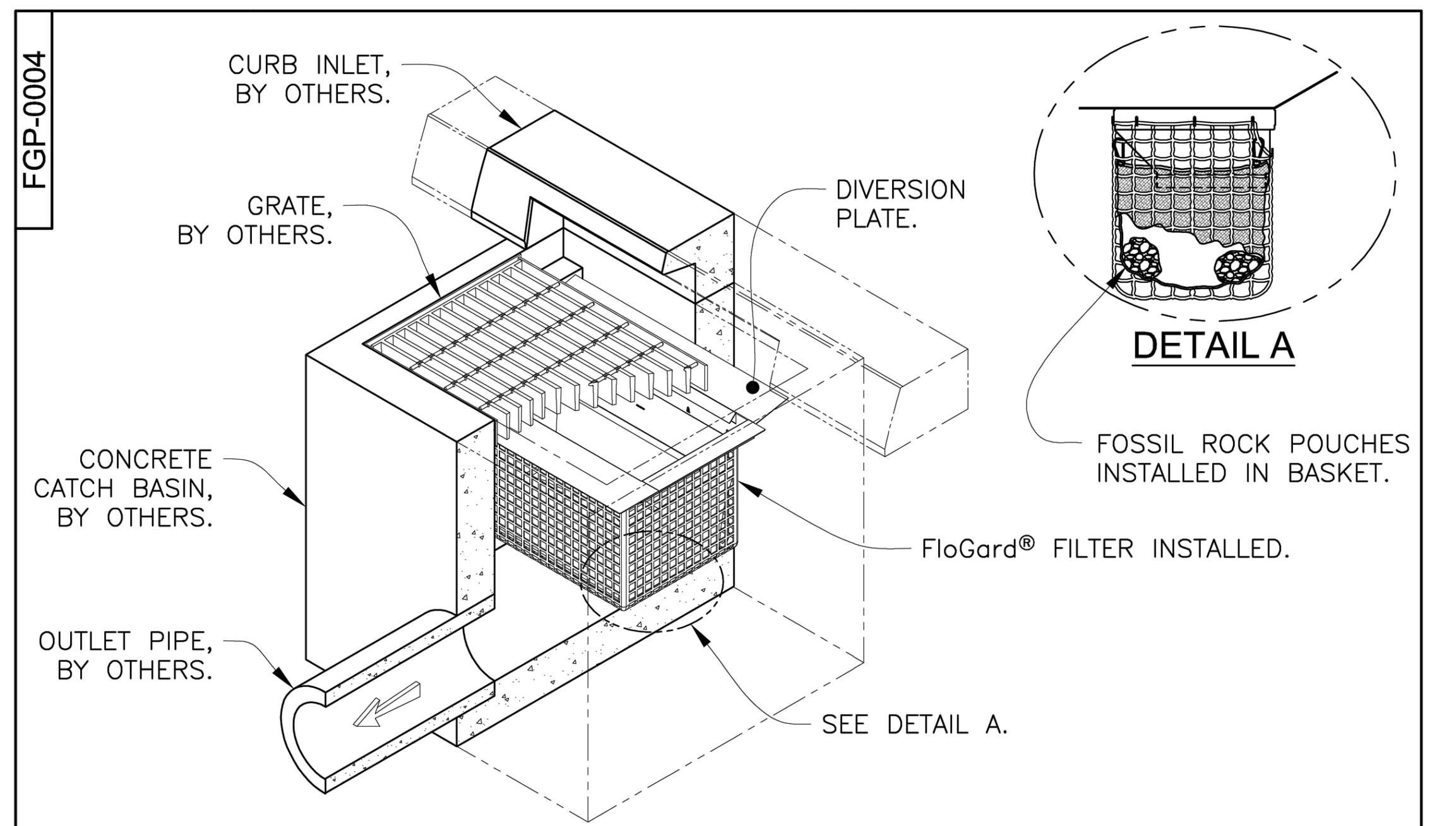
C&V CONSULTING, INC.
CIVIL ENGINEERING
LAND PLANNING & SURVEYING
9830 IRVINE CENTER DRIVE
IRVINE, CALIFORNIA 92618
(949) 916-3800
INFO@CVC-INC.NET
WWW.CVC-INC.NET

REGISTERED PROFESSIONAL ENGINEER
RYAN J. BITTNER
No. 68167
CIVIL
STATE OF CALIFORNIA

WQMP EXHIBIT
TR 19337, LOT 1
2020 E. FIRST STREET
PUBLIC WORKS AGENCY
CITY OF SANTA ANA

SHEET 1 OF 2

FGP-0004



SPECIFIER CHART								
MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data in these columes is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-	
	INLET ID Inside Dimension (inch x inch)	GRATE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft. / sec.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-1633FGO	16 X 33	18 X 36	7.0	2.5	1.7	FGP-1633FGO8	1.4	1.1
FGP-1836FGO	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836FGO8	1.3	.9
FGP-2234FGO	22 X 34	24 X 36	8.1	3.6	2.1	FGP-2234FGO8	2.1	1.4
FGP-2436FGO	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436FGO8	1.95	1.15
FGP-48FGO	48 X 48	20 X 54	6.3	2.2	1.5	FGP-48FGO8	1.25	.85

NOTES:

1. Filter insert shall have a high flow bypass feature.
2. Filter support frame shall be constructed from stainless steel Type 304.
3. Filter medium shall be *Fossil Rock* ™, installed and maintained in accordance with manufacturer specifications.
4. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.

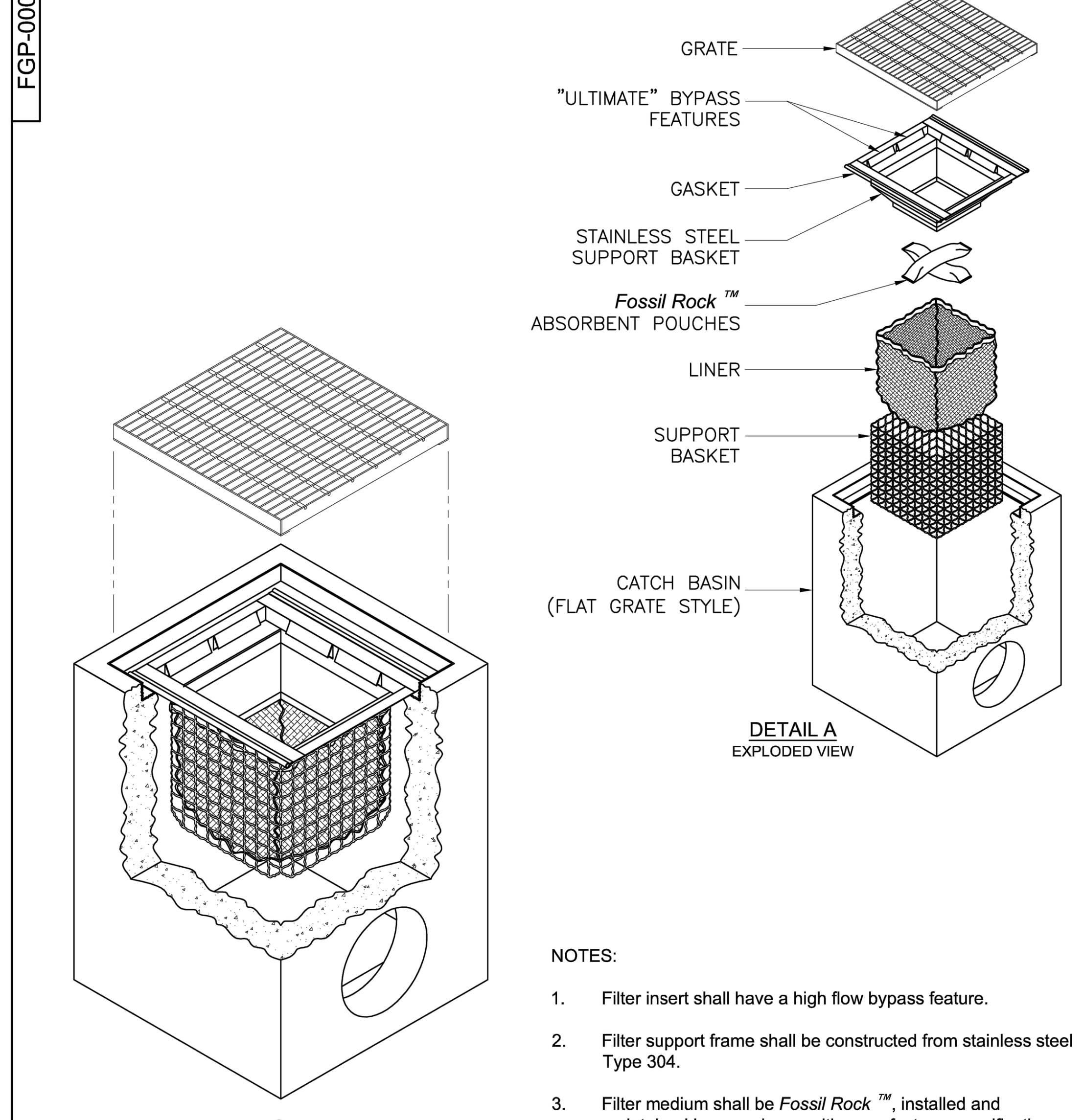
FloGard® Catch Basin Insert Filter *Combination Inlet Style*

Inlet Filtration

Oldcastle® Stormwater Solutions
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

DRAWING NO. FGP-0004 | REV A | ECO ECO-0127 JPR 5/18/15 | DATE JPR 1/25/13 | SHEET 1 OF 1

FGP-0001



FloGard® FILTER
-INSTALLED INTO CATCH BASIN-

U.S. PATENT # 6,00,023 & 6,877,029

NOTES:

1. Filter insert shall have a high flow bypass feature.
2. Filter support frame shall be constructed from stainless steel Type 304.
3. Filter medium shall be *Fossil Rock* ™, installed and maintained in accordance with manufacturer specifications.
4. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.

FloGard® Catch Basin Insert Filter *Grated Inlet Style*

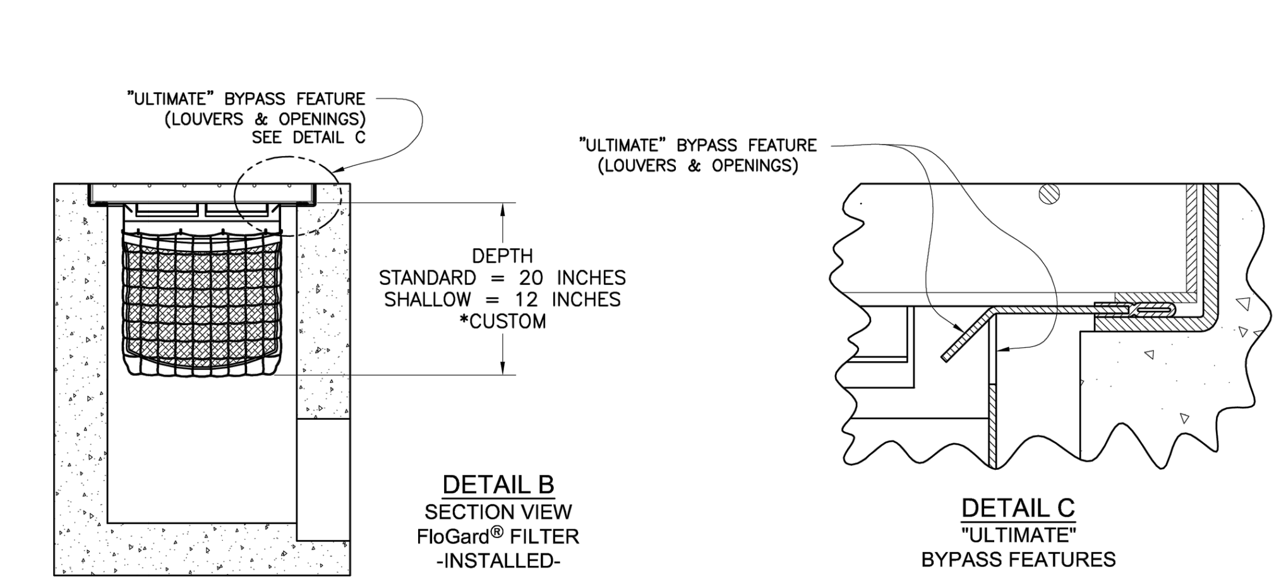
Inlet Filtration

Oldcastle® Stormwater Solutions
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

DRAWING NO. FGP-0001 | REV G | ECO ECO-0142 JPR 7/13/16 | DATE JPR 11/3/06 | SHEET 1 OF 2

FGP-0001

U.S. PATENT # 6,00,023 & 6,877,029



* MANY OTHER STANDARD & CUSTOM SIZES & DEPTHS AVAILABLE UPON REQUEST.

SPECIFIER CHART								
MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data in these columes is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-	
	INLET ID Inside Dimension (inch x inch)	GRATE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft. / sec.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-12F	12 X 12	12 X 14	2.8	0.3	0.4	FGP-12F8	.15	.25
FGP-16F	16 X 16	16 X 19	4.7	0.8	0.7	FGP-16F8	.45	.4
FGP-18F	18 X 18	18 X 20	4.7	0.8	0.7	FGP-18F8	.45	.4
FGP-1824F	16 X 22	18 X 24	5.0	1.5	1.2	FGP-1824F8	.85	.7
FGP-1836F	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836F8	1.3	.9
FGP-2024F	18 X 22	20 X 24	5.9	1.2	1.0	FGP-2024F8	.7	.55
FGP-21F	22 X 22	22 X 24	6.1	2.2	1.5	FGP-21F8	1.25	.85
FGP-24F	24 X 24	24 X 27	6.1	2.2	1.5	FGP-24F8	1.25	.85
FGP-2430F	24 X 30	26 X 30	7.0	2.8	1.8	FGP-2430F8	1.6	1.05
FGP-2436F	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436F8	1.95	1.15
FGP-2448F	24 X 48	26 X 48	9.3	4.4	2.4	FGP-2448F8	2.5	1.35
FGP-28F	28 X 28	32 X 32	6.3	2.2	1.5	FGP-28F8	1.25	.85
FGP-30F	30 X 30	30 X 34	8.1	3.6	2.0	FGP-30F8	2.05	1.15
FGP-36F	36 X 36	36 X 40	9.1	4.6	2.4	FGP-36F8	2.65	1.35
FGP-3648F	36 X 48	40 X 48	11.5	6.8	3.2	FGP-3648F8	3.9	1.85
FGP-48F	48 X 48	48 X 54	13.2	9.5	3.9	FGP-48F8	5.45	2.25
FGP-SD24F	24 X 24	28 X 28	6.1	2.2	1.5	FGP-SD24F8	1.25	.85

FloGard® Catch Basin Insert Filter *Grated Inlet Style*

Inlet Filtration

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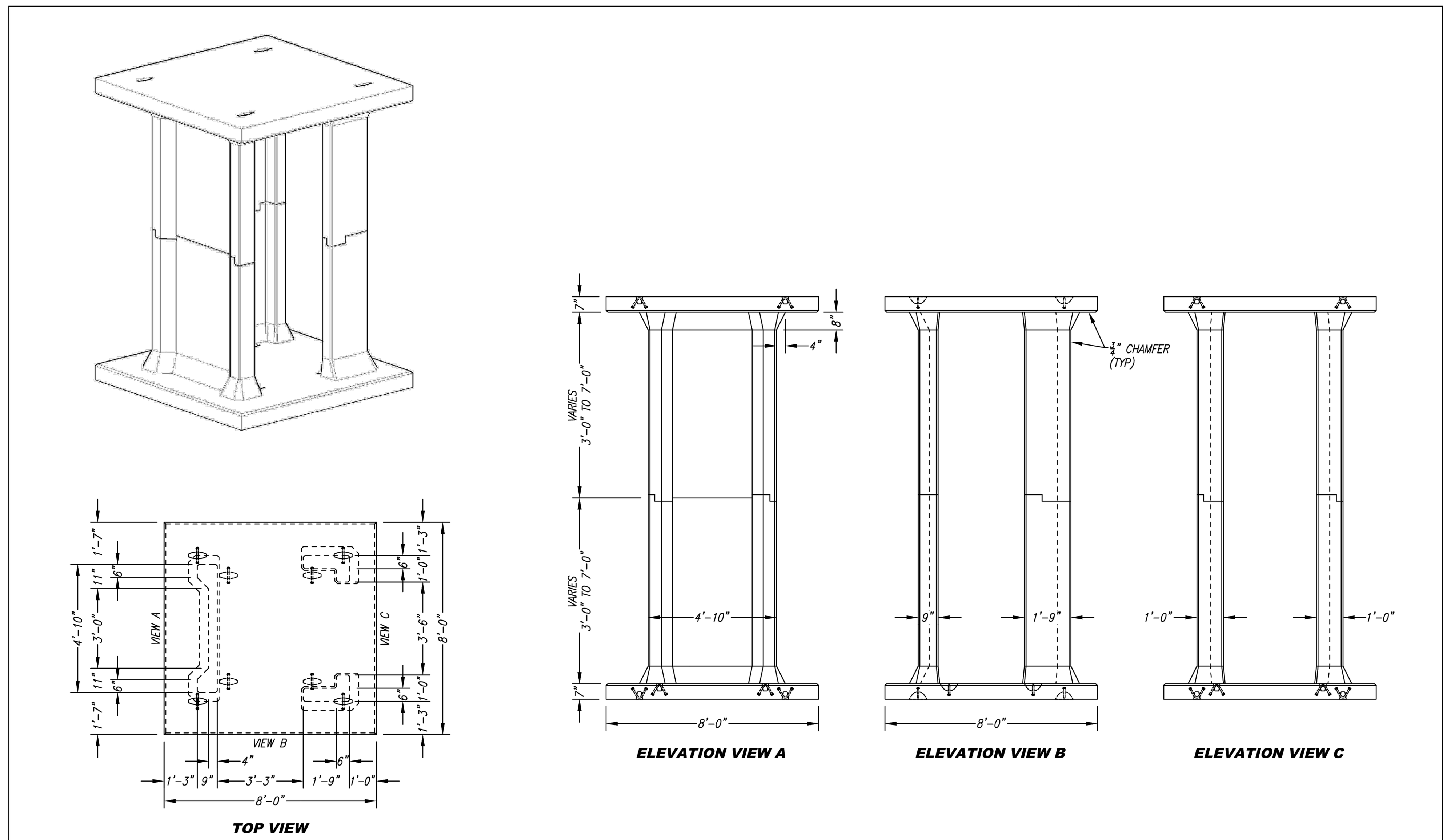
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

DRAWING NO. FGP-0001 | REV G | ECO ECO-0142 JPR 7/13/16 | DATE JPR 11/3/06 | SHEET 2 OF 2

CATCH BASIN INSERTS



1:40 SCALE

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 10,151,083 B2 & 10,151,096 B2, RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING.

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Bio Clean A Forterra Company

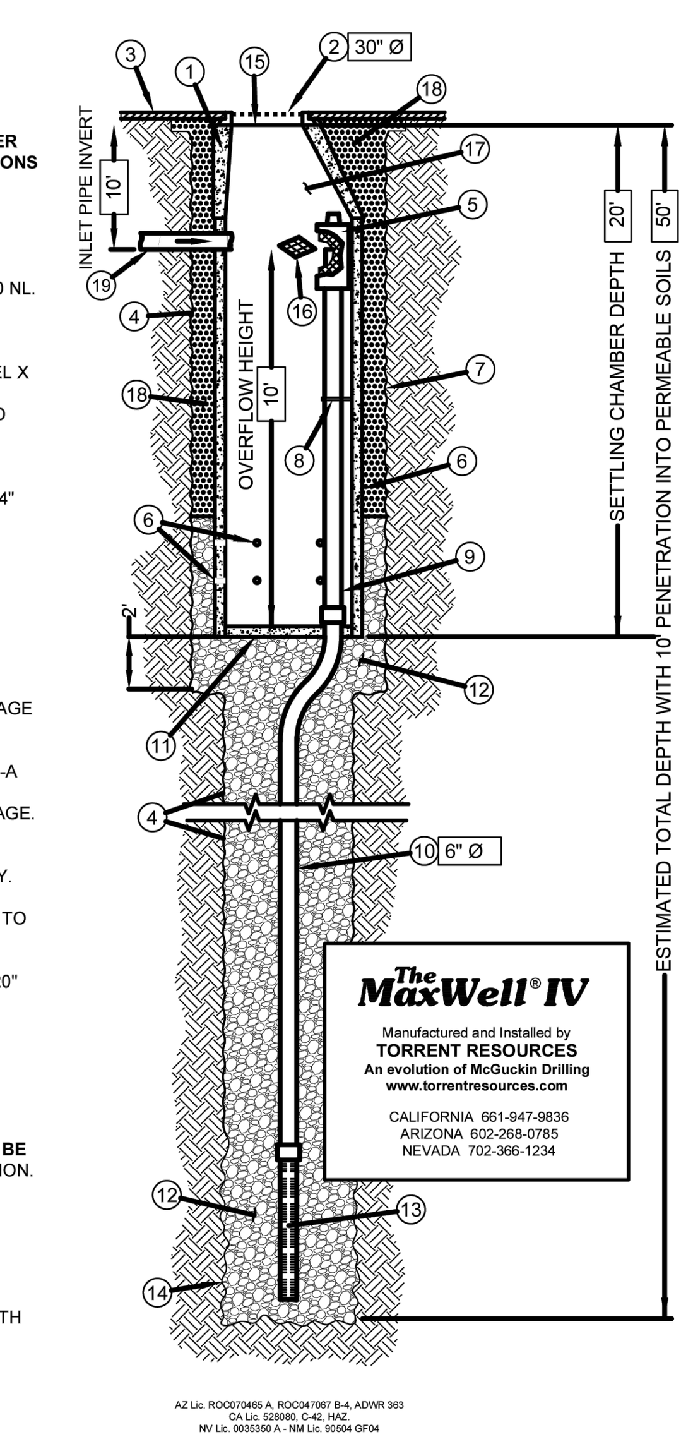
URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
DOUBLE MODULE - INTERIOR

URBAND POND DETENTION SYSTEM

The MaxWell® IV Drainage System Detail And Specifications

ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **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.
3. **GRADED BASIN OR PAVING** (BY OTHERS).
4. NON-WOVEN GEOTEXTILE SLEEVE, MIRAFITM/ 140 NL. MIN. 6 FT Ø, HELD APPROX. 10 FEET OFF THE BOTTOM OF EXCAVATION.
5. **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**.
6. **PRE-CAST LINER** - 4000 PSI CONCRETE 48" ID. X 54" OD. **CENTER IN HOLE** AND ALIGN SECTIONS **TO MAXIMIZE BEARING SURFACE. EIGHT (8) PERFORATIONS PER FOOT, 2 ROWS MINIMUM.**
7. **MIN. 6' Ø DRILLED SHAFT**.
8. **SUPPORT BRACKET** - FORMED 12 GA. STEEL. **FUSION BONDED EPOXY COATED**.
9. **OVERFLOW PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
10. **DRAINAGE PIPE** - ADS HIGHWAY GRADE WITH TRI-A COUPLER. **SUSPEND PIPE** DURING BACKFILL OPERATIONS TO PREVENT BUCKLING OR BREAKAGE. DIAMETER AS NOTED.
11. **BASE SEAL** - GEOTEXTILE OR CONCRETE SLURRY.
12. **ROCK** - WASHED, SIZED BETWEEN 3/8" AND 1-1/2" TO **BEST COMPLEMENT SOIL CONDITIONS**.
13. **FLOFAST® DRAINAGE SCREEN** - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. 120" OVERALL LENGTH WITH TRI-B COUPLER.
14. **MIN. 4' Ø SHAFT** - DRILLED TO **MAINTAIN PERMEABILITY** OF DRAINAGE SOILS.
15. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER** AT PROJECT COMPLETION.
16. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY. TYPICAL, TWO PER CHAMBER.
17. **FREEBOARD DEPTH VARIES** WITH INLET PIPE ELEVATION. INCREASE SETTLING CHAMBER DEPTH AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE OVERFLOW PIPE INLET.
18. STABILIZED BACKFILL - TWO-SACK SLURRY MIX.
19. **INLET PIPE** (BY OTHERS).



DRYWELL

REVISIONS					
NUMBER	DATE	INITIALS	DESCRIPTION	APPROVED	INSTALLED

PLANS PREPARED BY:

C&V CONSULTING, INC.
CIVIL ENGINEERING
LAND PLANNING & SURVEYING

9830 IRVINE CENTER DRIVE
IRVINE, CALIFORNIA 92618
(949) 916-3800
INFO@CVC-INC.NET
WWW.CVC-INC.NET

REGISTERED PROFESSIONAL ENGINEER
RYAN J. BITTNER
No. 68167
CIVIL
STATE OF CALIFORNIA

BMP DETAILS

TR 19337, LOT 1

2020 E. FIRST STREET

PUBLIC WORKS AGENCY
CITY OF SANTA ANA

SHEET 2 OF 2

ATTACHMENT C

BMP Fact Sheets & Details

The MaxWell® IV Drainage System Detail And Specifications

ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **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.
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4. NON-WOVEN GEOTEXTILE SLEEVE, MIRAFITM/ 140 NL. MIN. 6 FT Ø, HELD APPROX. 10 FEET OFF THE BOTTOM OF EXCAVATION.
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6. **PRE-CAST LINER** - 4000 PSI CONCRETE 48" ID. X 54" OD. **CENTER IN HOLE** AND ALIGN SECTIONS **TO MAXIMIZE BEARING SURFACE**. **EIGHT (8) PERFORATIONS PER FOOT, 2 ROWS MINIMUM.**
7. **MIN. 6' Ø DRILLED SHAFT**.
8. **SUPPORT BRACKET** - FORMED 12 GA. STEEL. **FUSION BONDED EPOXY COATED**.
9. **OVERFLOW PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
10. **DRAINAGE PIPE** - ADS HIGHWAY GRADE WITH TRI-A COUPLER. **SUSPEND PIPE** DURING BACKFILL OPERATIONS TO PREVENT BUCKLING OR BREAKAGE. DIAMETER AS NOTED.
11. **BASE SEAL** - GEOTEXTILE OR CONCRETE SLURRY.
12. **ROCK** - WASHED, SIZED BETWEEN 3/8" AND 1-1/2" TO **BEST COMPLEMENT SOIL CONDITIONS**.
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14. **MIN. 4' Ø SHAFT** - DRILLED TO **MAINTAIN PERMEABILITY** OF DRAINAGE SOILS.
15. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER** AT PROJECT COMPLETION.
16. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY. TYPICAL, TWO PER CHAMBER.
17. **FREEBOARD DEPTH VARIES** WITH INLET PIPE ELEVATION. INCREASE SETTLING CHAMBER DEPTH AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE OVERFLOW PIPE INLET.
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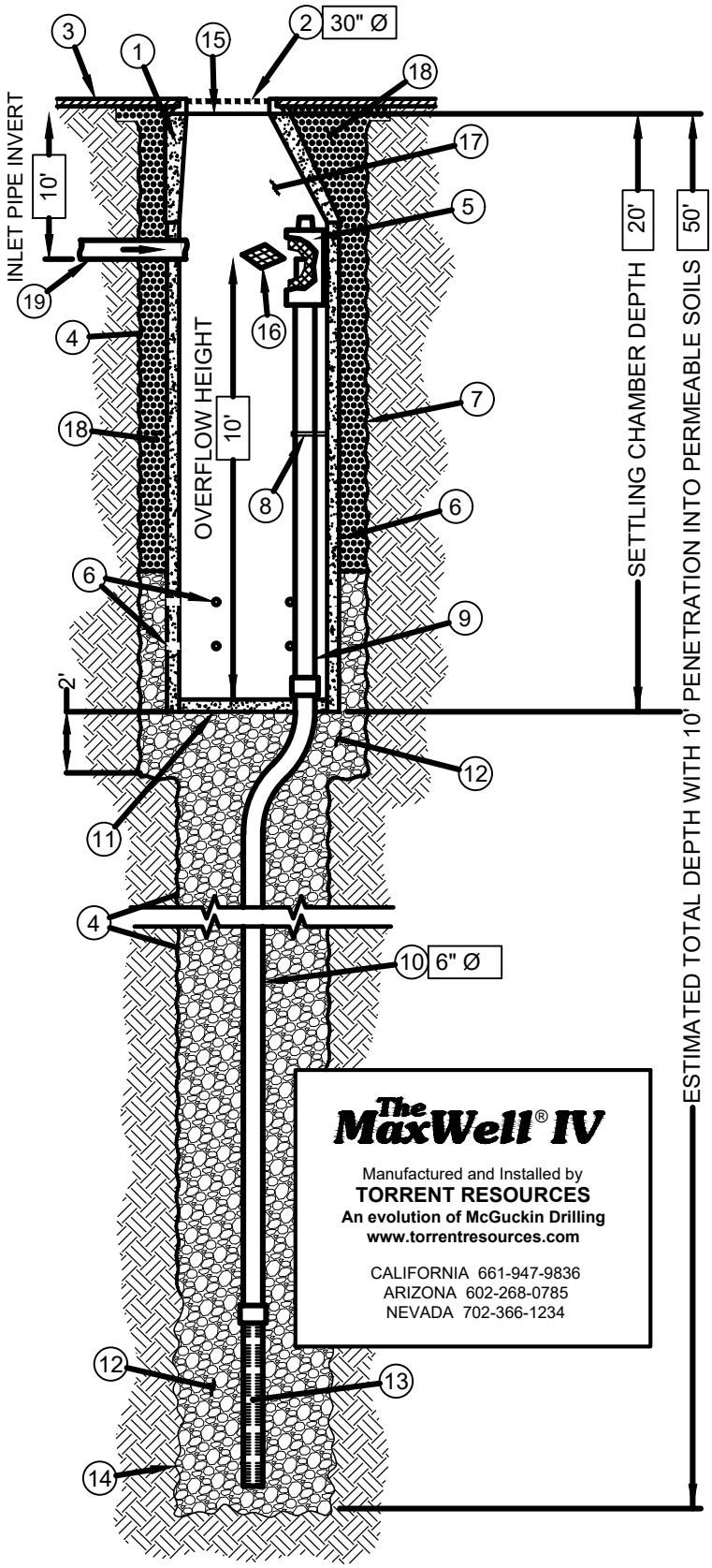
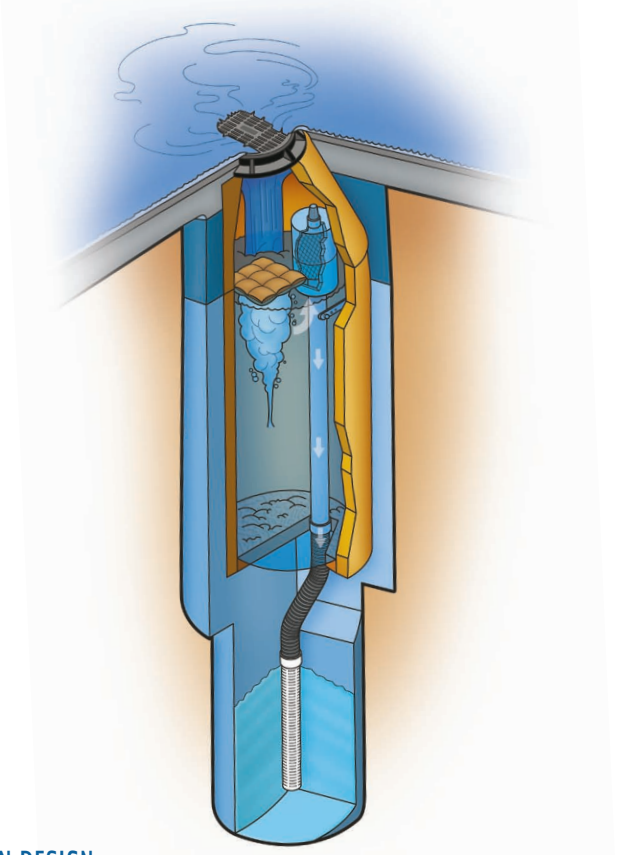


MaxWell® IV DRAINAGE SYSTEM

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

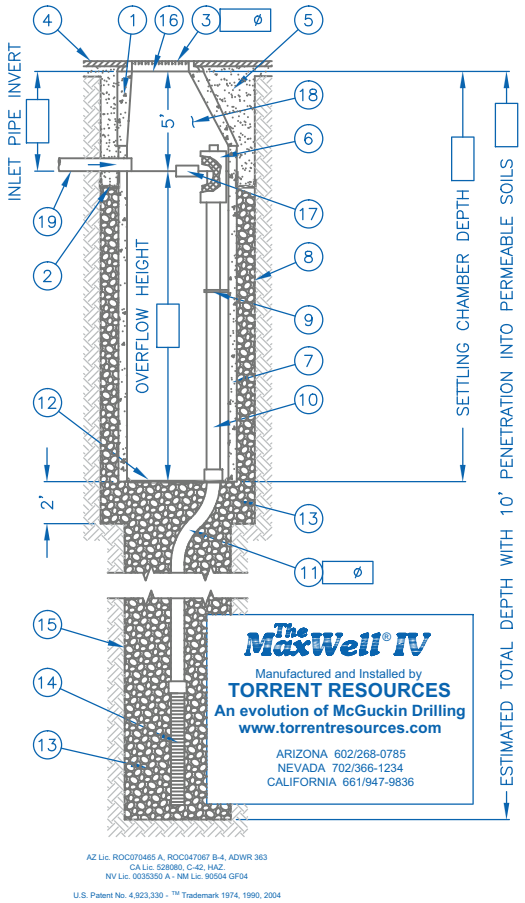
Please see reverse side for additional information

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.

TORRENT RESOURCES INCORPORATED
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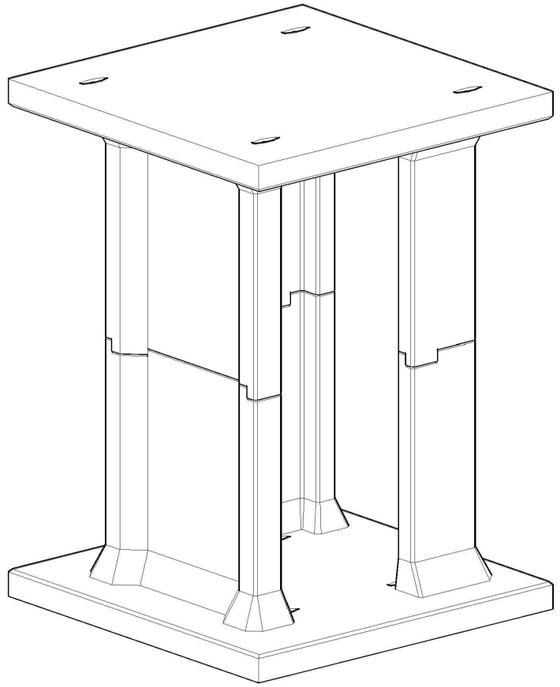
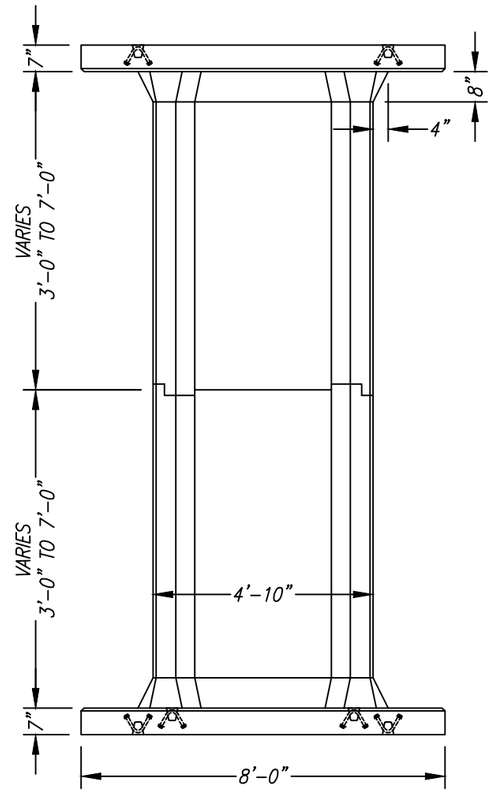
phone 602~268~0785 fax 602~268~0820
Nevada 702~366~1234
AZ Lic. ROC070465 A, ROC047067 B-4; ADWR 363
CA Lic. 528080 A, C-42, HAZ ~ NV Lic. 0035350 A ~ NM Lic. 90504 GF04

TORRENT RESOURCES (CA) INCORPORATED
phone 661~947~9836
CA Lic. 886759 A, C-42
www.TorrentResources.com
An evolution of McGuckin Drilling

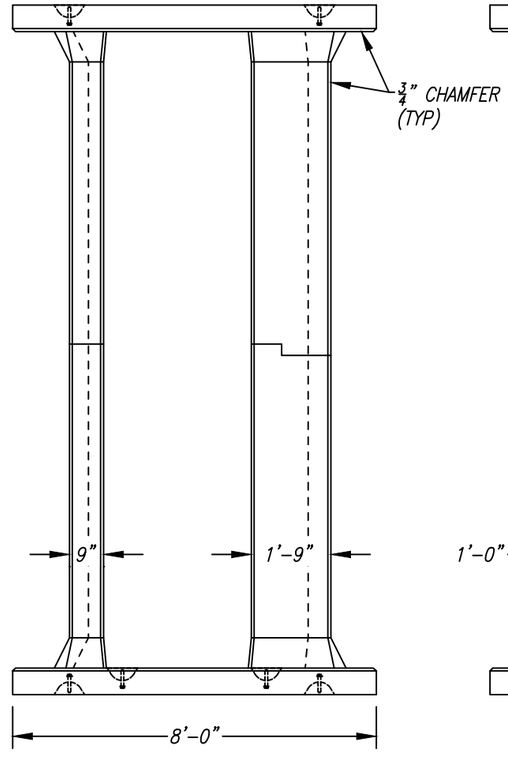
The watermark for drainage solutions.®

TORRENT® RESOURCES

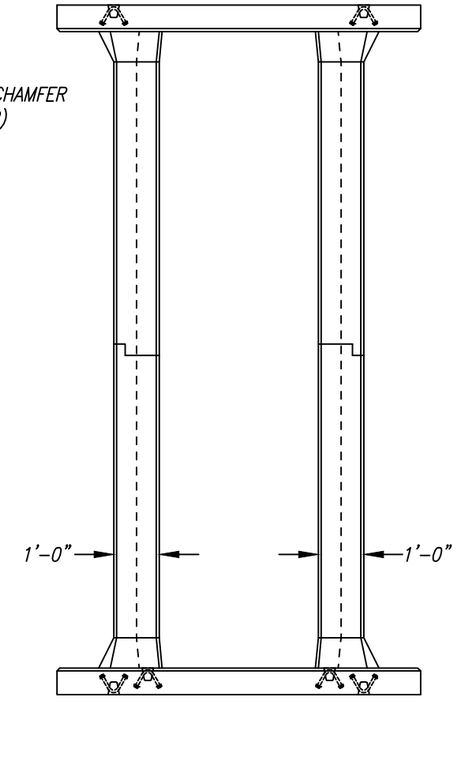




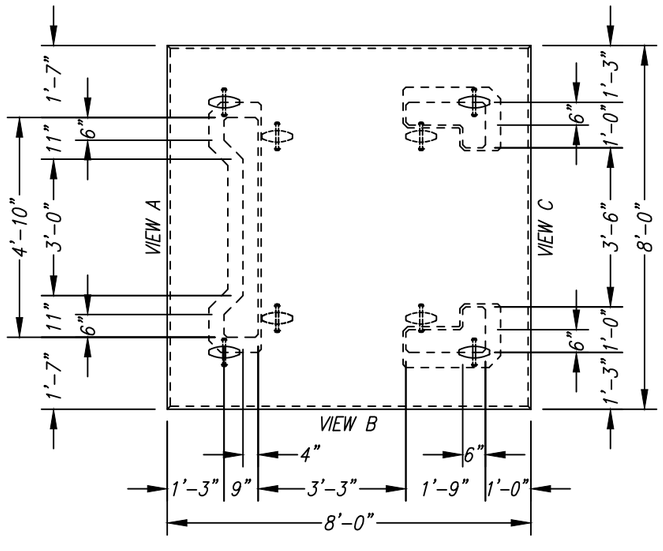
ELEVATION VIEW A



ELEVATION VIEW B



ELEVATION VIEW C



TOP VIEW

1:40 SCALE

7/30/19SSERTICH

BioClean
A Forterra Company

URBANPOND
PRECAST CONCRETE STORMWATER DETENTION
DOUBLE MODULE - INTERIOR

Bio Clean

A Forterra Company

UrbanPond™

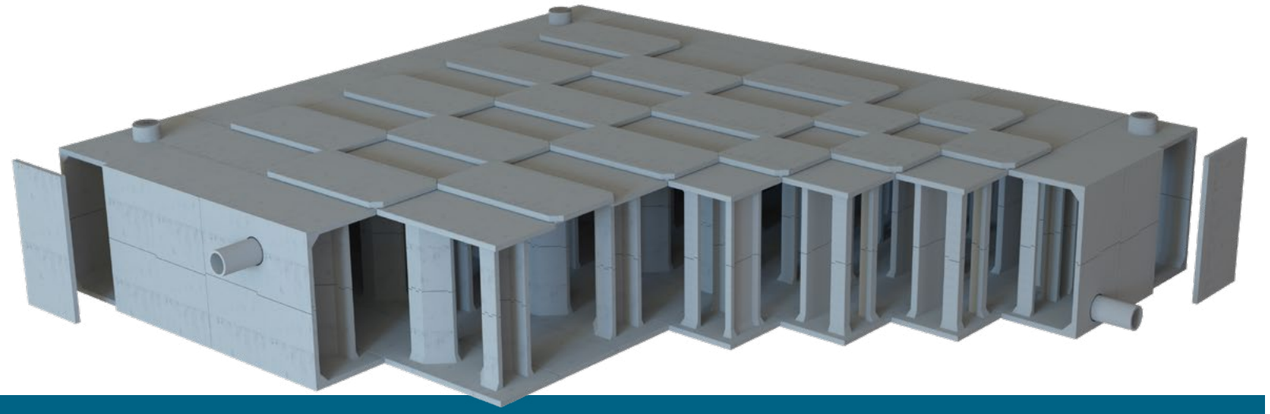
A Stormwater Storage Solution

OVERVIEW

UrbanPond™ is a modular precast concrete underground storage system that mimics the function of ponds and open detention basins.

Modules are available in 8x8 feet square or 8x16 rectangular options, giving designers more versatility to accommodate dense development, urban infill, or larger high-volume projects. The modular design can be placed under roadways, parking lots and landscape areas in various shapes, sizes, and depths.

The system's internal offset leg configuration provides channel-less water distribution for stormwater entering and exiting the system, and the robust precast form allows it to be buried deeper without the need for specialized backfill, increased wall thickness, or extra rebar reinforcement.



A BREAKTHROUGH SYSTEM FOR MANAGING STORMWATER RUNOFF

ADVANTAGES

- SUPERIOR STRENGTH & LOAD CAPACITY
- DESIGNED TO MEET H-20 LOADING REQUIREMENTS
- CAN BE INSTALLED DEEPER WITHOUT THE NEED TO INCREASE WALL THICKNESS OR ADD ADDITIONAL REBAR
- EVERY MODULE DRAINS DOWN FULLY
- HIGHER VOID PERCENTAGES AND INCREASED MATERIAL EFFICIENCY FOR BEST IN CLASS COST PER CUBIC FOOT STORAGE
- 8X8 MODULES ARE LIGHTER WEIGHT AND EASIER TO INSTALL
- 8X16 MODULES REDUCE CRANE PICKS AND MAXIMIZE SPACE
- LIGHTER WEIGHT, EASIER TO INSTALL
- A LINKUP SLAB ALLOWS ELIMINATION OF SOME MODULES, FURTHER DECREASING COST AND INSTALLATION TIME

APPLICATIONS

Detention with controlled discharge utilizing built-in outlet orifice structures.

Retention for long-term retention of runoff onsite to meet strict stormwater requirements.

Harvesting self-contained treatment and reuse of stormwater for irrigation and grey water needs.

Capture & Infiltration of runoff back into underlying native soils for recharge needs.

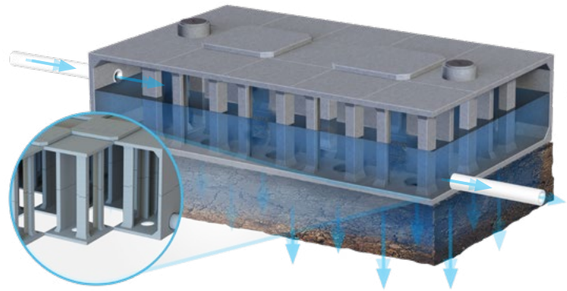
Flood Control of peak storm events to minimize downstream flooding and erosion.

Low Impact Development to maximize land use with underground storage - construct an urban infill without a pond at grade.

Treatment utilized as an underground extended detention basin or pond for advanced treatment of stormwater - integrates well with treatment train components (biofiltration, separation, etc.).

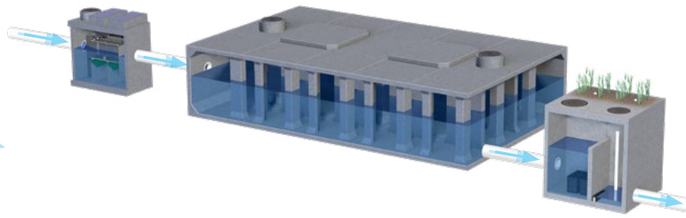
INFILTRATION GALLERIES

UrbanPond infiltration galleries are designed to maximize the transfer of water for percolation into native soils and groundwater recharge. The features include open floor spaces under the LinkUP Slabs and 30" diameter infiltration openings in each module.
See ***Treatment*** page for more details.



TREATMENT TRAIN DESIGN OPTIONS

The example shows an upstream DSBB Separator to treat large flows, and capture trash, debris, and suspended solids, as well as hydrocarbons. The Modular Wetlands Linear is downstream, and the only biofiltration product that can be placed downstream of a detention system.
See ***Treatment*** page for more details on flow based and volume based treatment trains.

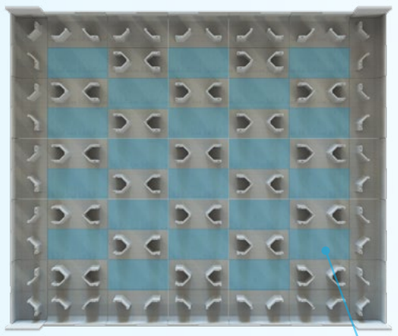


SIZING CHART

UrbanPond is available with inside heights ranging from 3 feet to 14 feet, in 6-inch increments. Single UrbanPond Modules are available with inside heights ranging from 3 feet to 7 feet, in 6-inch increments, and the Double UrbanPond Modules are stackable up to 14 feet.

UrbanPond Inside Height (ft.)	8x8 Module Storage Volume (cu. ft.)	8x16 Module Storage Volume (cu. ft.)
3	180	360
4	242	484
5	304	607
6	366	730
7	428	854
8	485	968
9	546	1091
10	608	1214
11	670	1338
12	732	1461
13	793	1584
14	855	1708

MODULE OVERVIEW

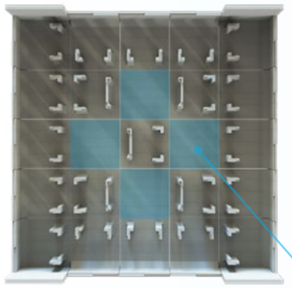


Top view without top slabs.

8X16 MODULE ASSEMBLY

The UrbanPond structure benefits from repeating tessellated shapes, and as shown below in the main graphic, both the 8x8 and 8x16 modules can even combine for increased design versatility and efficiency.

The diagram to the left, also highlights the LinkUP slab placements. LinkUP slabs reduce the number of precast modules needed without compromising storage space.



Top view without top slabs.

8X8 MODULE ASSEMBLY

The UrbanPond 8x8 modules' square tessellation repeats, covering a plane without any gaps or overlaps. Because of the self-supporting characteristic of tessellated-shaped structures, Bio Clean has been able to further reduce material usage and costs up to 20% without sacrificing structural strength.

As shown in the image to the left, the offset leg configuration of the modules creates an open channel-less internal space.

LINKUP SLAB (8X16)

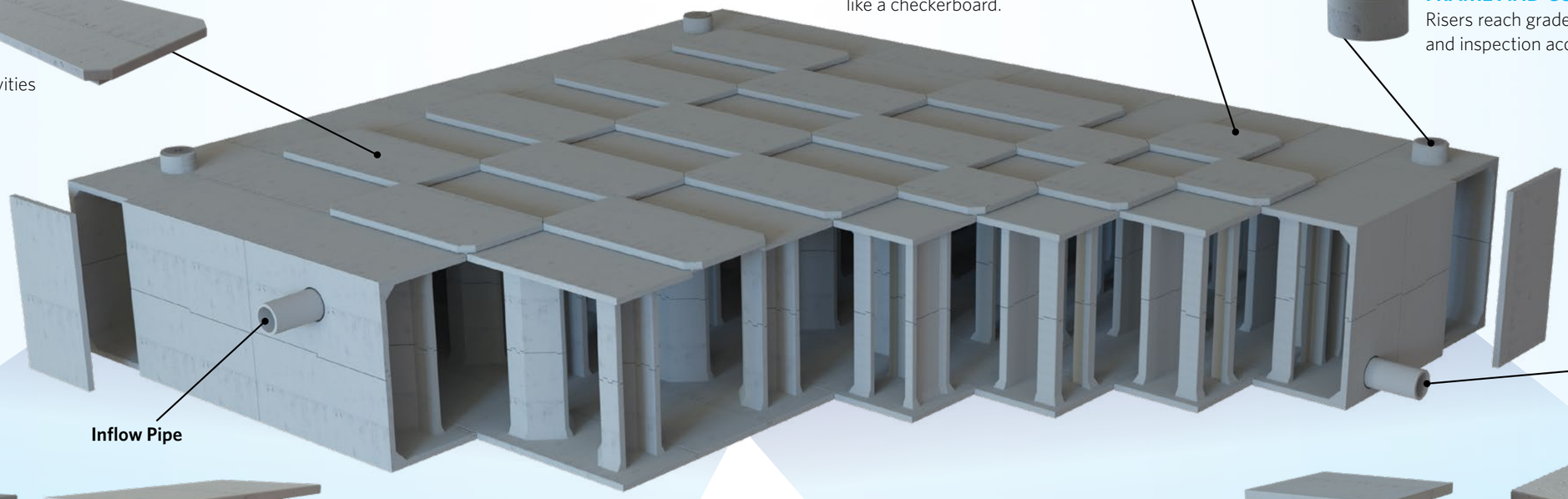
LinkUP Slabs span the open cavities like a checkerboard.

LINKUP SLAB (8X8)

LinkUP Slabs span the open cavities like a checkerboard.

