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

Project Name:

Van Buren & Orangethorpe – Residential

433 S. VAN BUREN STREET, PLACENTIA, CA 92870

TTM 19104, APNS: 346-164-25, 346-164-26, & 346-164-22

Prepared for:

DeNova Homes, Inc.

3 Hughes

Irvine, CA 92618

Alan Toffoli, SoCal Division President

(949) 762-2535

Prepared by:

C&V Consulting, Inc./ Dane McDougall, P.E.

6 Orchard, Suite 200, Lake Forest, CA 92630

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

February 2020

Project Owner's Certification			
Planning Application No. (If applicable)	TBD	Grading Permit No.	TBD
Tract/Parcel Map and Lot(s) No.	19