FRAME AND COVER WITH RISERS

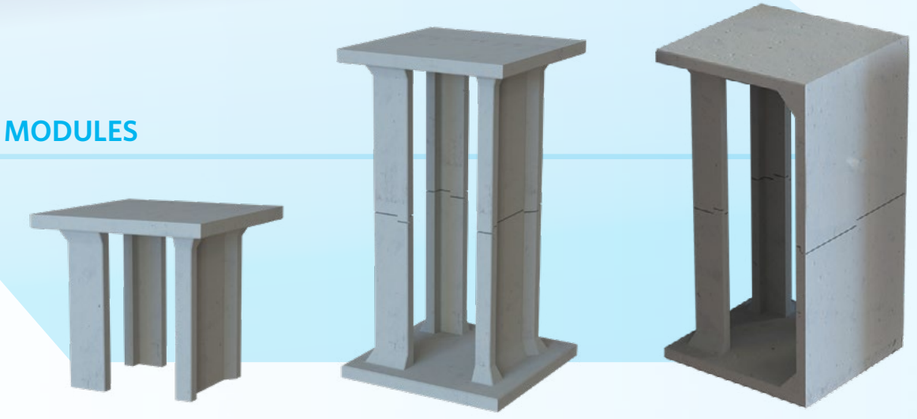
Risers reach grade, for easy maintenance and inspection access.



8X16 MODULES

Perimeter Double | **Interior Double** | **Single**

8X8 MODULES

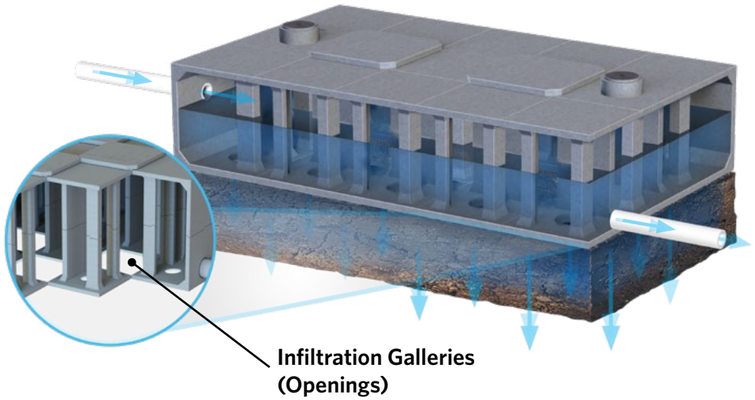


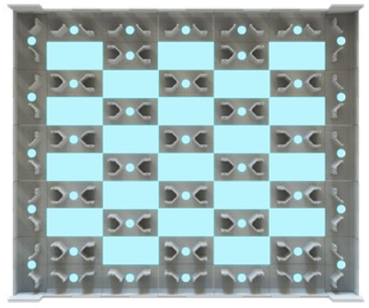
Single | **Interior Double** | **Perimeter Double**

TREATMENT

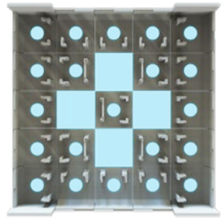
INFILTRATION GALLERIES

UrbanPond can be designed with full open spaces below LinkUP slabs and 30" diameter openings in the base modules for infiltration, returning runoff back into the native soils for recharge.





8x16 Infiltration Galleries

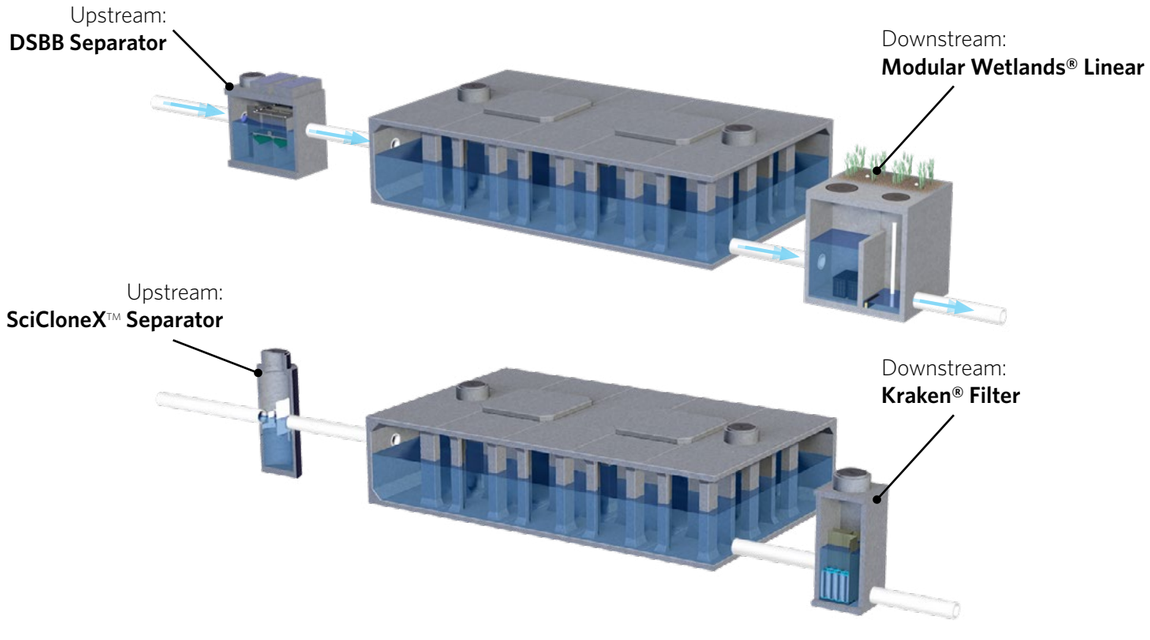


8x8 Infiltration Galleries

TREATMENT TRAIN COMBINATIONS

Below are just a few of the UrbanPond treatment train examples for flow based and volume based treatment. First, an upstream separator, like the DSBB Separator or SciCloneX Separator, reduce flow velocity and capture pollutants like trash, debris, oils, and large amounts of sediment. This pretreats the stormwater and supports the entire connected system's efficiency and long-term maintenance costs.

While downstream, a volume based treatment train gives engineers the ability to size a more cost-effective yet enhanced biofiltration or membrane filter, like the Modular Wetlands or Kraken Filter.



INSTALLATION

UrbanPond modules can easily fit onto a flatbed truck, and the size maximizes the space on each truck load.

As many as 4 individual pieces can be delivered on a single truckload to reduce shipping costs and minimize crane requirements during install. Most units can be installed using a simple backhoe due to low weights.

MAINTENANCE

UrbanPond is designed to be easily accessed and maintained from finished surface via multiple access ports. Using a standard vacuum truck, each access point is conveniently located, as ports are strategically placed throughout the assembly.

Modules can be modified to act as clear wells or pretreatment chambers for capturing trash, debris, and sediment. This consolidates maintenance requirements to a select few modules. Standard manholes, hinged manholes, and other access hatches are available.

Bio Clean
A Forterra Company

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stormwater@forterrabp.com
biocleanenvironmental.com

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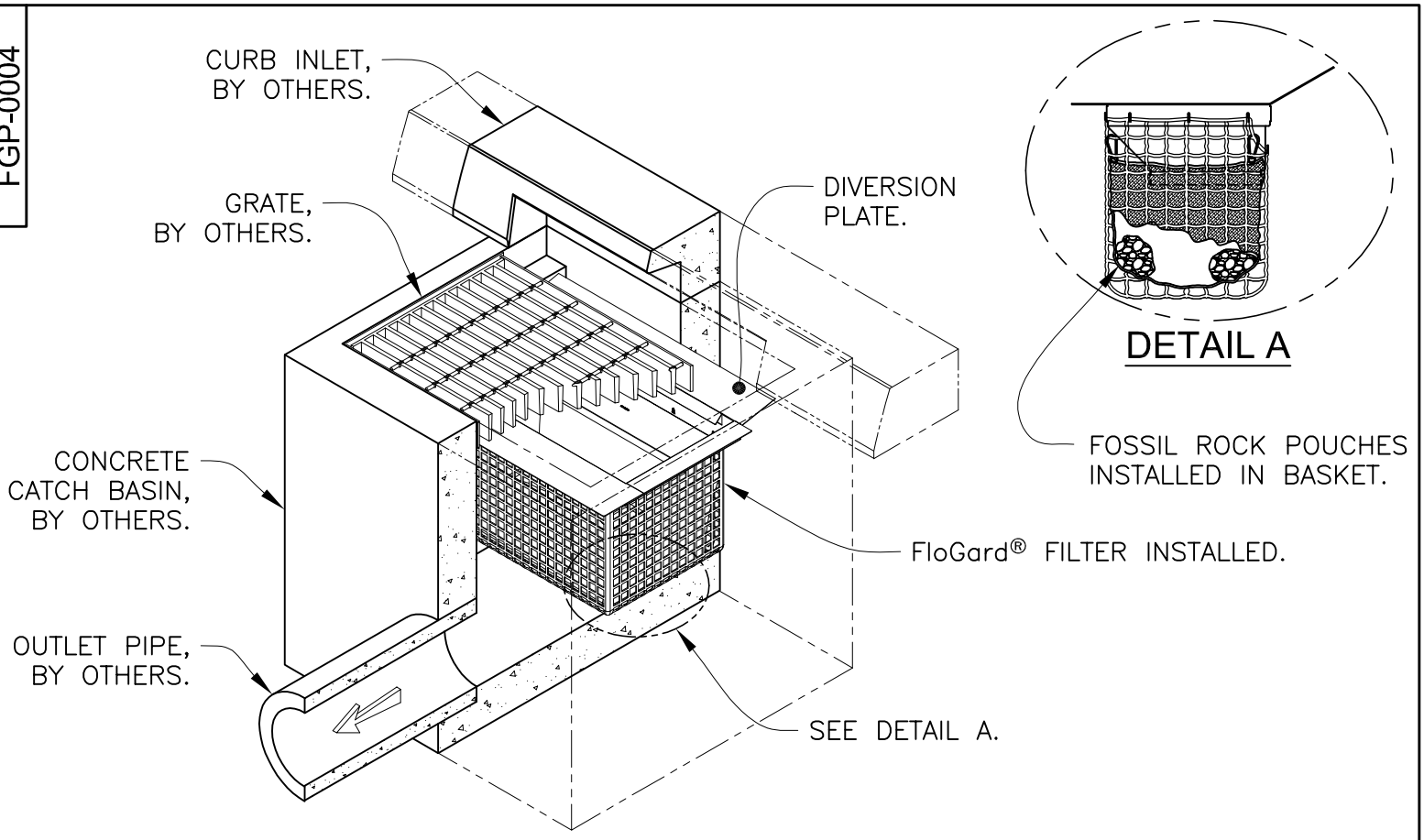


SPECIFIER CHART

MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data in these columes is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-	
	INLET ID Inside Dimension (inch x inch)	GRATE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft. / sec.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-1633FGO	16 X 33	18 X 36	7.0	2.5	1.7	FGP-1633FGO8	1.4	1.1
FGP-1836FGO	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836FGO8	1.3	.9
FGP-2234FGO	22 X 34	24 X 36	8.1	3.6	2.1	FGP-2234FGO8	2.1	1.4
FGP-2436FGO	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436FGO8	1.95	1.15
FGP-48FGO	48 X 48	20 X 54	6.3	2.2	1.5	FGP-48FGO8	1.25	.85

NOTES:

1. Filter insert shall have a high flow bypass feature.
2. Filter support frame shall be constructed from stainless steel Type 304.
3. Filter medium shall be *Fossil Rock* ™, installed and maintained in accordance with manufacturer specifications.
4. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.

Inlet Filtration

FloGard®

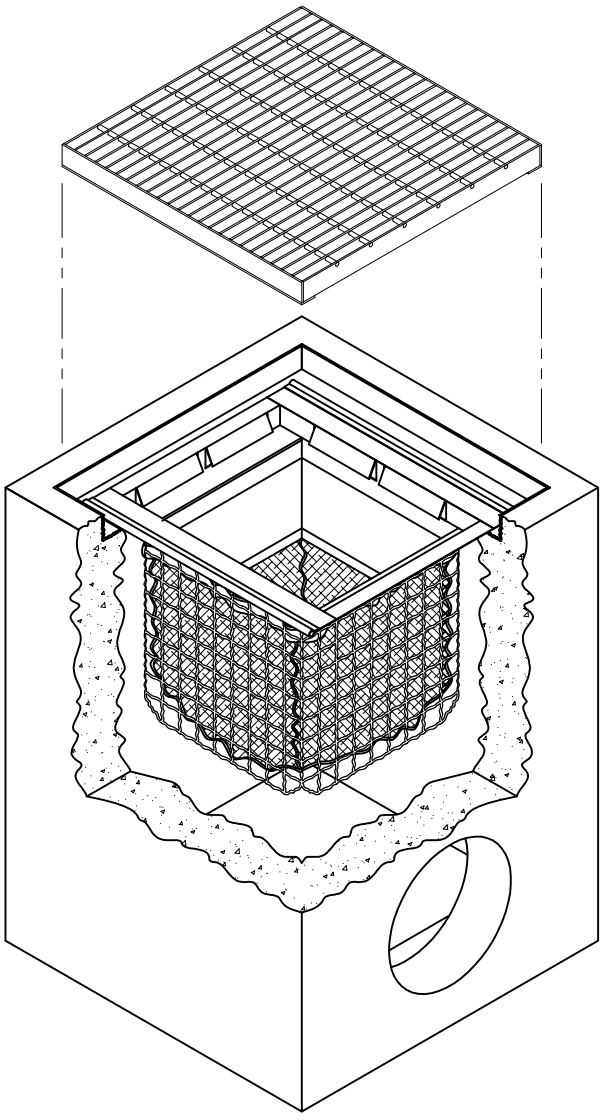
Catch Basin Insert Filter

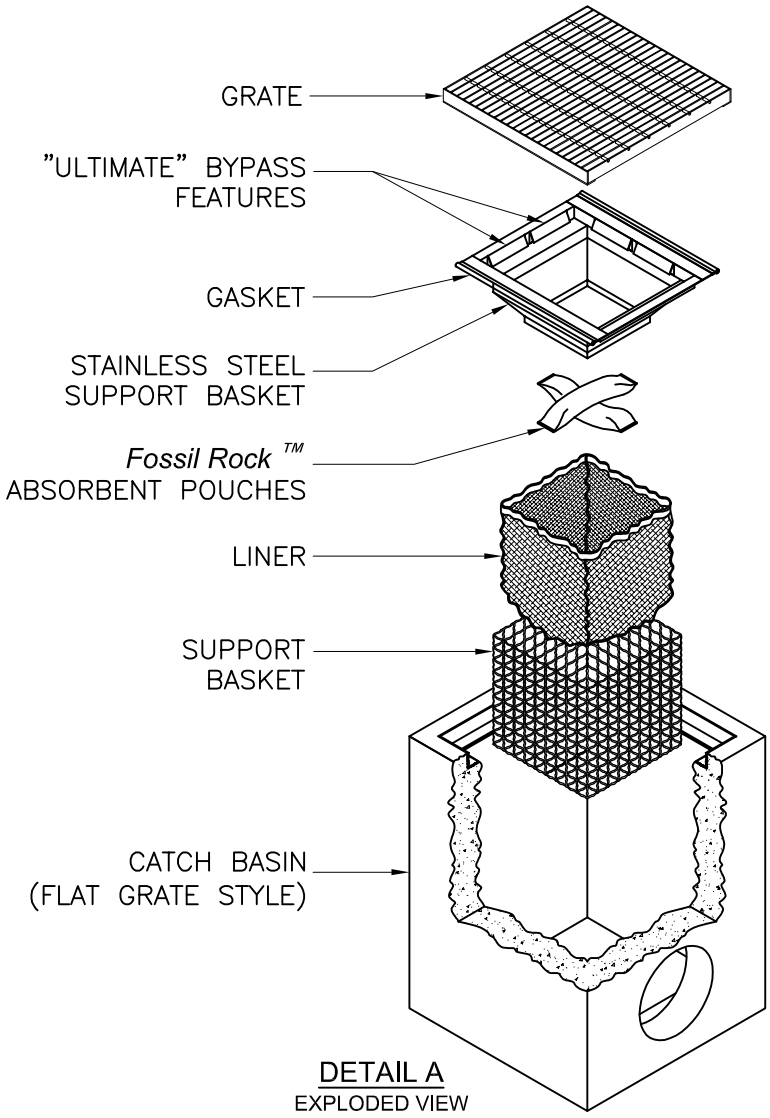
Combination Inlet Style

Oldcastle® Stormwater Solutions
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

DRAWING NO.	REV	ECO	DATE	
FGP-0004	A	ECO-0127 JPR 5/18/15	JPR 1/25/13	SHEET 1 OF 1

FGP-0001





DETAIL A
EXPLODED VIEW

FloGard® FILTER
-INSTALLED INTO CATCH BASIN-

U.S. PATENT # 6,00,023 & 6,877,029

NOTES:

1. Filter insert shall have a high flow bypass feature.
2. Filter support frame shall be constructed from stainless steel Type 304.
3. Filter medium shall be *Fossil Rock* ™, installed and maintained in accordance with manufacturer specifications.
4. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.

Inlet Filtration

FloGard®

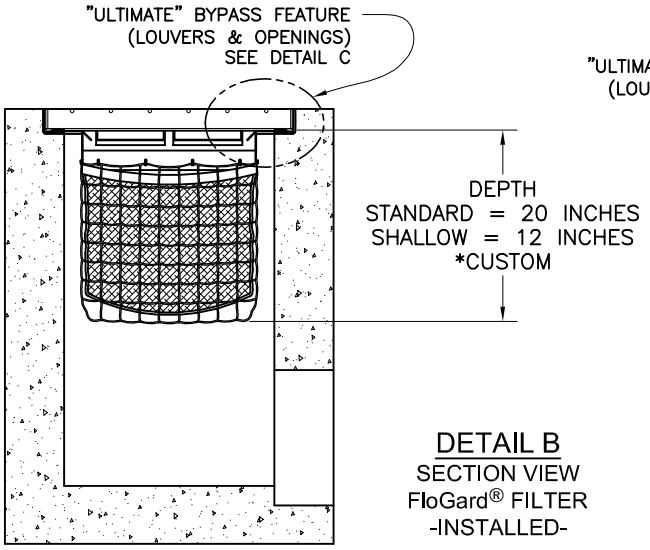
Catch Basin Insert Filter

Grated Inlet Style

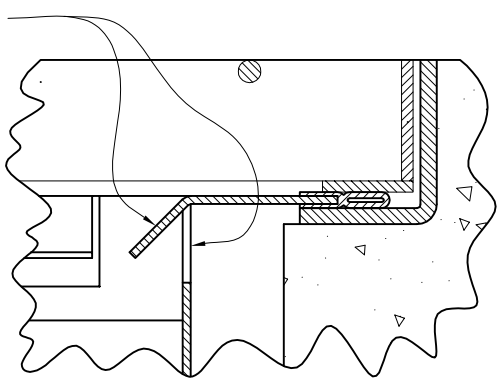
Oldcastle® Stormwater Solutions
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

DRAWING NO.	REV	ECO	DATE	
FGP-0001	G	ECO-0142 JPR 7/13/16	JPR 11/3/06	SHEET 1 OF 2

U.S. PATENT # 6,00,023 & 6,877,029



DETAIL B
SECTION VIEW
FloGard® FILTER
-INSTALLED-



DETAIL C
"ULTIMATE"
BYPASS FEATURES

* MANY OTHER STANDARD & CUSTOM SIZES & DEPTHS AVAILABLE UPON REQUEST.

SPECIFIER CHART

MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data In these columes Is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-	
	INLET ID Inside Dimension (inch x inch)	GRATE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft. / sec.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-12F	12 X 12	12 X 14	2.8	0.3	0.4	FGP-12F8	.15	.25
FGP-16F	16 X 16	16 X 19	4.7	0.8	0.7	FGP-16F8	.45	.4
FGP-18F	18 X 18	18 X 20	4.7	0.8	0.7	FGP-18F8	.45	.4
FGP-1824F	16 X 22	18 X 24	5.0	1.5	1.2	FGP-1824F8	.85	.7
FGP-1836F	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836F8	1.3	.9
FGP-2024F	18 X 22	20 X 24	5.9	1.2	1.0	FGP-2024F8	.7	.55
FGP-21F	22 X 22	22 X 24	6.1	2.2	1.5	FGP-21F8	1.25	.85
FGP-24F	24 X 24	24 X 27	6.1	2.2	1.5	FGP-24F8	1.25	.85
FGP-2430F	24 X 30	26 X 30	7.0	2.8	1.8	FGP-2430F8	1.6	1.05
FGP-2436F	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436F8	1.95	1.15
FGP-2448F	24 X 48	26 X 48	9.3	4.4	2.4	FGP-2448F8	2.5	1.35
FGP-28F	28 X 28	32 X 32	6.3	2.2	1.5	FGP-28F8	1.25	.85
FGP-30F	30 X 30	30 X 34	8.1	3.6	2.0	FGP-30F8	2.05	1.15
FGP-36F	36 X 36	36 X 40	9.1	4.6	2.4	FGP-36F8	2.65	1.35
FGP-3648F	36 X 48	40 X 48	11.5	6.8	3.2	FGP-3648F8	3.9	1.85
FGP-48F	48 X 48	48 X 54	13.2	9.5	3.9	FGP-48F8	5.45	2.25
FGP-SD24F	24 X 24	28 X 28	6.1	2.2	1.5	FGP-SD24F8	1.25	.85

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DRAWING NO.	REV	ECO	DATE	
FGP-0001	G	ECO-0142 JPR 7/13/16	JPR 11/3/06	SHEET 2 OF 2

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.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

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

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

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

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.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

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.

Street Sweeping and Vacuuming SE-7

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

INF-5: Drywell

Also known as:

- *Soakaway Pits*
- *Infiltration Sumps*
- *Rock Sumps*
- *Underground Injection Controls*

Drywell
Source: K&A Enterprises

Drywells are similar to infiltration trenches in their design and function, but generally have a greater depth to footprint area ratio and can be installed at relatively large depths. A drywell is a subsurface storage facility designed to temporarily store and infiltrate runoff, primarily from rooftops or other impervious areas with low pollutant loading. A drywell may be either a small excavated pit filled with aggregate or a prefabricated storage chamber or pipe segment. Drywells can be used to reduce the volume of runoff from roofs and other relatively clean surfaces. While roofs are generally not a significant source of stormwater pollutants, they can be a major contributor of runoff volumes. Therefore, drywells can indirectly enhance water quality by reducing the water quality design volume that must be treated by other, downstream stormwater management facilities. *Note: A drywell is considered a "Class V Injection Wells" under the federal Underground Injection Control (UIC) Program regulated in California by U.S. EPA Region 9. A UIC permit may be required (for details see http://www.epa.gov/region9/water/groundwater/uic-classv.html).*

Feasibility Screening Considerations

- Drywells shall pass infiltration infeasibility screening criteria (□□D□□□□□□□2□□2□□) to be considered for use.
- Dry wells provide a more direct pathway for stormwater to groundwater, therefore pose a greater risk to groundwater quality than surface infiltration systems.

Opportunity Criteria

- Drywells may be used to infiltrate roof runoff, either directly or from the overflow from a cistern.
- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Space available for pretreatment (biotreatment or treatment control BMP as described below).
- The drywell must be located in native soil; over-excavated by at least one foot in depth and replaced uniformly without compaction.
- Potential for groundwater contamination can be mitigated through isolation of pollutant sources, pretreatment of inflow, and/or demonstration of adequate treatment capacity of underlying soils.
- Infiltration is into native soil, or depth of engineered fill is ≤ 5 feet from the bottom of the facility to native material and infiltration into fill is approved by a geotechnical professional.

OC-Specific Design Criteria and Considerations

[X] Must comply with local, state, and federal UIC regulations; a permit may be required.

[X] Minimum set-backs from foundations and slopes should be observed

- [X] Infiltration should not cause geotechnical concerns related to slope stability, liquefaction, or erosion.
- [X] Minimum separation to mounded seasonally high groundwater of 10 feet shall be observed.
- [ ] Drywells should not receive untreated stormwater runoff, except rooftop runoff. Pretreatment of runoff from other surfaces is necessary to prevent premature failure that results from clogging with fine sediment, and to prevent potential groundwater contamination due to nutrients, salts, and hydrocarbons. Maxwell Drywell Systems contain internal pretreatment systems
- [X] Design infiltration rate should be determined with an infiltration test at each drywell location.
- [ ] Drywell should be encased by 1 foot of coarse (3/4" to 2 ½"), round river rock on sides and bottom of facility. Maxwell Drywell System is encased by its manufacturer specific recommended rock as well as stabilized backfill.
- [X] Maximum facility depth is 25 feet with the approval of a geotechnical professional; preferred depth less than 10 feet does not require geotechnical approval.
- [X] If inlet is an underground pipe, a fine mesh screen should be installed to prevent coarse solids from entering drywell.
- [ ] An overflow route must be installed for flows that overtop facility. Flows will not overtop facility

Sizing Criteria for Drywells

Drywell sizing is highly site-specific. Sizing calculations shall demonstrate via the methods described in **Appendix III** or via project-specific methods that the system captures and fully discharges the DCV within 48 hours following the end of precipitation, or captures and infiltrates 80 percent of average annual runoff volume.

Configuration for Use in a Treatment Train

- Drywells may be preceded in a treatment train by HSCs in the drainage area, which would reduce the required volume of the drywell.
- Drywells treating any areas other than roof tops must be preceded by a robust biotreatment or conventional treatment capable of addressing all potentially generated pollutants.
- Drywells may be used in conjunction with other infiltration BMPs to increase the infiltration capacity of the entire treatment train system.

Additional References for Design Guidance

- Stormwater Management in Western Washington (Volume III: Hydrologic Analysis and Flow Control Design BMPs) **http://www.ecy.wa.gov/pubs/0510031.pdf**
- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: **http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850**
- City of Portland Stormwater Management Manual (Drywell, page 2-87) **http://www.portlandonline.com/bes/index.cfm?c=47954&a=202883**
- San Diego County LID Handbook Appendix 4 (Factsheet 25): **http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf**
- City of Santa Barbara Storm Water BMP Guidance Manual, Chapter 6: **http://www.santabarbaraca.gov/NR/rdonlyres/91D1FA75-C185-491E-A882-49EE17789DF8/0/Manual_071008_Final.pdf**

PRE-2: Catch Basin Insert Fact Sheet

Catch basin inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris and may include sorbent media (oil absorbent pouches) to remove floating oils and grease. Catch basin inserts are selected specifically based upon the orientation of the inlet and the expected sediment and debris loading.

Also known as:

- *Drop Inlet Filters*
- *Catch Basin Filters*

Catch Basin Insert (DrainPac™)

Opportunity Criteria

- Catch basin inserts come in such a wide range of configurations that it is practically impossible to generalize the expected performance. Inserts should mainly be used for catching coarse sediments and floatable trash and are effective as pretreatment in combination with other types of structures that are recognized as water quality treatment BMPs. Trash and large objects can greatly reduce the effectiveness of catch basin inserts with respect to sediment and hydrocarbon capture.
- Catch basin inserts are applicable for drainage area that include parking lots, vehicle maintenance areas, and roadways with catch basins that discharge directly to a receiving water.

OC-Specific Design Criteria and Considerations

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

☐ Consult proprietors for specific criteria concerning the design of catch basin inserts.

☐ Catch basin inserts can be installed with specific media for pollutants of concern.

Proprietary Manufacturer / Supplier Websites

- **Table XIV.2** is a list of manufacturers that provide catch basin inserts. The inclusion of these manufacturers does not represent an endorse of their products. Other devices and manufacturers may be acceptable for pretreatment.

Table XIV.2: Proprietary Catch Basin Insert Manufacturer Websites

Device	Manufacturer	Website
AbTech Industries Ultra-Urban Filter™	AbTech Industries	www.abtechindustries.com
Aquashield Aqua-Guardian™ Catch Basin Insert	Aquashield™ Inc.	www.aquashieldinc.com
Bowhead StreamGuard™	Bowhead Environmental & Safety, Inc.	http://www.shopbowhead.com/
Contech® Triton Catch Basin Filter™	Contech® Construction Products Inc.	www.contech-cpi.com
Contech® Triton Curb Inlet Filter™	Contech® Construction Products Inc.	www.contech-cpi.com

Table XIV.2: Proprietary Catch Basin Insert Manufacturer Websites

Device	Manufacturer	Website
Contech® Triton Basin StormFilter™	Contech® Construction Products Inc.	www.contech-cpi.com
Contech® Curb Inlet StormFilter™	Contech® Construction Products Inc.	www.contech-cpi.com
Curb Inlet Basket	SunTree Technologies Inc.	www.suntreetech.com
Curb Inlet Grates	EcoSense International™	http://www.ecosenseint.com/
DrainPac™	United Storm Water, Inc.	http://www.unitedstormwater.com
Grate Inlet Skimmer Box	SunTree Technologies Inc.	www.suntreetech.com
KriStar FloGard+PLUS®	KriStar Enterprises Inc.	www.kristar.com
KriStar FloGard®	KriStar Enterprises Inc.	www.kristar.com
KriStar FloGard LoPro Matrix Filter®	KriStar Enterprises Inc.	www.kristar.com
Nyloplast Storm-PURE Catch Basin Insert	Nyloplast Engineered Surface Drainage Products	www.nyloplast-us.com
StormBasin®	FabCo® Industries Inc.	www.fabco-industries.com
Stormdrain Solutions Interceptor	FabCo® Industries Inc.	www.fabco-industries.com
Stormdrain Solutions Inceptor®	Stormdrain Solutions	www.stormdrains.com
StormPod®	FabCo® Industries Inc.	www.fabco-industries.com
Stormwater Filtration Systems	EcoSense International™	http://www.ecosenseint.com/
Ultra-CurbGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-DrainGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-GrateGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-GutterGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-InletGuard®	UltraTech International Inc.	www.spillcontainment.com

ATTACHMENT D

Hydrology Calculations

2020 E. First Street
Santa Ana, CA

HCOC Calculations

2-Year, 24-hour storm even volume and Time of Concentration calculations were derived from the Orange County Hydrology Manual. The following equations were utilized:

V2-YEAR = C(D)(A)

C = Runoff Coefficient
D = Mean Precipitation Depth for 24 Hours
A = Area

C = 0.90(a_i), for Intensities (I) less than or equal to F_P *
- a_i = Ratio of Impervious areas to total area
- F_P = Infiltration Rate for Pervious areas = 0.30

* Refer to Orange County Hydrology Manual Section C.6.4 and D.5.

Intensity:

$I(t) = a(t^b)$
- a = 5.702
- t = 1440 minutes (24 hours)
- b = -0.574

$I(t = 1440) = 5.702(1440^{-0.574}) = \mathbf{0.0877}$

Depth:

$D(t) = a(t^b)$
- a = 0.095
- t = 1,440 minutes (24 hours)
- b = 0.426

$D(t = 1440) = 0.095(1{,}440^{0.426}) = \mathbf{2.104\ in}$

Existing Conditions
Total Area = 3.72 ac (161,949 sf)

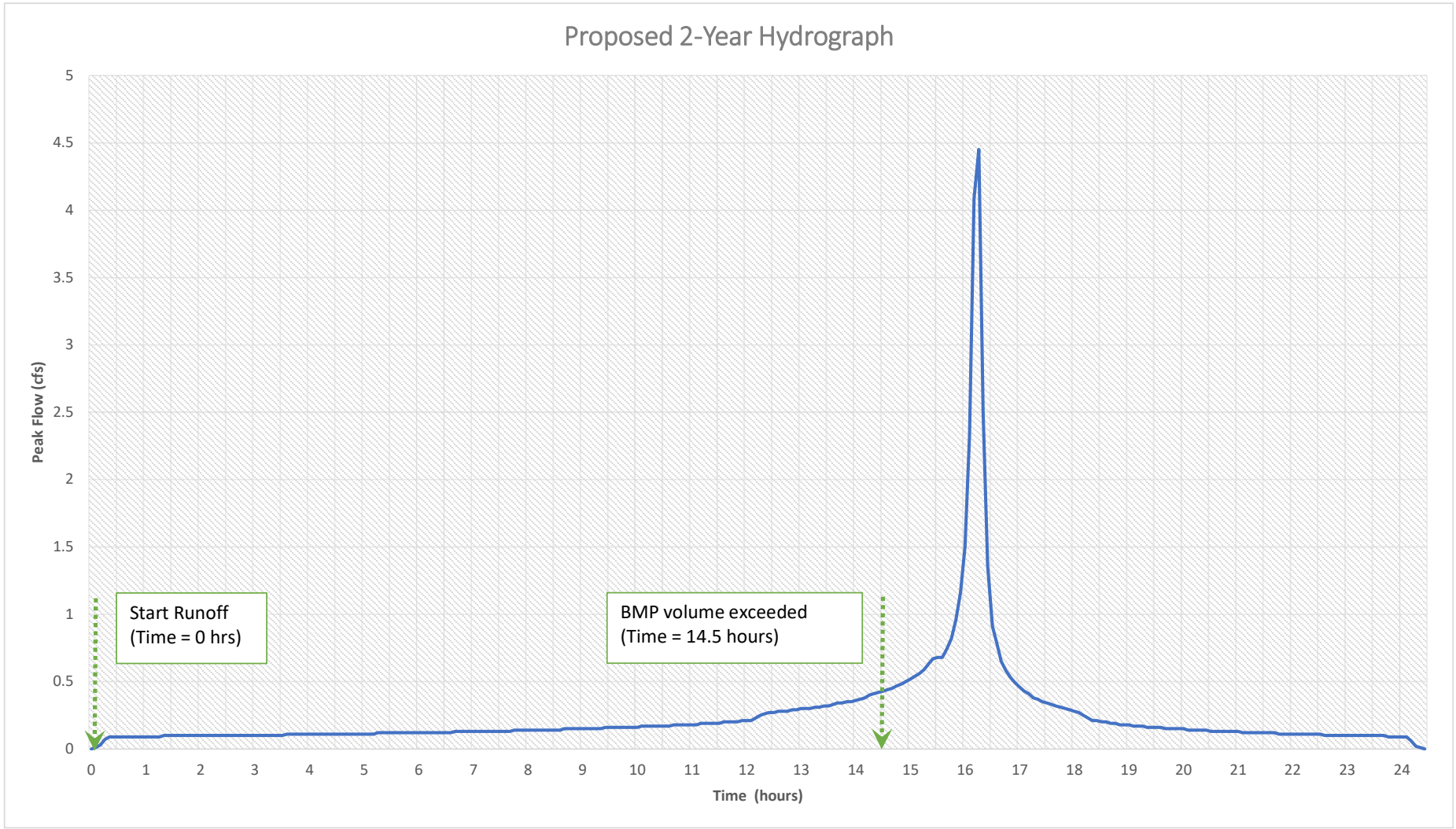
a_i = 0.90
C = 0.90(0.90) = 0.81

V2-YEAR-PRE = 0.81(2.104 in)(161,949 sf)(1 ft/12 in) = **23,000 cf**

Proposed Conditions
Total Area = 3.68 ac (160,130 sf)

a_i = 0.87
C = 0.90(0.87) = 0.78

V2-YEAR-POST = 0.78(2.104 in)(160,130 sf)(1 ft/12 in) = **21,899 cf**


Proposed 2-Year Hydrograph
Peak Flow (cfs)
Time (hours)
Start Runoff
(Time = 0 hrs)
BMP volume exceeded
(Time = 14.5 hours)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
           (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2014 Advanced Engineering Software (aes)
             Ver. 21.0  Release Date: 06/01/2014  License ID 1580

                          Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* 2020 E. FIRST STREET                                                 *
* VTTM 19937, SANTA ANA                                                *
* EXISTING Q2                                                          *
 ************************************************************************

  FILE NAME: GR01X2.DAT
  TIME/DATE OF STUDY: 11:34 06/27/2024
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *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 0.0313 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      1.00 TO NODE      1.10 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   883.00
  ELEVATION DATA: UPSTREAM(FEET) =    138.30  DOWNSTREAM(FEET) =    131.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.961
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.372
  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        3.72      0.30     0.100    36   11.96
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      4.49
  TOTAL AREA(ACRES) =      3.72   PEAK FLOW RATE(CFS) =      4.49

****************************************************************************
  FLOW PROCESS FROM NODE      1.10 TO NODE      1.10 IS CODE =  16
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
  USER-SPECIFIED CONSTANT SOURCE FLOW =     3.26(CFS)
  USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =     1.20(ACRES)
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =     3.26  AREA(AC.) =     1.20
  * SUMMED DATA: FLOW(CFS) =     7.75    TOTAL AREA(ACRES) =     4.92

****************************************************************************
  FLOW PROCESS FROM NODE      1.10 TO NODE      1.10 IS CODE =  16
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
  USER-SPECIFIED CONSTANT SOURCE FLOW =    20.59(CFS)
  USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =     6.78(ACRES)
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =    23.85  AREA(AC.) =     7.98
  * SUMMED DATA: FLOW(CFS) =    28.34    TOTAL AREA(ACRES) =    11.70

****************************************************************************
  FLOW PROCESS FROM NODE      1.10 TO NODE      1.10 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   528.00
  ELEVATION DATA: UPSTREAM(FEET) =    134.50  DOWNSTREAM(FEET) =    131.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.225
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.242
  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.)
  SCHOOL                     B        5.04      0.30     0.600    36   14.23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      4.82
  TOTAL AREA(ACRES) =      5.04   PEAK FLOW RATE(CFS) =      4.82

********************************************************************************
  FLOW PROCESS FROM NODE      2.10 TO NODE      1.10 IS CODE =  11
--------------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
================================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.82   14.23    1.242  0.30( 0.18) 0.60       5.0       2.00
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      1.10 =     528.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER  SOURCE
NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE      FLOW
   1        4.49   11.96    1.372  0.30( 0.03) 0.10       3.7       1.00    23.9

  * SOURCE FLOW DATA: FLOW(CFS) =    23.85     AREA(ACRES) =     7.98
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.10 =     883.00 FEET.

  ** PEAK FLOW RATE TABLE **
STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER  SOURCE
NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE      FLOW
   1        9.04   11.96    1.372  0.30( 0.11) 0.37       8.0       1.00    23.9
   2        8.88   14.23    1.242  0.30( 0.12) 0.39       8.8       2.00     0.0
    TOTAL AREA(ACRES) =         8.8

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        9.04  Tc(MIN.) =   11.961
  EFFECTIVE AREA(ACRES) =      7.96  AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.39
  TOTAL AREA(ACRES) =        8.8
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =      23.85  AREA(AC.) =        8.0
  * SUMMED DATA: FLOW(CFS) =      32.89    TOTAL AREA(ACRES) =       16.7
```

```
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.10 =     883.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.8  TC(MIN.) =     11.96
  EFFECTIVE AREA(ACRES) =      7.96  AREA-AVERAGED Fm(INCH/HR)=  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.366
  PEAK FLOW RATE(CFS)   =       9.04
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =      23.85  AREA(AC.) =        8.0
  * SUMMED DATA: FLOW(CFS) =      32.89    TOTAL AREA(ACRES) =       16.7

  ** PEAK FLOW RATE TABLE **
STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER  SOURCE
NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE      FLOW
   1        9.04   11.96    1.372  0.30( 0.11) 0.37       8.0       1.00    23.9
   2        8.88   14.23    1.242  0.30( 0.12) 0.39       8.8       2.00     0.0
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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        (c) Copyright 1983-2014 Advanced Engineering Software (aes)
            Ver. 21.0  Release Date: 06/01/2014  License ID 1580

                          Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* 2020 E. FIRST STREET                                                 *
* VTTM 19337, SANTA ANA                                                *
* PROPOSED Q2                                                          *
 **********************************************************************

  FILE NAME: GR01P2.DAT
  TIME/DATE OF STUDY: 11:44 06/27/2024
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *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      1.00 TO NODE      1.10 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   204.00
  ELEVATION DATA: UPSTREAM(FEET) =    137.10  DOWNSTREAM(FEET) =    134.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.557
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.937
  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.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.67      0.30     0.200    36    6.56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.13
  TOTAL AREA(ACRES) =      0.67   PEAK FLOW RATE(CFS) =      1.13

****************************************************************************
  FLOW PROCESS FROM NODE      1.10 TO NODE      1.20 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  134.60  DOWNSTREAM ELEVATION(FEET) =  132.70
  STREET LENGTH(FEET) =   277.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 24.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  19.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.12
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.33
    HALFSTREET FLOOD WIDTH(FEET) =   10.07
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.87
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.61
  STREET FLOW TRAVEL TIME(MIN.) =   2.47   Tc(MIN.) =    9.02
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.613
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        1.41      0.30     0.200    36
```

```
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.41      SUBAREA RUNOFF(CFS) =    1.97
  EFFECTIVE AREA(ACRES) =      2.08    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.1        PEAK FLOW RATE(CFS) =       2.91

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.56
  FLOW VELOCITY(FEET/SEC.) =  2.00   DEPTH*VELOCITY(FT*FT/SEC.) =   0.71
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.20 =     481.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.20 TO NODE      1.30 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  132.70  DOWNSTREAM ELEVATION(FEET) =  130.70
  STREET LENGTH(FEET) =   291.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 24.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  19.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.91
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.39
    HALFSTREET FLOOD WIDTH(FEET) =   12.97
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.17
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.84
  STREET FLOW TRAVEL TIME(MIN.) =   2.24   Tc(MIN.) =   11.26
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.421
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        1.63      0.30     0.200    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.63      SUBAREA RUNOFF(CFS) =    2.00
  EFFECTIVE AREA(ACRES) =      3.71    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        3.7        PEAK FLOW RATE(CFS) =       4.54

  END OF SUBAREA STREET FLOW HYDRAULICS:
```

```
  DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.85
  FLOW VELOCITY(FEET/SEC.) =  2.23   DEPTH*VELOCITY(FT*FT/SEC.) =   0.90
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.30 =     772.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.30 TO NODE      1.30 IS CODE =  16
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
  USER-SPECIFIED CONSTANT SOURCE FLOW =     3.26(CFS)
  USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =     1.20(ACRES)
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =     3.26  AREA(AC.) =     1.20
  * SUMMED DATA: FLOW(CFS) =     7.80    TOTAL AREA(ACRES) =     4.91

****************************************************************************
  FLOW PROCESS FROM NODE      1.30 TO NODE      1.30 IS CODE =  16
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED CONSTANT SOURCE FLOW AT NODE<<<<<
============================================================================
  USER-SPECIFIED CONSTANT SOURCE FLOW =    20.59(CFS)
  USER-SPECIFIED AREA ASSOCIATED TO SOURCE FLOW =     6.78(ACRES)
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =    23.85  AREA(AC.) =     7.98
  * SUMMED DATA: FLOW(CFS) =    28.39    TOTAL AREA(ACRES) =    11.69

****************************************************************************
  FLOW PROCESS FROM NODE      1.30 TO NODE      1.30 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.10 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   528.00
  ELEVATION DATA: UPSTREAM(FEET) =    134.50  DOWNSTREAM(FEET) =    131.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.225
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.242
  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.)
  SCHOOL                     B        5.04      0.30     0.600    36   14.23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
  SUBAREA RUNOFF(CFS) =      4.82
  TOTAL AREA(ACRES) =      5.04   PEAK FLOW RATE(CFS) =      4.82
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      2.10 TO NODE      1.30 IS CODE =  56
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    131.50  DOWNSTREAM(FEET) =    130.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   206.00   CHANNEL SLOPE =  0.0058
  GIVEN CHANNEL BASE(FEET) =    2.00   CHANNEL FREEBOARD(FEET) =  0.0
  "Z" FACTOR =   2.000   MANNING'S FACTOR = 0.015
  *ESTIMATED CHANNEL HEIGHT(FEET) =   0.46
  CHANNEL FLOW THRU SUBAREA(CFS) =       4.82
  FLOW VELOCITY(FEET/SEC.) =   3.58   FLOW DEPTH(FEET) =   0.46
  TRAVEL TIME(MIN.) =   0.96   Tc(MIN.) =   15.18
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      1.30 =     734.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.30 TO NODE      1.30 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.82   15.18    1.197  0.30( 0.18) 0.60       5.0       2.00
  LONGEST FLOWPATH FROM NODE      2.00 TO NODE      1.30 =     734.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER  SOURCE
NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE      FLOW
   1        4.54   11.26    1.421  0.30( 0.06) 0.20       3.7       1.00    23.9

  * SOURCE FLOW DATA: FLOW(CFS) =    23.85     AREA(ACRES) =     7.98
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.30 =     772.00 FEET.

  ** PEAK FLOW RATE TABLE **
STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER  SOURCE
NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE      FLOW
   1        8.90   11.26    1.421  0.30( 0.12) 0.40       7.4       1.00    23.9
   2        8.61   15.18    1.197  0.30( 0.13) 0.43       8.8       2.00     0.0
    TOTAL AREA(ACRES) =         8.8

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        8.90  Tc(MIN.) =   11.259
  EFFECTIVE AREA(ACRES) =      7.45  AREA-AVERAGED Fm(INCH/HR) =  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.43
  TOTAL AREA(ACRES) =        8.8
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =      23.85  AREA(AC.) =        8.0
```

```
  * SUMMED DATA: FLOW(CFS) =      32.75    TOTAL AREA(ACRES) =       16.7
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      1.30 =     772.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.8  TC(MIN.) =     11.26
  EFFECTIVE AREA(ACRES) =      7.45  AREA-AVERAGED Fm(INCH/HR)=  0.12
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.401
  PEAK FLOW RATE(CFS)   =       8.90
  * CUMULATIVE SOURCE FLOW DATA: FLOW(CFS) =      23.85  AREA(AC.) =        8.0
  * SUMMED DATA: FLOW(CFS) =      32.75    TOTAL AREA(ACRES) =       16.7

  ** PEAK FLOW RATE TABLE **
STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER  SOURCE
NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE      FLOW
   1        8.90   11.26    1.421  0.30( 0.12) 0.40       7.4       1.00    23.9
   2        8.61   15.18    1.197  0.30( 0.13) 0.43       8.8       2.00     0.0
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

ATTACHMENT E

Soils and Infiltration Report

SA GEOTECHNICAL
OPTIMIZED SOIL ENGINEERING

February 23, 2024

Project No. 23050-01

To: Meritage Homes
5 Peters Canyon Road, Suite 310
Irvine, California 90026

Attention: Ms. Louisa Feletto

Subject: Geotechnical Due Diligence Study and Preliminary Geotechnical Recommendations, Proposed 86-Unit Residential Development, 2020 East First Street, Santa Ana, California

At your request, SA Geotechnical, Inc. (SA GEO) has conducted a geotechnical due diligence study for the proposed residential development at 2020 East First Street in the City of Santa Ana, California (Figure 1). The purpose of this study was to evaluate the geotechnical site conditions in light of the proposed grading and improvements in order to provide a geotechnical summary and preliminary geotechnical recommendations for project design, grading, and construction. Our evaluation included review of collected geologic and geotechnical engineering reports and maps pertinent to the subject site; city archive search; review of site-specific geotechnical reports provided by you; site reconnaissance; and preparation of this report.

The subject site is currently developed with a multi-story office building, adjacent at-grade asphalt paved parking lot and associated drive aisles, and hardscape/landscape improvements, all of which will be demolished as part of the proposed project. Based on our review, the primary geotechnical constraints include the presence of weathered/unsuitable near-surface alluvial soils, potentially wet and soft/compressible alluvium near surface, and seismic shaking during a strong seismic event. The subsurface soils at the site generally consist of interlayered silty sand, sandy/clayey silt, and sandy/silty clay (Salem, 2023; GeoTek, 2021). Onsite soils are anticipated to have a "Low" to "Medium" expansion potential at the completion of grading. Percolation testing performed during the prior studies indicates that stormwater infiltration is generally not feasible at shallow depth (5 to 10 feet) but is feasible at depth (48 to 50 feet deep).

This report presents our findings, conclusions, and preliminary design recommendations for the subject proposed residential development. Based on our review, the proposed grading and development is considered geotechnically feasible provided the recommendations in this report are implemented during design, grading, and construction. Additional subsurface exploration and laboratory testing may be necessary during the design phase of the project for determination/confirmation of the percolation rates, depending on the location and depth of the proposed system(s).

References pertinent to the site are included in Appendix A. Boring and laboratory test data from the prior site-specific geotechnical studies are included in Appendix B and C, respectively. Seismic design parameters are presented in Appendix D. Percolation test data collected during the prior studies are presented in Appendix E. General earthwork and grading specifications are presented in Appendix F.

If you have any questions regarding this report, please contact our office. We appreciate the opportunity to provide our services.

Respectfully submitted,

SA GEOTECHNICAL, INC.

Anthony Zepeda, CEG 2681
Project Geologist

Reza Saberi, GE 3071
Principal Engineer

Peter Anderson, CEG 2596
Principal Engineering Geologist

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EXECUTIVE SUMMARY

The subject site is underlain by native alluvium generally composed of interlayered silty/clayey sand, sandy silt, and sandy/silty clay. Groundwater was not encountered during the prior subsurface explorations to a maximum depth of 51.5 feet (Salem, 2023; GeoTek, 2021). Historic high groundwater is mapped as greater than 40 feet bgs (CDMG, 1998). Existing groundwater data available through the GeoTracker database indicates depth to groundwater is generally greater than 60 feet bgs in the vicinity of the site.

The primary geotechnical constraints at the site include the following:

- The presence of weathered/unsuitable alluvium which will need to be removed and replaced as compacted fill;
- Potentially wet and soft/compressible alluvium near surface; and
- Potential for strong seismic shaking during an earthquake event.

Remedial grading at the site should consist of the removal and recompaction of weathered/disturbed alluvium (and undocumented artificial fill, if any) in order to provide competent subgrade and bearing conditions. In general, remedial removals are anticipated to extend 5 feet below existing grades within the proposed building pads. Removals within the proposed streets may be limited to removal and re-compaction of the upper 2 to 3 feet, below existing grades, upon review and approval by the geotechnical consultant. Deeper removals may be required locally, where existing trees, utility lines, and structures/foundations are to be abandoned and removed or where deeper undocumented fill (if any) is encountered. The recommended remedial removals will help reduce the potential for future settlement at the site.

As discussed above and per our review of the prior data, near-surface soils may pump or be unable to support the weight of heavy equipment. Special handling (e.g., top-loading with excavator) may be required to complete remedial grading. The removal bottoms and/or trench excavations for utility lines may be wet/saturated, soft, and require stabilization of the bottom. Removal bottoms may require stabilization to support heavy compaction equipment and can be stabilized with a layer of geotextile material (Mirafi HP270 or equivalent) placed at the bottom of the excavation, with 6 to 12 inches of ¾-inch or 1-inch gravel (or crushed aggregate base) over the geotextile. Alternatively, removal bottoms may be stabilized with one foot of cement-treated soil with a minimum of 6 percent cement.

Considering the onsite soils may be wet/saturated, achieving adequate compaction at acceptable moisture contents during fill placement and in a short period of time may be difficult. Therefore, cement treating of the onsite soils should be considered. Cement treatment, if necessary, should consist of mixing the onsite soils with 6 percent cement. Other measures such as mixing, drying, etc. may also be used; however, these measures are typically time-consuming and logistically difficult to perform.

Septic tanks, cesspools, and/or wells may be encountered at the site during grading. If encountered, they should be removed in accordance with Orange County Health Care Agency requirements and the project environmental engineer's recommendations.

Considering the relatively minor grading anticipated to achieve design grades, the laboratory test data, and our analysis, building foundations and slabs should be designed to tolerate a total settlement (combined static and seismic) of 1.5 inches and a differential settlement of ¾-inch over a span of 40 feet. Onsite soils are anticipated to have "Low" to "Medium" expansion potential at the completion of grading.

Based on our findings, we conclude that the proposed residential development is feasible from a geotechnical viewpoint, provided it is designed and constructed in accordance with the recommendations presented in this report and any future design report(s). The site is not considered suitable for infiltration of stormwater at shallow depth (uppermost 10 feet); however, is suitable at depths between 48 and 50 feet below existing grades. Additional subsurface exploration and laboratory testing may be necessary during the design phase of the project in order to determine/confirm percolation rates, depending on the location and depth of the proposed system(s).

1.0 INTRODUCTION

1.1 Introduction and Scope of Services

At your request, SA Geotechnical, Inc. (SA GEO) has conducted a geotechnical due diligence study for the proposed residential development located at 2020 East First Street in the City of Santa Ana, California (Figure 1). The purpose of our review was to assess the onsite geologic and geotechnical conditions and provide preliminary recommendations for design, grading, and construction of the proposed improvements. We have reviewed the Conceptual Site Plan, dated April 20, 2023, which shows the generalized site layout; however, contains no existing or proposed grades. We have utilized a Google Earth satellite image as the base for our Geotechnical Map (Plate 1).

Our scope of services for this due diligence study included the following tasks:

- Review of available geologic and geotechnical maps, reports, and data for the subject site and surrounding area, including the site-specific studies performed by others. A list of references is included in Appendix A.
- Review of boring logs, laboratory test data, and percolation test data by others. The data is included in Appendices B, C, and E respectively.
- Historic aerial photograph review, dating back to 1946.
- Preliminary evaluation of faulting, seismicity, and seismic and static settlement in accordance with the 2022 California Building Code (CBC).
- Preparation of this report including our findings, conclusions, preliminary recommendations, and accompanying illustrations.

SA GEO's expertise and scope of services do not include assessment of potential subsurface environmental contaminants or environmental health hazards.

1.2 Site Condition and History

The subject site is located at 2020 East First Street, Santa Ana, California (see Figure 1). The approximately 3.7-acre rectangular-shaped site is bound by East First Street to the north, an apartment community to the east, a private school to the south, and Golden Circle Drive and a school athletic field to the west. The site is currently developed with an approximately five-story office building, at-grade asphalt paved parking lot and drive aisles, and landscaping/hardscaping throughout the property. We performed a site reconnaissance on February 15, 2024, to review the existing site conditions. The existing building appears vacant/abandoned with the first-floor doors and windows boarded with plywood.

We also performed an archive search and reviewed the architectural and structural plans for the existing building that were available at the City on February 23, 2024. The plan reviewed is titled "2020 East First Street, A Development of McMahon/Oliphant Properties, Santa Ana, California", dated August 15,1984 and prepared by The McMahon Partnership Architecture and Planning. The structural sheets were prepared by SKT Structural Engineering. Per our review of the foundation plan, the existing structure is supported on pad footings and grade beams. The footings vary in

dimension and include square pad footings (4 feet by 4 feet up to 18 feet by 18 feet) and rectangular pad footings (up to 14 feet by 24 feet) with footing depths ranging from 1.25 feet to 3 feet. The existing slab on grade thickness is 4 inches reinforced with welded-wire mesh, underlain by 2 inches of sand over visqueen vapor barrier.

Based on our review of available historic aerial photographs dating back to 1946, the earliest land use at the subject site and surrounding areas was for agricultural purposes (orchards). Development of the site and surrounding area occurred by 1966 and appears to have been for commercial/industrial use. At that time, the site was developed with two buildings and a large at-grade asphalt parking lot. The site remained unchanged until approximately 1985, when the original structures were demolished and the current multi-story office building was constructed. No significant changes were observed at the subject site since that time.

1.3 Proposed Grading and Improvements

Prior to any site development or grading, the existing structures, pavements, utilities, and hardscape will be demolished. Considering the site is relatively flat, we anticipate design grading to consist of cuts and fills on the order of 1 to 3 feet to reach pad grades and provide for proper site drainage.

Based on our review of the Conceptual Site Plan, the development is proposed to include construction of 12 multifamily residential buildings (3-story) and three multifamily live-work buildings (4-story) with a total of 86 units. The project also includes a public front plaza, interior streets, community courtyards and paseos, and utility improvements to support the development. We anticipate the proposed multifamily units will consist of wood-framed construction.

1.4 Prior Geotechnical Studies

In 2023, a geotechnical study was performed onsite by Salem Engineering Group, Inc. (2023). We were provided and have reviewed the "Geotechnical Engineering Investigation, Proposed Industrial Storage Facility, 2020 E. 1st Street, Santa Ana, California". The subsurface investigation included nine hollow-stem auger borings (B-1 through B-7, P-1, and P-2) to depths ranging from 5 to 51.5 feet bgs. Percolation testing was performed in two borings (P-1 and P-2) at depths of 5 and 9.75 feet bgs. Laboratory testing was conducted on bulk and in-situ samples collected during drilling.

A prior geotechnical study was also performed onsite by GeoTek, Inc (2021). We have reviewed the "Geotechnical and Infiltration Evaluation, Proposed Multi-Family Residential Development, APN 402-191-03, 2020 East 1st Street, Santa Ana, Orange County, California". The investigation included nine hollow-stem auger borings (B-1 through B-5 and I-1 through I-4) to depths ranging from 21.5 to 51.5 feet bgs. Percolation testing was performed in four of the borings, I-1 through I-4, at depths of 48 to 50 feet bgs. Laboratory testing was conducted on bulk and in-situ samples collected during drilling.

The approximate boring locations associated with the prior studies are provided on the Geotechnical Map (Plate 1). Boring logs and laboratory test data are provided in Appendix B and C, respectively.

2.0 GEOTECHNICAL FINDINGS

2.1 Geologic Setting and Geotechnical Conditions

The subject site is located in the western portion of the Tustin Plain, within the Peninsular Ranges geomorphic province of Southern California. The site is mapped by the U.S. Geological Survey (USGS, 2006) as underlain by extensive Quaternary-age alluvial fan deposits. The alluvium encountered during the prior subsurface exploration (Salem, 2023; GeoTek, 2021) generally consisted of brown, reddish brown, dark brown, and gray silty/clayey sand, sandy silt, and sandy/silty clay.

Based on our review of the prior geotechnical exploration and laboratory testing (Appendix C), the site geotechnical conditions are generally as follows:

Soil Moisture Content and Dry Density: Native alluvial soils had in-situ moisture contents and dry densities ranging from 1.4 to 26.4 percent and 86.1 to 120.3 pounds per cubic foot (pcf), respectively. Blow counts in the alluvial materials generally ranged from 3 to 42 blows per foot. Alluvial soils were generally found to be damp to wet and soft to very stiff/loose to medium dense.

Soil Properties: Grain-size distribution tests were performed on nine in-situ samples collected from depths of 2, 5, 10, 25, 35, 40, and 50 feet. The samples were classified in accordance with the Unified Soil Classification System (USCS) as silty sand (SM), sandy silt (ML), sandy clay (CL), and sandy gravel with silt (GW-GM) with fines contents (passing No. 200 sieve) of 21 to 44, 62 to 77, 53 to 69, and 8 (GW-GM) percent, respectively.

Grain-size distribution tests were also conducted on four bulk samples collected from the uppermost 5 feet and from depths of 25, 40 and 45 feet. The near-surface sample was classified in accordance with the USCS as clayey sand (SC), while the other tested samples were classified as silty sand (SM), clay (CL), and silty sand (SM) with fines contents of 48, 32, 76 and 13 percent, respectively.

Soil plasticity testing was performed on two in-situ samples collected at depths of 15 and 30 feet bgs and one bulk sample collected from the uppermost 5 feet. The bulk sample was also classified as CL with Plasticity Index of 63 and Liquid Limit of 89 percent. However, the results do not appear to be representative of the overall near-surface soil conditions at the site. The in-situ samples were classified as CL with Plasticity Indices of 14 and 16 and Liquid Limit of 30 percent.

Maximum dry density testing of two near surface samples (collected from the uppermost 5 feet) indicates that the near surface clayey and silty sands have maximum dry densities of 119.5 and 126.0 pcf with optimum moisture contents of 13.0 and 10.5 percent, respectively.

Shear Strength: Two undisturbed direct shear tests were performed on in-situ samples collected from depths of 2 and 5 feet bgs. The direct shear test results indicate the samples had peak internal friction angles of 29.7 to 32.2 degrees, with cohesions of 296 and 260 pounds per square foot (psf), respectively.

One remolded direct shear test was performed on a bulk sample collected from the uppermost 5 feet. The remolded direct shear test results indicate that the sample had an internal friction angle of 23 degrees, with cohesion of 344 psf, respectively.

Collapse/Hydroconsolidation: Tests were performed on five samples collected at depths between 2 to 6 feet. The samples generally had minor collapse (less than 1 percent) upon the addition of water at a load of 1.6 to 2 tsf.

Expansion Potential: Expansion index testing was performed on two samples collected from the uppermost 5 feet. The results indicate "Very Low" to "Low" expansion potential (EI = 10 and 48).

Chemical Properties: Chemical testing was performed on two bulk samples collected from the uppermost 5 feet. Testing included electrical resistivity, pH, chloride content, and soluble sulfate. The electrical resistivity test results (1,273 ohm-cm) indicate that the onsite soils are corrosive to ferrous metals. Soil pH value was 8.2. Chloride content was 17.6 and 29 ppm with soluble sulfate contents of 0.03 and 0.06 percent. Soluble sulfate contents indicate the soils are classified as "S0" per Table 19.3.1.1 of ACI-318-14.

2.2 Groundwater

Groundwater was not encountered during the prior explorations to a maximum depth of 51.5 feet bgs. Historic high groundwater mapping indicates high groundwater is greater than 40 feet bgs (CDMG, 1998). Groundwater well data available on the State of California Water Resources Control Board database ("GeoTracker") shows depth to groundwater in the vicinity is greater than 60 feet bgs. Groundwater is anticipated to fluctuate both seasonally and annually.

2.3 Regional Faulting and Seismicity

Regional Faults: The site is not located within a fault-rupture hazard zone as defined by the Alquist-Priolo Special Studies Zones Act (CGS, 2018). Also, based on mapping by the State (Jennings and Bryant, 2010), there are no active faults mapped at the site.

Seismicity: Properties in southern California are subject to seismic hazards of varying degrees depending upon the proximity, degree of activity, and capability of nearby faults. These hazards can be primary (i.e., directly related to the energy release of an earthquake) or secondary (i.e., related to the effect of earthquake energy on the physical world). Since there are no active faults at the site, the potential for primary ground rupture is considered very low. The primary seismic hazard for this site is ground shaking during a future earthquake.

Using the USGS deaggregation computer program (USGS, 2024) and the site coordinates of 33.74480 north latitude and –117.83772 west longitude, the closest major active faults include the San Joaquin Hills Fault and Peralta Hills Fault. The maximum moment magnitude for the controlling fault is 7.2 Mw, which would be generated from the San Joaquin Hills Fault; however, numerous other regionally active faults could also produce ground shaking at the site during an earthquake.

The site is not located within a mapped potential liquefaction hazard zone, as defined by the State's Seismic Hazard Mapping (CDMG, 2001). Other secondary seismic hazards, such as tsunami and

seiche are considered nil due to site elevation and distance from the ocean or other confined body of water (CGS, 2021).

2.4 Settlement and Foundation Considerations

In general, the anticipated settlements depend upon the building loads, type of foundations, and the geotechnical properties of the supporting subgrade soils. We have reviewed the consolidation test data included in the prior geotechnical reports by others (Salem, 2023; GeoTek, 2021). Considering the subsurface soil conditions and laboratory test data, and relatively lightly loaded residential structures, we estimate total settlement (combined static and seismic) to be on the order of 1.5 inches and differential settlement to be on the order of ¾-inch over a 40-foot span. This assumes remedial grading measures recommended in Section 3.2 of this report are implemented.

The total and differential seismic settlement is anticipated to be less than ½-inch and ¼-inch over a span of 40 feet respectively.

2.5 Shrinkage and Bulking

The shrinkage and bulking (reduction or increase in volume of excavated materials on recompaction as fill) varies by soil type and location. The volume changes depend primarily on in-situ density and the maximum dry density of the soil type. We anticipate that the near surface (uppermost 5 feet) alluvial materials will have shrinkage of 0 to 5 percent. An average value of 3 percent may be assumed for soil in the upper 5 feet. Ground subsidence at the site is estimated to be on the order of 0.1 foot. These values exclude losses due to removal of vegetation and debris and are dependent on the accuracy of the site topographic survey and type of equipment and compaction method used by the contractor.

2.6 Percolation Testing

Percolation testing at the site was performed as part of the prior studies (Salem, 2023; GeoTek, 2021). Testing was reportedly performed in general accordance with the County of Orange WQMP Technical Guidance Document.

We have reviewed the field data collected during testing in order to perform our own calculations for tests I-1 through I-4 (Geotek, 2021), which are presented in Appendix E. The County of Orange TGD does not include calculation adjustments to account for the presence of the annular backfill material (3/4-inch gravel) used to construct the test wells. In our experience, this generally results in overestimation of infiltration rates. We have used a correction factor to account for the volume loss due to the annular material, based on the porosity of the annular backfill material, the pipe diameter used, and the boring diameter. The correction factor is noted on the percolation test data sheets (Appendix E).

The test well construction for locations P-1 and P-2 was not discussed in the associated report (Salem 2023) and is unknown; thus, we did not recalculate the data for those locations.

The calculated infiltration rates are provided below, which include the correction factor discussed above (I-1 through I-4); however, the rates below do not include a factor of safety reduction. A discussion of the design infiltration rates, including factor of safety, is provided in Section 3.14.

The infiltration test results are representative of the locations and depths the tests were performed. Due to the potential for variation in the subsurface conditions, infiltration rates could vary across the site and with depth.

Boring No.	*Tested Depth (ft. bgs)*	*Calculated Infiltration Rate (in./hr.)*
P-1	3 to 5	0.24
P-2	8.0 to 9.75	0.61
I-1	48.25 to 50	3.0
I-2	48.25 to 50	2.9
I-3	48.25 to 50	2.9
I-4	48.25 to 50	3.0

2.7 Existing Pavement Section and Utilities

The existing pavement sections as measured during the prior explorations are shown on the boring logs (Appendix B). The existing asphalt concrete thicknesses varied at each boring location, ranging from 2.5 to 5.75 inches. Aggregate base was not encountered at some locations and in others approximately 3.5 to 11 inches of aggregate base was encountered below the asphalt concrete pavement.

Existing utilities consisting of storm drain, area drain, electric, gas, water and sewer lines should be anticipated at the site. At the time of our visit, we observed several sewer line manholes, electrical vaults, irrigation lines and fire water hydrants at the site. We also observed distressed pavement conditions at various locations but noticeably within a trench backfill area which settlement was apparent.

3.0 CONCLUSION AND PRELIMINARY RECOMMENDATIONS

3.1 General Conclusion and Recommendation

Based on our review, construction of the proposed residential development, as described herein, is considered geotechnically feasible provided the preliminary recommendations in this report are implemented during design, grading, and construction. The geotechnical consultant should review the WQMP once available. Additional geotechnical exploration and/or percolation testing may need to be performed during the design phase to determine/confirm infiltration rates at the location and depth of the infiltration device(s). Also, grading, foundation, utility, structural and wall plans for the project should be reviewed by the geotechnical consultant during the design phase. Updated recommendations should be provided once the project plans are finalized and reviewed by SA GEO and as needed.

The recommendations in this report should be considered minimum and may be superseded by more restrictive requirements of others. In addition to the following recommendations, General Earthwork and Grading Specifications are provided in Appendix F.

3.2 Site Preparation and Earthwork

Site preparation and grading should be performed in accordance with the recommendations herein and the requirements of the City of Santa Ana.

3.2.1 Site Demolition and Clearing

Prior to remedial grading, any existing structures, foundations, hardscape/landscape, and utilities to be abandoned should be demolished. Deleterious materials and debris should be cleared and disposed of offsite. Excavations for the removal of existing foundations, utilities and vegetation, including onsite trees, should be observed by the geotechnical consultant. Large roots, highly organic soils, and existing utilities should be removed and should not be incorporated into new fills.

Soil that is disturbed as part of excavations or removal of trees or underground utilities should be evaluated by the geotechnical consultant. Excavations that require backfill should be properly documented and compacted under the observation and testing of the geotechnical consultant.

Cesspools, septic tanks and/or wells may be encountered at the site. If encountered, they should be removed in accordance with Orange County Health Care Agency requirements and the project environmental engineer's recommendations. Any voids should be backfilled with suitable onsite or import materials and compacted in accordance with the recommendations provided in Section 3.2.4.

As discussed previously and per our review of the foundation plan, the existing structure is supported on pad footings and grade beams. The footings vary in dimension and include square pad footings (4 feet by 4 feet up to 18 feet by 18 feet) and rectangular pad footings (up to 14 feet by 24 feet) with footing depths ranging from 1.25 feet to 3 feet. The existing slab on grade thickness is 4 inches reinforced with welded-wire mesh, underlain by 2 inches

of sand over visqueen vapor barrier. All improvements associated with the existing building should be removed in their entirety prior to grading of the site.

3.2.2 Protection of Existing Improvements and Utilities

Existing buildings, improvements and utilities that are to be protected in place should be located and visually marked prior to grading operations. Excavations adjacent to improvements to be protected in-place or any utility easement should be performed with care, so as not to undermine existing foundations or destabilize the adjacent ground.

Stockpiling of soils more than 5 feet in height at or near existing structures and over utility lines should not be allowed. If deeper removals are required, shoring or other special measures (i.e., setback or laybacks) to provide safety and mitigate the potential for lateral/vertical movements may be required.

3.2.3 Remedial Grading Measures

Remedial grading at the site should consist of removal of undocumented fill (if any) and weathered/unsuitable alluvium in their entirety. In general, we recommend that remedial removals within the proposed building pads consist of removal and recompaction of soils in the upper 5 feet, below existing grades. Removals within the proposed streets may be limited to removal and re-compaction of the upper 2 to 3 feet, below existing grades, provided the removal bottom exposes competent native alluvium. Where deeper unsuitable material or undocumented fill is encountered, the removals should be extended to the bottom of unsuitable materials and/or undocumented fill to competent native soils. Where not limited by adjacent properties, the removals should extend a minimum of 5 feet laterally beyond the building footprints.

Based on our review of prior onsite data, saturated and soft soils may be encountered at depths between 2.5 and 5 feet bgs. The near-surface soils may pump and/or lose bearing under the weight of heavy equipment. Special handling (e.g., top-loading with excavator) may be required to complete the remedial grading. If removal bottoms expose wet/saturated soft materials, stabilization of the removal bottom will be required. Removal bottoms may be stabilized with a layer of geotextile material (Mirafi HP270 or equivalent) placed at the bottom of the excavation, with 6 to 12 inches of ¾-inch or 1-inch gravel (or crushed aggregate base) over the geotextile. Alternatively, bottoms may be stabilized with one foot of cement-treated soil with a minimum of 6 percent cement. In addition, we anticipate that achieving adequate compaction at acceptable moisture contents may be difficult considering the presence of wet/saturated soils at the site (see Section 3.2.4).

The geotechnical consultant should review and approve removal bottoms prior to fill placement and should provide specific recommendations based on actual conditions, if necessary.

Excavations deeper than 4 feet will need to be laid back at a minimum inclination of 1H:1V (horizontal to vertical) or provided with shoring. Shallow, unconfined excavations (4 feet or less) may consist of near-vertical excavation, locally, and upon review by the geotechnical consultant. Trench excavations are anticipated to expose Type "B" soils and should be performed in accordance with Cal/OSHA requirements. The contractor's qualified person

should review field conditions and verify compliance with Cal/OSHA requirements. Excavations near existing structures (within a 1:1 projection) should be provided with shoring that is designed to support the surcharge load of the existing structure. Otherwise, excavations may need to be performed in sections (A/B/C slot cuts). The conditions should be reviewed in the field by the project geotechnical consultant. Additional recommendations should be provided based on the actual conditions encountered during excavation and grading, as needed.

3.2.4 Fill Placement

Upon the completion of remedial grading measures, the approved removal bottoms should be scarified a minimum of 6 inches. Onsite soils may be used as fill material, provided that adequate compaction at acceptable moisture contents is achievable. In general, we anticipate that achieving adequate compaction at acceptable moisture contents may be difficult considering the presence of wet/saturated soils at the site. Therefore, cement treatment of the soils may be necessary and should be anticipated during grading and fill placement. If needed, we recommend that the onsite soils be mixed with 6 percent cement. Other measures such as mixing, drying, etc. may also be used; however, these measures are typically time-consuming and logistically difficult to perform. The removal bottoms and fill materials should be compacted to at least 90 percent of maximum dry density, as determined by ASTM Test Method D1557. The moisture content of the fill materials should be 2 to 3 percent above the optimum moisture content but within the compactable levels. Fill materials should be placed in loose lifts no thicker than 8 inches.

Fill materials should be relatively free of deleterious material. The existing native alluvial soils are considered suitable for re-use as compacted fill provided any deleterious material is removed. The compacted fill soils should be moisture conditioned to 2 to 3 percentage points above optimum moisture content but within the compactable moisture range.

3.2.5 Import

The geotechnical consultant should evaluate and accept any import soils prior to transportation to the subject site. We recommend that import soils have similar engineering properties as onsite soils. At minimum, the import materials should have Expansion Index of less than 90, Plasticity Index of less than 15, fines content (passing Sieve 200) of less than 50 percent, and negligible soluble sulfate content.

3.3 Settlement Potential

The amount of settlement will depend upon the type of foundation(s) selected and future loading by additional fill and structures. Based on our analysis and considering the remedial grading recommendations provided in this report are implemented during grading, and the anticipated structural loads typically associated with the proposed structures, we estimate that total and differential post-construction settlement (combined static and seismic) will be on the order of 1.5 inches and ¾-inch over a span of 40 feet, respectively.

SA GEO should be provided with the foundation plans and structural loads, once available, in order to further evaluate the potential for post-construction settlement of the proposed building

and associated improvements. The parameters provided herein will then be confirmed/updated based on the planned foundations and loads and additional testing and analysis.

3.4 Foundation Design

The slab and foundations should be designed by the project structural engineer based on the proposed structure type and the anticipated loading conditions. The foundation soils have expansive soil conditions (Expansion Index of greater than 20) and will be subject to climatic and landscape moisture fluctuations. The following foundation recommendations are provided with the assumption that the recommendations included in Section 3.2 of this report are implemented during grading of the site.

The recommended net allowable bearing capacity for continuous and isolated footings may be calculated based on the following equation:

$q_{all} = 700\ D + 200\ B + 900$ (but not to exceed 3,000 psf)

where:
D = embedment depth of footing, in feet
B = width of footing, in feet

Also, the following parameters may be used for design of foundation and slabs:

- Soil unit weight = 120 pcf
- Soil internal friction angle = 28 degrees
- Coefficient of Friction = 0.35
- Subgrade modulus (k) of 75 pci (corrected for large slabs)
- Soil elastic modulus (Es) of 1,500 psi

The dead load of concrete below adjacent grades (buried concrete foundations) may be neglected. The allowable bearing pressure and friction coefficient may be increased by one-third for wind and seismic loading.

We recommend that strip and isolated footings for the buildings have a minimum embedment depth of 12 inches below the lowest adjacent grade. Continuous footings should be at least 12 inches wide and isolated column footings should be at least 24 inches wide. The footings of freestanding and isolated structures, such as walls and pilasters, should have a minimum embedment depth of 18 inches into approved soils.

The following table provides our general guidelines and preliminary recommendations for design of post-tensioned foundations and slabs in accordance with the 2022 California Building Code (CBC) and Post-Tension Institute (PTI) DC 10.5 Edition provisions.

GEOTECHNICAL GUIDELINES FOR DESIGN OF POST-TENSIONED SLABS

Parameter	Recommendation
Center Lift	
Edge Moisture Variation Distance, e_m	9.00 feet
Center Lift, y_m	0.55 inches
Edge Lift	
Edge Moisture Variation Distance, e_m	4.60 feet
Edge Lift, y_m	0.75 inch
Presaturation, as needed, to obtain the minimum moisture down to the minimum depth	1.2 x optimum down to 12 inches

We recommend that post-tensioned slabs have a thickened edge such that the slab is embedded a minimum of 12 inches below the lowest adjacent grade.

In addition, as indicated in the DC 10.5 Edition of PTI, shape factor calculations should be performed by the project structural engineer in order to determine if strengthening/modification of foundations are necessary. Per PTI guidelines, modifications to the foundations design should be considered if the shape factor (ratio of square of foundation perimeter over foundation area) exceeds 24.

If non-post-tensioned slabs-on-grade and foundations are considered at the site, an effective Plasticity Index of 30 is considered appropriate for the upper 15 feet of soil materials, in accordance with Wire Reinforcement Institute (WRI) method (per the 2022 CBC). For non-post-tensioned slabs, we recommend a minimum embedment of 12 inches below the lowest adjacent grade for the perimeter footings. Also, the upper 12 inches of subgrade soil should be pre-saturated to 120 percent of optimum moisture content prior to placement of moisture barrier and concrete.

The foundations and slabs should also be designed to tolerate the total and differential settlements discussed in Section 3.3 of this report.

For the design of pole-type foundations (i.e., light poles, shade structures, etc.), an allowable soil-bearing pressure (s_1) of 340 psf/ft may be used for Equation 18-1 (the "pole" equation) of the 2022 CBC Section 1807.3.2.1 to determine the depth of embedment for the footings, considering level ground conditions. The equation is applicable for designed embedment depths of less than 12 feet for the purpose of computing lateral pressure. Also, for vertical loads on pole-type foundations, an allowable skin friction of 250 pounds per square foot may be used. For cast-in-place pole-type foundations, the vertical end bearing pressure should be neglected. We recommend that pole-type foundations have a minimum embedment of 2.5 feet below lowest adjacent grades.

3.5 Interior Slab Moisture Mitigation

In addition to geotechnical and structural considerations, the project owner should also consider interior moisture mitigation when designing and constructing slabs-on-grade.

The intended use of the interior space, type of flooring, and the type of goods in contact with the floor may dictate the need for, and design of, measures to mitigate potential effects of moisture emission from and/or moisture vapor transmission through the slab. Typically, for human occupied structures, a vapor retarder or barrier is recommended under the slab to help mitigate moisture transmission through slabs. The most recent guidelines by the American Concrete Institute (ACI 302.1R-04) suggest that the vapor retarder be placed directly under the slab (no sand layer). However, the location of the vapor retarder may also be subject to the builder's past successful practice. Placement of 1 or 2 inches of sand over the moisture retardant has been common practice by builders in southern California. Specifying the strength of the retarder to resist puncture and its permeance rating is important. These qualities are not necessarily a function of the retarder thickness. A minimum of 10-mil is typical but some materials, such as 10-mil polyethylene ("Visqueen"), may not meet the desired standards for toughness and permeance.

Vapor retarders, when used, should be installed in accordance with standards such as ASTM E 1643 and/or those specified by the manufacturer.

Concrete mix design and curing are also significant factors in mitigating slab moisture problems. Concrete with lower water/cement ratios results in denser, less permeable slabs that also "dry" faster with regard to when flooring can be installed (reduced moisture emission quantities and rates). Rewetting of the slab following curing should be avoided since it can result in additional drying time required prior to flooring installation. Proper concrete slab testing prior to flooring installation is also important.

Concrete mix design, the type and location of the vapor retarder should be determined in coordination with all parties involved in the finished product, including the project owner, architect, structural engineer, geotechnical consultant, concrete subcontractors, and flooring subcontractors.

3.6 Retaining Walls Design and Lateral Earth Pressures

Recommendations for lateral earth pressures for permanent retaining walls and structures (if any) with approved onsite drained soils and above groundwater table are as follows:

Conditions	*Level (pcf)*	*2:1 Sloping*
Active	43	68
At-Rest	63	90
Passive	340	160 (sloping down)

These parameters are based on a soil internal friction angle of 28 degrees and soil unit weight of 120 pcf.

To design an unrestrained retaining wall, such as a cantilever wall, the active earth pressure may be used. For a restrained retaining wall, the at-rest pressure should be used. Passive pressure is used to compute lateral soils resistance developed against lateral structural movement. The passive pressures provided above may be increased by one-third for wind and seismic loads. The passive resistance is taken into account only if it is ensured that the soil against embedded structure will remain intact with time. Future landscaping/planting and improvements adjacent to the retaining walls should also be taken into account in the design of the retaining walls. Excessive soil disturbance, trenches (excavation and backfill), future landscaping adjacent to footings and over-saturation can adversely impact retaining structures and result in reduced lateral resistance.

For sliding resistance, the friction coefficient of 0.35 may be used at the concrete and soil interface. The coefficient of friction may be increased by one-third for wind and seismic loading. The retaining walls may also need to be designed for additional lateral loads if other structures or walls are planned within a 1H:1V projection.

The seismic lateral earth pressure for walls retaining more than 6 feet of soil and level backfill conditions may be estimated to be an additional 17 pcf for active and at-rest conditions. The earthquake soil pressure has a triangular distribution and is added to the static pressures. For the active and at-rest conditions, the additional earthquake loading is zero at the top and maximum at the base. The seismic lateral earth pressure does not apply to walls retaining less than, or equal to, 6 feet of soil (2022 CBC Section 1803.5.12).

Drainage behind walls retaining more than 2.5 feet of soil should also be provided in accordance with the attached Figure 4. Specific drainage connections, outlets and avoiding open joints should be considered during design.

3.7 Seismic Design Parameters

The following table summarizes the seismic design criteria for the subject site. The seismic design parameters are developed in accordance with ASCE 7-16 and 2022 CBC. Please note that, considering the proposed structures and anticipated structural periods, site-specific ground-motion hazard analysis was not performed for the site. Per Supplement 3 of ASCE 7-16, the value of S_{M1}, and therefore S_{D1}, have been increased by 50 percent. The seismic response coefficient, Cs, should be determined per the parameters provided below and using equation 12.8-2 of ASCE 7-16.

Selected Seismic Design Parameters from 2022 CBC/ASCE 7-16	*Seismic Design Values*	*Reference*
Latitude	33.74480 North	
Longitude	-117.83772 West	
Controlling Seismic Source	San Joaquin Hills	USGS, 2024
Site Class per Table 20.3-1 of ASCE 7-16	D	
Spectral Acceleration for Short Periods (Ss)	1.286 g	SEA/OSHPD, 2024
Spectral Accelerations for 1-Second Periods (S_1)	0.459 g	SEA/OSHPD, 2024
Site Coefficient F_a, Table 11.4-1 of ASCE 7-16	1.0	SEA/OSHPD, 2024
Site Coefficient F_v, Table 11.4-2 of ASCE 7-16	1.841	
Design Spectral Response Acceleration at Short Periods (S_{DS}) from Equation 11.4-4 of ASCE 7-16	0.857 g	SEA/OSHPD, 2024
Design Spectral Response Acceleration at 1-Second Period (S_{D1}) from Equation 11.4-4 of ASCE 7-16 (Includes 50% increase per Supplement 3)	0.845 g	
T_S, S_{D1} /S_{DS} 11.4.6 of ASCE 7-16	0.986 sec	
T_L, Long-Period Transition Period	8 sec	SEA/OSHPD, 2024
Peak Ground Acceleration Corrected for Site Class Effects (PGA_M) from Equation 11.8-1 of ASCE 7-16	0.593 g	SEA/OSHPD, 2024
Seismic Design Category, Section 11.6 of ASCE 7-16	D	

3.8 Corrosivity

Based on the laboratory testing performed during prior studies, soluble sulfates exposure in the onsite soils may be classified as "S0" per Table 19.3.1.1 of ACI-318-14. Structural concrete elements in contact with soil include footings and building slabs-on-grade. The flatwork and sidewalk concrete are typically not considered structural elements. Concrete mix for structural elements should be based on the "S0" soluble sulfate exposure class of Table 19.3.2.1 in ACI-318-14. Other ACI guidelines for structural concrete are recommended. Also, onsite soils are anticipated to be corrosive to metals.

3.9 Expansion Potential

At the completion of grading, we anticipate that onsite soils will have "Low" to "Medium" expansion potential. The geotechnical recommendations provided in this report including the design parameters for foundations, slab-on-grade and flatwork improvement should be implemented during design and construction. These parameters may be updated upon additional testing at the completion of grading.

Homeowners and their design/construction team should be familiar with the recommendations in this report as well as principles described in a useful reference published by the California Geotechnical Engineers Association (CalGeo), titled, "Coexisting with Expansive Soil: An Informational Guide for Homeowners." This free booklet can be downloaded at www.calgeo.org.

3.10 Exterior Concrete

The driveway, patio slabs and other flatwork elements should be at least 4 inches thick. Concrete should be reinforced with No. 3 bars placed at 24 inches on center both ways (or equivalent wire-mesh). We recommend that the concrete flatwork be placed over 2 to 4 inches of granular material placed over compacted subgrade soils. Concrete slabs should be provided with construction or weakened plane control joints at a maximum spacing of 8 feet. The control joints should have a thickness that is ¼ of the total concrete thickness. Upon the placement and compaction of subgrade soils (per Section 3.2 of these recommendations), the upper 12 inches of the subgrade soils should be pre-saturated to 120 percent of optimum moisture content prior to placement of concrete and reinforcement.

For exterior slabs, the use of a granular sublayer is primarily intended to facilitate presaturation and subsequent construction by providing a better working surface over the saturated soil. It also helps retain the added moisture in the native soil in the event that the slab is not placed immediately. Where these factors are not significant, the layer may be omitted.

Exterior concrete elements such as curb and gutter, driveways, sidewalks and patios are susceptible to lifting and cracking when constructed over expansive soils. With expansive soils, the impacts to flatwork/hardscape can be significant, generally requiring removal and replacement of the affected improvements. Please note that reducing concrete problems is often a function of proper slab design, concrete mix design, placement, and curing/finishing practices. Adherence to guidelines of the American Concrete Institute (ACI) is recommended. Also, the amount of post-construction watering, or lack thereof, can have a very significant impact on the adjacent concrete flatwork.

On projects with expansive soils, additional measures such as thickened concrete edges/footings, subdrains and/or moisture barriers should be considered where planters or natural areas with irrigation are located adjacent to the concrete improvements. Design and maintenance of proper surface drainage is also very important. If the concrete will be subject to heavy loading from cars/trucks or other heavy objects, at minimum, a 6-inch-thick pavement section should be used; however, the section should be designed by the geotechnical consultant using appropriate traffic indices for the intended use.

The above recommendations typically are not applied to curb and gutter.

3.11 Preliminary Asphalt Concrete Pavement Design

Final structural pavement sections should be based on R-value testing after the completion of grading and in accordance with City of Santa Ana requirements. Based on an assumed R-value of 10 and estimated traffic indices (TIs), we recommend the following preliminary pavement sections:

Street Location	***Estimated TIs***	***Pavement Section***
General Drives	TI – 5.5	0.35' AC / 0.75' AB
Parking Stalls	TI – 4.0	0.25' AC / 0.50' AB

AC = Asphalt Concrete, AB = Aggregate Base

Please note that for two-stage paving operations, we recommend that the final AC cap be a minimum of 0.10 foot thick and the base AC course have a minimum thickness of 0.25 foot.

Asphalt concrete pavement should be placed in accordance with the requirements of Sections 301 and 302 of the Standard Specifications of Public Works Construction (the Greenbook). Prior to construction of pavement sections, the subgrade soils should be scarified to a minimum depth of 6 inches, moisture-conditioned as needed, and recompacted in-place to a minimum of 90 percent relative compaction (per ASTM D1557). Subgrade should be firm prior to aggregate base placement.

Aggregate base materials may consist of crushed aggregate base or crushed miscellaneous base, in accordance with the Greenbook (Section 200-2). The materials should be free of any deleterious materials. Aggregate base materials should be placed in 6- to 8-inch-thick loose lifts, moisture-conditioned as necessary, and compacted to a minimum of 95 percent relative compaction (per ASTM D1557). Asphalt concrete should also be compacted to a minimum relative compaction of 95 percent.

Unpaved median and parkway areas should also be provided with vertical moisture barriers.

3.12 Trench Excavation and Backfill

Excavations should be performed in accordance with the requirements set forth by Cal/OSHA Excavation Safety Regulations (Construction Safety Orders, Section 1504, 1539 through 1547, Title 8, California Code of Regulations). In general, onsite soils may be classified as Type "B". Cal/OSHA regulations indicate that, for workmen in confined conditions, the steepest allowable slopes in Type "B" soils are 1H:1V (horizontal to vertical), for excavations less than 20 feet deep. Where there is no room for these layback slopes, we anticipate that shoring will be necessary. The soils within the adjacent streets are anticipated to be similar to onsite soils. Adequate shoring (i.e., shields) should be provided, as deemed necessary. Excavations should be reviewed by the contractor's qualified person to confirm compliance with Cal/OSHA requirements.

As discussed previously, wet, soft/compressible soils that may require stabilization measures prior to placement of the utility lines should be anticipated. Excavation bottoms may be stabilized with a layer of geotextile material (Mirafi HP270 or equivalent) placed at the bottom of the excavation, with 4 to 12 inches of ¾-inch or 1-inch gravel (or crushed aggregate base) over the geotextile. Alternatively, bottoms may be stabilized with one 12 to 18 inches of ¾-inch or 1-inch gravel (or crushed aggregate base).

Utility trench backfill should be in accordance with City of Santa Ana and/or the governing jurisdiction's specifications. In general, native soils are anticipated to be suitable for use as trench backfill from a geotechnical viewpoint with the exception of wet/saturated materials; however, the City or governing agency may require select material, sand-slurry, or other measures. Native soils used as backfill materials should be compacted to a minimum of 90 percent relative compaction (per ASTM D1557). Rocks/oversize material greater than 3 inches in largest diameter should generally not be used as trench backfill unless approved by the agency and geotechnical consultant of record. Excavation and backfilling of HDPE pipes should be in accordance with the manufacturer’s requirement and the Greenbook. Select granular backfill (i.e., clean sand with SE

30 or better) may be used in lieu of native soils but should also be compacted or densified with water jetting and flooding.

Trenches excavated next to structures and foundations should also be properly backfilled and compacted to provide full lateral support and reduce settlement potential.

3.13 Groundwater

Based on the prior subsurface exploration and our review of published groundwater data in the vicinity, groundwater is anticipated to remain greater than 50 feet below proposed finish grades. Groundwater is not expected to be encountered during rough grading; however, the presence of locally saturated soils and/or perched water cannot be ruled out, especially during rainy seasons.

3.14 Stormwater Infiltration

Based on the prior onsite percolation testing, stormwater infiltration is not considered feasible in the uppermost 10 feet (below the required minimum infiltration rate); however, it is feasible at depths tested between 48 and 50 feet bgs. Additional infiltration testing may need to be conducted onsite once a water quality management plan has been prepared in order to evaluate the infiltration rates at the actual location and depth of the proposed device(s). Based on our review of the boring logs, the subsurface alluvium is very interlayered (sands/silts/clays) and is anticipated to have widely varying infiltration rates. Infiltration systems such as drywells may be well-suited for the subject site as they intersect soil stratigraphic layers and can utilize the sandy soils at depth. For preliminary design purposes, a design infiltration rate of 1.5 inch per hour may be used for devices that extend to depths of 48 to 50 feet. This rate includes a factor-of-safety of 2.

Also, based on our review of the groundwater data in the vicinity of the site, groundwater has been documented 60+ feet bgs over a reporting period of several years (2001 through 2010). Infiltration systems should maintain a minimum 10-foot vertical separation from high groundwater; thus, infiltration systems should not extend deeper than 50 feet bgs.

Infiltration systems should be designed and constructed in accordance with County of Orange and City of Santa Ana guidelines. Infiltration systems should have a minimum setback of 10 feet from proposed residential structures. The soil utilized as the infiltration surface should be reviewed and approved by the geotechnical consultant prior to installation of any infiltration devices. Special care should be taken to limit disturbance to native soils used as the infiltration surface. Proper maintenance will also be required to extend the operational life and reduce siltation or reduction in infiltration performance. All infiltration devices should be provided with an overflow system.

3.15 Surface Drainage and Irrigation

Maintaining adequate surface drainage, proper disposal of run-off water, and control of irrigation will help reduce the potential for future moisture-related problems and differential movements from soil heave/settlement.

Surface drainage should be carefully taken into consideration during design, grading, landscaping, and building construction. Positive surface drainage should be provided to direct surface water away from structures and slopes and toward the street or suitable drainage devices. Ponding of

water adjacent to the structures should not be allowed. Buildings should have roof gutter systems and the run-off should be directed to parking lot/street gutters by area drainpipes or by sheet flow over paved areas. Paved areas should be provided with adequate drainage devices, gradients, and curbing to prevent run-off flowing from paved areas onto adjacent unpaved areas.

Considering the climatic conditions in southern California and the recommended mitigation measures for expansive soils included in this report, a two-percent slope away from structures should be provided and is in substantial compliance with the 2022 CBC. Also, swales with one-percent slopes are acceptable from our geotechnical standpoint and are common practice in this locale.

Construction of planter areas immediately adjacent to structures should be avoided if possible. If planter boxes are constructed adjacent to or near buildings, the planters should be provided with controls to prevent excessive penetration of the irrigation water into the foundation and flatwork subgrades. Provisions should be made to drain excess irrigation water from the planters without saturating the subgrade below or adjacent to the planters. Raised planter boxes may be drained with weepholes. Deep planters (such as palm tree planters) should be drained with below-ground, water-tight drainage lines connected to a suitable outlet. Moisture barriers should also be considered.

It is also important to maintain a consistent level of soil moisture, not allowing the subgrade soils to become overly dry or overly wet. Properly designed landscaping and irrigation systems can help in that regard.

3.16 Additional Subsurface Exploration and Laboratory Testing

Additional subsurface exploration and laboratory testing may be necessary during the design phase of the project for determination/confirmation of the percolation rates, depending on the location and depth of the proposed system(s). Also, additional laboratory testing should be performed during and upon the completion of grading to confirm/update the design parameters herein.

3.17 Review of Future Plans

The project grading, foundation, wall, water quality management, and landscape plans should be reviewed and accepted by the geotechnical consultant prior to grading and construction.

3.18 Observation and Testing during Grading and Construction

Geotechnical observation and testing should be performed by SA GEO during the following phases of grading and construction:

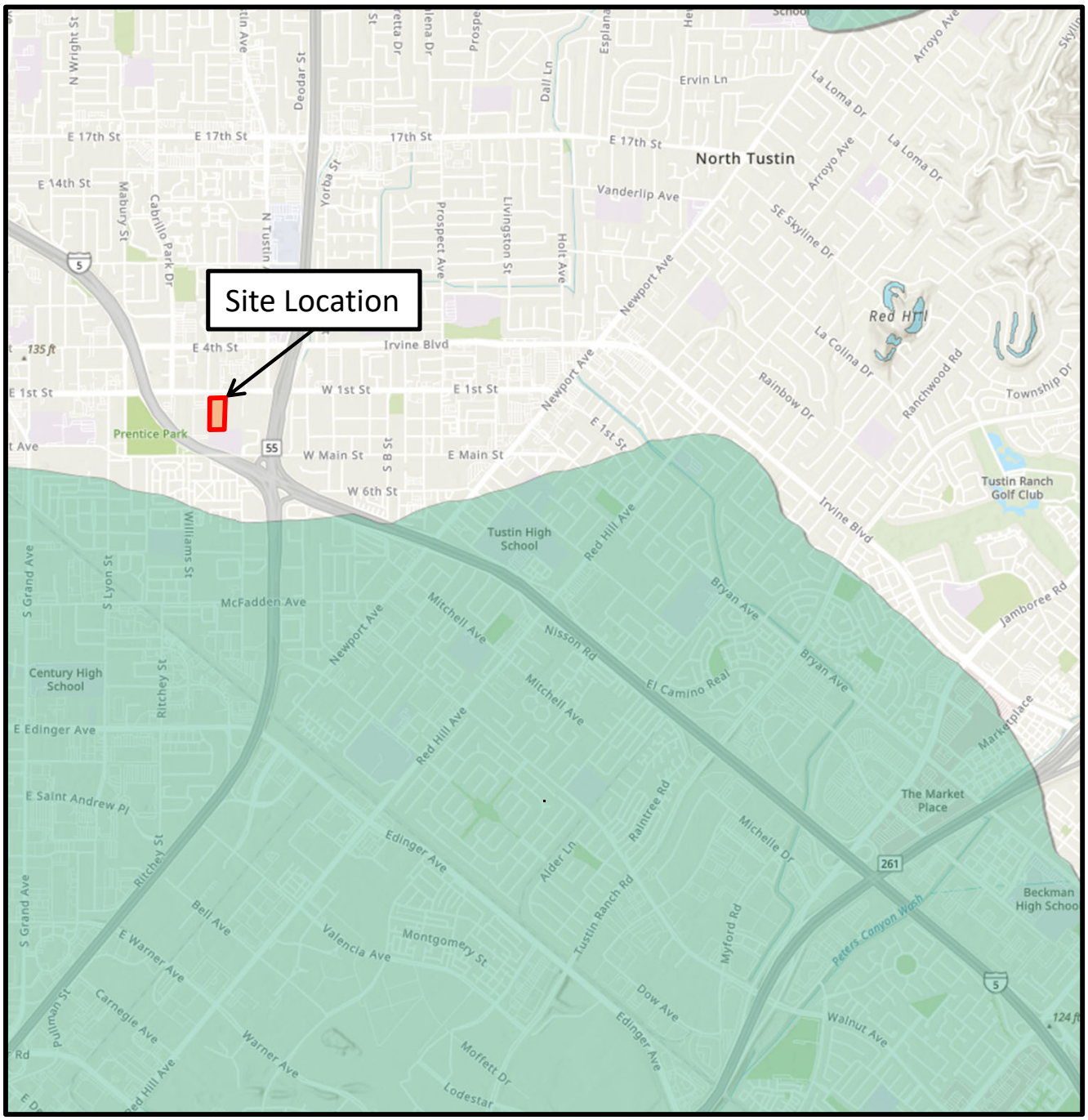
- During site demolition, preparation and clearing;
- During excavations performed for remedial grading and to relocate or remove existing underground improvements;
- During earthwork, including observation and acceptance of remedial removal bottoms and fill placement, including import material (if any);

- During removal bottom/subgrade stabilization and soil-cement mixing operation (if needed);
- Following the completion of grading, in order to verify soil properties for foundations, slab-on-grade and pavements;
- Upon completion of any foundation or structural excavation, prior to pouring concrete;
- During slab and flatwork subgrade preparation prior to pouring concrete;
- During placement of backfill for utility trenches, and stormwater infiltration devices;
- During placement of backfill for retaining structures (if any);
- During installation and backfill of subdrainage systems (if any); and
- When any unusual soil conditions are encountered.

4.0 LIMITATIONS

This report has been prepared for the exclusive use of our client, Meritage Homes, within the scope of services requested for the subject property described herein. This report or its contents should not be used or relied upon for other projects or purposes, or by other parties without the acknowledgement of SA GEO and the consultation of a geotechnical professional. The means and methods used by SA GEO for this study are based on local geotechnical standards of practice, care, and requirements of governing agencies. No warranty or guarantee, expressed or implied, is given.

Our findings, conclusions, and recommendations are professional opinions based on interpretations and inferences made from geologic and engineering data from specific locations and depths, observed or collected at a given time. By nature, geologic conditions can vary from point to point, can be very different in-between exploration points, and can also change over time. Our conclusions and recommendations are, by nature, preliminary and subject to verification and/or modification during grading and construction when more subsurface data is exposed.



Source: Seismic Hazard Zones Map, Tustin Quadrangle (CDMG, 2001)

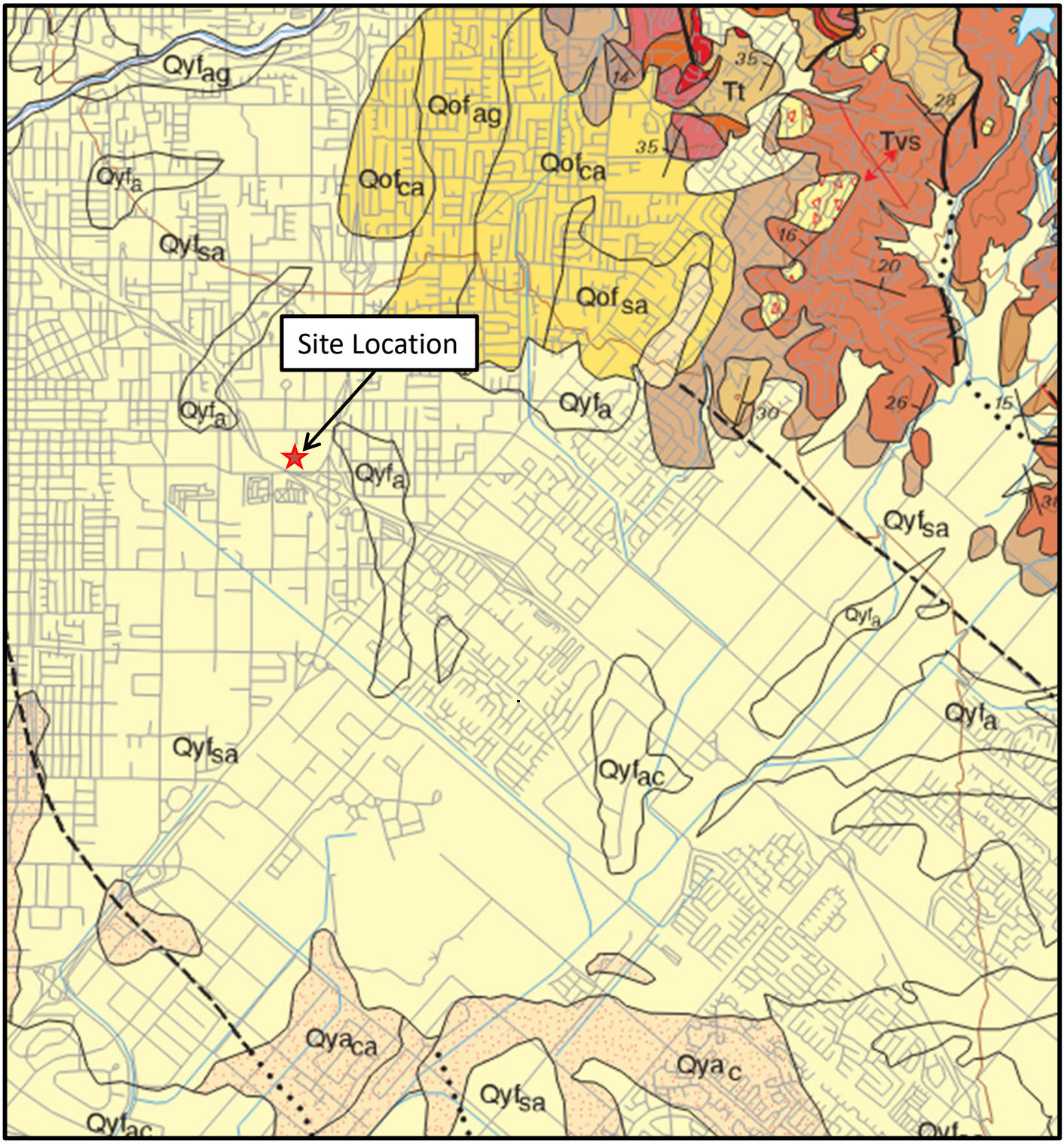
Liquefaction
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resource Code Section 2693(c) would be required.

Earthquake-Induced Landslides
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resource Code Section 2693(c) would be required.

Site Location and Seismic Hazard Zones Map

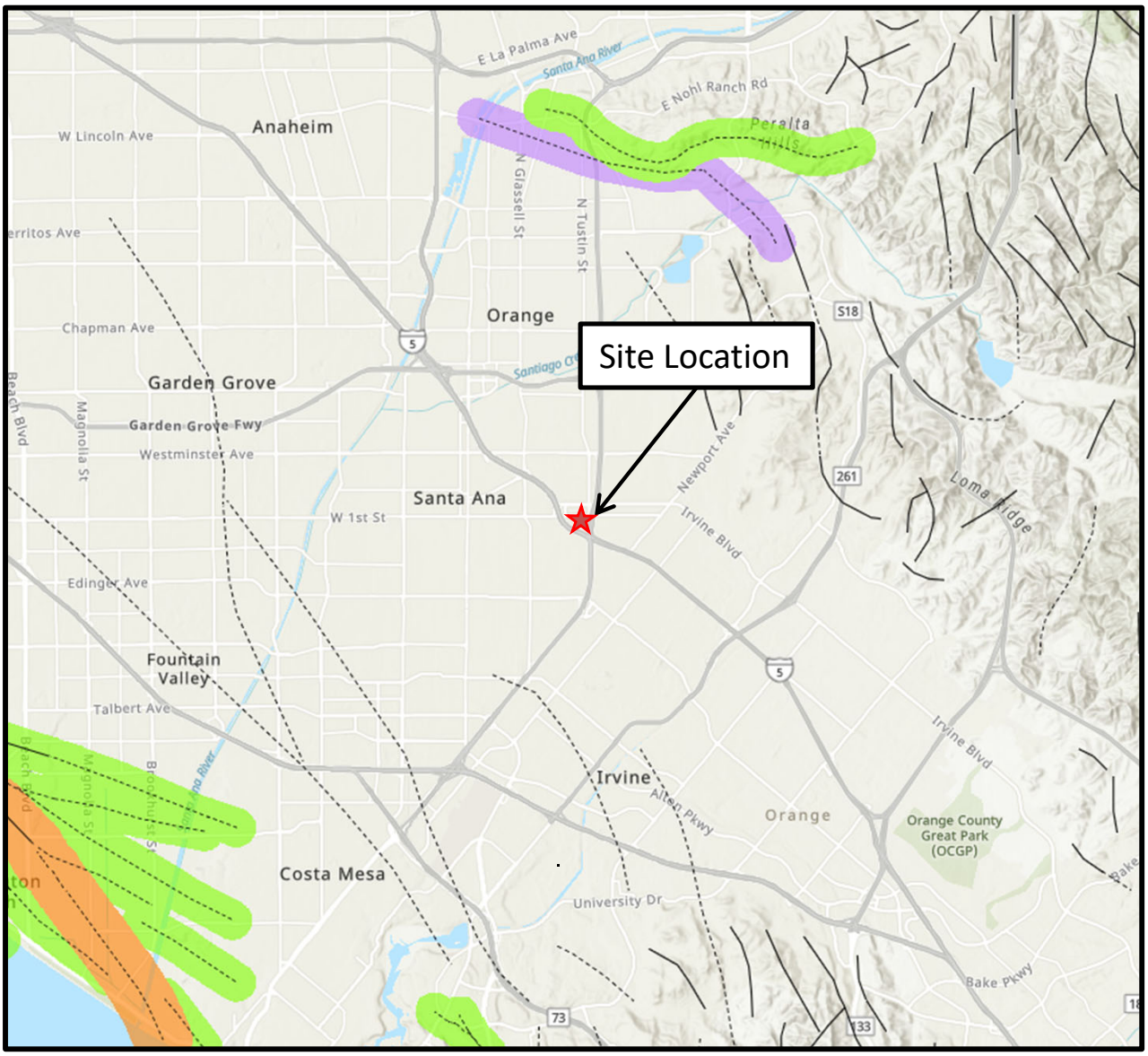
Meritage Homes
Proposed Residential Development
2020 East First Street
Santa Ana, California

Project Number: 23050-01
Date: February 23, 2024
Figure 1



Source: Geologic Map of the San Bernardino and Santa Ana 30'x60' Quadrangles (USGS, 2006)

Regional Geologic Map		
Meritage Homes Proposed Residential Development 2020 East First Street Santa Ana, California	Project Number: 23050-01 Date: February 23, 2024 Figure 2	S/A



Source: Fault Activity Map of California (Jennings and Bryant, 2010)

Holocene fault displacement (during past 11,700 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting.

Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.

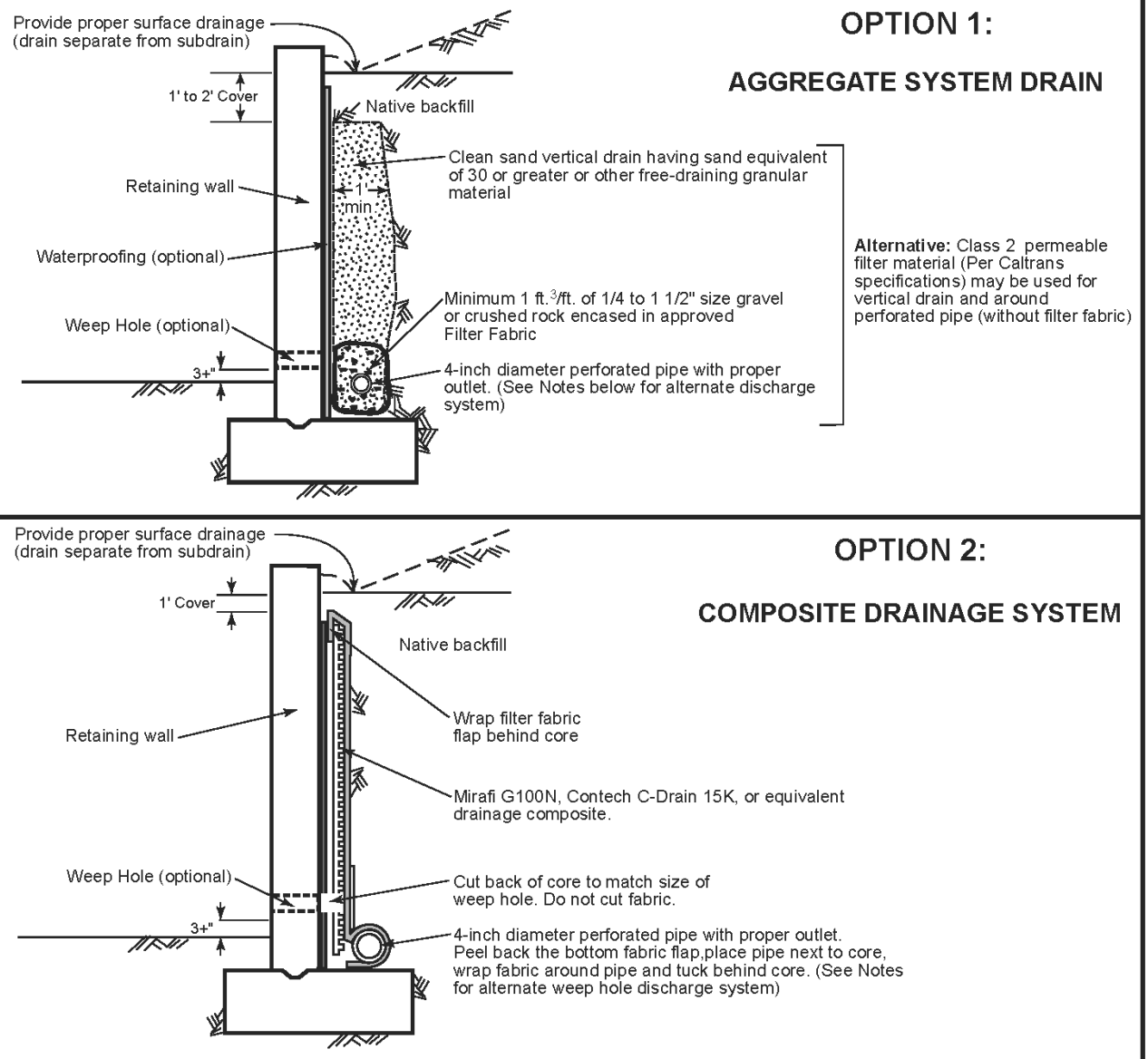
Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.

Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissnce nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

Regional Fault Map

Meritage Homes
Proposed Residential Development
2020 East First Street
Santa Ana, California

Project Number: 23050-01
Date: February 23, 2024
Figure 3



NOTES:

1. PIPE TYPE SHOULD BE PVC OR ABS, SCHEDULE 40 OR SDR35 SATISFYING THE REQUIREMENTS OF ASTM TEST STANDARD D1527, D1785, D2751 , OR D3034.
2. FILTER FABRIC SHALL BE APPROVED PERMEABLE NON-WOVEN POLYESTER, NYLON, OR POLYPROPYLENE MATERIAL.
3. DRAIN PIPE SHOULD HAVE A GRADIENT OF 1 PERCENT MINIMUM.
4. WATERPROOFING MEMBRANE MAY BE REQUIRED FOR A SPECIFIC RETAINING WALL (SUCH AS A STUCCO OR BASEMENT WALL).
5. WEEP HOLES MAY BE PROVIDED FOR LOW RETAINING WALLS (LESS THAN 3 FEET IN HEIGHT) IN LIEU OF A VERTICAL DRAIN AND PIPE AND WHERE POTENTIAL WATER FROM BEHIND THE RETAINING WALL WILL NOT CREATE A NUISANCE WATER CONDITION. IF EXPOSURE IS NOT PERMITTED, A PROPER SUBDRAIN OUTLET SYSTEM SHOULD BE PROVIDED.
6. IF EXPOSURE IS PERMITTED, WEEP HOLES SHOULD BE 2-INCH MINIMUM DIAMETER AND PROVIDED AT 25-FOOT MAXIMUM SPACING ALONG WALL. WEEP HOLES SHOULD BE LOCATED 3+ INCHES ABOVE FINISHED GRADE.
7. SCREENING SUCH AS WITH A FILTER FABRIC SHOULD BE PROVIDED FOR WEEP HOLES/OPEN JOINTS TO PREVENT EARTH MATERIALS FROM ENTERING THE HOLES/JOINTS.
8. OPEN VERTICAL MASONRY JOINTS (I.E., OMIT MORTAR FROM JOINTS OF FIRST COURSE ABOVE FINISHED GRADE) AT 32-INCH MAXIMUM INTERVALS MAY BE SUBSTITUTED FOR WEEP HOLES.
9. THE GEOTECHNICAL CONSULTANT MAY PROVIDE ADDITIONAL RECOMMENDATIONS FOR RETAINING WALLS DESIGNED FOR SELECT SAND BACKFILL.

Retaining Wall Drainage Detail

Figure 4

Appendix A

APPENDIX A

REFERENCES

California Division of Mines and Geology (CDMG), 1998, Seismic Hazard Zone Report for the Tustin 7.5-Minute Quadrangle, Orange County, California, Seismic Hazard Zone Report 012.

California Division of Mines and Geology (CDMG), 2001, Seismic Hazard Zones Map, Tustin Quadrangle, Official Map dated January 17, 2001.

California Geological Survey (CGS), 2018, Earthquake Fault Zones, A Guide for Government Agencies, Property Owners / Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California, Special Publication 42, Revised 2018.

California Geological Survey (CGS), 2021, Tsunami Hazard Area Map, County of Orange, California, Official Map dated July 8, 2021.

GeoTek, Inc., 2021, Geotechnical and Infiltration Evaluation, Proposed Multi-Family Residential Development, APN 402-191-03, 2020 East 1st Street, Santa Ana, Orange County, California, Dated September 30, 2021, Project No. 2881-CR.

Jennings, Charles W. and Bryant W.A., 2010, Fault Activity Map of California, Department of Conservation, California Geological Survey, Geologic Data Map No. 6.

Nationwide Environmental Title Research, LLC (NETR), 2024, Historic Aerials by NETR Online, Date Accessed: February 8, 2024; website address: http://historicaerials.com

Orange County Public Works (OCPW), 2013, Orange County Watersheds Water Quality Management Plan (WQMP) Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans, Exhibit 7.III, Dated December 20, 2013.

Salem Engineering Group, Inc., 2023, Geotechnical Engineering Investigation, Proposed Industrial Storage Facility, 2020 E. 1st Street, Santa Ana, California, Dated April 17, 2023, Project No. 3-223-0252.

State of California Water Resources Control Board, 2024, GeoTracker Website, http://geotracker.waterboards.ca.gov/

Structural Engineers Association/Office of Statewide Health Planning and Development (SEA/OSHPD), 2024, U.S. Seismic Design Maps, web site address: https://seismicmaps.org/; Date Accessed: February 6, 2024.

U.S. Geological Survey, 2006, Geologic Map of the San Bernardino and Santa Ana 30' X 60' Quadrangles, California, dated 2006, Open File Report 2006-1217.

APPENDIX A (Cont'd)

REFERENCES

U.S. Geological Survey, 2024, Unified Hazard Tool, NSHM 2014 Dynamic Deaggregation Program; web site address: https://earthquake.usgs.gov/hazards/interactive/; Date Accessed: February 6, 2024.

Appendix B

Boring Logs by Salem Engineering Group (2023)

KEY TO SYMBOLS

Symbol Description

Strata symbols

Asphaltic Concrete

Silty sand

Silt

Lean Clay

Well graded gravel with silt

Misc. Symbols

Boring continues

Soil Samplers

California sampler

Standard penetration test

Notes:

Granular Soils
Blows Per Foot (Uncorrected)

	MCS	SPT
Very loose	<5	<4
Loose	5-15	4-10
Medium dense	16-40	11-30
Dense	41-65	31-50
Very dense	>65	>50

Cohesive Soils
Blows Per Foot (Uncorrected)

	MCS	SPT
Very soft	<3	<2
Soft	3-5	2-4
Firm	6-10	5-8
Stiff	11-20	9-15
Very Stiff	21-40	16-30
Hard	>40	>30

MCS = Modified California Sampler
SPT = Standard Penetration Test Sampler

SALEM
engineering group, inc.

Test Boring: B-1 **Page** 1 **Of:** 2

Project Number: 3-223-0252

Date: 03/29/2023

Client: Harbor Associates

Project: Proposed Industrial Storage Facility

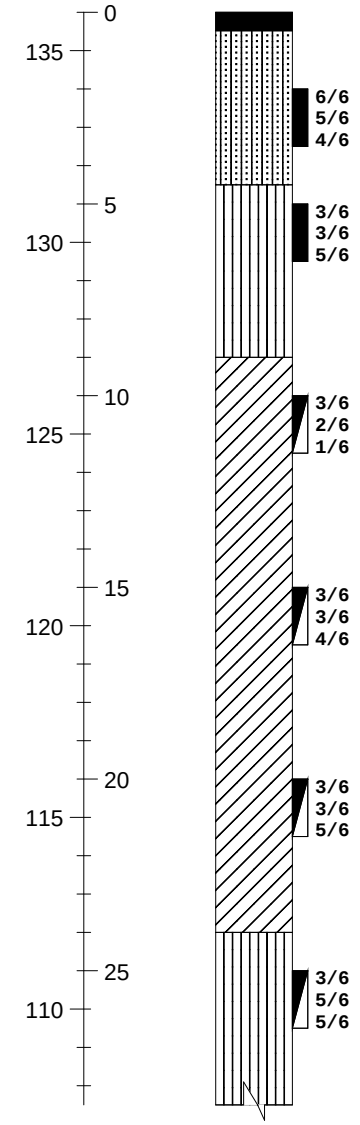
Location: 2020 E. 1st Street, Santa Ana, CA

Drilled By: SALEM **Logged By:** CC

Drill Type: CME 45C **Elevation:** 136'

Auger Type: 6-5/8 in. Hollow Stem Auger **Initial Depth to Groundwater:** N/A

Hammer Type: Automatic Trip - 140 lb/30 in **Final Depth to Groundwater:** N/A



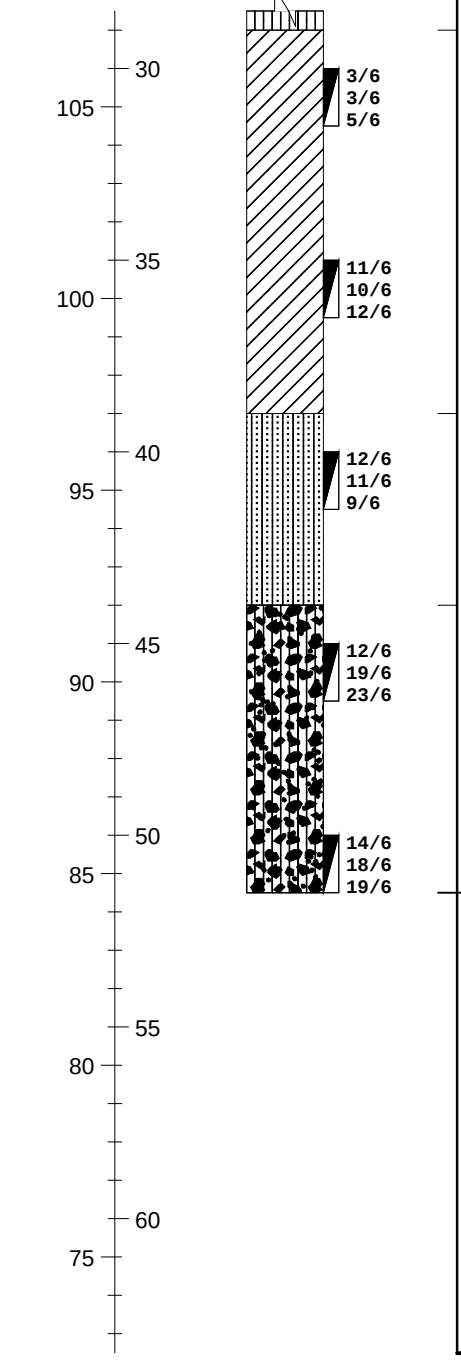
ELEVATION/ DEPTH (feet)	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
	AC	Asphalt Concrete = 5.75 in.				
	SM	*No Aggregate Base Silty SAND Loose; moist; brown; fine to medium grain sand; trace clay; trace gravel.	9	5.9	113.9	
	ML	SILT with Sand Firm; very moist; brown; fine grain sand.	8	20.2	99.8	
	CL	Sandy CLAY Soft; moist; brown; fine grain sand.	3	15.7	-	
		Grades as above; firm; very moist.	7	17.7	-	LL=30 PI=16
		Grades as above.	8	17.2	-	
	ML	Sandy SILT Stiff; moist; brown; fine grain sand.	10	14.3	-	

Notes:

Figure Number A-1

SALEM engineering group, inc.

Project Number: 3-223-0252
Date: 03/29/2023
Test Boring: B-1



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
		CL	Sandy CLAY Firm; moist; brown; fine grain sand.	8	17.4	-	LL=30 PI=14
			Grades as above; very stiff; very moist.	22	21.4	-	
		SM	Silty SAND Medium dense; moist; brown; fine to coarse grain sand; trace gravel.	20	7.7	-	
		GW-GM	Sandy GRAVEL with Silt Dense; slightly moist; brown/light gray; fine to coarse gravel; fine to coarse grain sand.	42	1.4	-	
			Grades as above.	37	2.2	-	Cu=56.00 Cc=2.57
			End of boring at 51.5 feet BSG.				

Notes:

Figure Number A-1

SALEM
engineering group, inc.

Test Boring: B-2 **Page** 1 **Of:** 1

Project Number: 3-223-0252

Date: 03/29/2023

Client: Harbor Associates

Project: Proposed Industrial Storage Facility

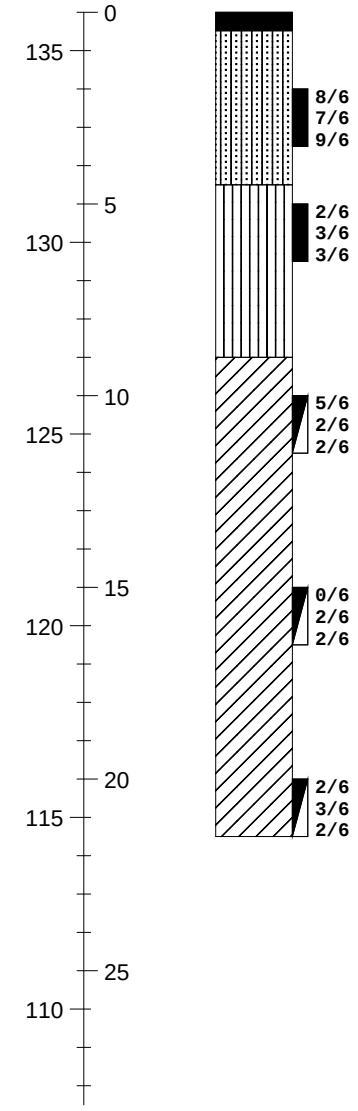
Location: 2020 E. 1st Street, Santa Ana, CA

Drilled By: SALEM **Logged By:** CC

Drill Type: CME 45C **Elevation:** 136'

Auger Type: 6-5/8 in. Hollow Stem Auger **Initial Depth to Groundwater:** N/A

Hammer Type: Automatic Trip - 140 lb/30 in **Final Depth to Groundwater:** N/A



ELEVATION/ DEPTH (feet)	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
	AC	Asphalt Concrete = 5.75 in.				
	SM	*No Aggregate Base				
		Silty SAND Medium dense; moist; brown; fine to medium grain sand; trace clay and gravel.	16	12.7	112.0	
	ML	SILT with Sand Firm; moist; brown; fine grain sand.	6	24.6	92.0	
	CL	Sandy CLAY Soft; moist; brown; fine grain sand.	4	15.1	-	Partial recovery.
		Grades as above; very moist.	4	17.2	-	
		Grades as above; firm.	5	19.6	-	
		End of boring at 21.5 feet BSG.				

Notes:

Figure Number A-2

SALEM engineering group, inc.

Test Boring: B-3 **Page** 1 **Of:** 1

Project Number: 3-223-0252

Date: 03/29/2023

Client: Harbor Associates

Project: Proposed Industrial Storage Facility

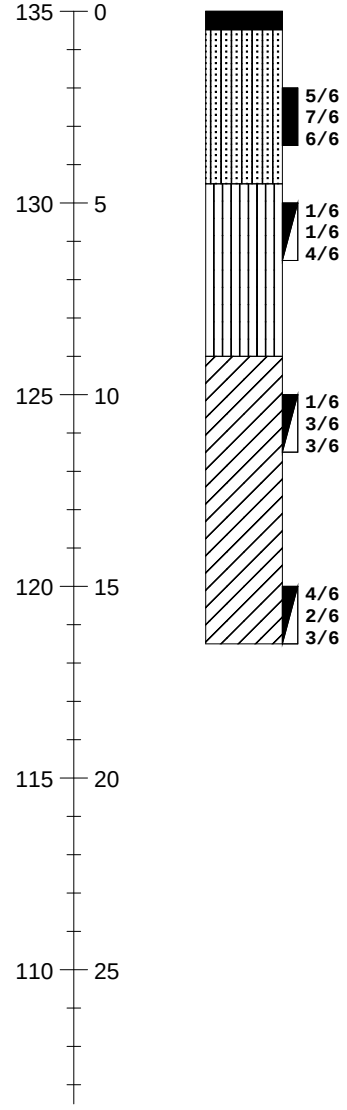
Location: 2020 E. 1st Street, Santa Ana, CA

Drilled By: SALEM **Logged By:** CC

Drill Type: CME 45C **Elevation:** 135'

Auger Type: 6-5/8 in. Hollow Stem Auger **Initial Depth to Groundwater:** N/A

Hammer Type: Automatic Trip - 140 lb/30 in **Final Depth to Groundwater:** N/A



ELEVATION/ DEPTH (feet)	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
	AC	Asphalt Concrete = 5.75 in.				
	SM	*No Aggregate Base Silty SAND Loose; very moist; brown; fine to medium grain sand; with trace gravel.	13	13.5	113.6	
	ML	SILT with Sand Firm; moist; brown; fine to medium grain sand.	5	26.4	-	
	CL	CLAY with Sand Firm; very moist; brown; fine grain sand.	6	17.2	-	
		Grades as above.	5	18.2	-	
		End of boring at 16.5 feet BSG.				

Notes:

Figure Number A-3

SALEM
engineering group, inc.

Test Boring: B-4 **Page** 1 **Of:** 1

Project Number: 3-223-0252

Date: 03/29/2023

Client: Harbor Associates

Project: Proposed Industrial Storage Facility

Location: 2020 E. 1st Street, Santa Ana, CA

Drilled By: SALEM **Logged By:** CC

Drill Type: CME 45C **Elevation:** 134'

Auger Type: 6-5/8 in. Hollow Stem Auger **Initial Depth to Groundwater:** N/A

Hammer Type: Automatic Trip - 140 lb/30 in **Final Depth to Groundwater:** N/A

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		AC	Asphalt Concrete = 5.5 in.				
		ML	*No Aggregate Base	4	22.2	86.1	
			Sandy SILT				
			Soft; very moist; brown; fine grain sand; with clay	4	19.6	-	
130 5	3/6 2/6 2/6		Grades as above.				
	1/6 2/6 2/6		End of boring at 5 feet BSG.				
125 10							
120 15							
115 20							
110 25							

Notes:

Figure Number A-4

SALEM engineering group, inc.

Test Boring: B-5 **Page** 1 **Of:** 1

Project Number: 3-223-0252

Date: 03/29/2023

Client: Harbor Associates

Project: Proposed Industrial Storage Facility

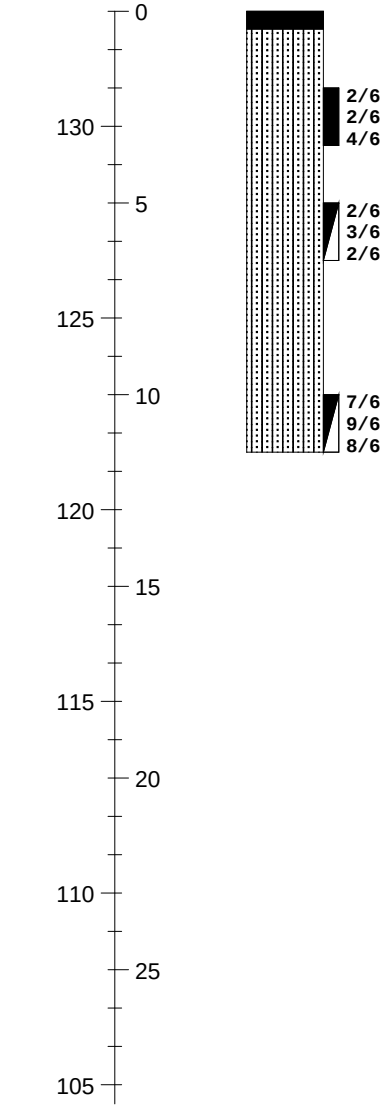
Location: 2020 E. 1st Street, Santa Ana, CA

Drilled By: SALEM **Logged By:** CC

Drill Type: CME 45C **Elevation:** 133'

Auger Type: 6-5/8 in. Hollow Stem Auger **Initial Depth to Groundwater:** N/A

Hammer Type: Automatic Trip - 140 lb/30 in **Final Depth to Groundwater:** N/A



ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
		AC	Asphalt Concrete = 5.5 in.				
		SM	*No Aggregate Base				
			Silty SAND Loose; moist; brown/grayish brown; fine to medium grain sand.	6	6.6	104.6	
			Grades as above; fine to coarse grained sand.	5	7.5	-	
			Grades as above; medium dense; with gravel.	17	11.6	-	
			End of boring at 11.5 feet BSG.				

Notes:

Figure Number A-5

SALEM
engineering group, inc.

Test Boring: B-6 **Page** 1 **Of:** 1

Project Number: 3-223-0252

Date: 03/29/2023

Client: Harbor Associates

Project: Proposed Industrial Storage Facility

Location: 2020 E. 1st Street, Santa Ana, CA

Drilled By: SALEM **Logged By:** CC

Drill Type: CME 45C **Elevation:** 134'

Auger Type: 6-5/8 in. Hollow Stem Auger **Initial Depth to Groundwater:** N/A

Hammer Type: Automatic Trip - 140 lb/30 in **Final Depth to Groundwater:** N/A

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		AC	Asphalt Concrete = 5.5 in.				
		ML	*No Aggregate Base				
	8/6 8/6 8/6		Sandy SILT Stiff; very moist; brown; fine grain sand; with clay.	16	19.2	107.6	
130 5	3/6 3/6 3/6		Grades as above; firm.	6	20.2	-	
			End of boring at 6.5 feet BSG.				
125 10							
120 15							
115 20							
110 25							

Notes:

Figure Number A-6

SALEM
engineering group, inc.

Test Boring: B-7 **Page** 1 **Of:** 1

Project Number: 3-223-0252

Date: 03/29/2023

Client: Harbor Associates

Project: Proposed Industrial Storage Facility

Location: 2020 E. 1st Street, Santa Ana, CA

Drilled By: SALEM **Logged By:** CC

Drill Type: CME 45C **Elevation:** 135'

Auger Type: 6-5/8 in. Hollow Stem Auger **Initial Depth to Groundwater:** N/A

Hammer Type: Automatic Trip - 140 lb/30 in **Final Depth to Groundwater:** N/A

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
135 / 0		AC	Asphalt Concrete = 5.5 in.				
		ML	*No Aggregate Base				
	9/6 8/6 10/6		SILT with Sand Stiff; very moist; mottled brown/ reddish brown; fine grain sand; with clay.	18	22.7	97.7	
130 / 5	4/6 8/6 7/6	SM	Silty SAND Medium dense; very moist; brown; fine to coarse grain sand.	15	7.3	-	
	5/6 8/6 12/6		Grades as above; with gravel.	20	7.3	-	
125 / 10			End of boring at 10 feet BSG.				
120 / 15							
115 / 20							
110 / 25							

Notes:

Figure Number A-7

Boring Logs by Geotek, Inc. (2021)

A - FIELD TESTING AND SAMPLING PROCEDURES

The Modified Split-Barrel Sampler (Ring)

The Ring sampler is driven into the ground at various depths in accordance with ASTM D 3550 test procedures. The sampler, with an external diameter of 3.0 inches, is lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sampler is typically driven into the ground 12 or 18 inches with a 140-pound hammer free falling from a height of 30 inches. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. The samples are removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

Bulk Samples (Large)

These samples are normally large bags of earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

Bulk Samples (Small)

These are plastic bag samples which are normally airtight and contain less than 5 pounds in weight of earth materials collected from the field by means of hand digging or exploratory cuttings. These samples are primarily used for determining natural moisture content and classification indices.

B - BORING LOG LEGEND

The following abbreviations and symbols often appear in the classification and description of soil and rock on the log of borings:

SOILS

USCS	Unified Soil Classification System
f-c	Fine to coarse
f-m	Fine to medium

GEOLOGIC

B: Attitudes	Bedding: strike/dip
J: Attitudes	Joint: strike/dip
C: Contact line	
……..	Dashed line denotes USCS material change
———	Solid Line denotes unit / formational change
———	Thick solid line denotes end of boring

(Additional denotations and symbols are provided on the boring log)

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Griffin Residential	**DRILLER:**	2R Drilling	**LOGGED BY:**	GP
PROJECT NAME:	2020 East 1st Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Nick/Victor
PROJECT NO.:	2881-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	Santa Ana, CA			**DATE:**	9/14/2021

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	**Boring No.: B-1** / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					4 in. asphalt concrete / 9 in. base			
					Younger Alluvial Fan:			
		12		CL	Silty CLAY, brown/black, slightly moist, very stiff, trace gravel			48% passing #200 Sieve
		13				12.8	112.9	SH, EI, MD, AL
		13						LL=89; PL=25; PI=63
								EI=48
		12		ML	Clayey SILT, brown/gray, slightly moist, stiff, trace gravel			
		12				11.9	109.6	
		10						
5		5			Clayey SILT, brown/gray, slightly moist, stiff			
		6				9.6	116.7	
		10						
		5		SM	Silty f SAND, light brown/gray, slightly moist, medium dense, trace gravel			
		8				3.9	117.9	
		15						
10		8			Silty f-c SAND, gray, slightly moist, loose, trace gravel			
		8						
		6						
15		4		ML	F sandy SILT w/ trace clay, brown, slightly moist, stiff			
		8						
		11						
20		5			Same as above			
		11						
		14						
					BORING TERMINATED AT 21.5 FEET			
					No groundwater encountered			
					Boring backfilled with spoils and patched with aspalt concrete			
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Griffin Residential	**DRILLER:**	2R Drilling	**LOGGED BY:**	GP
PROJECT NAME:	2020 East 1st Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Nick/Victor
PROJECT NO.:	2881-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	Santa Ana, CA			**DATE:**	9/14/2021

Boring No.: B-2

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					4 in. asphalt concrete / 9 in. base			
					Younger Alluvial Fan:			
				CL	Silty CLAY, brown/black, slightly moist, stiff, trace gravel			
	■	6 6 8				13.2	110.3	
5	■	4 4 5		ML	Clayey SILT, brown, slightly moist, medium stiff	16.7	101.9	Collapse
	■	4 4 5		SM	Silty f-c SAND, dark brown, slightly moist, loose, trace gravel	6.9	120.3	
10	■	4 6 7			Silty f-c SAND, light brown/gray, slightly moist, loose, trace gravel			
15	■	8 5 8		ML	F sandy SILT w/ trace clay, brown, slightly moist, medium stiff			
20	■	4 7 10			Same as above, stiff			
					BORING TERMINATED AT 21.5 FEET			
					No groundwater encountered Boring backfilled with spoils and patched with asphalt concrete			
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Griffin Residential	**DRILLER:**	2R Drilling	**LOGGED BY:**	GP
PROJECT NAME:	2020 East 1st Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Nick/Victor
PROJECT NO.:	2881-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	Santa Ana, CA			**DATE:**	9/14/2021

Boring No.: B-3

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					5 in. asphalt concrete / 11 in. base			
					Younger Alluvial Fan:			
				CL	Silty CLAY, brown/black, slightly moist, stiff			
		5 8 8				12.1	110.0	
5		3 4 4			Clayey SILT, brown, slightly moist, medium stiff	22.1	97	
		2 2 3		ML	F sandy SILT w/ trace clay, dark brown, slightly moist, soft	14.5	109.4	Collapse
		7 18 16			F sandy SILT w/ trace clay, dark brown, slightly moist, very stiff, trace gravel	11.8	92.8	
10		8 7 5		SM	Silty f-c SAND, gray, slightly moist, loose, trace gravel			
15		5 6 9		CL	Silty CLAY, dark brown, slightly moist, stiff			
20		4 8 13		ML	Clayey SILT, brown, slightly moist, stiff			
					BORING TERMINATED AT 21.5 FEET			
					No groundwater encountered Boring backfilled with spoils and patched with asphalt concrete			
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Griffin Residential	**DRILLER:**	2R Drilling	**LOGGED BY:**	GP
PROJECT NAME:	2020 East 1st Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Nick/Victor
PROJECT NO.:	2881-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	Santa Ana, CA			**DATE:**	9/14/2021

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	**Boring No.: B-4** / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					3 in. asphalt concrete / 6 in. base			
					Younger Alluvial Fan:			
		4		ML	Clayey SILT, dark brown, slightly moist, medium stiff, trace gravel			
		5				18.2	96.3	
		6						
		3			Clayey SILT, dark brown, slightly moist, soft to medium stiff			
		4				23.8	89.5	
		3						
5		3		CL	F-c sandy CLAY, dark brown, slightly moist, medium stiff			
		4				17.9	103.7	Collapse
		6						
		3		ML	F sandy SILT w/ trace clay, brown/gray, slightly moist, medium stiff			
		3				11.6	112	
		5						
10		5			F sandy SILT w/ trace clay, brown/gray, slightly moist, medium stiff, trace gravel			
		5						
		7						
15		4		CL	Silty CLAY, dark brown, slightly moist, stiff			
		7						
		10						
20		7			Silty CLAY, dark brown, slightly moist, very stiff			
		13						
		17						
					BORING TERMINATED AT 21.5 FEET			
					No groundwater encountered			
					Boring backfilled with spoils and patched with asphalt			
25								
30								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Griffin Residential	**DRILLER:**	2R Drilling	**LOGGED BY:**	GP
PROJECT NAME:	2020 East 1st Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Nick/Victor
PROJECT NO.:	2881-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	Santa Ana, CA			**DATE:**	9/13/2021

Boring No.: B-5

Depth (ft)	Sample Type	Blows/ 6 in	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Water Content (%)	Dry Density (pcf)	Others
0					2.5 asphalt concrete / 3.5 base			
					Younger Alluvial Fan:			
				ML	Clayey SILT, dark brown, slightly moist, medium stiff			SR
		4 5 5				25.5	88.9	
		4 5 7		CL	F sandy SILT w/ trace clay, brown/gray, slightly moist, medium stiff	8.5	98.2	
5		4 7 15			F sandy SILT w/ trace clay, brown/gray, slightly moist, stiff	7.7	119.2	
		7 11 11		SM	Silty f-c SAND, brown/gray, slightly moist, medium dense, trace gravel	1.8		
10		5 8 11			Silty f-c SAND, brown/gray, slightly moist, medium dense, trace gravel			
15		7 11 17			Clayey SILT, brown, slightly moist, very stiff			
20		7 4 15			F-c sandy SILT w/ trace clay, yellow/brown, slightly moist, stiff			
25		4 10 7			F sandy SILT, gray/brown, slightly moist, very stiff			32% passing #200 sieve
30		4 6 10			Clayey SILT, yellow/brown, slightly moist, very stiff			

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Griffin Residential	**DRILLER:**	2R Drilling	**LOGGED BY:**	GP
PROJECT NAME:	2020 East 1st Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Nick/Victor
PROJECT NO.:	2881-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	Santa Ana, CA			**DATE:**	9/13/2021

Boring No.: B-5 (continued)

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
35		3 11 14		ML	F sandy SILT, gray/brown, slightly moist, very stiff			
40		2 4 7		CL	Silty CLAY, brown/gray, slightly moist, stiff, trace gravel			76% passing #200 sieve AL
45		17 16 24		SM	Silty f-c SAND, brown/gray, slightly moist, dense, trace gravel			13% passing # 200 sieve
50		3 4 6		ML	F sandy SILT, yellow/brown, slightly moist, stiff, trace gravel			
55					**BORING TERMINATED AT 51.5 FEET** No groundwater encountered Boring backfilled with spoils and patched with asphalt concrete			
60								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Griffin Residential	**DRILLER:**	2R Drilling	**LOGGED BY:**	GP
PROJECT NAME:	2020 East 1st Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Nick/Victor
PROJECT NO.:	2881-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	Santa Ana, CA			**DATE:**	9/13/2021

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	**Boring No.: I-1** / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					4 in. asphalt concrete / 9 in. base			
					Younger Alluvial Fan:			
				CL	Silty CLAY, brown, slightly moist, trace gravel			
10								
20				ML	Becomes f sandy SILT, brown, slightly moist			
30								
40				SM	Becomes silty f-c SAND, dark brown, slightly moist, trace gravel			
50					**BORING TERMINATED AT 50 FEET**			
					No groundwater encountered Boring prepped with pipe, filter sock and gravel for infiltration testing			
60								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Griffin Residential	**DRILLER:**	2R Drilling	**LOGGED BY:**	GP
PROJECT NAME:	2020 East 1st Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Nick/Victor
PROJECT NO.:	2881-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	Santa Ana, CA			**DATE:**	9/13/2021

Boring No.: I-2

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					5 in. asphalt concrete / 11 in. base			
					Younger Alluvial Fan:			
				CL	Clayey SILT, brown/black, slightly moist, trace gravel			
10								
20								
30								
40				ML	Becomes f-c sandy SILT, brown, slightly moist			
50					**BORING TERMINATED AT 50 FEET**			
					No groundwater encountered			
					Boring prepped with pipe, filter sock and gravel for infiltration testing			
60								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Griffin Residential	**DRILLER:**	2R Drilling	**LOGGED BY:**	GP
PROJECT NAME:	2020 East 1st Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Nick/Victor
PROJECT NO.:	2881-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	Santa Ana, CA			**DATE:**	9/13/2021

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	**Boring No.: I-3** / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					3 in. asphalt concrete / 6 in. base			
					Younger Alluvial Fan:			
				ML	Clayey SILT, dark brown, slightly moist, trace gravel			
10								
20					Becomes light brown			
30								
40				ML	Becomes f-c sandy SILT, brown, slightly moist			
50					**BORING TERMINATED AT 50 FEET**			
					No groundwater encountered			
					Boring prepped with pipe, filter sock and gravel for infiltration testing			
60								

LEGEND

Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

GeoTek, Inc.

LOG OF EXPLORATORY BORING

CLIENT:	Griffin Residential	**DRILLER:**	2R Drilling	**LOGGED BY:**	GP
PROJECT NAME:	2020 East 1st Street	**DRILL METHOD:**	Hollow Stem	**OPERATOR:**	Nick/Victor
PROJECT NO.:	2881-CR	**HAMMER:**	140#/30"	**RIG TYPE:**	CME 75
LOCATION:	Santa Ana, CA			**DATE:**	9/13/2021

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows/ 6 in	SAMPLES: Sample Number	USCS Symbol	**Boring No.: I-4** / MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Water Content (%)	Laboratory Testing: Dry Density (pcf)	Laboratory Testing: Others
0					2.5 asphalt concrete / 3.5 base			
					Younger Alluvial Fan:			
				ML	Clayey SILT, dark brown, slightly moist, medium stiff			
10								
20					Becomes f-c sandy silt, yellow/brown, slightly moist			
30								
40					Becomes silty f-c SAND, dark brown, slightly moist, trace gravel			
50					**BORING TERMINATED AT 50 FEET**			
					No groundwater encountered Boring prepped with pipe, filter sock and gravel for infiltration testing			
60								

LEGEND

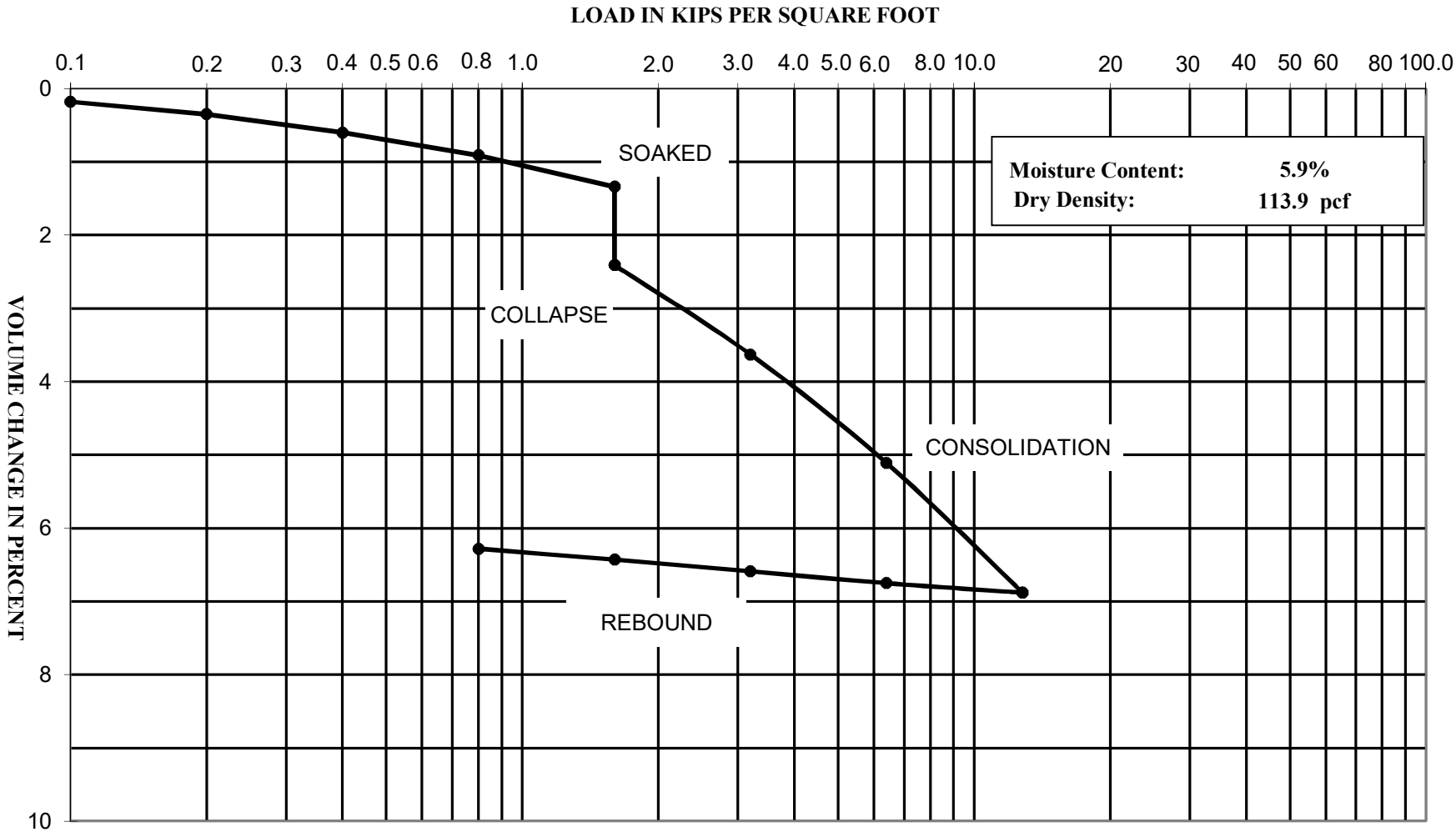
Sample type: ---Ring ---SPT ---Small Bulk ---Large Bulk ---No Recovery ---Water Table

Lab testing: AL = Atterberg Limits; EI = Expansion Index; SA = Sieve Analysis; RV = R-Value Test; SR = Sulfate/Resisitivity Test; SH = Shear Test; HC= Consolidation; MD = Maximum Density

Appendix C

Laboratory Test Results by Salem Engineering Group (2023)

CONSOLIDATION - PRESSURE TEST DATA
ASTM D2435



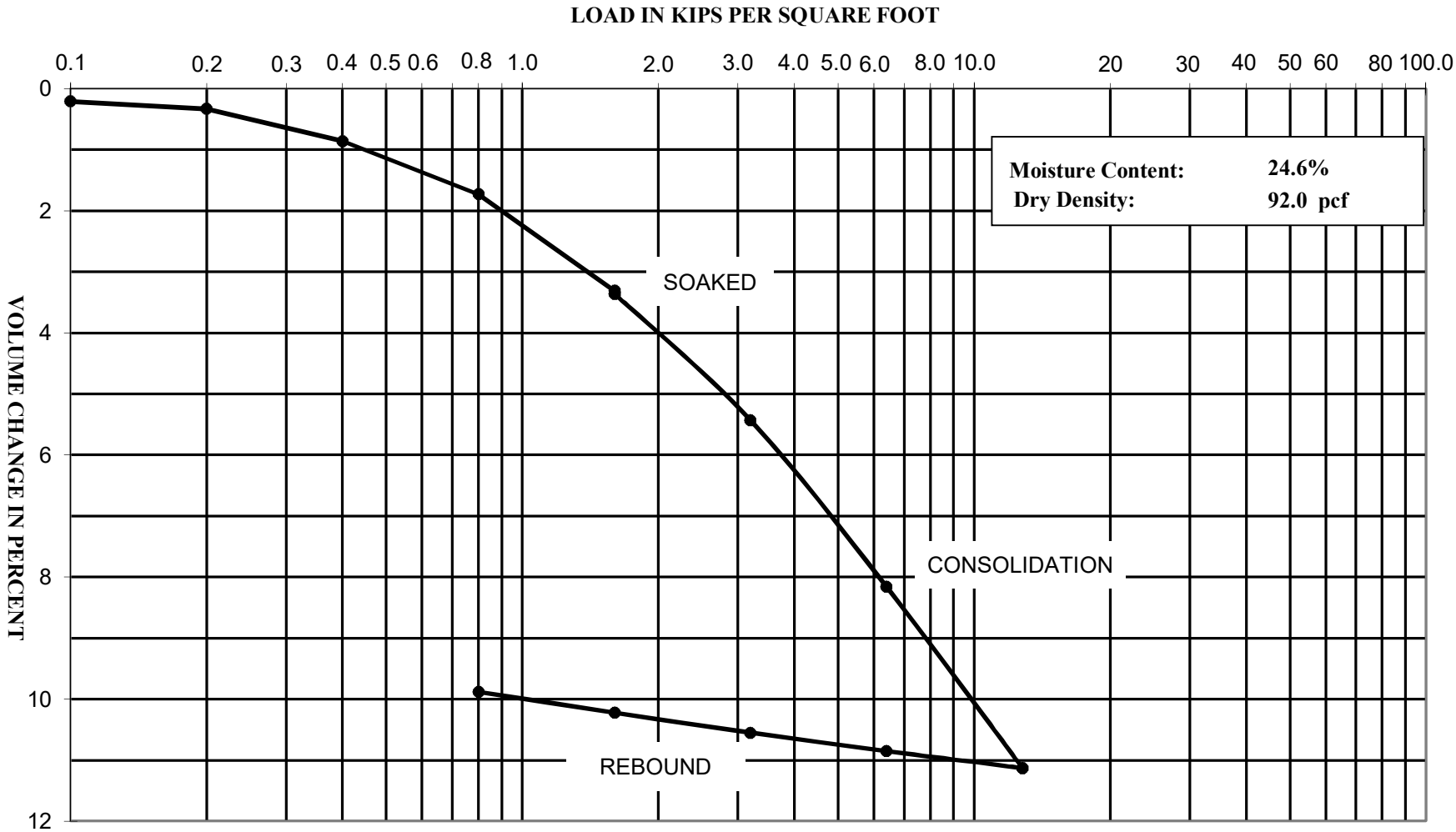
Project Name: Proposed Industrial Storage Facility - Santa Ana, CA

Project Number: 3-223-0252

Boring: B-1 @ 2'

SALEM engineering group, inc.

CONSOLIDATION - PRESSURE TEST DATA
ASTM D2435



Project Name: Proposed Industrial Storage Facility - Santa Ana, CA

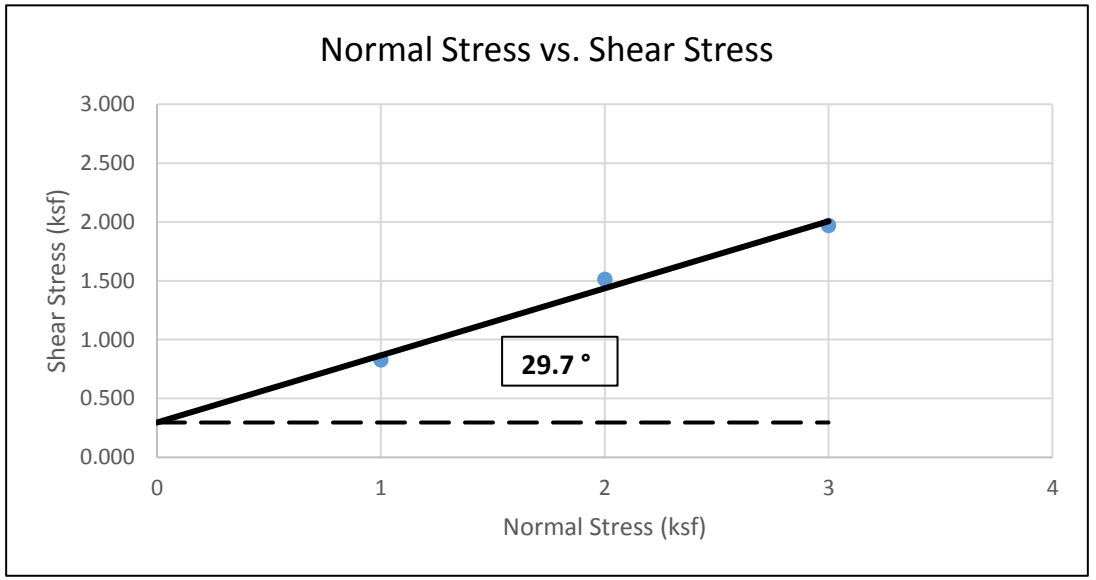
Project Number: 3-223-0252

Boring: B-2 @ 5'

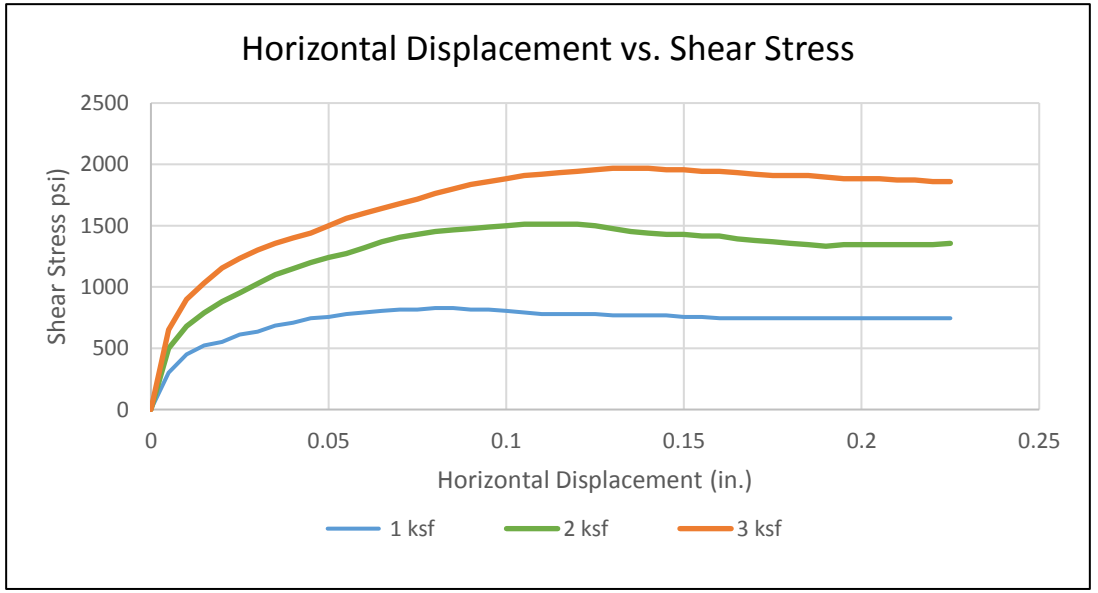
SALEM
engineering group, inc.

Direct Shear Test (ASTM D3080)

Project Name:	Proposed Industrial Storage Facility - Santa Ana, CA
Project Number:	3-223-0252
Client:	Harbor Associates
Sample Location:	B-1 @ 5'
Sample Type:	Undisturbed Ring
Soil Classification:	SILT with Sand (ML)
Tested By:	M. Noorzay
Reviewed By:	CJ
Date:	4/5/2023
Equipment Used:	Geomatic Direct Shear Machine



	Sample 1	Sample 2	Sample 3
Normal Stress (ksf)	1.000	2.000	3.000
Shear Rate (in/min)	0.002		
Peak Shear Stress (ksf)	0.828	1.512	1.968
Residual Shear Stress (ksf)	0.000	0.000	0.000



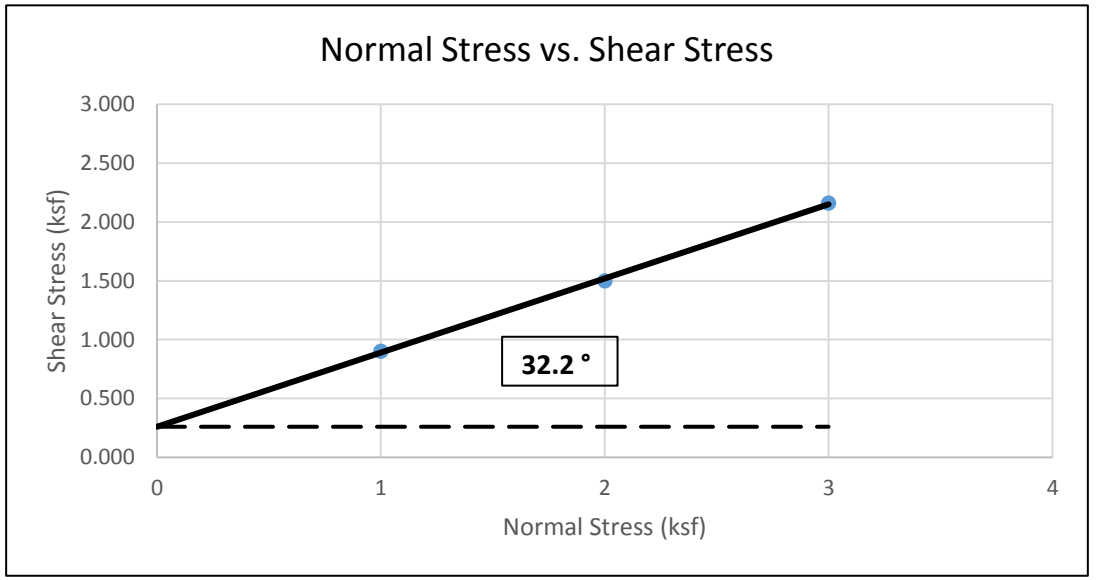
Initial Height of Sample (in)	1.000	1.000	1.000
Height of Sample before Shear (in.)	1	1	1
Diameter of Sample (in)	2.416	2.416	2.416
Initial Moisture Content (%)	19.4		
Final Moisture Content (%)	25.7	23.4	23.2
Dry Density (pcf)	99.9	100.4	99.7

Peak Shear Strength Values	
Slope	0.57
Friction Angle	29.7
Cohesion (psf)	296

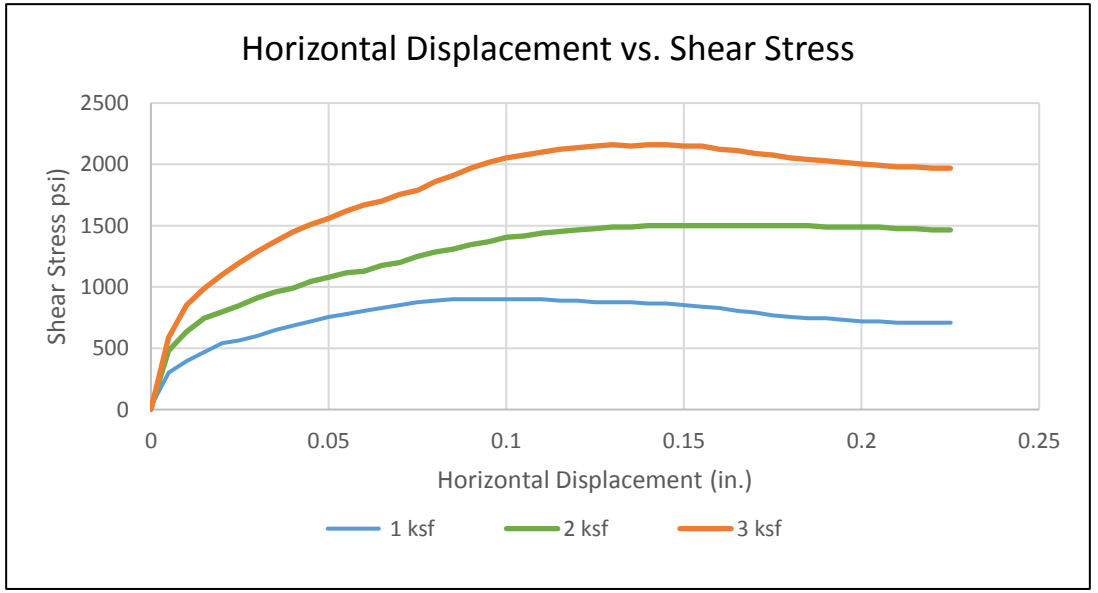
SALEM
engineering group, inc.

Direct Shear Test (ASTM D3080)

Project Name:	Proposed Industrial Storage Facility - Santa Ana, CA
Project Number:	3-223-0252
Client:	Harbor Associates
Sample Location:	B-2 @ 2'
Sample Type:	Undisturbed Ring
Soil Classification:	Silty SAND (SM)
Tested By:	M. Noorzay
Reviewed By:	CJ
Date:	4/7/2023
Equipment Used:	Geomatic Direct Shear Machine



	Sample 1	Sample 2	Sample 3
Normal Stress (ksf)	1.000	2.000	3.000
Shear Rate (in/min)	0.004		
Peak Shear Stress (ksf)	0.900	1.500	2.160
Residual Shear Stress (ksf)	0.000	0.000	0.000



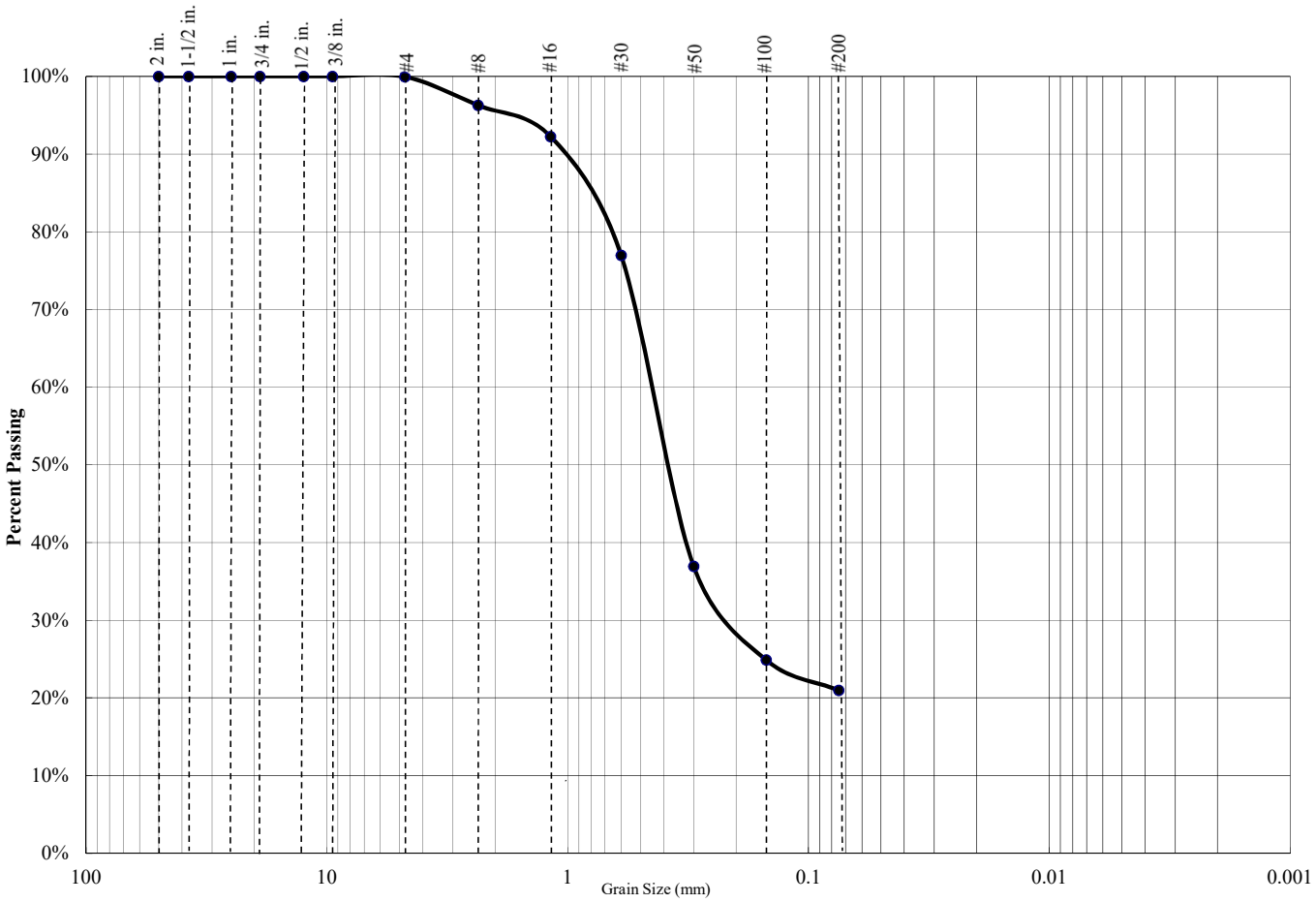
Initial Height of Sample (in)	1.000	1.000	1.000
Height of Sample before Shear (in.)	1	1	1
Diameter of Sample (in)	2.416	2.416	2.416
Initial Moisture Content (%)	12.3		
Final Moisture Content (%)	18.3	18.0	17.1
Dry Density (pcf)	111.0	111.2	110.7

Peak Shear Strength Values	
Slope	0.63
Friction Angle	32.2
Cohesion (psf)	260

SALEM
engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
0%	79%	21%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	100.0%
#8	96.3%
#16	92.3%
#30	77.0%
#50	36.9%
#100	24.9%
#200	21.0%

Atterberg Limits		
PL=	LL=	PI=

Coefficients					
D_{85}=		D_{60}=		D_{50}=	
D_{30}=		D_{15}=		D_{10}=	
C_u=	N/A	C_c=	N/A		

USCS CLASSIFICATION
Silty SAND (SM)

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA

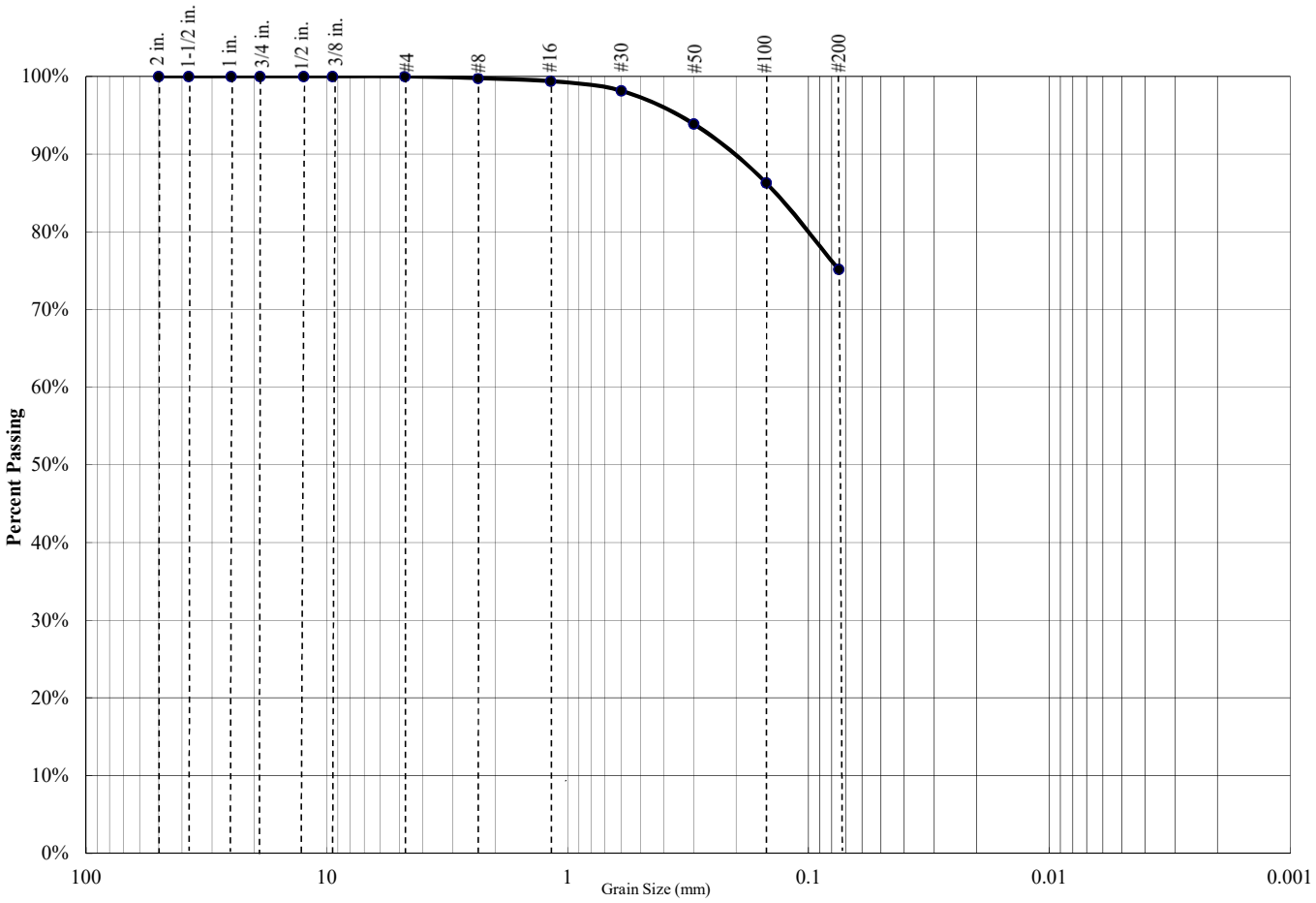
Project Number: 3-223-0252

Boring: B-1 @ 2'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
0%	25%	75%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	100.0%
#8	99.8%
#16	99.4%
#30	98.1%
#50	93.9%
#100	86.3%
#200	75.2%

Atterberg Limits		
PL=	LL=	PI=

Coefficients					
D_{85}=		D_{60}=		D_{50}=	
D_{30}=		D_{15}=		D_{10}=	
C_u=	N/A	C_c=	N/A		

USCS CLASSIFICATION
SILT with Sand (ML)

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA

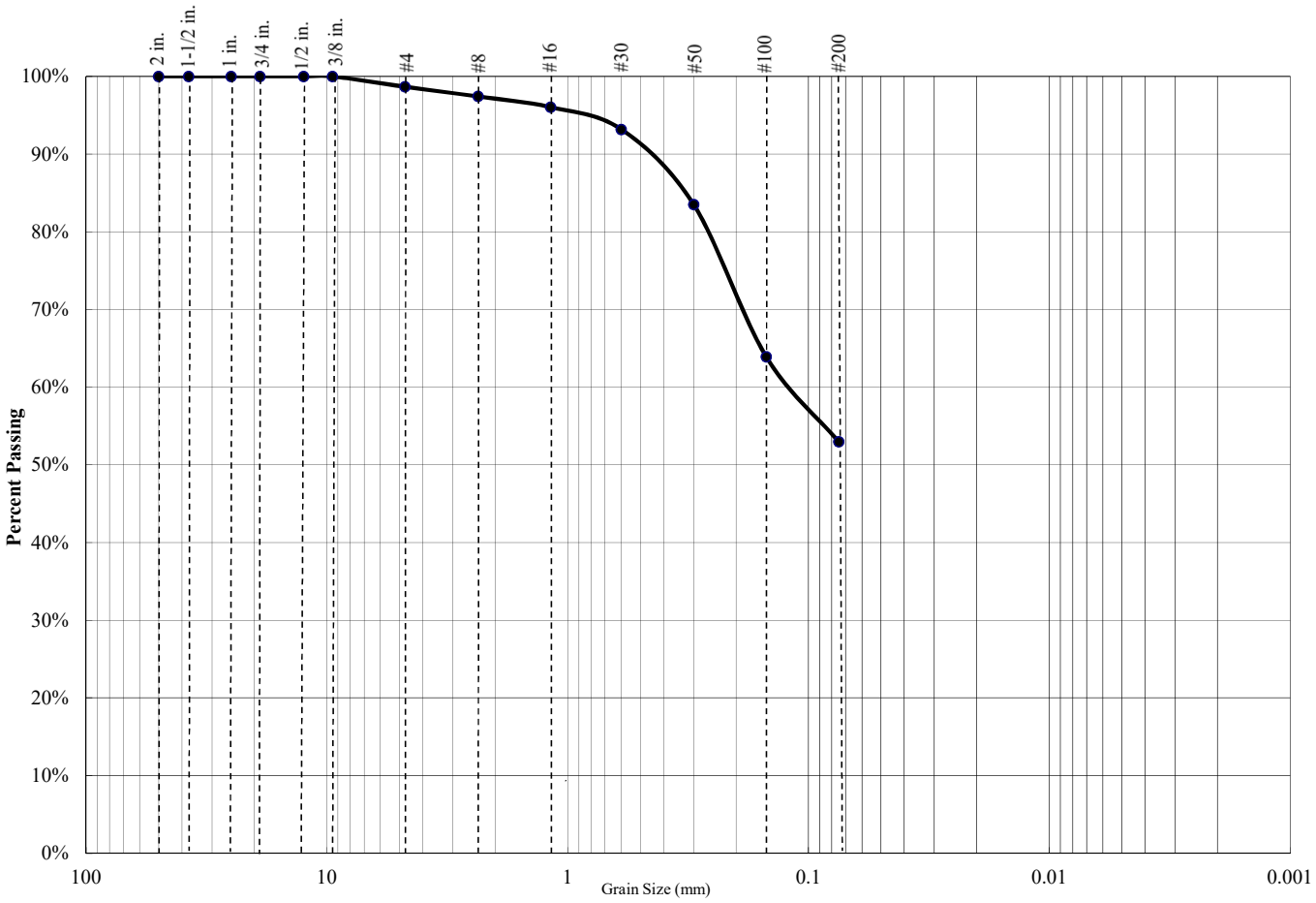
Project Number: 3-223-0252

Boring: B-1 @ 5'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
1%	46%	53%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	98.7%
#8	97.4%
#16	96.0%
#30	93.2%
#50	83.5%
#100	63.9%
#200	53.0%

Atterberg Limits		
PL=	LL=	PI=

Coefficients					
D_{85}=		D_{60}=		D_{50}=	
D_{30}=		D_{15}=		D_{10}=	
C_u=	N/A	C_c=	N/A		

USCS CLASSIFICATION
Sandy CLAY (CL)

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA

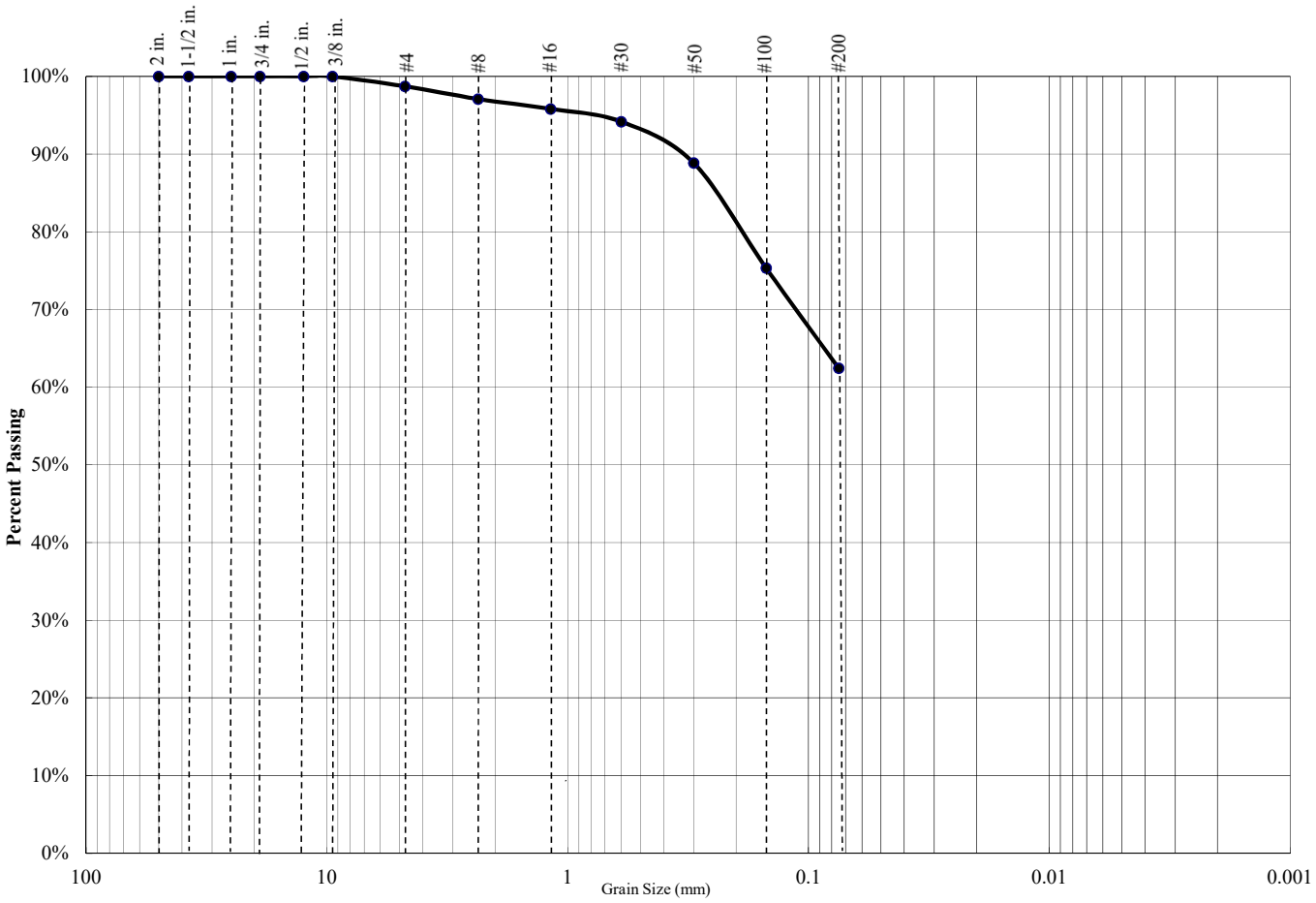
Project Number: 3-223-0252

Boring: B-1 @ 10'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
1%	36%	62%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	98.7%
#8	97.1%
#16	95.8%
#30	94.2%
#50	88.8%
#100	75.3%
#200	62.4%

Atterberg Limits		
PL=	LL=	PI=

Coefficients					
D_{85}=		D_{60}=		D_{50}=	
D_{30}=		D_{15}=		D_{10}=	
C_u=	N/A	C_c=	N/A		

USCS CLASSIFICATION
Sandy SILT (ML)

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA

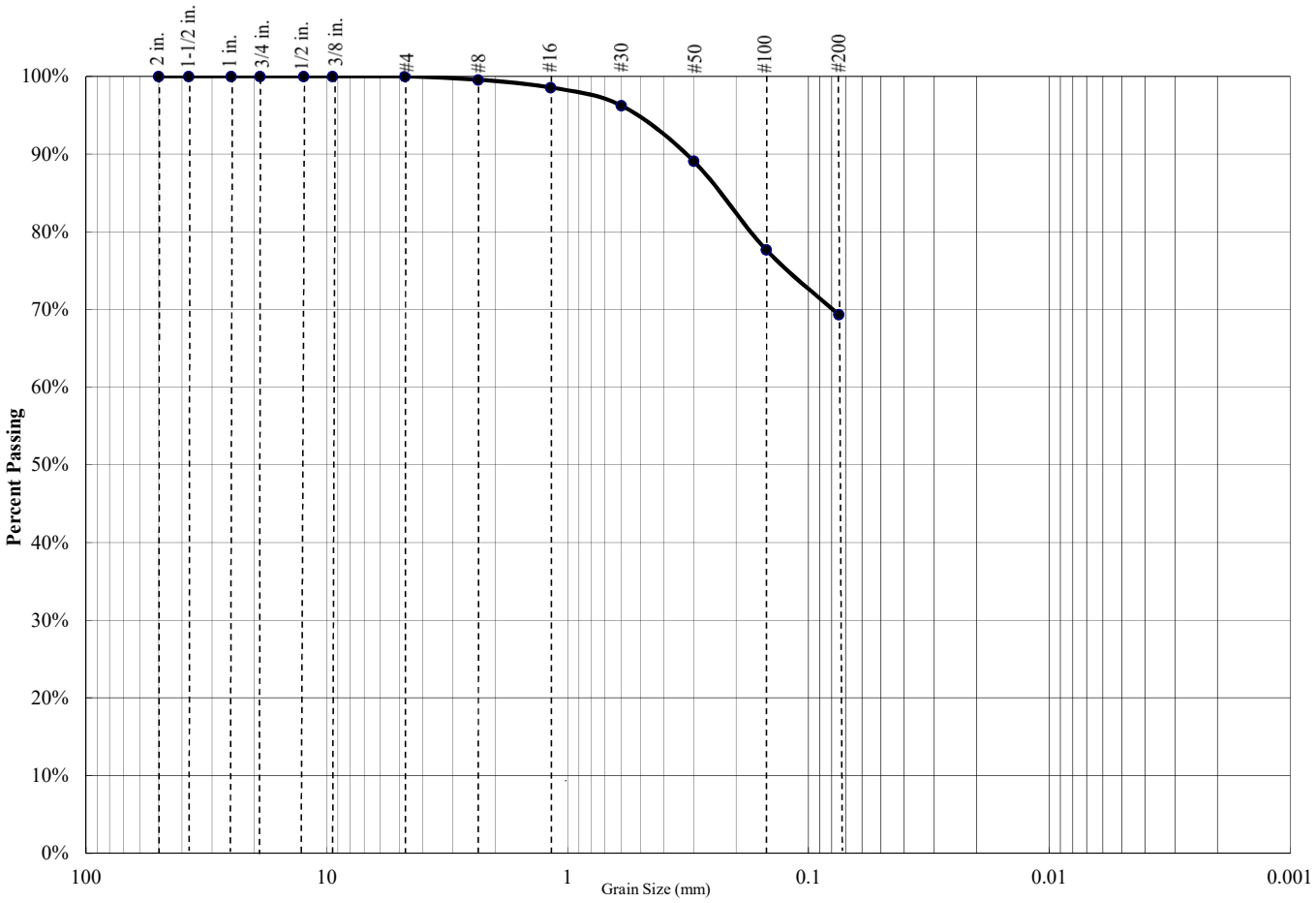
Project Number: 3-223-0252

Boring: B-1 @ 25'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
0%	31%	69%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	100.0%
#8	99.6%
#16	98.6%
#30	96.2%
#50	89.1%
#100	77.7%
#200	69.3%

Atterberg Limits		
PL=	LL=	PI=

Coefficients					
D_{85}=		D_{60}=		D_{50}=	
D_{30}=		D_{15}=		D_{10}=	
C_u=	N/A	C_c=	N/A		

USCS CLASSIFICATION
Sandy CLAY (CL)

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA

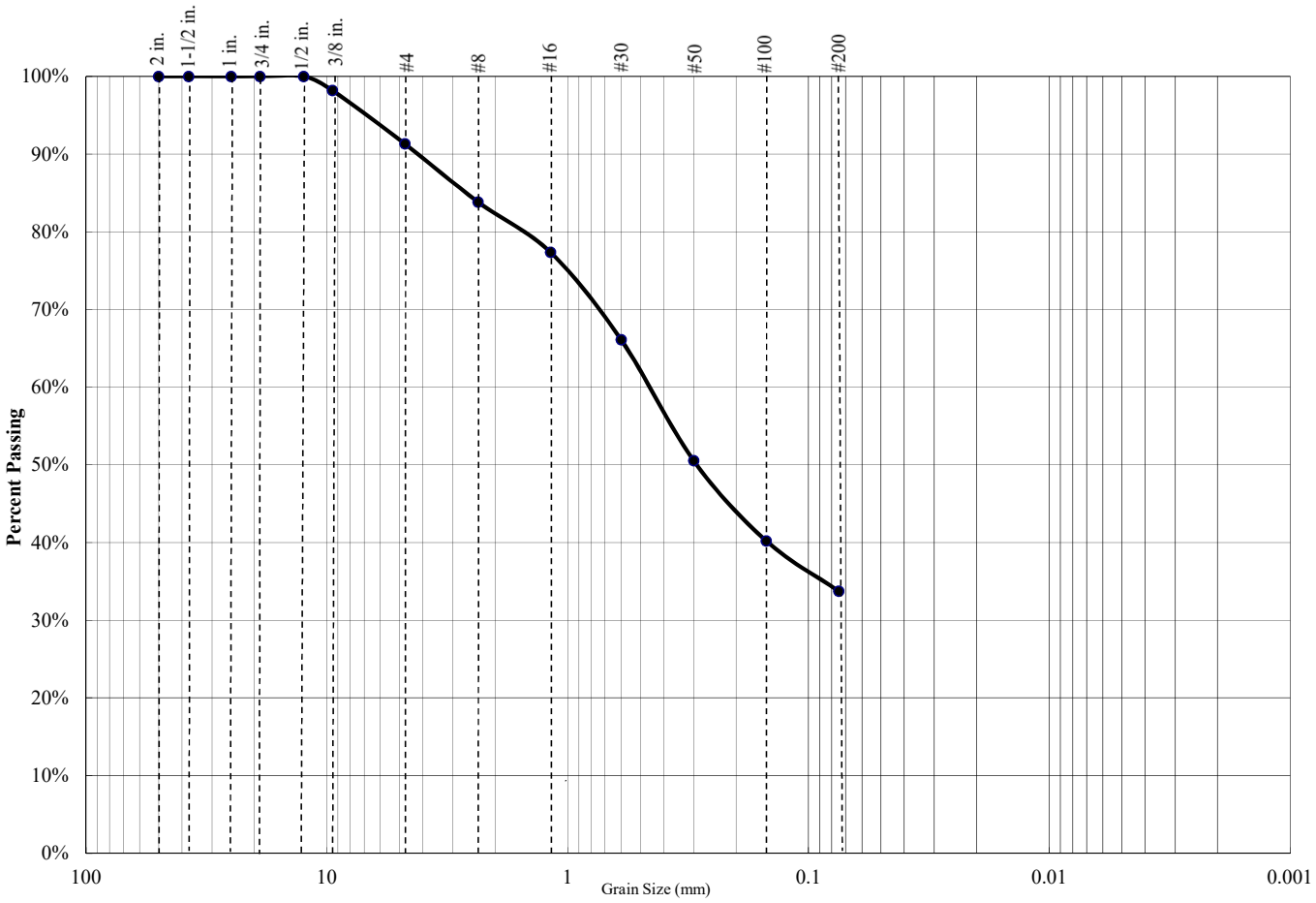
Project Number: 3-223-0252

Boring: B-1 @ 35'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
9%	58%	34%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	98.2%
#4	91.3%
#8	83.8%
#16	77.4%
#30	66.1%
#50	50.5%
#100	40.2%
#200	33.7%

Atterberg Limits		
PL=	**LL=**	**PI=**

Coefficients			
D_{85}=		**D_{60}=**	**D_{50}=**
D_{30}=		**D_{15}=**	**D_{10}=**
C_u=	N/A	**C_c=**	N/A

USCS CLASSIFICATION
Silty SAND (SM)

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA

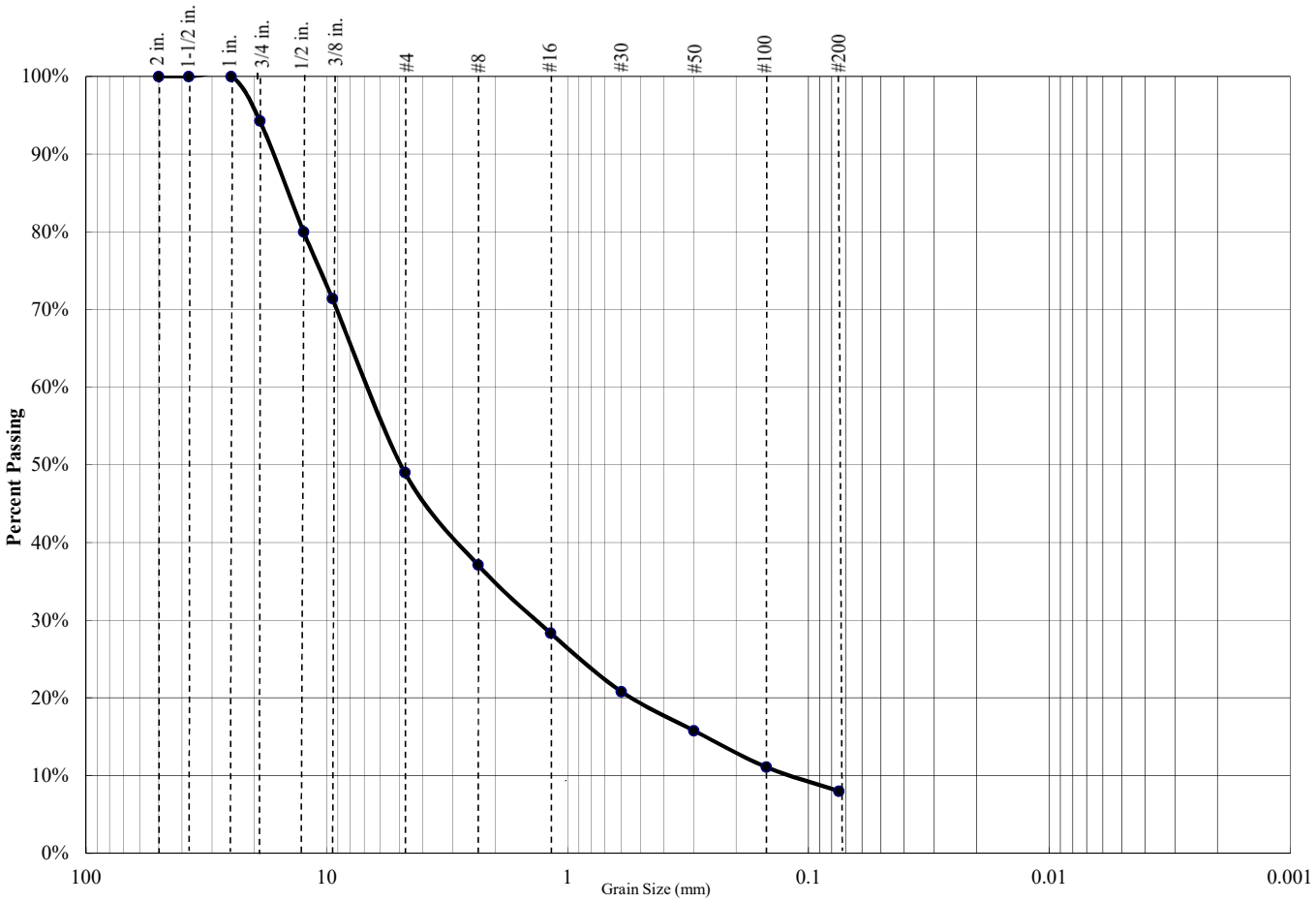
Project Number: 3-223-0252

Boring: B-1 @ 40'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
51%	41%	8%

Sieve Size	Percent Passing
3/4 inch	94.3%
1/2 inch	80.0%
3/8 inch	71.4%
#4	49.0%
#8	37.1%
#16	28.3%
#30	20.8%
#50	15.8%
#100	11.1%
#200	8.0%

Atterberg Limits		
PL=	LL=	PI=

Coefficients					
D_{85}=		D_{60}=	7.0	D_{50}=	
D_{30}=	1.5	D_{15}=		D_{10}=	0.125
C_u=	56.00	C_c=	2.57		

USCS CLASSIFICATION
Sandy GRAVEL with Silt (GW-GM)

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA

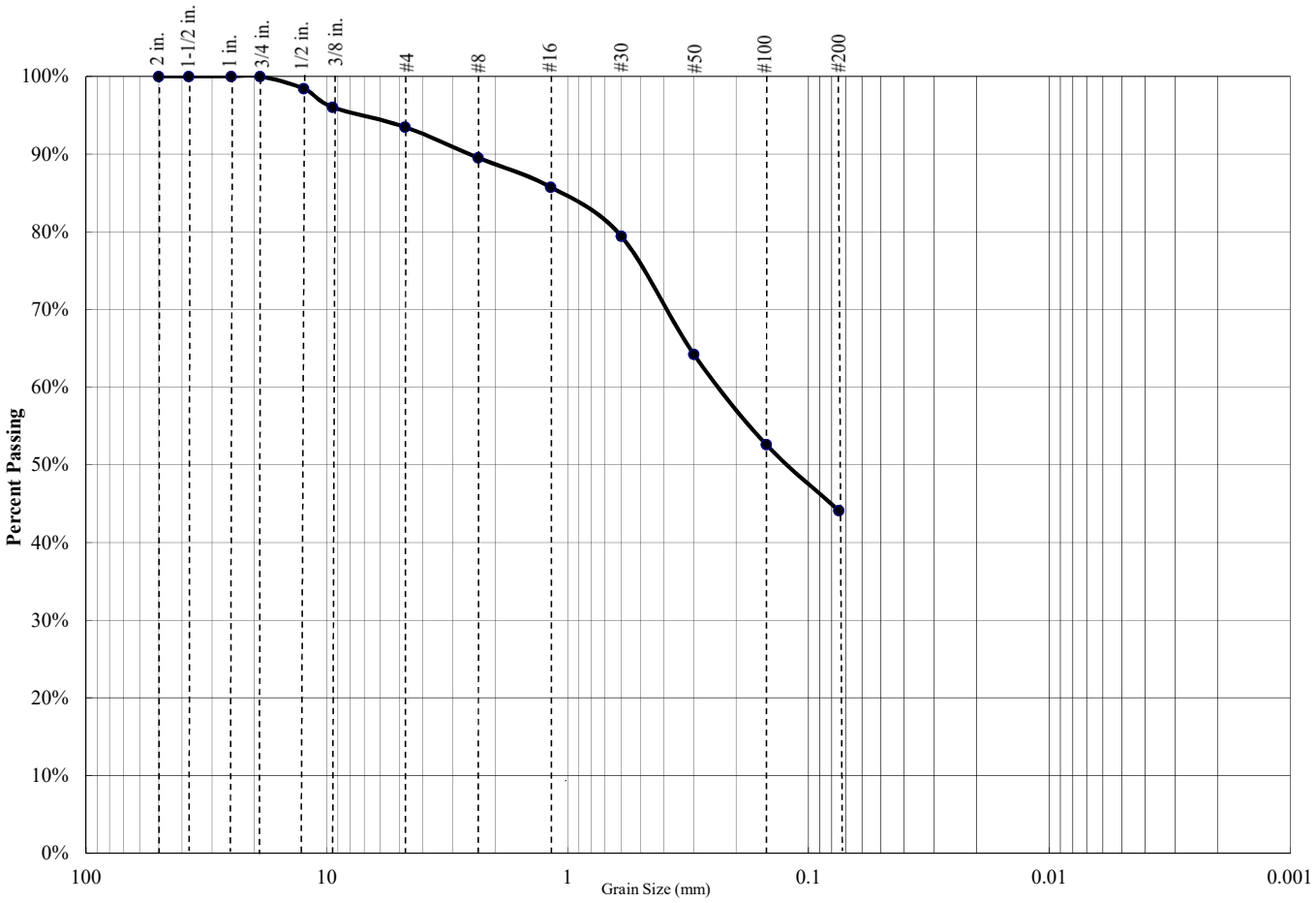
Project Number: 3-223-0252

Boring: B-1 @ 50'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
7%	49%	44%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	98.4%
3/8 inch	96.0%
#4	93.5%
#8	89.5%
#16	85.8%
#30	79.4%
#50	64.3%
#100	52.6%
#200	44.1%

Atterberg Limits		
PL=	LL=	PI=

Coefficients					
D_{85}=		D_{60}=		D_{50}=	
D_{30}=		D_{15}=		D_{10}=	
C_u=	N/A	C_c=	N/A		

USCS CLASSIFICATION
Silty SAND (SM)

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA

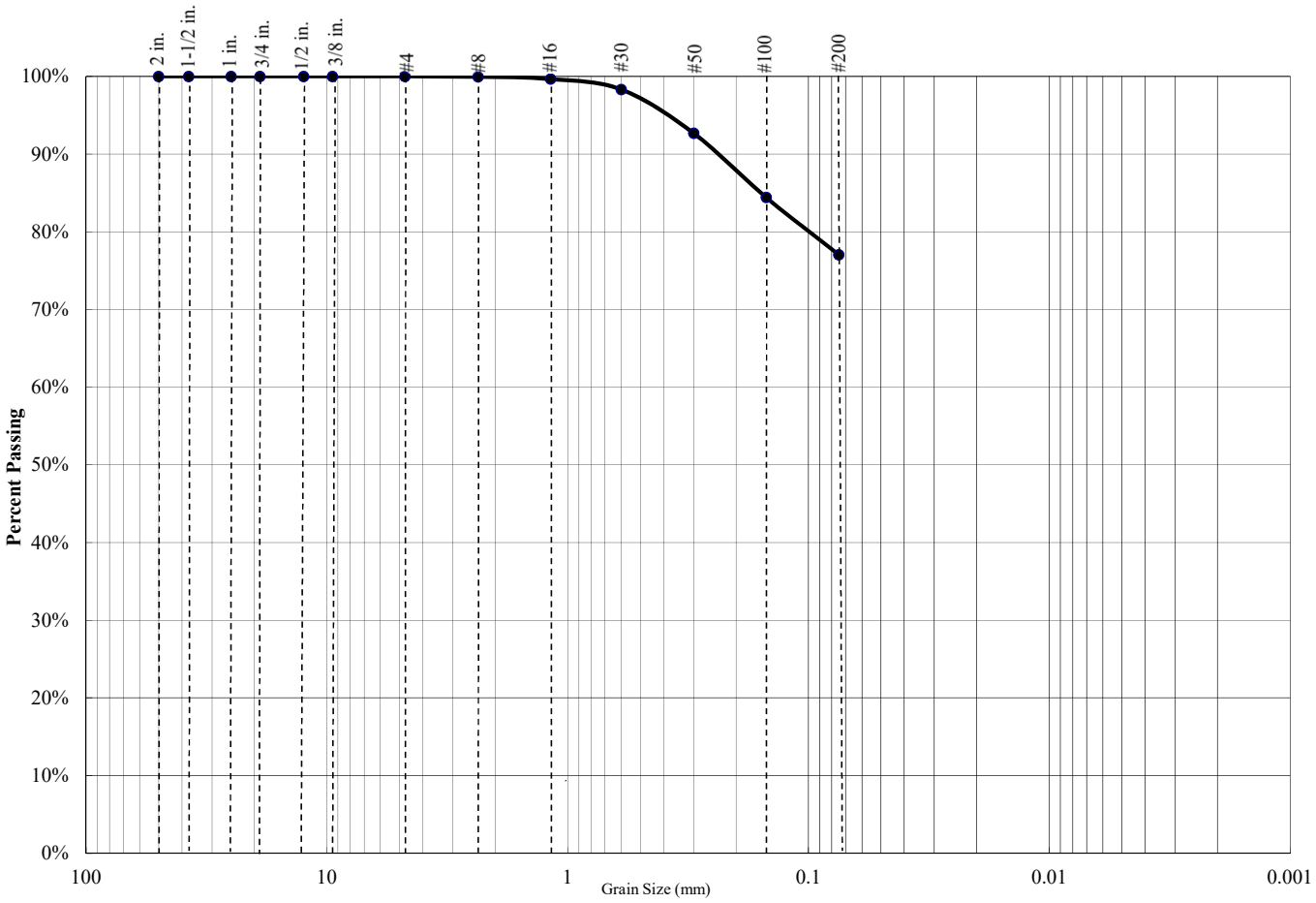
Project Number: 3-223-0252

Boring: B-2 @ 2'

SALEM engineering group, inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM C136



Percent Gravel	Percent Sand	Percent Silt/Clay
0%	23%	77%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	100.0%
#8	100.0%
#16	99.7%
#30	98.3%
#50	92.7%
#100	84.4%
#200	77.1%

Atterberg Limits		
PL=	LL=	PI=

Coefficients					
D_{85}=		D_{60}=		D_{50}=	
D_{30}=		D_{15}=		D_{10}=	
C_u=	N/A	C_c=	N/A		

USCS CLASSIFICATION
SILT with Sand (ML)

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA

Project Number: 3-223-0252

Boring: B-2 @ 5'

SALEM engineering group, inc.

EXPANSION INDEX TEST
ASTM D4829

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA
Project Number: 3-223-0252
Date Sampled: 3/29/2023 Date Tested: 4/7/2023
Sampled By: CC Tested By: M. Noorzay
Sample Location: B-1 @ 1'-4'
Soil Description: Brown Silty SAND (SM) w/trace Clay and Gravel

Trial #	1	2	3
Weight of Soil & Mold, g.	777.4		
Weight of Mold, g.	367.8		
Weight of Soil, g.	409.6		
Wet Density, pcf	123.5		
Weight of Moisture Sample (Wet), g.	200.0		
Weight of Moisture Sample (Dry), g.	183.9		
Moisture Content, %	8.8		
Dry Density, pcf	113.6		
Specific Gravity of Soil	2.7		
Degree of Saturation, %	48.9		

Time	Inital	30 min	1 hr	6 hrs	12 hrs	24 hrs
Dial Reading	0	0.005	0.01	--	--	0.01

Expansion Index $_{measured}$ = 10
Expansion Index $_{50}$ = 9.5

Expansion Index = **10**

Expansion Potential Table	
Exp. Index	Potential Exp.
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

SALEM engineering group, inc.

Atterberg Limits Determination

ASTM D4318

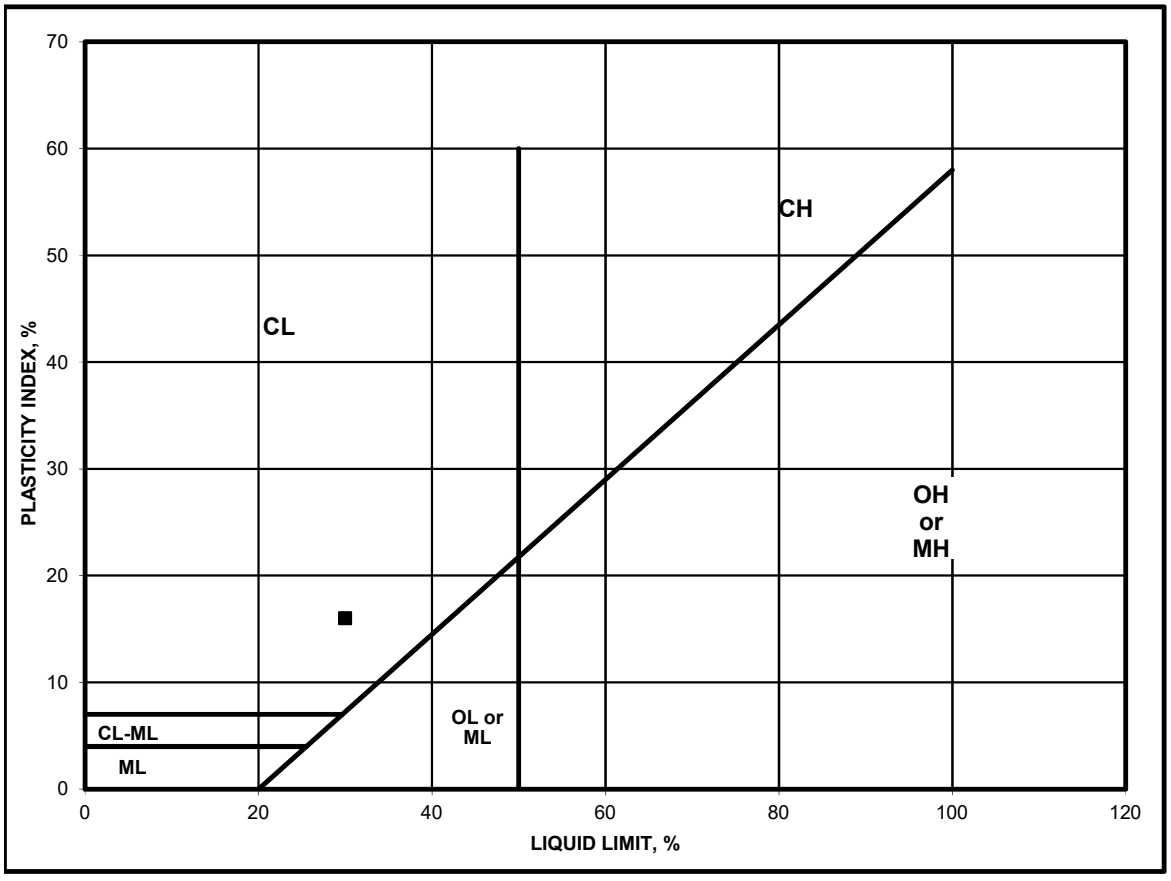
Project Name: Proposed Industrial Storage Facility - Santa Ana, CA
Project Number: 3-223-0252
Date Sampled: 3/29/2023 Date Tested: 4/10/2023
Sampled By: CC Tested By: M. Noorzay
Sample Location: B-1 @ 15'

Run Number	Plastic Limit			Liquid Limit		
	1	2	3	1	2	3
Weight of Wet Soil & Tare	31.56	31.58	31.48	39.48	39.54	39.50
Weight of Dry Soil & Tare	30.21	30.23	30.16	35.24	35.22	35.05
Weight of Water	1.35	1.35	1.32	4.24	4.32	4.45
Weight of Tare	20.84	20.82	20.73	20.76	20.84	20.73
Weight of Dry Soil	9.37	9.41	9.43	14.48	14.38	14.32
Water Content	14.4	14.3	14.0	29.3	30.0	31.1
Number of Blows				33	28	18

Plastic Limit : 14 **Liquid Limit : 30**

Plasticity Index : 16

Unified Soil Classification : CL



SALEM engineering group, inc.

Atterberg Limits Determination

ASTM D4318

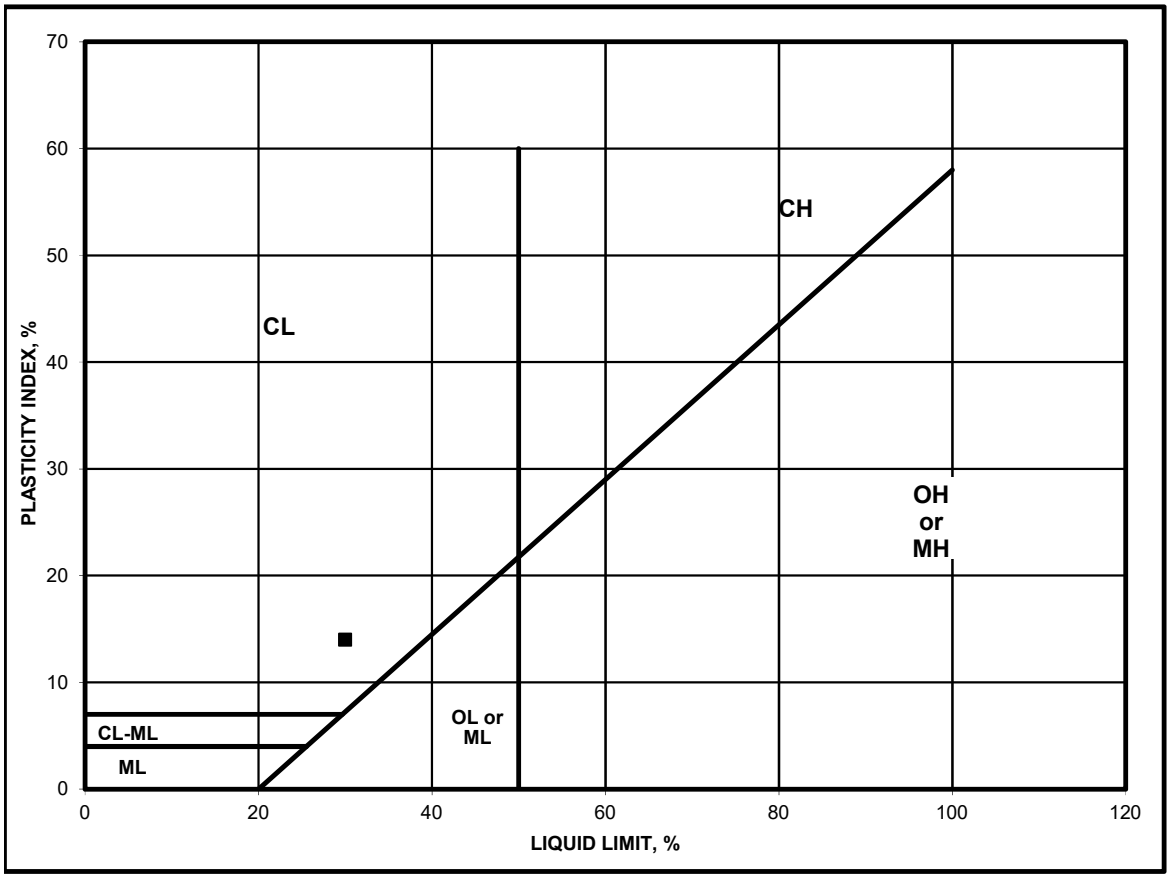
Project Name: Proposed Industrial Storage Facility - Santa Ana, CA
Project Number: 3-223-0252
Date Sampled: 3/29/2023 Date Tested: 4/7/2023
Sampled By: CC Tested By: M. Noorzay
Sample Location: B-1 @ 30'

Run Number	Plastic Limit			Liquid Limit		
	1	2	3	1	2	3
Weight of Wet Soil & Tare	31.43	31.25	31.34	39.63	39.54	39.43
Weight of Dry Soil & Tare	29.95	29.82	29.87	35.48	35.24	34.90
Weight of Water	1.48	1.43	1.47	4.15	4.30	4.53
Weight of Tare	20.83	20.82	20.82	20.73	20.83	20.71
Weight of Dry Soil	9.12	9.00	9.05	14.75	14.41	14.19
Water Content	16.2	15.9	16.2	28.1	29.8	31.9
Number of Blows				35	25	15

Plastic Limit : 16 **Liquid Limit : 30**

Plasticity Index : 14

Unified Soil Classification : CL



SALEM engineering group, inc.

CHEMICAL ANALYSIS

SO_4 - Modified CTM 417 & Cl - Modified CTM 417/422

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA
Project Number: 3-223-0252
Date Sampled: 3/29/2023 Date Tested: 4/10/2023
Sampled By: CC Tested By: M. Noorzay
Soil Description: Brown Silty SAND (SM) w/trace Clay and Gravel

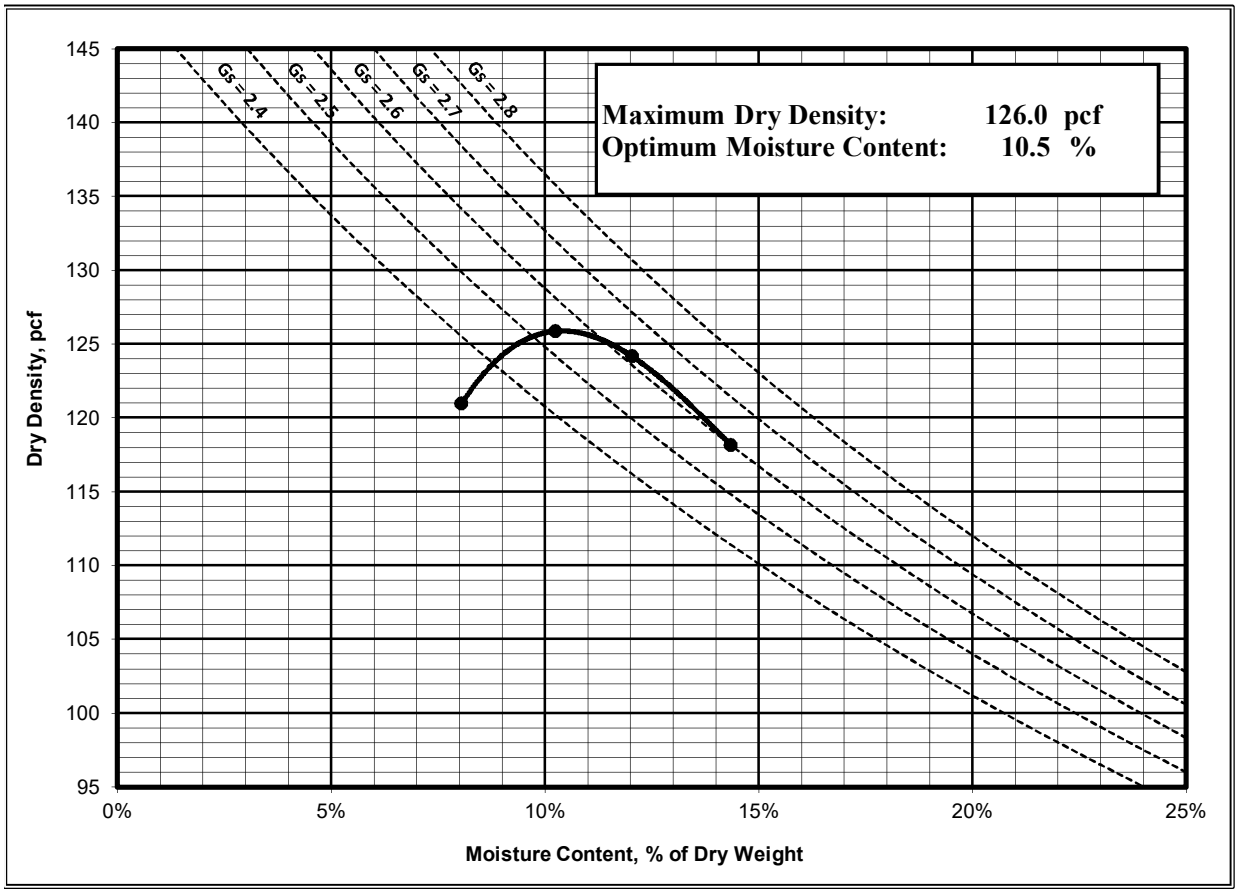
Sample Number	Sample Location	Soluble Sulfate SO_4-S	Soluble Chloride Cl	pH
1a.	B-1 @ 1'-4'	590 mg/kg	29 mg/kg	8.2
1b.	B-1 @ 1'-4'	600 mg/kg	29 mg/kg	8.2
1c.	B-1 @ 1'-4'	600 mg/kg	29 mg/kg	8.2
Average:		**597 mg/kg**	**29 mg/kg**	**8.2**

SALEM
engineering group, inc.

Laboratory Compaction Curve
ASTM D1557

Project Name: Proposed Industrial Storage Facility - Santa Ana, CA
Project Number: 3-223-0252
Date Sampled: 3/29/2023 Date Tested: 4/7/2023
Sampled By: CC Tested By: M. Noorzay
Sample Location: B-1 @ 1'-4'
Soil Description: Brown Silty SAND (SM) w/trace Clay and Gravel
Test Method: Method B

	1	2	3	4
Weight of Moist Specimen & Mold, (g)	6256.0	6378.2	6383.3	6322.8
Weight of Compaction Mold, (g)	4280.2	4280.2	4280.2	4280.2
Weight of Moist Specimen, (g)	1975.8	2098.0	2103.1	2042.6
Volume of Mold, (ft^3)	0.0333	0.0333	0.0333	0.0333
Wet Density, (pcf)	130.7	138.8	139.1	135.1
Weight of Wet (Moisture) Sample, (g)	200.0	200.0	200.0	200.0
Weight of Dry (Moisture) Sample, (g)	185.1	181.4	178.5	174.9
Moisture Content, (%)	8.0%	10.3%	12.0%	14.4%
Dry Density, (pcf)	120.9	125.9	124.1	118.1



SALEM engineering group, inc.

Laboratory Test Results by Geotek, Inc. (2021)

SUMMARY OF LABORATORY TESTING

Atterberg Limits

Atterberg limits testing were performed on a bulk sample collected from the site. The tests were performed in general accordance with ASTM D 4318. Results of these tests are shown on the boring logs at the appropriate sample depths in Appendix A.

Classification

Soils were classified visually in general accordance with the Unified Soil Classification System (ASTM Test Method D 2487). The soil classifications are shown on the logs of borings in Appendix A.

Collapse Test

Collapse tests were performed on selected samples of the site soils in general accordance with ASTM D 5333 test procedures. The results of this test are presented graphically in Appendix B.

Direct Shear

Shear testing was performed on a remolded sample in a direct shear machine of the strain-control type in general accordance with ASTM Test Method D 3080. The rate of deformation is approximately 0.035 inch per minute. The samples were sheared under varying confining loads in order to determine the coulomb shear strength parameters, angle of internal friction and cohesion. The samples were remolded to approximately 90 percent of the maximum dry density as determined by ASTM D 1557 test procedures. The results of the testing are presented in Appendix B.

Expansion Index

Expansion Index testing was performed on two (2) bulk soil samples obtained from the site. Testing was performed in general accordance with ASTM Test Method D 4829. The results of the testing are provided below.

Boring No.	Depth (ft.)	Description	Expansion Index	Classification
B-1	0-5	Silty Clay	48	Low

In-Situ Moisture and Density

The natural water content of sampled soils was determined in general accordance with ASTM D 2216 test procedures on samples of the materials recovered from the subsurface exploration. In addition, in-place dry density of the sampled soils was determined in general accordance with ASTM D 2937 test procedures on relatively undisturbed samples to measure the unit weight of the subsurface soils. Results of these tests are shown on the boring logs at the appropriate sample depths in Appendix A.

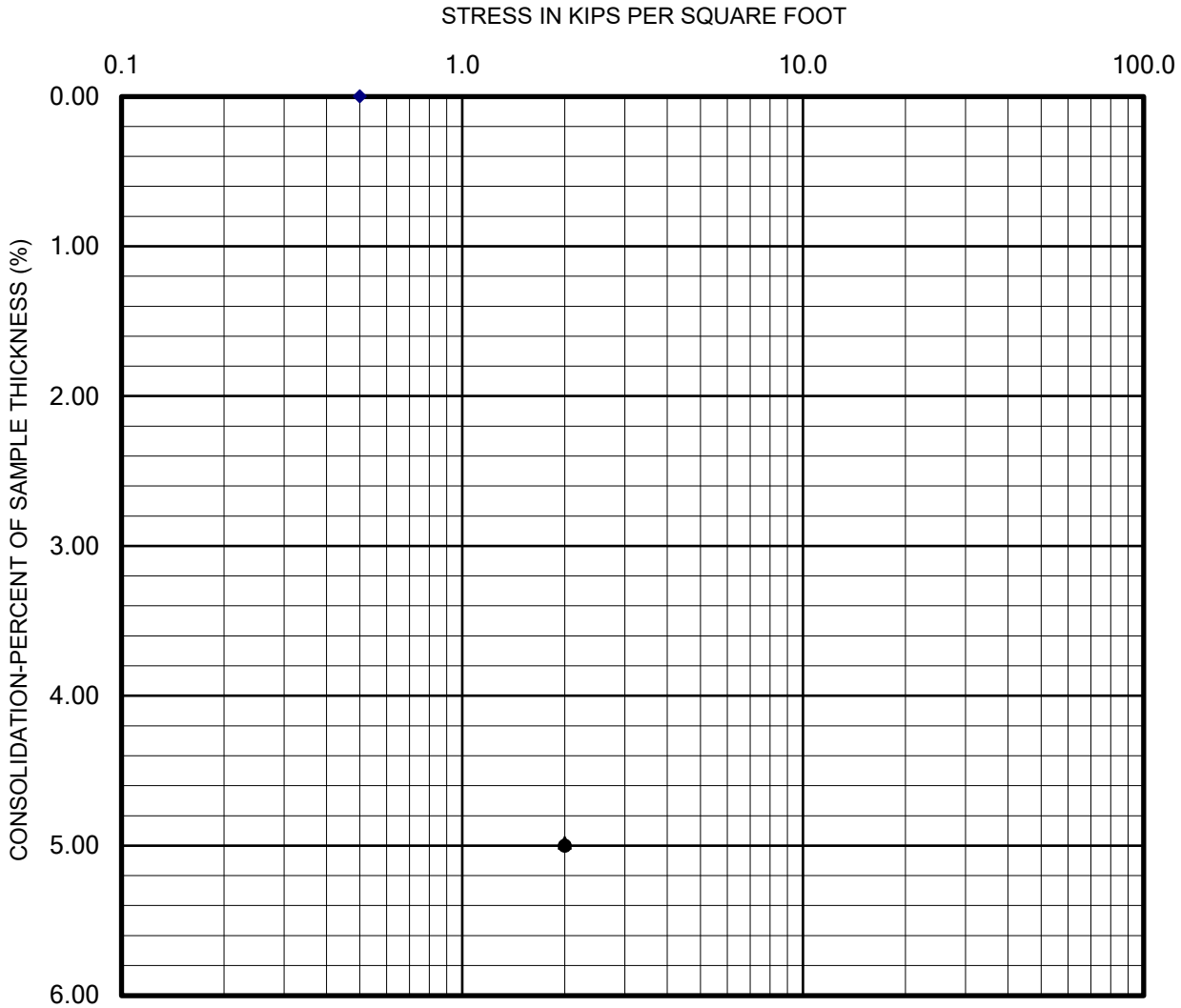
Moisture-Density Relationship

Laboratory testing was performed on one bulk sample collected during the subsurface exploration. The laboratory maximum dry density and optimum moisture content for the soil type was determined in general accordance with test method ASTM Test Procedure D 1557. The results of the testing are provided in Appendix B.

Sulfate Content, Resistivity and Chloride Content

Testing to determine the water-soluble sulfate content was performed by others in general accordance with ASTM D4327 test procedures. Resistivity testing was completed by others in general accordance with ASTM G187 test procedures. Testing to determine the chloride content was performed by others in general accordance with ASTM D4327 test procedures. The results of the testing are provided below and in Appendix B.

Boring No.	Depth (ft.)	pH ASTM D4972	Chloride ASTM D4327 (mg/kg)	Sulfate ASTM D4327 (% by weight)	Resistivity ASTM G187 (ohm-cm)
B-5	0-5	8.2	17.6	0.0331	1,273



Seating Cycle
Loading Prior to Inundation
Loading After Inundation
Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

GEOTEK

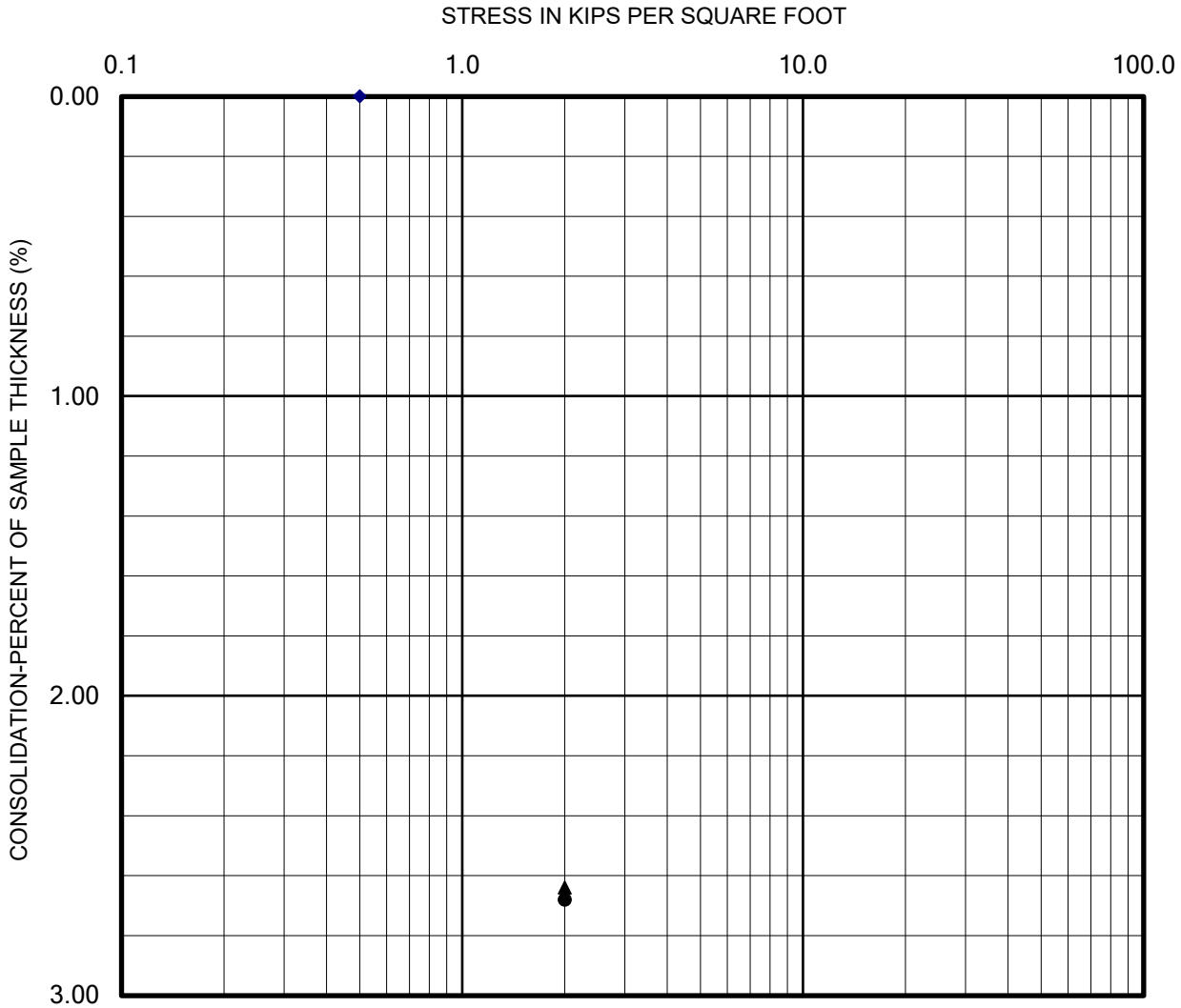
CHECKED BY: RJ	Lab: Corona
PROJECT NO.: 2881-CR	Date: 9-23-21

COLLAPSE REPORT

Sample: B-2 @ 4 feet

2020 East 1st Street
Santa Ana, California

Plate B-1



Seating Cycle
Loading Prior to Inundation
Loading After Inundation
Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

GEOTEK

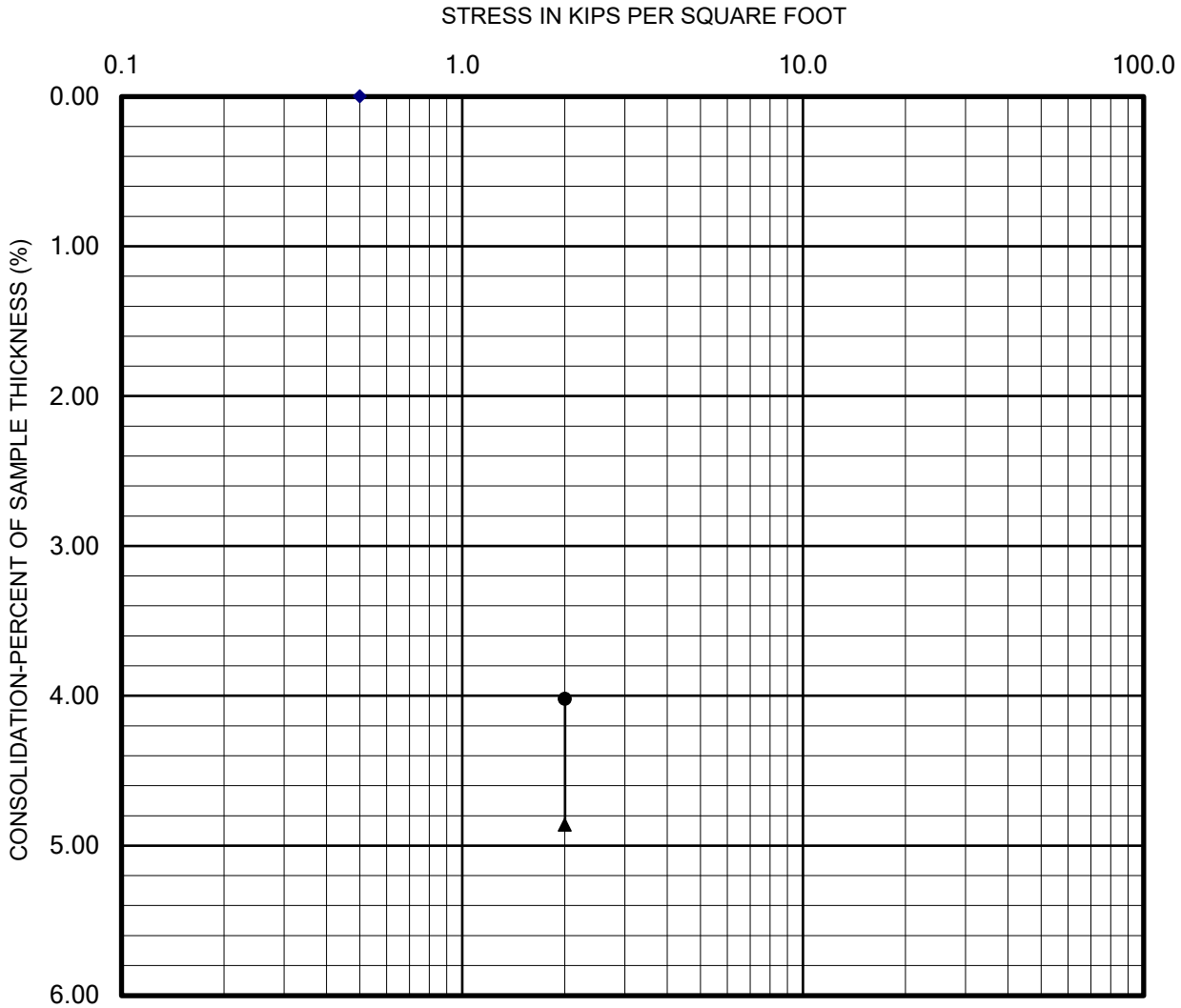
CHECKED BY: RJ	Lab: Corona
PROJECT NO.: 2881-CR	Date: 9-23-21

COLLAPSE REPORT

Sample: B-3 @ 6 feet

2020 East 1st Street
Santa Ana, California

Plate B-2



Seating Cycle
Loading Prior to Inundation
Loading After Inundation
Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

GEOTEK

CHECKED BY: RJ	Lab: Corona
PROJECT NO.: 2881-CR	Date: 9-23-21

COLLAPSE REPORT

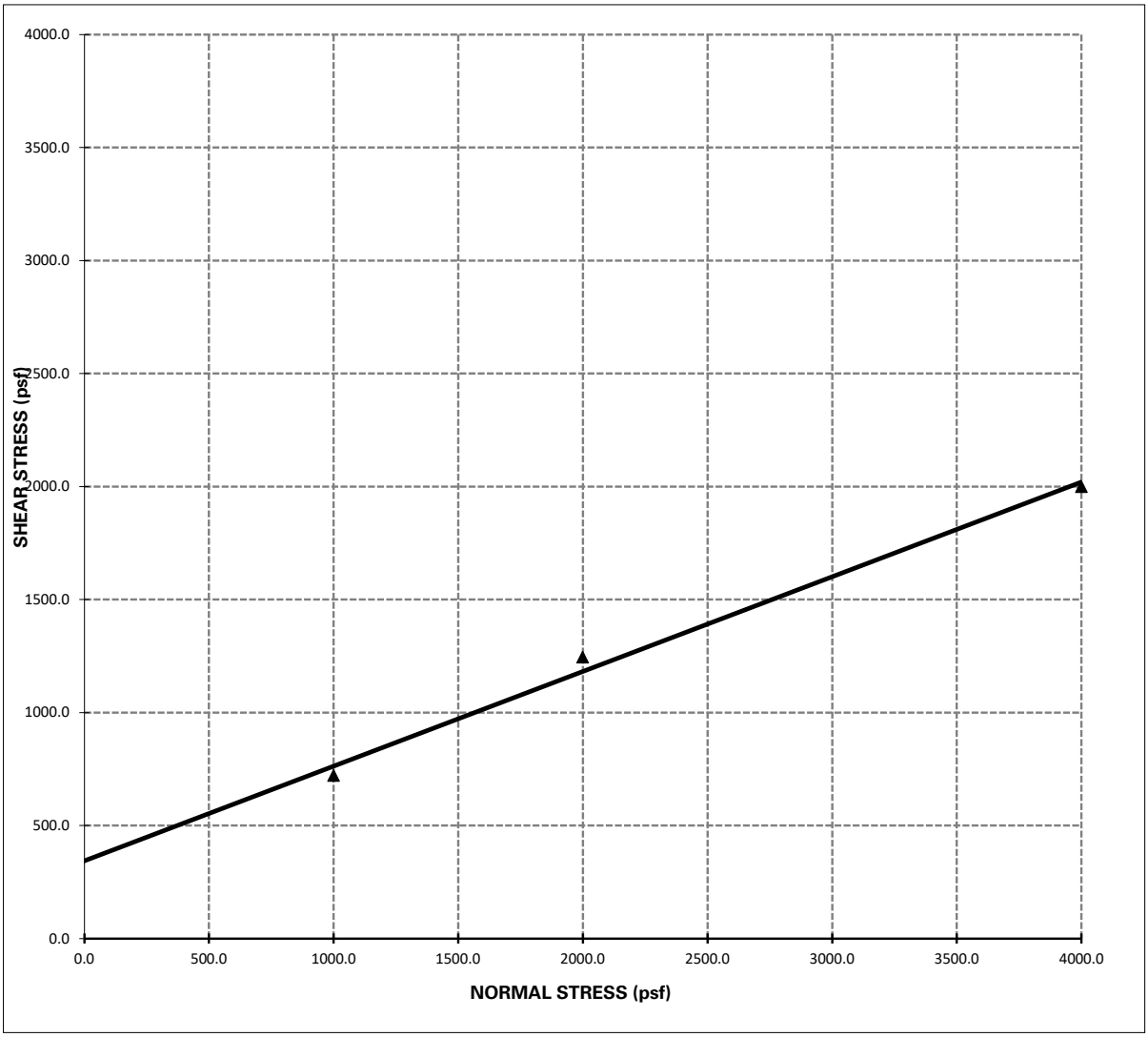
Sample: B-4 @ 5 feet

2020 East 1st Street
Santa Ana, California

Plate B-3

DIRECT SHEAR TEST

Project Name:	Griffin Residential	***Sample Location:***	B1 @ 0-5'
Project Number:	2881-CR	***Date Tested:***	9/28/2021



Shear Strength: Φ = **23°** , **C = 344 psf**

Notes: 1 - The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.

2 - The above reflect direct shear strength at saturated conditions.

3 - The tests were run at a shear rate of 0.035 in/min.

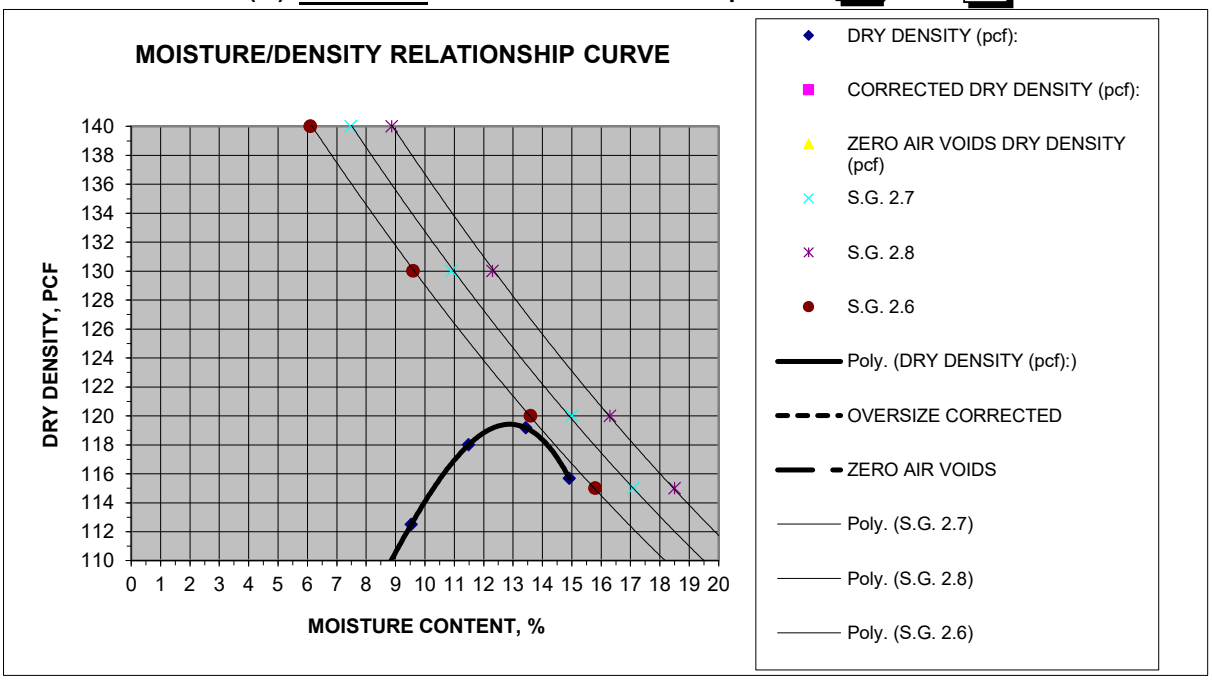
GEOTEK

MOISTURE/DENSITY RELATIONSHIP

Client:	Griffin Residential	**Job No.:**	2881-CR
Project:	2020 East 1st St.	**Lab No.:**	Corona
Location:	Santa Ana, CA		
Material Type:	Brown Silty Sand		
Material Supplier:	-		
Material Source:	-		
Sample Location:	B1 @ 0-5'		
	-		
Sampled By:	GP	**Date Sampled:**	9/15/2021
Received By:	RJ	**Date Received:**	9/15/2021
Tested By:	AD	**Date Tested:**	9/24/2021
Reviewed By:	RJ	**Date Reviewed:**	9/24/2021

Test Procedure: ASTM D1557 **Method:** A

Oversized Material (%): 3.5 **Correction Required:** [ ] yes [x] no



MOISTURE DENSITY RELATIONSHIP VALUES

Maximum Dry Density, pcf	119.5	**@ Optimum Moisture, %**	13.0
Corrected Maximum Dry Density, pcf		**@ Optimum Moisture, %**	

MATERIAL DESCRIPTION

Grain Size Distribution:

	% Gravel (retained on No. 4)
	% Sand (Passing No. 4, Retained on No. 200)
	% Silt and Clay (Passing No. 200)

Atterberg Limits:

	Liquid Limit, %
	Plastic Limit, %
	Plasticity Index, %

Classification:

Unified Soils Classification:

AASHTO Soils Classification:

Soil Analysis Lab Results

Client: GeoTek, Inc.
Job Name: 2020 East 1st Street - Santa Ana
Client Job Number: 2881-CR Griffin Residential
Project X Job Number: S210923A
September 24, 2021

	Method	ASTM D4327		ASTM D4327		ASTM G187		ASTM D4972	ASTM G200	ASTM D4658	ASTM D4327	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D4327	ASTM D4327
Bore# / Description	**Depth**	**Sulfates** SO_4^{2-}		**Chlorides** Cl^-		**Resistivity** As Rec'd | Minimum		**pH**	**Redox**	**Sulfide** S^{2-}	**Nitrate** NO_3^-	**Ammonium** NH_4^+	**Lithium** Li^+	**Sodium** Na^+	**Potassium** K^+	**Magnesium** Mg^{2+}	**Calcium** Ca^{2+}	**Fluoride** F_2^{--}	**Phosphate** PO_4^{3-}
	(ft)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(Ohm-cm)	(Ohm-cm)		(mV)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
2881-CR B5 @	0-5	331.0	0.0331	17.6	0.0018	2,680	1,273	8.2	208	<0.01	54.3	13.2	0.01	86.5	8.4	19.3	106.7	1.6	0.7

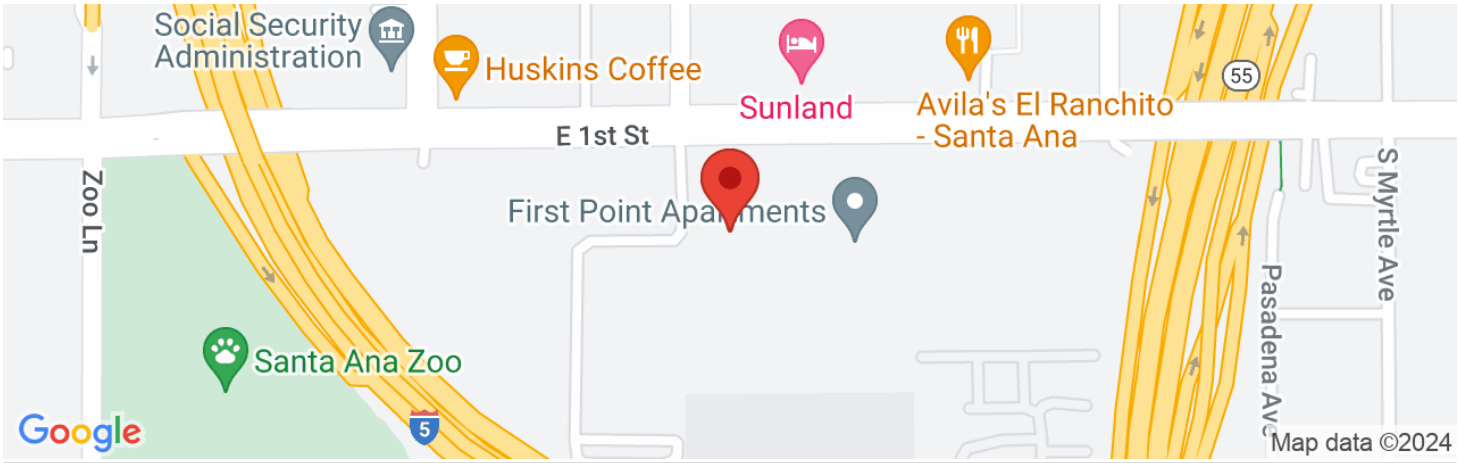
Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown
Chemical Analysis performed on 1:3 Soil-To-Water extract
PPM = mg/kg (soil) = mg/L (Liquid)

Appendix D

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

OSHPD

Latitude, Longitude: 33.74480, -117.83772



Date	2/5/2024, 2:58:32 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.286	MCE_R ground motion. (for 0.2 second period)
S_1	0.459	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.286	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.857	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.539	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.593	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.286	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.375	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.459	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.494	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.562	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.539	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.935	Mapped value of the risk coefficient at short periods
C_{R1}	0.928	Mapped value of the risk coefficient at a period of 1 s
C_V	1.357	Vertical coefficient

DISCLAIMER

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U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new USGS Earthquake Hazard Toolbox for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

Input

Edition

Dynamic: Conterminous U.S. 2014 (updat…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

33.7448

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

-117.83772

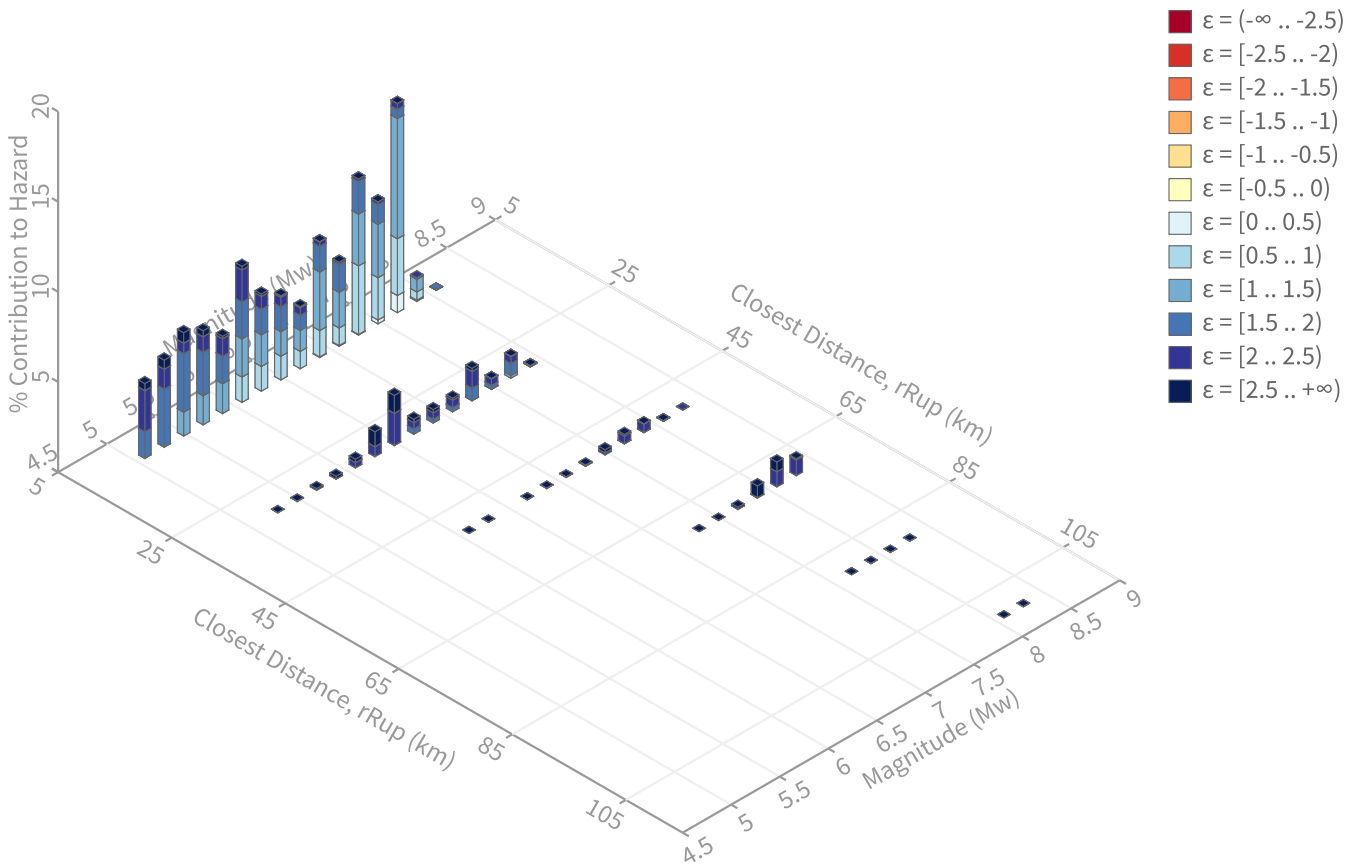
Site Class

259 m/s (Site class D)

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.63681319 g

Recovered targets

Return period: 3065.7108 yrs
Exceedance rate: 0.00032618863 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.07 %

Mean (over all sources)

m: 6.68
r: 15.75 km
ε_0: 1.59 σ

Mode (largest m-r bin)

m: 7.71
r: 14.62 km
ε_0: 1.15 σ
Contribution: 11.6 %

Mode (largest m-r-ε_0 bin)

m: 7.71
r: 16.94 km
ε_0: 1.33 σ
Contribution: 6.67 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							29.56
San Joaquin Hills [0]		9.02	7.19	1.00	117.845°W	33.669°N	184.74	5.20
Whittier alt 2 [2]		18.32	7.60	1.51	117.746°W	33.891°N	27.50	3.64
Compton [0]		16.95	7.28	1.11	118.043°W	33.702°N	256.15	2.95
Newport-Inglewood alt 2 [1]		16.05	7.50	1.39	117.974°W	33.657°N	232.36	2.36
Peralta Hills [0]		10.44	7.34	1.12	117.814°W	33.835°N	12.34	1.95
Elsinore (Glen Ivy) rev [0]		24.76	6.61	2.44	117.590°W	33.829°N	67.71	1.73
Anaheim [0]		11.54	6.90	1.16	117.943°W	33.780°N	292.09	1.57
Chino alt 2 [2]		22.55	7.04	1.95	117.634°W	33.882°N	50.80	1.34
Richfield [1]		15.91	6.40	2.03	117.862°W	33.883°N	351.81	1.09
UC33brAvg_FM31	System							28.21
San Joaquin Hills [0]		9.02	7.54	0.83	117.845°W	33.669°N	184.74	4.22
Whittier alt 1 [2]		18.38	7.51	1.56	117.740°W	33.888°N	29.45	3.92
Compton [0]		16.95	7.22	1.13	118.043°W	33.702°N	256.15	2.76
Newport-Inglewood alt 1 [0]		16.13	7.48	1.39	117.976°W	33.658°N	232.99	2.51
Peralta Hills [0]		10.44	6.99	1.34	117.814°W	33.835°N	12.34	2.12
Elsinore (Glen Ivy) rev [0]		24.76	6.63	2.42	117.590°W	33.829°N	67.71	1.72
Anaheim [0]		11.54	6.85	1.19	117.943°W	33.780°N	292.09	1.55
Chino alt 1 [4]		19.55	6.82	1.98	117.629°W	33.876°N	52.80	1.52
UC33brAvg_FM31 (opt)	Grid							21.16
PointSourceFinite: -117.838, 33.812		8.69	5.74	1.56	117.838°W	33.812°N	0.00	3.62
PointSourceFinite: -117.838, 33.812		8.69	5.74	1.56	117.838°W	33.812°N	0.00	3.62
PointSourceFinite: -117.838, 33.803		7.73	5.85	1.38	117.838°W	33.803°N	0.00	2.62
PointSourceFinite: -117.838, 33.803		7.73	5.85	1.38	117.838°W	33.803°N	0.00	2.62
PointSourceFinite: -117.838, 33.821		9.07	5.89	1.55	117.838°W	33.821°N	0.00	1.69
PointSourceFinite: -117.838, 33.821		9.07	5.89	1.55	117.838°W	33.821°N	0.00	1.69
UC33brAvg_FM32 (opt)	Grid							21.07
PointSourceFinite: -117.838, 33.812		8.71	5.73	1.57	117.838°W	33.812°N	0.00	3.59
PointSourceFinite: -117.838, 33.812		8.71	5.73	1.57	117.838°W	33.812°N	0.00	3.59
PointSourceFinite: -117.838, 33.803		7.74	5.85	1.38	117.838°W	33.803°N	0.00	2.64
PointSourceFinite: -117.838, 33.803		7.74	5.85	1.38	117.838°W	33.803°N	0.00	2.64
PointSourceFinite: -117.838, 33.821		9.08	5.88	1.55	117.838°W	33.821°N	0.00	1.65
PointSourceFinite: -117.838, 33.821		9.08	5.88	1.55	117.838°W	33.821°N	0.00	1.65

Appendix E

Percolation Test Worksheet

Project: **Proposed Industrial Storage Facility**
2020 E. 1st Street
Santa Ana, California

Job No.: **3-223-0252**
Date Drilled: **3/29/2023**
Soil Classification: **Sandy SILT (ML)**

Hole Radius: 4 in.
Pipe Dia.: 3 in.
Total Depth of Hole: 60 in.

Test Hole No.: **P-1**
Tested by: **CC**
Drilled Hole Depth: **5.0** ft.

Presoaking Date: **3/29/2023**
Test Date: **3/30/2023**

Pipe Stick up: 0.5 ft.

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Infiltration Rate, It (in/hr)
12:10	12:40	5.5	Y	0:30	2.00	2.27	3.24	30	9.3	42.0	38.8	40.4	0.31
12:40	13:10	5.5	N	0:30	2.27	2.51	2.88	30	10.4	38.8	35.9	37.3	0.29
13:10	13:40	5.5	N	0:30	2.51	2.72	2.52	30	11.9	35.9	33.4	34.6	0.28
13:40	14:10	5.5	N	0:30	2.72	2.91	2.28	30	13.2	33.4	31.1	32.2	0.27
14:10	14:40	5.5	N	0:30	2.91	3.09	2.16	30	13.9	31.1	28.9	30.0	0.27
14:40	15:10	5.5	N	0:30	3.09	3.26	2.04	30	14.7	28.9	26.9	27.9	0.27
15:10	15:40	5.5	N	0:30	3.26	3.41	1.80	30	16.7	26.9	25.1	26.0	0.26
15:40	16:10	5.5	N	0:30	3.41	3.55	1.68	30	17.9	25.1	23.4	24.2	0.26
16:10	16:40	5.5	N	0:30	3.55	3.68	1.56	30	19.2	23.4	21.8	22.6	0.25
16:40	17:10	5.5	N	0:30	3.68	3.80	1.44	30	20.8	21.8	20.4	21.1	0.25
17:10	17:40	5.5	N	0:30	3.80	3.91	1.32	30	22.7	20.4	19.1	19.7	0.24
17:40	18:10	5.5	N	0:30	3.91	4.02	1.32	30	22.7	19.1	17.8	18.4	0.26
											Infiltration Rate		**0.24**

SALEM engineering group, inc.

Percolation Test Worksheet

Project: **Proposed Industrial Storage Facility**
2020 E. 1st Street
Santa Ana, California

Job No.: **3-223-0252**
Date Drilled: **3/29/2023**
Soil Classification: **Silty SAND (SM)**

Hole Radius: 4 in.
Pipe Dia.: 3 in.
Total Depth of Hole: 117 in.

Test Hole No.: **P-2**
Tested by: **CC**
Drilled Hole Depth: **9.75** ft.

Presoaking Date: **3/29/2023**
Test Date: **3/30/2023**

Pipe Stick up: 0.5 ft.

Time Start	Time Finish	Depth of Test Hole (ft)#	Refill- Yes or No	Elapsed Time (hrs:min)	Initial Water Level# (ft)	Final Water Level# (ft)	Δ Water Level (in.)	Δ Min.	Meas. Perc Rate (min/in)	Initial Height of Water (in)	Final Height of Water (in)	Average Height of Water (in)	Infiltration Rate, It (in/hr)
12:20	12:50	10.3	Y	0:30	7.50	7.98	5.76	30	5.2	33.0	27.2	30.1	0.72
12:50	13:20	10.3	N	0:30	7.98	8.36	4.56	30	6.6	27.2	22.7	25.0	0.68
13:20	13:50	10.3	N	0:30	8.36	8.68	3.84	30	7.8	22.7	18.8	20.8	0.67
13:50	14:20	10.3	N	0:30	8.68	8.94	3.12	30	9.6	18.8	15.7	17.3	0.65
14:20	14:50	10.3	N	0:30	8.94	9.16	2.64	30	11.4	15.7	13.1	14.4	0.64
14:50	15:20	10.3	N	0:30	9.16	9.35	2.28	30	13.2	13.1	10.8	11.9	0.65
15:23	15:53	10.3	Y	0:30	7.50	7.93	5.16	30	5.8	33.0	27.8	30.4	0.64
15:53	16:23	10.3	N	0:30	7.93	8.30	4.44	30	6.8	27.8	23.4	25.6	0.64
16:23	16:53	10.3	N	0:30	8.30	8.61	3.72	30	8.1	23.4	19.7	21.5	0.63
16:53	17:23	10.3	N	0:30	8.61	8.87	3.12	30	9.6	19.7	16.6	18.1	0.62
17:23	17:53	10.3	N	0:30	8.87	9.09	2.64	30	11.4	16.6	13.9	15.2	0.61
17:53	18:23	10.3	N	0:30	9.09	9.28	2.28	30	13.2	13.9	11.6	12.8	0.62
											Infiltration Rate		**0.61**

SALEM engineering group, inc.

Percolation Data Sheet

Project Name: 2020 E 1st Street
Project Number: 23150-01
Test Hole Number: I-1
Date Excavated: 9/13/2021
Depth (in): 600 Radius (in.): 4
Date Presoak: 9/13/2021
Tested By: GeoTek (2021) Pipe Diameter (in.): 3
Date Tested: 9/14/2021

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	8:12	10	580	589.5	9.5
	8:22				
2	8:24	10	580	589.5	9.5
	8:34				

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
8:36	10	10	580	589.3	9.3	55.5
8:46						
8:48	10	22	580	589.0	9.0	54.0
8:58						
9:00	10	34	580	589.0	9.0	54.0
9:10						
9:12	10	46	580	589.0	9.0	54.0
9:22						
9:24	10	58	580	588.8	8.8	52.5
9:34						
9:36	10	70	580	588.8	8.8	52.5
9:46						

Initial Height of Water (Ho) = 20.0
Final Height of Water (Hf) = 11.3
Change in Height Over Time (ΔH) = 8.8
Average Head Over Time (Havg) = 15.6
Annulus Gravel/Sand Correction (C) = 0.5

$I_t = \Delta H(60r)/\Delta t(r+2Havg)$

I_t = 6.0 in./hr.

C x I_t = **3.0** **in./hr.**

Percolation Data Sheet

Project Name: 2020 E 1st Street
Project Number: 23150-01
Test Hole Number: I-2
Date Excavated: 9/13/2021
Depth (in): 600 Radius (in.): 4
Date Presoak: 9/13/2021
Tested By: GeoTek (2021) Pipe Diameter (in.): 3
Date Tested: 9/14/2021

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	9:52	10	580	589.3	9.3
	10:02				
2	10:04	10	580	589.3	9.3
	10:14				

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
10:16	10	10	580	589.0	9.0	54.0
10:26						
10:28	10	22	580	589.0	9.0	54.0
10:38						
10:40	10	34	580	588.8	8.8	52.5
10:50						
10:52	10	46	580	588.8	8.8	52.5
11:02						
11:04	10	58	580	588.8	8.8	52.5
11:14						
11:16	10	70	580	588.5	8.5	51.0
11:26						

Initial Height of Water (Ho) = 20.0
Final Height of Water (Hf) = 11.5
Change in Height Over Time (ΔH) = 8.5
Average Head Over Time (Havg) = 15.8
Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)
I_t= 5.7 in./hr.
C x I_t = **2.9** **in./hr.**

Percolation Data Sheet

Project Name: 2020 E 1st Street
Project Number: 23150-01
Test Hole Number: I-3
Date Excavated: 9/13/2021
Depth (in): 600 Radius (in.): 4
Date Presoak: 9/13/2021
Tested By: GeoTek (2021) Pipe Diameter (in.): 3
Date Tested: 9/14/2021

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	11:32	10	580	589.3	9.3
	11:42				
2	11:44	10	580	589.0	9.0
	11:54				

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
11:56	10	10	580	589.0	9.0	54.0
12:06						
12:08	10	22	580	588.8	8.8	52.5
12:18						
12:20	10	34	580	588.8	8.8	52.5
12:30						
12:32	10	46	580	588.5	8.5	51.0
12:42						
12:44	10	58	580	588.5	8.5	51.0
12:54						
12:56	10	70	580	588.5	8.5	51.0
13:06						

Initial Height of Water (Ho) = 20.0
Final Height of Water (Hf) = 11.5
Change in Height Over Time (ΔH) = 8.5
Average Head Over Time (Havg) = 15.8
Annulus Gravel/Sand Correction (C) = 0.5

$I_t = \Delta H(60r)/\Delta t(r+2Havg)$

$I_t =$ 5.7 in./hr.

$C \times I_t =$ **2.9** **in./hr.**

Percolation Data Sheet

Project Name: 2020 E 1st Street
Project Number: 23150-01
Test Hole Number: I-4
Date Excavated: 9/13/2021
Depth (in): 600 Radius (in.): 4
Date Presoak: 9/13/2021
Tested By: GeoTek (2021) Pipe Diameter (in.): 3
Date Tested: 9/14/2021

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	13:12	10	580	589.5	9.5
	13:22				
2	13:24	10	580	589.3	9.3
	13:34				

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
13:36	10	10	580	589.3	9.3	55.5
13:46						
13:48	10	22	580	589.0	9.0	54.0
13:58						
14:00	10	34	580	589.0	9.0	54.0
14:10						
14:12	10	46	580	588.8	8.8	52.5
14:22						
14:24	10	58	580	588.8	8.8	52.5
14:34						
14:36	10	70	580	588.8	8.8	52.5
14:46						

Initial Height of Water (Ho) = 20.0
Final Height of Water (Hf) = 11.3
Change in Height Over Time (ΔH) = 8.8
Average Head Over Time (Havg) = 15.6
Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)
I_t= 6.0 in./hr.
C x I_t = **3.0** **in./hr.**

Appendix F

APPENDIX F

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 GENERAL

1.1 **Intent:** These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these general Specifications. Observations of the earthwork by the project Geotechnical Consultant during grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 **Geotechnical Consultant:** Prior to commencement of work, the project owner shall employ a geotechnical consultant. The geotechnical consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all keyway bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of subgrade and fill materials and perform adequate relative compaction testing of fill to determine the attained level of compaction and assess if, in their opinion, if the work was performed in substantial compliance

with the geotechnical report(s) and these specifications. The Geotechnical Consultant shall provide test results to the owner on a routine and frequent basis.

1.3 The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with applicable grading codes, the project plans, and these specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork planned for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are corrected.

2.0 PREPARATION OF FILL AREAS

2.1 Clearing and Grubbing: Areas to be excavated and filled shall be cleared and grubbed. Vegetation, such as brush, grass, roots, and other deleterious material, man-made structures, and similar debris shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant. Borrow areas shall be cleared and grubbed to the extent necessary to provide a suitable fill material.

Concrete fragments that are free of reinforcing street may be placed in fills, provided they are placed in accordance with Section 3 and 4. Earth fill material

shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent organic matter. Nesting of organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, etc.) have chemical constituents that are considered hazardous waste. As such, the indiscriminate dumping or spillage of such fluids may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

The Geotechnical Consultant shall not be responsible for the identification or analysis of potentially hazardous materials; however, if observations, odors, or soil discoloration are suspect, the Geotechnical Consultant may request from the owner the termination of grading operations until such materials are deemed not hazardous as defined by applicable laws and regulations.

2.2 **Evaluation/Acceptance of Fill Areas:** All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

2.3 **Processing:** Ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Ground that is not satisfactory shall be removed/overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction. After scarification, the surface should be moisture conditioned, as necessary, to achieve the proper moisture content and compacted in accordance with Section 4 of these specifications.

2.4 **Overexcavation:** In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured, or otherwise unsuitable ground shall be overexcavated to competent ground as recommended by the Geotechnical Consultant during grading.

2.5 **Benching:** Fills to be placed on ground sloping steeper than 5H:1V (horizontal to vertical units) shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for fill placement.

3.0 FILL MATERIAL

3.1 **General:** Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 **Oversize:** Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or other underground construction.

3.3 **Import:** If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1 and/or requirements defined in the project geotechnical report(s). The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before import begins so that suitability can be determined, and appropriate laboratory tests performed.

4.0 FILL PLACEMENT AND COMPACTION

4.1 **Fill Layers:** Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 **Fill Moisture Conditioning:** Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with ASTM International (ASTM Test Method D1557).

4.3 **Compaction of Fill:** After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction and uniformity.

Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

4.4 **Compaction Testing:** Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.5 **Frequency of Compaction Testing:** Tests shall be taken at intervals required by the governing agency and as deemed necessary by the Geotechnical Consultant in order to adequately qualify the fill material. In general, it should be anticipated that tests will be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill, unless recommended otherwise by the Geotechnical Consultant. In addition, test(s) shall be taken on slope faces and/or each 10 feet of vertical height of slope as deemed necessary by the Geotechnical Consultant. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.6 **Compaction Test Locations:** The Geotechnical Consultant shall document the approximate elevation and location of each compaction test. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided. Alternatively, GPS units may be used to determine the approximate location/coordinates of the field density tests.

5.0 SUBDRAIN INSTALLATION

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and standard details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys. The Contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The Contractor is responsible for the performance of subdrains.

6.0 EXCAVATION

Excavations, including over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical report(s) and plans are estimates. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 TRENCH BACKFILLS

7.1 Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

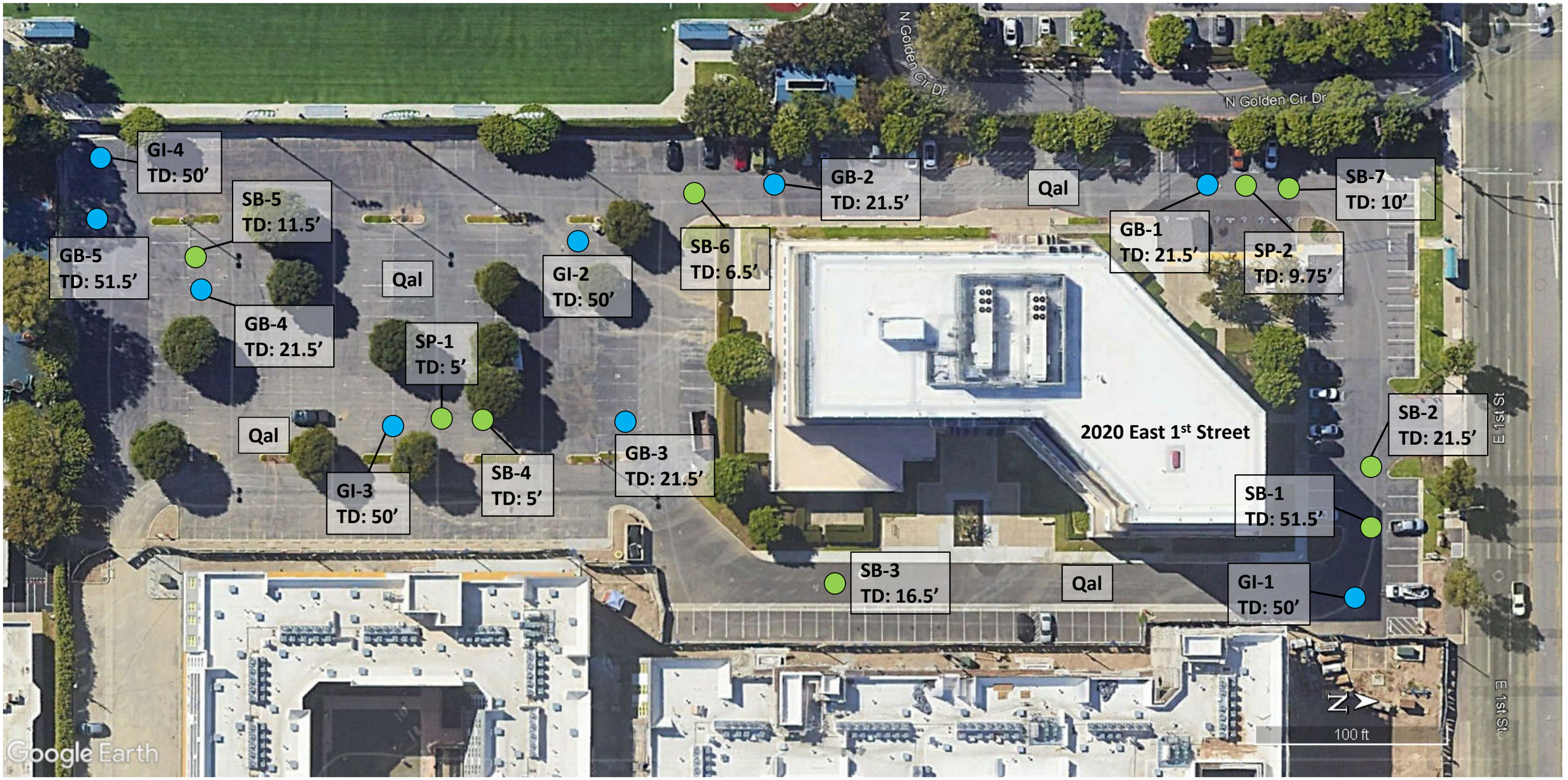
7.2 Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum 90 percent of maximum from 1 foot above the top of the conduit to the surface, except in traveled ways (see Section 7.6 below).

7.3 Jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

7.4 Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill, unless required differently by the governing agency or the Geotechnical Consultant.

7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

7.6 Trench backfill in the upper foot measured from finish grade within existing or future traveled way, shoulder, and other paved areas (or areas to receive pavement) should be placed to a minimum 95 percent relative compaction.



Base Map Source: Google Earth

Legend

SB-7/SP-2 TD: 10’	Approximate Hollow Stem Auger Boring Location/Percolation Test Location (Salem, 2023), Showing Total Depth in Feet.
GB-5/GI-4 TD: 50’	Approximate Hollow Stem Auger Boring or Percolation Test Location (Geotek, 2021), Showing Total Depth in Feet.

Earth Units
Circled Where Buried

Qal Alluvium

GEOTECHNCIAL MAP

Meritage Homes
Proposed Residential Development
2020 East 1st Street
Santa Ana, California

Project Number: 23050-01
Date: February 23, 2024
Plate 1

SA GEOTECHNICAL
OPTIMIZED SOIL ENGINEERING

June 12, 2024

Project No. 23050-01

To: Meritage Homes
5 Peters Canyon Road, Suite 310
Irvine, California 92606

Attention: Ms. Louisa Feletto

Subject: Addendum Geotechnical Report, Supplemental Exploration and Percolation Testing, Proposed 86-Unit Residential Development, 2020 East First Street, Santa Ana, California

INTRODUCTION

In accordance with your request, SA Geotechnical, Inc. (SA GEO) has conducted a supplemental geotechnical study that included subsurface exploration and percolation testing to provide infiltration rates as part of the Water Quality Management Plan (WQMP) preparation for the subject proposed residential development in the City of Santa Ana, California. The purpose of our study was to evaluate the infiltration potential of subsurface soils and provide geotechnical recommendations for design and construction of stormwater infiltration devices.

The scope of services for this study included review of background geologic data and pertinent geotechnical reports and nearby infiltration studies (see Appendix A), subsurface exploration, percolation testing, laboratory testing, analysis, and preparation of this report.

This report summarizes our findings and conclusions and provides infiltration rates and stormwater related geotechnical recommendations that supersede those presented in our prior report (SA GEO, 2024). All other recommendations provided in our prior report remain valid. The geotechnical boring logs (Appendix B), laboratory test results (Appendix C), and percolation test data (Appendix D), are included at the rear of text.

ATTACHMENTS

Appendix A – References
Appendix B – Boring Logs
Appendix C – Laboratory Test Data
Appendix D – Percolation Test Data Sheets

Plate 1 – Geotechnical Map – Rear of Appendices

SCOPE OF SERVICES

Our scope of services for this supplemental study included the following tasks:

- Review of available geologic maps, reports, and data for the subject site and surrounding area. Our review included geotechnical reports and infiltration studies performed near the subject site. A list of references is included in Appendix A.
- Site reconnaissance to identify the existing site conditions and mark boring locations.
- Notification and coordination with DigAlert to identify and clear underground utilities at the boring locations.
- Drilling, logging, and sampling of three hollow-stem auger borings (H-1, P-1, and P-2) to a maximum depth of 66.5 feet below ground surface (bgs). The approximate boring locations are provided on the Geotechnical Map (Plate 1). Boring logs are included in Appendix B.
- Percolation testing in two borings (P-1 and P-2) in general accordance with the County of Orange WQMP Technical Guidance Document and in coordination with the project civil engineer, C&V Consulting, Inc.
- Laboratory testing of selected samples to determine engineering properties of onsite soils, including in-situ moisture and density, grain size distribution, Atterberg limits, expansion potential, and soluble sulfate content. Laboratory test results are included in Appendix C.
- Geotechnical evaluation, analysis, and calculation of infiltration rates.
- Preparation of this report including our findings, conclusions, preliminary recommendations, and accompanying illustrations.

SA GEO's expertise and scope of services do not include assessment of potential subsurface environmental contaminants or environmental health hazards.

SITE LOCATION AND EXISTING CONDITIONS

The subject site is located at 2020 East First Street, Santa Ana, California. The approximately 3.7-acre, rectangular-shaped site is bound by East First Street to the north, an apartment community to the east, a private school to the south, and Golden Circle Drive and a school athletic field to the west. The site is currently developed with a five-story office building, at-grade asphalt paved parking lot with drive aisles, and landscaping/hardscaping throughout the property.

PROPOSED IMPROVEMENTS

Based on our review of the Conceptual Site Plan, the overall development is proposed to include construction of 12 multifamily buildings (4-story) with a total of 86 units. Per our communications with the project civil engineer, C&V Consulting, Inc., we understand that the preliminary WQMP is proposed to include stormwater infiltration devices (drywells) within the southwesterly portion of the site, between 40 and 60 feet below existing grade.

PRIOR GEOTECHNICAL STUDIES AND PERCOLATION TESTING

As part of our study, we have reviewed relevant geotechnical studies and percolation testing that was performed in the vicinity of the site in addition to the preliminary design report we had prepared for the project (SA GEO, 2024). The reports reviewed are summarized in Appendix A and included sites adjacent to the subject site (2110 and 2114 E. First Street) and in the vicinity of the site (1814 and 1818 E. First Street). These studies included eight total percolation tests at depths ranging from 40 to 55 feet bgs. The measured infiltration rates obtained from these studies ranged from 3.8 to 11.2 inches per hour (no factor of safety applied).

GEOTECHNICAL EXPLORATION

Our subsurface geotechnical exploration was performed on May 20, 2024, and consisted of drilling three 8-inch-diameter, hollow-stem auger borings (H-1, P-1, and P-2) to a maximum depth of 66.5 feet below ground surface (bgs). Borings were geotechnically logged, and samples were collected at selected intervals. Borings P-1 and P-2 were also used to perform percolation testing on May 21, 2024, and were backfilled with soil cuttings and sand at the completion of testing. The pavement was patched with quick-set concrete. The approximate boring locations are shown on Plate 1. Boring logs are included in Appendix B.

Relatively undisturbed ring samples were obtained from the exploratory borings with a 2.5-inch inside-diameter, split-barrel sampler. The samplers were driven into the soil with a 140-pound automatic safety hammer, free-falling 30-inches. The drive samples were also used to obtain a measure of resistance of the soil to penetration (recorded as blows-per-foot on our geotechnical boring logs). Bulk samples were also collected during drilling.

GEOLOGIC SETTING

The subject site is located in the western portion of the Tustin Plain, approximately 4 miles east of the Santa Ana River, within the Peninsular Ranges geomorphic province of Southern California. The site is mapped by the United States Geologic Survey (2006) as underlain by extensive Quaternary-age alluvial fan (Qal) deposits. The alluvium encountered during this and prior explorations generally consisted of brown, reddish brown, and brownish silty/clayey sand, and clean fine to coarse-grained gravelly sands, with local sandy clay and clayey sand layers. The near surface soils are generally fine-grained sandy silts and clays.

GEOTECHNICAL CONDITIONS

The following includes the geotechnical conditions based on this supplemental subsurface exploration and laboratory testing conducted by SA GEO. Prior laboratory test data by others, provided in the referenced report (SA GEO, 2024), are not repeated/included herein. Laboratory test results from this study are included in Appendix C.

Native alluvial soils had in-situ moisture content and dry densities ranging from 1.7 to 31.7 percent and 83.6 to 124.6 pounds per cubic foot (pcf), respectively. Blow counts in the alluvial materials

ranged from 5 to 70+ blows per foot. Alluvial soils were generally found to be damp to very moist and medium dense to very dense/medium stiff to stiff.

Grain-size distribution tests were conducted on one bulk sample collected from the uppermost 5 feet and four ring samples collected at depths of 40, 43, and 47 feet. The bulk sample was classified in accordance with the Unified Soil Classification System (USCS) as silty clay (CL), with a fines content (passing No. 200 sieve) of 88 percent. The ring samples were found to have fines contents of 85 percent (40-foot-deep sample, Boring P-1), 67 percent (43-foot-deep sample, Boring P-1), 8 percent (43-foot-deep sample, Boring P-2), and 2 percent (47-foot-deep sample, Boring P-2) and were given USCS classifications of sandy silt (ML), sand with silt (SP-SM), and sand (SP).

Soil plasticity testing was performed on the bulk sample collected from the uppermost 5 feet and was classified as silty lean clay (CL) with a Plasticity Index (PI) of 16 and Liquid Limit (LL) of 38 percent. Plasticity testing was also performed on the fines portion of two ring samples collected at depths of 5 and 25 feet. The 5-foot sample was classified as silty sandy clay (CL) with a PI of 9 and an LL of 25. The 25-foot sample had less than 50 percent fines, was determined to be non-plastic, and classified and silty sand (SM).

One bulk sample collected from the uppermost 5 feet was tested to determine the expansion potential of the onsite alluvial materials. The sample had an Expansion Index of 72, indicating a "Medium" expansion potential. The soluble sulfate content of the soil was also measured from the same bulk sample. Soluble sulfate content testing indicates the samples may be classified as "S0" per Table 19.3.1.1 of ACI-318-14.

GROUNDWATER

Groundwater was not encountered during this or prior subsurface exploration to a maximum depth of 66.5 feet. Historic high groundwater mapping indicates that groundwater has remained deep below the site, in excess of 40 feet (CDMG, 1998). We have also reviewed groundwater data available through the GeoTracker database for several sites near the subject site. The data indicates groundwater in the vicinity of the site ranges from 63 to 89 feet bgs for monitoring periods between 2002 to 2013. A summary table of the nearby sites reviewed on GeoTracker website/database is provided below.

Site Address	*Distance from Subject Site (mi)*	*Monitoring Period*	*Depth to Groundwater Range (feet bgs)*
320 N Tustin Avenue	0.25	2002 - 2003	83.4 to 85.5
325 N Tustin Avenue	0.30	2003 - 2006	76.9 to 86.3
401 N Tustin Avenue	0.32	2005 - 2013	73.3 to 89.0
1601 E First Street	0.51	2001 - 2007	63.4 to 78.2
395 W First Street	0.58	2002 - 2010	66.9 to 81.2

PERCOLATION TESTING AND INFILTRATION RATE CALCULATION

Percolation testing was performed in Borings P-1 and P-2 on May 21, 2024, in general accordance with the County of Orange WQMP Technical Guidance Document (TGD) (2013). The Percolation Test Method was utilized as outlined in the County of Orange WQMP TGD. Two-inch diameter slotted well pipe and #3 select sand backfill (annular space) were constructed within the hollow-stem auger to prevent caving of the sandy soils during auger extraction and percolation testing. The borings were presoaked and tested to confirm onsite soils fell under the "Sandy Soil" criteria as defined in the guidance documents. Test results were tabulated, and final measurements were used to calculate the infiltration rate per the WQMP TGD.

The County of Orange TGD does not include calculation adjustments to account for the presence of the annular backfill material described above, which, in our experience, overestimates infiltration rates. We have used a correction factor to account for the volume loss due to the annular material, based on the porosity of the select material (#3 sand), the pipe diameter, and the boring diameter. The correction factor (0.4) is noted on the percolation test data sheets (Appendix D).

The calculated infiltration rates are provided below, which include the correction factor discussed above; however, the rates below do not include a factor of safety reduction. A discussion of the design infiltration rates, including required factory of safety, is provided in the following Conclusion and Recommendations Section. The infiltration test results are considered representative of the location and depths the tests were performed.

TABLE 1 – PERCOLATION TEST RESULTS

Boring No.	***Tested Depth (Below Ground Surface)***	***Calculated Infiltration Rate (in./hr.)***
P-1	38.75 to 45	0.63
P-2	40 to 50	75.0

The percolation test results and calculated infiltration rates were found to vary widely with depth of testing. Borings H-1 and P-2 encountered clean sands with gravel (SP, SP-GP) between depths of 45 and 60 feet bgs, resulting in a very high infiltration rate while Boring P-2 encountered fine grained soils to nearly the total depth (44 feet bgs).

CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS

1. General Conclusion

Based on our findings, stormwater infiltration at the subject site is considered feasible from a geotechnical standpoint provided the recommendations included in this report are implemented during design, grading, and construction. The specific recommendations provided in this report supersede those previously reported (SA GEO, 2024); other recommendations previously provided, not included or revised herein, remain valid and should be implemented during design, grading and construction of the site. The recommendations in this report are considered minimum and may be superseded by more stringent requirements of others.

The following recommendations are considered preliminary and should be reviewed and revised as needed once the WQMP is prepared and available for review by SA GEO.

2. Groundwater

Based on our subsurface exploration and review of the prior geotechnical reports and existing groundwater data for the vicinity, the groundwater is anticipated to be more than 65 feet bgs at the site. Proposed infiltration systems will need to meet the required minimum separation from high groundwater (10 feet) per the County of Orange WQMP TGD. Thus, stormwater infiltration should not be performed deeper than 55 feet bgs.

3. Settlement/Hydroconsolidation Potential

The conclusions pertaining to settlement potential provided in the prior report (SA GEO, 2024) remain valid. Based on the recent and prior boring and laboratory test data, we anticipate that introduction of stormwater to the subsurface will have a negligible contribution to the overall settlement potential of onsite soils. We recommend that stormwater infiltration devices have a minimum setback of 10 feet from building foundations.

SA GEO should be provided with the foundation plans and structural loads, once available, in order to further evaluate the potential for post-construction settlement of proposed buildings and associated improvements. The parameters previously provided will then be confirmed/updated based on the planned foundations and loads and analysis.

4. Stormwater Infiltration Feasibility

Based on our evaluation and analysis as described herein, we conclude that onsite stormwater infiltration is geotechnically feasible with deep drywell systems. We recommend using the infiltration data obtained from Boring P-2 test location, which is consistent with the soil data obtained from Boring H-1, for drywalls within the southwestern portion of the site that are 50 to 55 feet deep. Considering the variability of onsite soils, we recommend a factor-of-safety of 10 be applied to the calculated rate. The project civil engineer should determine if additional factors-of-safety are appropriate; however, this should be collaborated with SA GEO during design.

Assuming a factor-of-safety of 10 is applied, a design infiltration rate of **7 inches per hour** may be used for design of infiltration systems (drywalls) that are 50 to 55 feet deep and installed within the southwestern portion of the site (near the test location Boring P-2).

Infiltration systems should be constructed per the recommendations outlined in the County of Orange WQMP TGD. Special care should be taken to limit disturbance to native soils utilized as the infiltration surface such that the infiltration performance is not adversely impacted. We recommend that the infiltration systems have a minimum setback of 10 feet from any building foundations. Proper and routine maintenance should be provided for the infiltration systems in accordance with the TGD and manufacturer's recommendations.

Proposed stormwater infiltration systems should be reviewed by the geotechnical consultant during design to verify conformance with the recommendations provided herein. SA GEO should also observe and evaluate the subsurface soil conditions during excavation for installation devices to confirm the subsurface soil conditions. Additionally, the drywell systems should be tested after installation to verify that the design infiltration rate is achieved.

5. Geotechnical Review of Future Plans

The WQMP should be provided to the geotechnical consultant for review and to verify conformance with the recommendations provided herein. Additional recommendations should be provided upon our review and as needed.

LIMITATIONS

This report has been prepared for the exclusive use of our client, Meritage Homes, within the scope of services requested by our client for the proposed improvements described herein. This report or its contents should not be used or relied upon for other projects or purposes, or by other parties without the acknowledgement of SA GEO and the consultation of a geotechnical professional. The means and methods used by SA GEO for this study are based on local geotechnical standards of practice, care, and requirements of governing agencies. No warranty or guarantee, expressed or implied, is given.

Our findings, conclusions, and recommendations are professional opinions based on interpretations and inferences made from geologic and engineering data from specific locations and depths, observed or collected at a given time. By nature, geologic conditions can vary from point to point, can be very different in-between exploration points, and can also change over time. Our conclusions and recommendations are, by nature, preliminary and subject to verification and/or modification during grading and construction when more subsurface data is exposed.

If you have any questions regarding this report, please contact our office. We appreciate the opportunity to provide our services.

Respectfully submitted,

SA GEOTECHNICAL, INC.

Anthony Zepeda, CEG 2681
Project Geologist

Reza Saberi, GE 3071
Principal Engineer

Peter Anderson, CEG 2596
Principal Engineering Geologist

AZ/RS/PA

Distribution: (1) Addressee (E-mail)
(1) Joy Hendricks, C&V Consulting, Inc. (E-mail)

Appendix A

APPENDIX A

REFERENCES

Alta California Geotechnical, Inc., 2023, Summary of Additional Infiltration Testing, Cabrillo Project, 1814 and 1818 E. 1st Street, City of Santa Ana, County of Orange, California, Project No. 1-0378, Dated April 14, 2023.

California Division of Mines and Geology (CDMG), 1998, Seismic Hazard Zone Report for the Tustin 7.5-Minute Quadrangle, Orange County, California, Seismic Hazard Zone Report 012.

California Division of Mines and Geology (CDMG), 2001, Seismic Hazard Zones Map, Tustin Quadrangle, Official Map dated January 17, 2001.

California Geological Survey (CGS), 2018, Earthquake Fault Zones, A Guide for Government Agencies, Property Owners / Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California, Special Publication 42, Revised 2018.

California Geological Survey (CGS), 2021, Tsunami Hazard Area Map, County of Orange, California, Official Map dated July 8, 2021.

Jennings, Charles W. and Bryant W.A., 2010, Fault Activity Map of California, Department of Conservation, California Geological Survey, Geologic Data Map No. 6.

NOVA Services, 2019, Updated Drywell Design Review and Historic Local Groundwater Level Assessment, First Point, 2110 and 2114 E. 1st Street Senior Project, Santa Ana, California, Project No. 1376-03, Dated April 22, 2019.

Orange County Public Works (OCPW), 2013, Orange County Watersheds Water Quality Management Plan (WQMP) Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans, Exhibit 7.III, Dated December 20, 2013.

SA Geotechnical, Inc., 2024, Geotechnical Due Diligence Study and Preliminary Geotechnical Recommendations, Proposed 86-Unit Residential Development, 2020 East First Street, Santa Ana, California, Project No. 23050-01, Dated February 23, 2024.

South Coast Geotechnical/NOVA Services, 2017, Geotechnical Engineering Report & Infiltration Study, 2114 E. 1st Street Family and Seniors Project, 2114 E. 1st Street, Santa Ana, California, File No. 1376-03, Dated December 8, 2017.

State of California Water Resources Control Board, 2024, GeoTracker Website, http://geotracker.waterboards.ca.gov/

U.S. Geological Survey, 2006, Geologic Map of the San Bernardino and Santa Ana 30' X 60' Quadrangles, California, dated 2006, Open File Report 2006-1217.

Appendix B

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	*GRAVEL AND GRAVELLY SOILS* MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	*CLEAN GRAVELS* (LITTLE OR NO FINES)	**GW**	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	**GM**	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	*CLEAN SANDS* (LITTLE OR NO FINES)	**SW**	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	**SM**	SILTY SANDS, SAND - SILT MIXTURES
			SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	*SILTS AND CLAYS*	LIQUID LIMIT LESS THAN 50	**ML**	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			**PT**	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Dual symbols are used to indicate gravels or sand with 5-12% fines and soils with fines classifying as CL-ML. Symbols separated by a slash indicate borderline soil classifications.

Sampler and Symbol Descriptions

- Modified California sample (D-#)
- Standard Penetration Test (S-#)
- Shelby tube sample (T-#)
- Large bulk sample (B-#)
- Small bulk sample (SB-#)
- Approximate depth of groundwater during drilling
- Approximate depth of static groundwater

Note: Number of blows required to advance driven sample 12 inches (or length noted).

Laboratory and Field Test Abbreviations

AL	Atterberg limits (plasticity)
CC	Chemical Testing incl. Soluble Sulfate
CN	Consolidation
DS	Direct Shear
EI	Expansion Index
GS	Grain Size Analysis (Sieve, Hydro. and/or -No. 200)
MD	Maximum Density and Optimum Moisture
RV	Resistance Value (R-Value)
SE	Sand Equivalent
UU	Unconsolidated Undrained Shear Strength

Notes:

1. Soil classifications are based on the Unified Soil Classification System and include color, moisture, and relative density or consistency. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate. Bedrock descriptions are based on visual classification and include rock type, moisture, color, grain size, strength, and weathering.
2. Descriptions on these boring logs apply only at the specific boring locations and at the time the borings were drilled. They are not warranted to be representative of subsurface conditions at other locations or times.

S/A

KEY TO LOG OF BORING

Date(s)Drilled: 5-20-2024	**Logged By:** AC/PA	**H-1**
Drilling Method: Hollow Stem	**Drill Bit Size/Type:** 8"	
Drill Rig Type: CME 75	**Hammer Type:** Auto (140lbs @ 30")	Page 1 of 3
Sampling Method(s): Modified California, Bulk		**Total Depth Drilled (ft)** 66.5
Approximate Groundwater Depth: Groundwater Not Encountered.		**Approximate Ground Surface Elevation (ft)**
Comments:		

Depth (ft)	SAMPLES Type Number	SAMPLES Blows Per Foot	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	REMARKS
0	B-1			**Alluvium (Qal)**			B-1 @ 0-5'
	D-1	7	ML	@ 2.5': Brown to reddish brown fine sandy SILT, very moist, medium stiff, root hairs.	19.0	87.0	
5	D-2	11	SM-ML	@ 5': Brown to reddish brown sandy SILT/silty fine SAND, very moist, medium stiff/medium dense, root hairs.	17.9	104.7	
	D-3	13	SM	@ 7.5': Brown silty fine SAND, damp to moist, medium dense, trace coarse gravel.	9.8	116.4	
10	D-4	14	SM	@ 10': Brown silty fine SAND, moist, medium dense, trace fine to coarse gravel and cobbles.	16.3	104.9	
15	D-5	21	SM	@ 15': Brown to reddish brown silty fine SAND, moist, medium dense, soil pores, roots.	13.6	115.5	
20	D-6	23	SM	@ 20': Brown to reddish brown silty fine SAND with coarse gravel, damp, medium dense, trace soil pores.	9.5	118.0	
25	D-7	24	SM	@ 25': Brown to reddish brown silty fine SAND, damp, medium dense, interbeds of fine to coarse clean sand.	9.1	103.4	
30							

Log Of Boring

Meritage Homes
Proposed Residential Development
2020 East 1st Street
Santa Ana, California

Project Number: 23050-01

Appendix B

Date(s)Drilled: 5-20-2024	**Logged By:** AC/PA	**H-1**
Drilling Method: Hollow Stem	**Drill Bit Size/Type:** 8"	
Drill Rig Type: CME 75	**Hammer Type:** Auto (140lbs @ 30")	
Sampling Method(s): Modified California, Bulk		**Total Depth Drilled (ft)** 66.5
Approximate Groundwater Depth: Groundwater Not Encountered.		**Approximate Ground Surface Elevation (ft)**
Comments:		

Depth (ft)	SAMPLES Type Number	SAMPLES Blows Per Foot	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	REMARKS
30	D-8	46	SM	@ 30': Brown to reddish brown silty SAND, damp, dense, soil pores with gray alteration, thin sandy interbeds.	7.5	124.6	
35	D-9	32		@ 35': No sample recovery.			
40	D-10	15	SP	@ 40': Upper: Yellowish brown to reddish brown fine to coarse SAND with coarse gravel, moist, medium dense.	23.8	100.4	
			CL	Lower: Reddish brown sandy CLAY, very moist, stiff.			
45	D-11	71	SP-GP	@ 45': Yellowish gray sandy fine to coarse GRAVEL/gravelly fine to coarse SAND, moist, very dense. – SAMPLE DISTURBED –	1.7		
50	D-12	74	SP	@ 50': Yellowish gray fine to coarse gravelly SAND, damp to moist, friable, very dense.	1.9		
55	D-13	50/ 6"		@ 55': No sample recovery.			
60							

Log Of Boring

Meritage Homes
Proposed Residential Development
2020 East 1st Street
Santa Ana, California

Project Number: 23050-01

Appendix B

Date(s)Drilled: 5-20-2024	**Logged By:** AC/PA	**H-1**
Drilling Method: Hollow Stem	**Drill Bit Size/Type:** 8"	Page 3 of 3
Drill Rig Type: CME 75	**Hammer Type:** Auto (140lbs @ 30")	
Sampling Method(s): Modified California, Bulk		**Total Depth Drilled (ft)** 66.5
Approximate Groundwater Depth: Groundwater Not Encountered.		**Approximate Ground Surface Elevation (ft)**
Comments:		

Depth (ft)	SAMPLES Type Number	SAMPLES Blows Per Foot	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	REMARKS
60	D-14	56	SM	@ 60': Reddish brown to brown silty fine SAND, moist, medium dense.	12.2	117.4	
			SP-SM	@ 61': Reddish brown to brownish gray fine to coarse gravelly SAND with silt, damp to moist, dense.			
65	D-15	28	SC	@ 65': Mottled reddish brown to brownish gray clayey fine SAND with silt, moist to very moist, medium dense.	16.0	114.0	
				Notes: Total Depth: 66.5 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Tamped. Asphalt Patched with Cold Patch Asphalt.			
70							
75							
80							
85							
90							

Log Of Boring

Meritage Homes
Proposed Residential Development
2020 East 1st Street
Santa Ana, California

Project Number: 23050-01

Appendix B

Date(s)Drilled: 5-20-2024	**Logged By:** AC/PA	**P-1** Page 1 of 2
Drilling Method: Hollow Stem	**Drill Bit Size/Type:** 8"	
Drill Rig Type: CME 75	**Hammer Type:** Auto (140lbs @ 30")	
Sampling Method(s): Modified California, Bulk		**Total Depth Drilled (ft)** 45
Approximate Groundwater Depth: Groundwater Not Encountered.		**Approximate Ground Surface Elevation (ft)**
Comments:		

Depth (ft)	SAMPLES Type Number	SAMPLES Blows Per Foot	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	REMARKS
				Surface: 4" AC, 3.5" AB.			
0	B-1			**Alluvium (Qal)**			B-1 @ 0-5'
	D-1	7	SM-ML	@ 2.5': Brown silty fine SAND/sandy SILT, moist, loose/ medium stiff, soil pores, root hairs.	17.6	97.9	
5	D-2	8	SM-ML	@ 5': Brown silty fine SAND/sandy SILT, moist, loose/ medium stiff, soil pores, root hairs, less silty in sampler tip.	16.4	94.2	
	D-3	22	SM	@ 7.5': Brown to reddish brown silty fine SAND with fine to coarse gravel, moist, medium dense.	13.0	105.3	
10	D-4	13	SM	@ 10': Brown to reddish brown silty fine SAND, moist, medium dense, soil pores.	13.0	99.9	
15	D-5	15	SM	@ 15': Brown to reddish brown silty fine SAND, moist, medium dense.	12.7	118.0	
20	D-6	21	SM	@ 20': Brown to reddish brown silty fine SAND, moist, medium dense, soil pores with gray alteration.	17.8	112.9	
25	D-7	23	SM	@ 25': Reddish brown to yellowish brown slightly silty fine to medium SAND, damp, medium dense, trace coarse gravel.	6.8	118.6	
30							

Log Of Boring

Meritage Homes
Proposed Residential Development
2020 East 1st Street
Santa Ana, California

Project Number: 23050-01

Appendix B

Date(s)Drilled: 5-20-2024	**Logged By:** AC/PA	**P-1**
Drilling Method: Hollow Stem	**Drill Bit Size/Type:** 8"	Page 2 of 2
Drill Rig Type: CME 75	**Hammer Type:** Auto (140lbs @ 30")	
Sampling Method(s): Modified California; Bulk		**Total Depth Drilled (ft)** 45
Approximate Groundwater Depth: Groundwater Not Encountered.		**Approximate Ground Surface Elevation (ft)**
Comments:		

Depth (ft)	SAMPLES Type Number	SAMPLES Blows Per Foot	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	REMARKS
30	D-8	33	SM	@30': Reddish brown silty fine SAND, moist, dense, soil pores with gray alteration.	13.6	117.6	
35	D-9	61	SM	@ 35': Upper: Reddish brown to yellowish brown slightly silty fine to medium SAND, damp, dense.	3.3	112.3	
			SP	Lower: Yellowish brown to yellowish gray fine to coarse gravelly SAND, damp, very dense.			
40	D-10	15	ML	@ 40': Reddish brown fine sandy SILT, very moist, stiff.	23.1	98.9	GS
	D-11	50/ 6"	ML	@ 43': Upper: Reddish brown fine sandy SILT, very moist, stiff.	13.5	107.2	GS
45			SP	Lower: Reddish brown to gray fine to coarse gravelly SAND, damp, very dense. – SAMPLE DISTURBED –			
50				Notes: Total Depth: 45 Feet. Groundwater Not Encountered. 10' Slotted; 35' Solid 2" Well Pipe Installed. Annular Backfill with No. 3 Sand. Presoak Performed 5/20/24. Percolation Testing Performed 5/21/24. Pipe Removed and Backfilled with Cuttings/Sand. Asphalt Patched with Quickset.			
55							
60							

Log Of Boring

Meritage Homes
Proposed Residential Development
2020 East 1st Street
Santa Ana, California

Project Number: 23050-01

Appendix B

Date(s)Drilled: 5-20-2024	**Logged By:** AC/PA	**P-2**
Drilling Method: Hollow Stem	**Drill Bit Size/Type:** 8"	Page 1 of 2
Drill Rig Type: CME 75	**Hammer Type:** Auto (140lbs @ 30")	
Sampling Method(s): Modified California, Bulk		**Total Depth Drilled (ft)** 50
Approximate Groundwater Depth: Groundwater Not Encountered.		**Approximate Ground Surface Elevation (ft)**
Comments:		

Depth (ft)	SAMPLES Type Number	SAMPLES Blows Per Foot	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	REMARKS
				Surface: 3" AC, 4.5" AB.			
0	B-1			**Alluvium (Qal)**			B-1 @ 0-5' AL, GS, EI, CC
	D-1	5	CL	@ 2.5': Brown slightly silty CLAY, very moist to wet, soft.	31.7	83.6	
5	D-2	7	CL	@ 5': Brown to reddish brown silty CLAY, moist, medium stiff, trace fine sand.	17.9	106.2	AL
	D-3	19	SP	@ 7.5': Yellowish brown fine to coarse gravelly SAND, moist, medium dense, trace silt.	4.0	107.2	
10	D-4	8	SM-ML	@ 10': Brown to reddish brown silty fine SAND, moist, medium stiff, less silty in sampler tip.	25.1	91.8	
15	D-5	12	SM-ML	@ 15': Brown to reddish brown silty fine SAND/sandy SILT, damp to moist, medium dense/medium stiff.	17.7	107.0	
20	D-6	11	SM-ML	@ 20': Brown to reddish brown silty fine SAND/sandy SILT, moist, medium dense/medium stiff, soil pores.	18.8	106.4	
25	D-7	13	SP-SM	@ 25': Yellowish brown to reddish brown fine to coarse SAND with silt, damp, medium dense, trace coarse gravel.	13.6	106.2	AL
			CL	@ 26': Reddish brown silty CLAY, moist, medium stiff, trace fine sand.			
30							

Log Of Boring

Meritage Homes
Proposed Residential Development
2020 East 1st Street
Santa Ana, California

Project Number: 23050-01

Appendix B

Date(s)Drilled: 5-20-2024	**Logged By:** AC/PA	**P-2**
Drilling Method: Hollow Stem	**Drill Bit Size/Type:** 8"	Page 2 of 2
Drill Rig Type: CME 75	**Hammer Type:** Auto (140lbs @ 30")	
Sampling Method(s): Modified California, Bulk		**Total Depth Drilled (ft)** 50
Approximate Groundwater Depth: Groundwater Not Encountered.		**Approximate Ground Surface Elevation (ft)**
Comments:		

Depth (ft)	SAMPLES Type Number	SAMPLES Blows Per Foot	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	REMARKS
30	D-8	12	ML-CL	@ 30': Mottled reddish brown and brownish gray silty CLAY/clayey SILT, very moist, medium stiff, trace fine sand.	22.0	100.5	
35	D-9	42	SP-SM	@ 35': Yellowish gray to reddish brown fine to coarse SAND with silt, damp to moist, medium dense, silty interbeds.	5.0	106.0	
40	D-10	25	SM	@ 40': Reddish brown silty fine SAND, moist, medium dense, trace medium sand.	11.8	116.0	
	D-11	64	SP-SM	@ 43': Yellowish gray to reddish gray fine to coarse SAND with silt and gravel, damp, dense.	3.7	116.8	GS
45	D-12	51	SP	@ 47': Yellowish gray medium to coarse SAND with fine gravel, damp, dense.	2.6	114.9	GS
50				Notes: Total Depth: 50 Feet. Groundwater Not Encountered. Annular Backfill with No. 3 Sand. 10' Slotted; 40' Solid Well Pipe Installed. Presoak Performed 5/20/24. Percolation Testing Performed 5/21/24. Pipe Removed and Backfilled with Cuttings/Sand. Asphalt Patched with Quickset.			
55							
60							

Log Of Boring

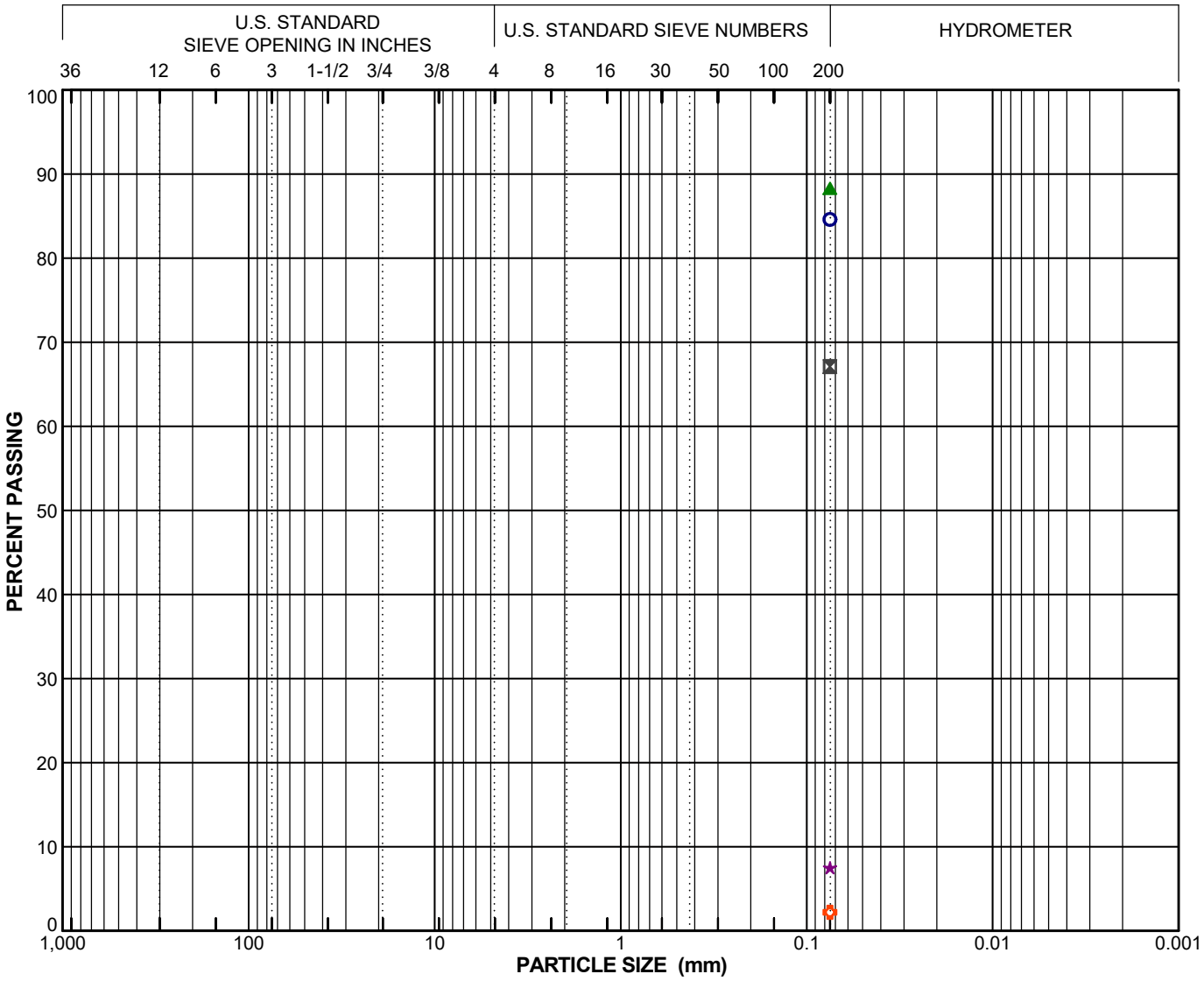
Meritage Homes
Proposed Residential Development
2020 East 1st Street
Santa Ana, California

Project Number: 23050-01

Appendix B

Appendix C

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		coarse	fine	coarse	medium	fine	

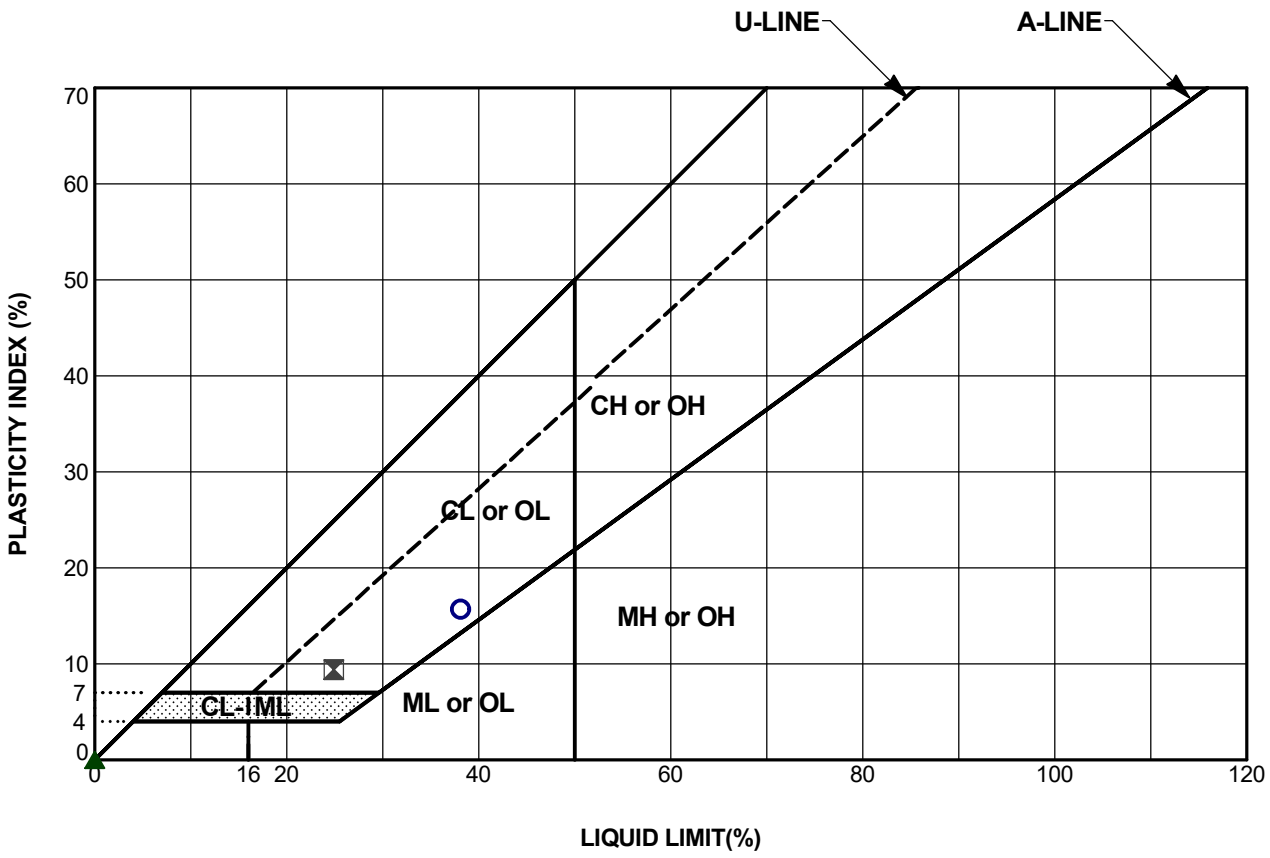


Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	P-1	D-10	40.0	23						85		ML
⊠	P-1	D-11	43.0	13						67		ML
▲	P-2	B-1	0.0 - 5.0		38	16				88		CL
★	P-2	D-11	43.0	4						8		SP-SM
✿	P-2	D-12	47.0	3						2		SP

PARTICLE SIZE DISTRIBUTION

SA Geo / 2020 E. 1st St. (23050-01)
California
PROJECT NO. 22026-98

NMG Geotechnical, Inc.



Symbol	Boring Number	Sample Number	Depth (feet)	Passing No. 200 Sieve (%)	LL	PI	USCS	Description
○	P-2	B-1	0.0 - 5.0	88	38	16	CL	Dark yellowish brown silty CLAY
⊠	P-2	D-2	5.0		25	9	CL	Dark brown silty sandy CLAY
▲	P-2	D-7	25.0		NP	NP	SM	Yellowish brown silty SAND

PLASTICITY CHART

SA Geo / 2020 E. 1st St. (23050-01)
California
PROJECT NO. 22026-98

NMG Geotechnical, Inc.

Sample	*Compacted Moisture (%)*	*Compacted Dry Density (pcf)*	*Final Moisture (%)*	*Volumetric Swell (%)*	*Expansion Index[1] Value/Method*		*Expansive Classification[2]*	*Soluble Sulfate (%)*	*Sulfate Exposure[3]*
P-2 B-1 0-5'	12.5	101.6	26.6	7.21	72	A	Medium	0.05	S0

Test Method:
ASTM D4829

HACH SF-1 (Turbidimetric)

Notes:
1. Expansion Index (EI) method of determination*:*
   [A] E.I. determined by adjusting water content to achieve a 50 ±2% degree of saturation
   [B] E.I. calculated based on measured saturation within the range of 40% and 60%
2. ASTM D4829 *(Classification of Expansive Soil)*
3. ACI-318-14 Table 19.3.1.1 *(Requirement for Concrete Exposed to Sulfate-Containing Solutions)*

Expansion Index and Soluble Sulfate Test Results

(FRM001 Rev.5)

Project No. 22026-98

Project Name: SA Geo / 2020 1st St. (23050-01)

NMG

Appendix D

Percolation Data Sheet

Project Name: Meritage/2020 E First Street
Project Number: 23150-01
Test Hole Number: P-1
Date Excavated: 5/20/2024
Depth (in): 542.4 Radius (in.): 4
Date Presoak: 5/21/2024
Tested By: AZ Pipe Diameter (in.): 2
Date Tested: 5/21/2024

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	9:35 9:45	10	469.2	482.4	13.2
2	9:45 9:55	10	470.4	477.6	7.2

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
9:55 10:05	10	10	477.6	486.0	8.4	50.4
10:07 10:17	10	22	466.8	477.6	10.8	64.8
10:17 10:27	10	32	477.6	486.6	9.0	54.0
10:27 10:37	10	42	486.6	494.4	7.8	46.8
10:46 10:56	10	61	471.6	480.6	9.0	54.0
10:58 11:08	10	73	480.6	488.4	7.8	46.8

Initial Height of Water (Ho) = 61.8
Final Height of Water (Hf) = 54
Change in Height Over Time (ΔH) = 7.8
Average Head Over Time (Havg) = 57.9
Annulus Gravel/Sand Correction (C) = 0.4

$I_t = \Delta H(60r)/\Delta t(r+2Havg)$

I_t = 1.56 in./hr.

C x I_t = **0.63** **in./hr.**

Percolation Data Sheet

Project Name: Meritage/2020 E First Street
Project Number: 23150-01
Test Hole Number: P-2
Date Excavated: 5/20/2024
Depth (in): 600
Radius (in.): 4
Date Presoak: 5/21/2024
Tested By: AC
Pipe Diameter (in.): 2
Date Tested: 5/21/2024

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	9:33	1	480	582	102
	9:34				
2	9:36	1	480	598.8	118.8
	9:37				

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
9:45	1	1	480	581.0	101.0	6060
9:46						
9:47	1	3	480	584.4	104.4	6264
9:48						
9:50	1	6	480	579.7	99.7	5982
9:51						
9:54	1	10	480	583.7	103.7	6222
9:55						
9:57	1	13	480	584.8	104.8	6288
9:58						
9:59	1	15	480	586.4	106.4	6384
10:00						
10:01	1	17	480	586.2	106.2	6372
10:02						
10:03	1	19	480	582.7	102.7	6162
10:04						
10:06	1	22	480	587.3	107.3	6438
10:07						
10:08	1	24	480	585.2	105.2	6312
10:09						

Percolation Data Sheet

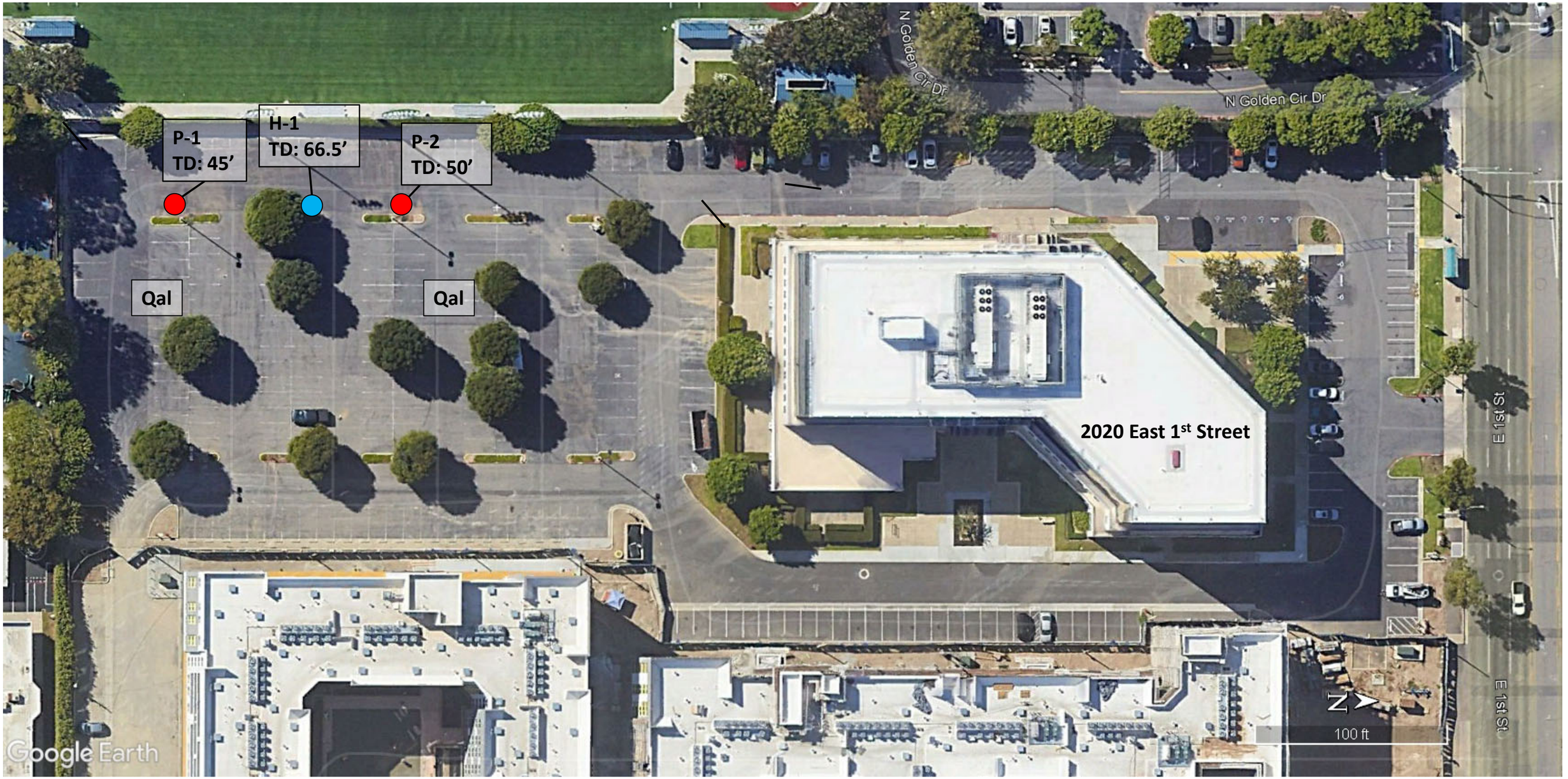
Project Name: Meritage/2020 E First Street
Project Number: 23150-01
Test Hole Number: P-2 (Continued)
Date Excavated: 5/20/2024
Depth (in): 600 Radius (in.): 4
Date Presoak: 5/21/2024
Tested By: AC Pipe Diameter (in.): 2
Date Tested: 5/21/2024

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
10:14	1	30	480	586.3	106.3	6378
10:15						
10:19	1	35	480	583.6	103.6	6216
10:20						
10:23	1	39	480	586.6	106.6	6396
10:24						
10:26	1	42	480	586.9	106.9	6414
10:27						
10:30	1	45	480	586.0	106.0	6360
10:31						
10:37	1	52	480	587.4	107.4	6444
10:38						
10:41	1	56	480	585.4	105.4	6324
10:42						
10:45	1	60	480	587.0	107.0	6420
10:46						

Initial Height of Water (Ho) = 120
Final Height of Water (Hf) = 13
Change in Height Over Time (ΔH) = 107
Average Head Over Time (Havg) = 66.5
Annulus Gravel/Sand Correction (C) = 0.4

$I_t = \Delta H(60r)/\Delta t(r+2Havg)$
I_t = 187.4 in./hr.
C x I_t = **75.0** **in./hr.**



Base Map Source: Google Earth

Legend

H-1 TD: 66.5’	Approximate Hollow Stem Auger Boring Location, Showing Total Depth in Feet.
P-2 TD: 50’	Approximate Percolation Test Location, Showing Total Depth in Feet.

Earth Units
Circled Where Buried

Qal Alluvium

GEOTECHNICAL MAP

Meritage Homes
Proposed Residential Development
2020 East 1st Street
Santa Ana, California

Project Number: 23050-01
Date: June 12, 2024
Plate 1

S/A

Orange County and Part of Riverside County, California

166—Mocho loam, 0 to 2 percent slopes, warm MAAT, MLRA 19

Map Unit Setting

National map unit symbol: 2tyyv
Elevation: 20 to 1,920 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 62 to 66 degrees F
Frost-free period: 320 to 365 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Mocho and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mocho

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 10 inches: loam
A - 10 to 16 inches: loam
Bk1 - 16 to 34 inches: loam
Bk2 - 34 to 60 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Sorrento
Percent of map unit: 6 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Bolsa, silt loam, drained
Percent of map unit: 3 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Anacapa
Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hueneme
Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Mocho, 2 to 9 percent slopes
Percent of map unit: 1 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Chino, drained
Percent of map unit: 1 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

Hydric soil rating: No

Data Source Information

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 15, Sep 13, 2021

Orange County and Part of Riverside County, California

194—San Emigdio fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2y8t6
Elevation: 30 to 1,190 feet
Mean annual precipitation: 11 to 14 inches
Mean annual air temperature: 64 to 65 degrees F
Frost-free period: 360 to 365 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

San emigdio and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of San Emigdio

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

A - 0 to 7 inches: fine sandy loam
C - 7 to 61 inches: stratified gravelly loamy coarse sand to fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.4 inches)

Interpretive groups

Land capability classification (irrigated): 1

Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Palmview

Percent of map unit: 4 percent
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Metz

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hueneme

Percent of map unit: 4 percent
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Mocho

Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Soboba

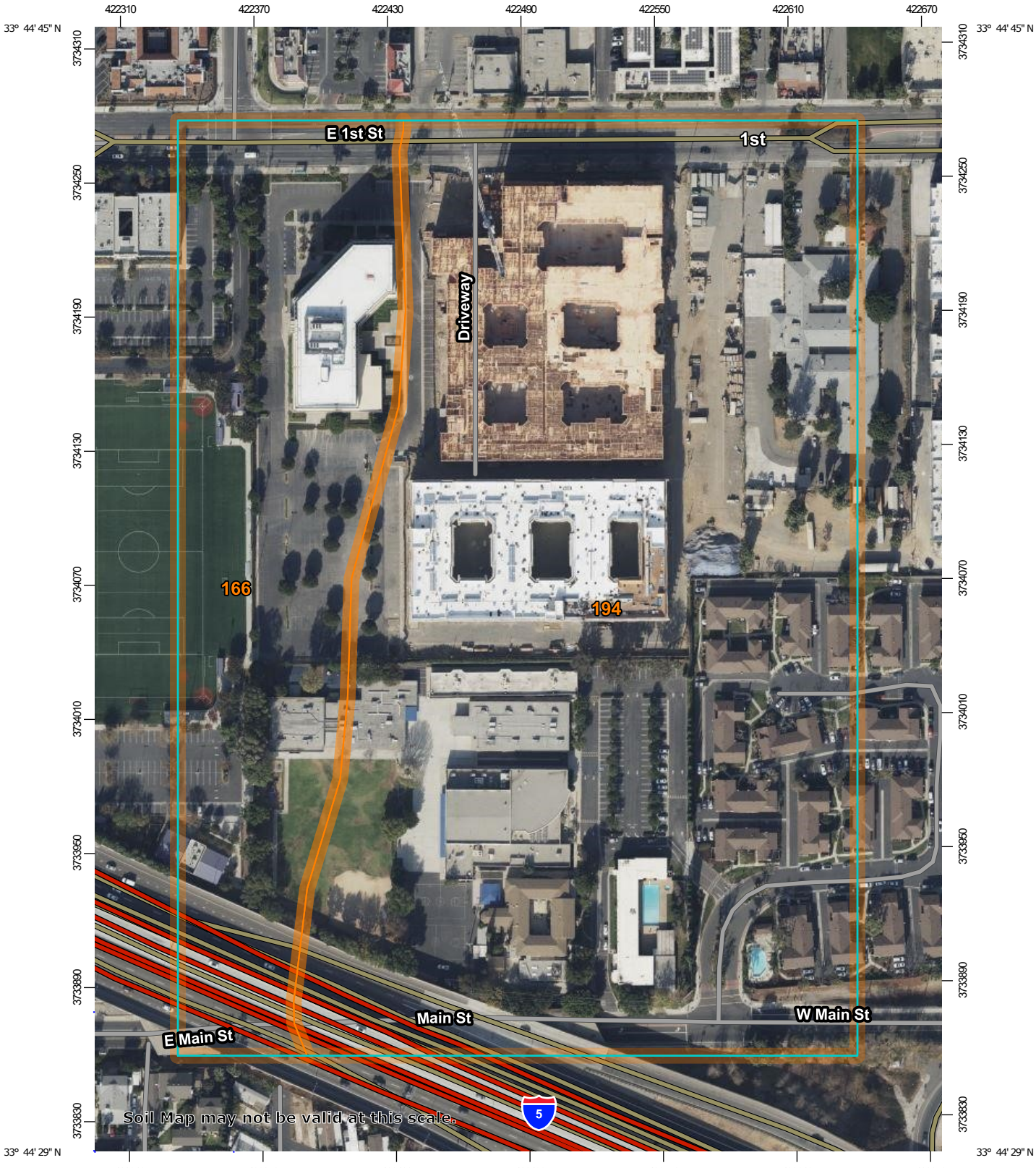
Percent of map unit: 1 percent
Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex

Hydric soil rating: No

Data Source Information

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 15, Sep 13, 2021

Soil Map—Orange County and Part of Riverside County, California
(MRTG-008_Soil Map)



Map Scale: 1:2,450 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 15, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 21, 2020—Dec 19, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
166	Mocho loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	8.4	26.5%
194	San Emigdio fine sandy loam, 0 to 2 percent slopes	23.3	73.5%
Totals for Area of Interest		**31.7**	**100.0%**

ATTACHMENT F

Notice of Transfer

Water Quality Management Plan
Notice of Transfer of Responsibility

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 Responsibility Party Information

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

II. Information about Site Transferred

Name of Project			
Title of WQMP Applicable to Site:			
Street Address of Site			
Tract Number(s) for Site		Lot Numbers	
Date WQMP Prepared (or Revised)			

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 Number(s) of Site Transferred to New Owner	
Remaining Lot/ Tract Number(s) 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 the 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 the Previous Owner. Those portions retained by the Previous Owner shall be labeled "Previous Owner," and those portions previously transferred by the 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 Owner is now the Responsible Party of record for the WQMP for this 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 New Owner.

Print 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.

Print Name of New Owner Representative	Title
Signature of New Owner Representative	Date

ATTACHMENT G

Operation & Maintenance Plan

OPERATION AND MAINTENANCE OF *MaxWell*® DRYWELL

The Operation and Maintenance Format will include the following key components:

1.) Inspection Guidelines:

New installations

Newly installed systems should receive a thorough visual examination following the first several significant rainfall events. This assessment will assure that there is no standing water, and that runoff or nuisance water flows are being eliminated within the allowable 48 hour draw-down timeframe.

Ongoing Operations

At a minimum, the drainage structures should be inspected annually, and within 48 hours following a significant storm event to ensure that there is no standing water in the chambers.

2.) Maintenance Format:

After the first 12-months of entering service, it is recommended that an initial cleaning be undertaken. This will help to establish the amount of accumulated particulate matter and debris to be expected on a yearly basis. Thereafter, the systems should receive inspection at least annually, and cleaning should be undertaken when the evaluation reveals that 15% or more of the original chamber volume is occupied by silt and sediment.

During the maintenance operation, all screens and filters should be serviced and the floating absorbent blankets replaced, along with the geo-textile fabric at the bottom of the chambers. Should repair be needed, descriptions of deficiencies and estimated costs for suggested corrections should be provided. The above information shall be submitted in writing to the Owner at the conclusion of the maintenance service. Replacement is recommended for drywells that no longer dispose of ponded water within 48 hours after cleaning.

3.) Maintenance Records:

A written log shall be kept on-site of all inspections and maintenance performed on the drainage systems.

Torrent Resources Incorporated
1509 East Elwood Street
Phoenix Arizona 85040-1391

phone 602-268-0785
fax 602-268-0820

www.TorrentResources.com

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

An evolution of McGuckin Drilling

CONTECH®
ENGINEERED SOLUTIONS

UrbanPond®
Maintenance Manual

UrbanPond® Inspection & Maintenance

Inspection and maintenance of the Urban Pond underground detention, retention, or infiltration system is vital for the performance and life cycle of the stormwater management system. All local, state, and federal permits and regulations must be followed for system compliance. Manway access locations are provided on each system for ease of ingress and egress for routine inspection and maintenance activities. Stormwater regulations require that most BMPs be inspected and maintained to ensure they are operating as designed and providing protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess the site specific conditions. Inspection after the first significant rainfall event and at semiannual intervals is typical. This is recommended because pollutant loading and pollutant characteristics can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding on roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided. Without appropriate maintenance a BMP can exceed its storage capacity, become blocked, or damaged, which can negatively affect its continued performance.

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the underground detention, retention, or infiltration system:

- Contech Inspection and Maintenance Report Form
- Flashlight
- Manhole hook or appropriate tools to access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure
- Protective clothing and eye protection
- Note: Entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system.

Inspection Steps

The key to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Urban Pond underground detention, retention, or infiltration system are quick and easy. As mentioned above, the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long term inspection and maintenance interval requirements.

The Urban Pond underground detention, retention, or infiltration system can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened, the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other information (see inspection form).
- Observe the upstream drainage area and look for sources of pollution, sediment, trash and debris.
- Observe the inside of the system through the access manholes. If minimal light is available and vision into the unit is impaired, utilize a flashlight to see inside the system and all of its modules.
- Look for any out of the ordinary obstructions in the inflow and outflow pipes. Check pipes for movement or leakage. Write down any observations on the inspection form.
- Observe any movement of modules.
- Observe concrete for cracks and signs of deterioration.
- In detention and retention systems inspect for any signs of leakage.
- In infiltration systems inspect for any signs of blockage or reasons that the soils are not infiltrating.
- Through observation and/or digital photographs, estimate the amount of floatable debris accumulated in the system. Record this information on the inspection form. Next, utilizing a tape measure or measuring stick, estimate the amount of sediment accumulated in the system. Sediment depth may vary throughout the system, depending on the flow path. Record this depth on the inspection form.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Damaged inlet and outlet pipes.
- Obstructions in the system or its inlet or outlet.
- Excessive accumulation of floatables.
- Excessive accumulation of sediment of more than 6” in depth.
- Damaged joint sealant.

Maintenance Equipment

While maintenance can be done fully by hand it is recommended that a vacuum truck be utilized to minimize time requirements required to maintain the Urban Pond underground detention, retention, or infiltration system:

- Contech Inspection and Maintenance Report Form
- Flashlight
- Manhole hook or appropriate tools to access hatches and covers
- Appropriate traffic control signage and procedures

- Measuring pole and/or tape measure
- Protective clothing and eye protection
- Vacuum truck
- Trash can
- Pressure washer
- Note: Entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system. Entry into the system will be required if maintenance is required.

Maintenance Procedures

It is recommended that maintenance occurs at least three days after the most recent rain event to allow for drain down of the system and any upstream detention systems designed to drain down over an extended period of time. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Once all safety measures have been set up, cleaning of the system can proceed as follows:

- Using an extension on a boom on the vacuum truck, position the hose over the opened manway and lower into the system. Remove all floating debris, standing water (as needed) and sediment from the system. A power washer can be used to assist if sediments have become hardened and stuck to the walls and columns. Repeat the same procedure at each manway until the system has been fully maintained. Be sure not to pressure wash the infiltration area as it may scour. Pressure washing is acceptable for concrete base modules and base slabs only; do not use on systems with gravel bedding. Do not vacuum up the infiltration stone or wash accumulated solids into the stone via pressure washing.

If maintenance requires entry into the vault:

- Following rules for confined space entry use a gas meter to detect the presence of any hazardous gases. If hazardous gases are present do not enter the vault. Follow appropriate confined space procedures, such as utilizing venting system, to address the hazard. Once it is determined to be safe, enter utilizing appropriate entry equipment such as a ladder and tripod with harness.
- The last step is to close up and replace all manhole covers and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.

CONTECH®
ENGINEERED SOLUTIONS

800-338-1122

WWW.CONTECHES.COM

CONTECH ENGINEERED SOLUTIONS LLC PROVIDES SITE SOLUTIONS FOR THE CIVIL ENGINEERING INDUSTRY. CONTECH'S PORTFOLIO INCLUDES BRIDGES, DRAINAGE, SANITARY SEWER, STORMWATER AND EARTH STABILIZATION PRODUCTS. FOR INFORMATION ON OTHER CONTECH DIVISION OFFERINGS, VISIT CONTECHES.COM OR CALL 800-338-1122.

SUPPORT

DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT WWW.CONTECHES.COM

Bio Clean

A Forterra Company

Bio Clean CPS

A Stormwater Trash Capture Solution

OPERATION & MAINTENANCE MANUAL

5796 Armada Drive Suite 250 | Carlsbad, CA 92008 | 855.566.3938

stormwater@forterrabp.com | biocleanenvironmental.com

Oldcastle Infrastructure™
A CRH COMPANY

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

Inspection and Maintenance Guide

DRAINAGE PROTECTION SYSTEMS
DPS
A division of
Oldcastle Infrastructure

Water

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed FloGard+Plus Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (wash racks, parking garages, etc.): On a recurring basis (no less than three times per year).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing FloGard+Plus catch basin inserts).
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc., shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary, and the pouch tethers re-attached to the liner's D-ring.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium will be replaced with new material. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of storm drain filters, catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined-space trained and certified. Call us at (888) 950-8826 for further information and assistance.

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

OUR MARKETS

BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

TRANSPORTATION

ATTACHMENT H
EPA Class V Injection Well Registration

(To be provided during 2nd Submittal)

ATTACHMENT I
EDUCATION MATERIALS

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

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

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

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.

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

Orange County Stormwater Program

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

The Ocean Begins at Your Front Door

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 approximately 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.

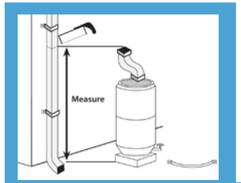
Permeable pavement allows water runoff to infiltrate through the soil and prevents most pollutants from reaching the storm drain system.

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.

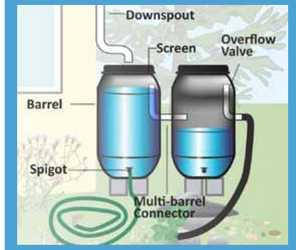
Downspout Disconnection/Redirection

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.

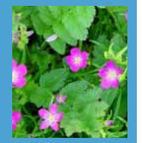


Rain Barrels

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.

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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.

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.

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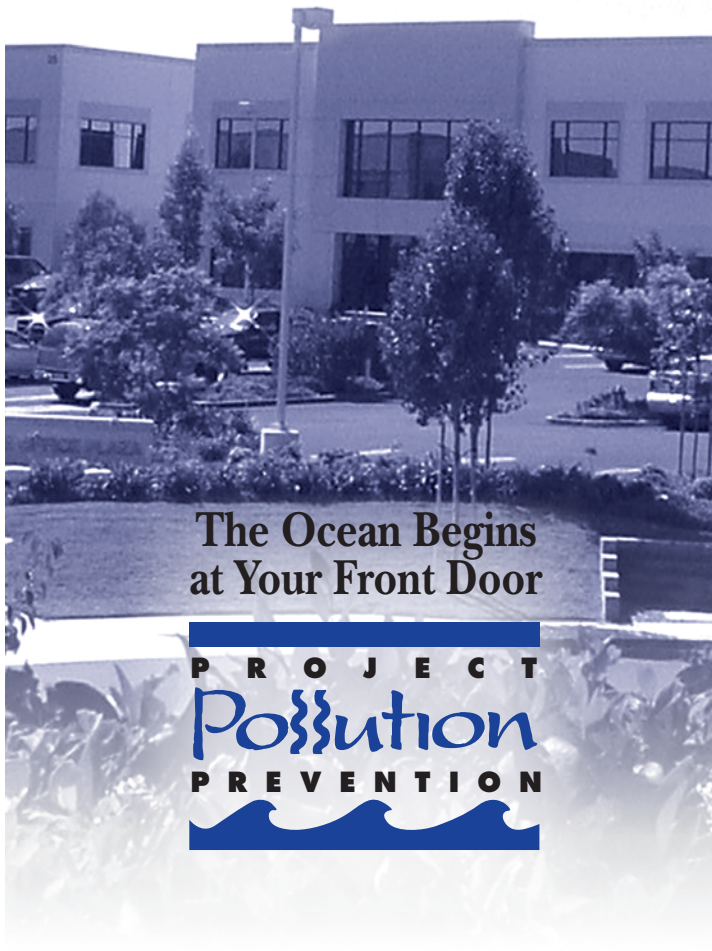
Help Prevent Ocean Pollution:

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

HOMEOWNER TIPS
PROTECTING WATER

Before Buying Pest Control Products

- Identify the pest.
- Decide if pest control products are the best control measure or if there are alternatives available.
- Are integrated pest management guidelines available for this pest?
- Read the product label:
  - Is the pest listed on the label?
  - Is it the best product for the pest?

Before Mixing Your Sprayer

- Read the label carefully.
- Buy only enough pesticide to treat the area affected by the pest.
- Check the weather and don't apply if it's windy or about to rain
- Measure the area you're treating.
- Calculate how much spray to mix.
- Wear long sleeve shirt, long pants, shoes and any other protective equipment listed on the label and follow all the label precautions.
- Be prepared for spills and know how to clean them up.

When You're Ready To Spray

- Mix and load spray in an area where any spilled pesticide will not be able to drain or be washed away into storm drains, ditches, streams, ponds or other bodies of water.
- Mix sprayer on grass, not the sidewalk or driveway.
- Mix only as much as needed.

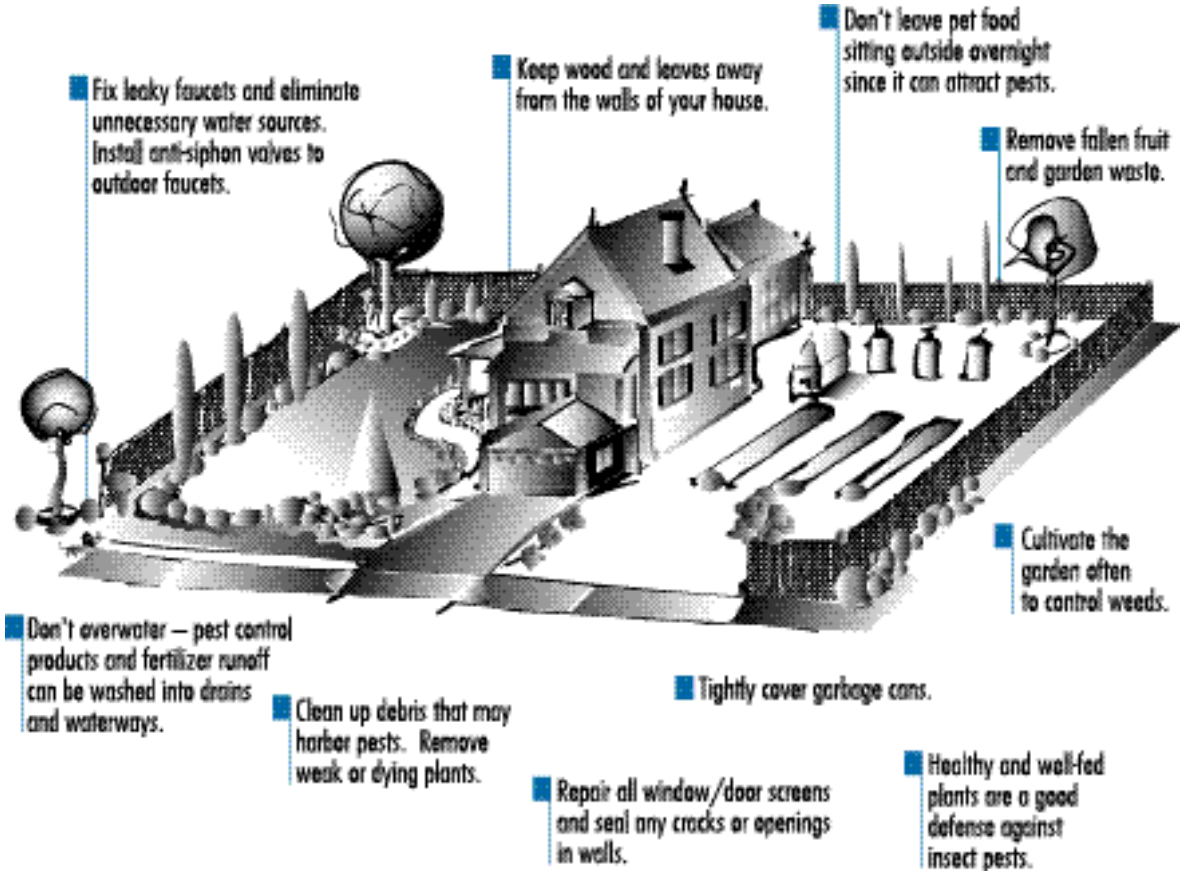
When You're Spraying

- AVOID spraying in or near storm drains, ditches, streams, and ponds!
- Leave an untreated strip around these areas to protect the water.

When You're done

- Never dump leftovers down any drain; Save for a future application.
- Triple-rinse sprayer and apply rinsewater to treated area.
- Take any old or unwanted pesticides to a Household Hazardous Waste Collection Center (714) 834-6752.

Using Pest Control Products. It's Your Responsibility To Do It Right!



IPM... Outsmarting Pests While Protecting Water

With Integrated Pest Management (IPM), homeowners use common sense and nature to make it difficult for pests to survive. IPM techniques include cultural practices (such as mulching to prevent weeds), encouraging natural enemies (good bugs), and judicious use of pest control products.

- First, identify your pest problem. To find the best solution, you need to pin down the problem. Consult gardening books, your county cooperative extension office or your local nursery.
- Decide how much pest control is necessary. If you can live with some pest damage, you can avoid intensive pest control product treatments.
- Choose an effective option. Try various types of controls first: washing bugs off plants, pruning diseased parts of plants. If you need to use pest control products, choose one that targets the problem and poses the least hazard.
- Finally, it's easier to prevent pests than to control them.

Think ahead.

This brochure is being distributed in order to reduce the impacts of pesticides on water quality. It was produced with support from the Orange County Storm Water Program, the Coalition for Urban/Rural Environmental Stewardship (CURES) and a 319(h) grant from the State Water Resources Control Board.

Orange County Storm Water Program Participants:

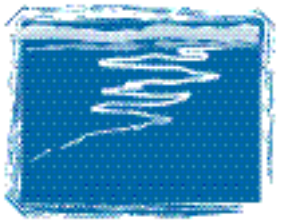
Anaheim Public Works/Engineering	(714) 765-5176
Brea Engineering	(714) 990-7666
Buena Park Public Works	(714) 562-3655
Costa Mesa Public Services	(714) 754-5248
Cypress Engineering	(714) 229-6752
Dana Point Public Works	(949) 248-3562
Fountain Valley Public Works	(714) 593-4400 x347
Fullerton Engineering Dept	(714) 738-6853
Garden Grove Development Services	(714) 741-5554
Huntington Beach Public Works	(714) 536-5432
Irvine Public Works	(949)724-6515
La Habra Public Services	(562) 905-9792
La Palma Public Works	(714) 523-1140 x102
Laguna Beach Municipal Services	(949) 497-0711
Laguna Hills Engineering	(949) 707-2600
Laguna Niguel Public Works	(949) 362-4337
Lake Forest Public Works	(949) 461-3480
Los Alamitos Community Dev	(562) 431-3538 x301
Mission Viejo Public Works	(949) 470-3095
Newport Beach Public works	(949) 644-3311
Orange Public Works	(714) 744-5551
Placentia Engineering	(714) 993-8131
San Clemente Engineering	(949) 361-6100
San Juan Capistrano Engineering	(949) 493-1171
Santa Ana Public Works	(714) 647-3380
Seal Beach Engineering	(562) 431-2527 x318
Stanton Public Works	(714) 379-9222 x204
Tustin Public Works Engineering	(714) 573-3150
Villa Park Engineering	(714) 998-1500
Westminster Public Works Eng.	(714) 898-3311 x215
Yorba Linda Engineering	(714) 961-7170 x174
O.C. Storm Water Program	1-877-89-SPILL (1-877-897-7455)
24 Hour Water Pollution Hotline	(714) 567-6363 or ashbyk@pfrd.co.orange.ca.us
Chemical and Hazardous Material Spill Emergencies	911

Other Important Phone Numbers:

For Additional Brochures	1-877-89-SPILL (1-877-897-7455)
UC Masters & Coop Extension	(714) 708-1646 ucmastergardeners@yahoo.com
O.C. Household Hazardous Waste Information	(714) 834-6752 or www.oc.ca.gov/IWMD
Information on agriculture chemicals, pesticides and possible alternatives, O.C. Agriculture Commissioner	(714) 447-7115

Original graphics developed with support from:
Coalition For Urban/Rural Environmental Stewardship (CURES)
Western Crop Protection Association (WCPA)
Responsible Industry for a Sound Environment (RISE)

Keeping Pest Control Products Out of Creeks, Rivers and The Ocean



HOMEOWNER TIPS

PROTECTING WATER

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.

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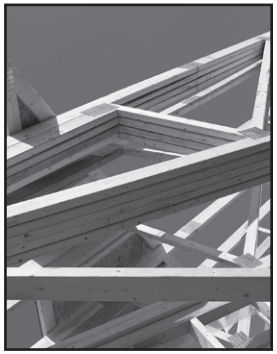
Help Prevent Ocean Pollution:

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



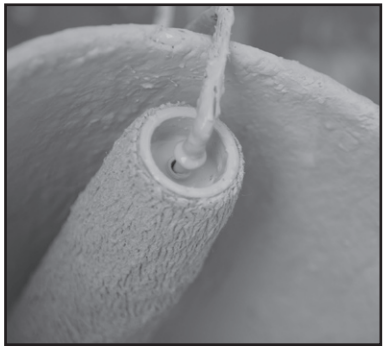
- Schedule projects for dry weather.
- Keep all construction debris away from the street, gutter and storm drain.
- Store materials under cover with temporary roofs or plastic sheets to eliminate or reduce the possibility that rainfall, runoff or wind will carry materials from the project site to the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

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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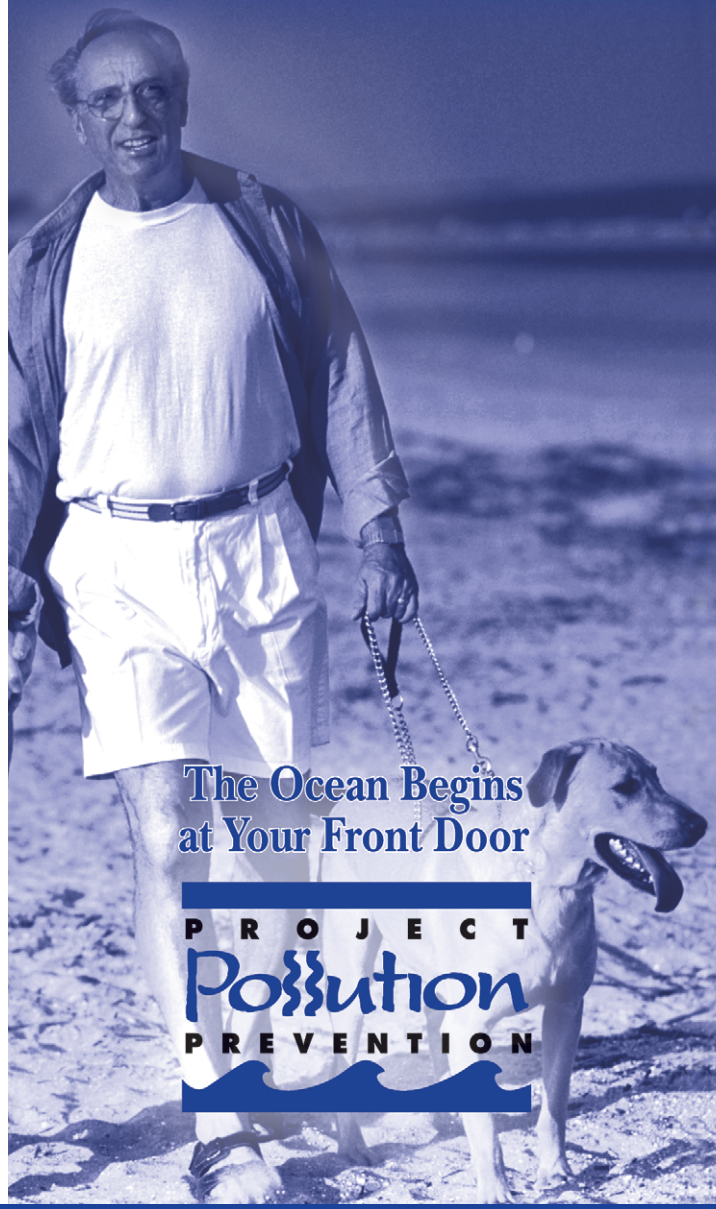
Help Prevent Ocean Pollution:

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

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,
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For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution. 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 Residential Pool, Landscape and Hardscape Drains

The Ocean Begins at Your Front Door

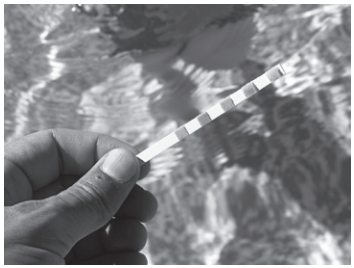
PROJECT Pollution PREVENTION

Tips for Residential Pool, Landscape and Hardscape Drains

Pool Maintenance

All pool water discharged to the curb, gutter or permitted pool drain from your property must meet the following water quality criteria:

- 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.
- There is no discharge of filter media or acid cleaning wastes.



Some cities have ordinances that do not allow pool water to be discharged to the storm drain. Check with your city.

Landscape and Hardscape Drains

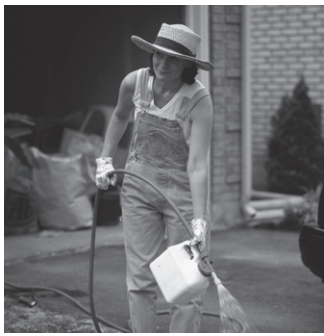
The following recommendations will help reduce or prevent pollutants from your landscape and hardscape drains from entering the street, gutter or storm drain. Unlike water that enters the sewer (from sinks and toilets), water that enters a landscape or hardscape drain is not treated before entering our creeks, rivers, bays and ocean.

Household Activities

- Do not rinse spills of materials or chemicals to any drain.
- Use dry cleanup methods such as applying cat litter or another absorbent material, then sweep it up and dispose of it in the trash. If the material is hazardous, dispose of it at a Household Hazardous Waste Collection Center (HHWCC). For locations, call **(714) 834-6752** or visit **www.oclandfills.com**.
- Do not hose down your driveways, sidewalks or patios to your landscape or hardscape drain. Sweep up debris and dispose of it in the trash.
- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash.
- Do not store items such as cleaners, batteries, automotive fluids, paint products, TVs, or computer monitors uncovered outdoors. Take them to a HHWCC for disposal.

Yard Maintenance

- Do not overwater. Water by hand or set automated irrigation systems to reflect seasonal water needs.
- Follow directions on pesticides and fertilizers (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Cultivate your garden often to control weeds and reduce the need to use chemicals.



Vehicle Maintenance

- Never pour oil or antifreeze down your landscape or hardscape drain. Recycle these substances at a service station, a waste collection center or used oil recycling center. For locations, contact the Used Oil Program at **1-800-CLEANUP** or visit **www.CLEANUP.org**.
- Whenever possible, take your vehicle to a commercial car wash.
- If you do wash your vehicle at home, do not allow the washwater to go down your landscape or hardscape drain. Instead, dispose of it in the sanitary sewer (a sink or toilet) or onto an absorbent surface such as your lawn.
- Use a spray nozzle that will shut off the water when not in use.

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as painting can lead to water pollution if you're not careful. Paint must be used, stored and disposed of properly to ensure that it does 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 paint 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 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 using, storing and disposing of paint. 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 Projects Using Paint

Tips for Projects Using Paint

Paint can cause significant damage to our environment. Whether you hire a contractor or do it yourself, it is important to follow these simple tips when purchasing, using, cleaning, storing and disposing of paint.

Purchasing Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Whenever possible, use water-based paint since it usually does not require hazardous solvents such as paint thinner for cleanup.

Painting

- Use only one brush or roller per color of paint to reduce the amount of water needed for cleaning.
- Place open paint containers or trays on a stable surface and in a position that is unlikely to spill.
- Always use a tarp under the area or object being painted to collect paint drips and contain spills.

Cleaning

- Never clean brushes or rinse paint containers in the street, gutter or storm drain.
- For oil-based products, use as much of the paint on the brushes as possible. Clean brushes with thinner. To reuse thinner, pour it through a fine filter (e.g. nylon, metal gauze or filter paper) to remove solids such as leftover traces of paint.
- For water-based products, use as much of the paint on the brushes as possible, then rinse in the sink.
- Collect all paint chips and dust. Chips and dust from marine paints or paints containing lead, mercury or tributyl tin are hazardous waste. Sweep up and dispose of at a Household Hazardous Waste Collection Center (HHWCC).

Storing Paint

- Store paint in a dry location away from the elements.
- Store leftover water-based paint, oil-based paint and solvents separately in original or clearly marked containers.
- Avoid storing paint cans directly on cement floors. The bottom of the can will rust much faster on cement.
- Place the lid on firmly and store the paint can upside-down to prevent air from entering. This will keep the paint usable longer. Oil-based paint is usable for up to 15 years. Water-based paint remains usable for up to 10 years.

Alternatives to Disposal

- Use excess paint to apply another coat, for touch-ups, or to paint a closet, garage, basement or attic.
- Give extra paint to friends or family. Extra paint can also be donated to a local theatre group, low-income housing program or school.
- Take extra paint to an exchange program such as the **"Stop & Swap"** that allows you to drop off or pick up partially used home care products free of charge. **"Stop & Swap"** programs are available at most HHWCCs.
- For HHWCC locations and hours, call **(714) 834-6752** or visit **www.oclandfills.com**.

Disposing of Paint

- Never put wet paint in the trash.

For water-based paint:

- If possible, brush the leftover paint on cardboard or newspaper. Otherwise, allow the paint to dry in the can with the lid off in a well-ventilated area protected from the elements, children and pets. Stirring the paint every few days will speed up the drying.
- Large quantities of extra paint should be taken to a HHWCC.
- Once dried, paint and painted surfaces may be disposed of in the trash. When setting a dried paint can out for trash collection, leave the lid off so the collector will see that the paint has dried.

For oil-based paint:

- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.

Aerosol paint:

- Dispose of aerosol paint cans at a HHWCC.

Spills

- Never hose down pavement or other impermeable surfaces where paint has spilled.
- Clean up spills immediately by using an absorbent material such as cat litter. Cat litter used to clean water-based paint spills can be disposed of in the trash. When cleaning oil-based paint spills with cat litter, it must be taken to a HHWCC.
- 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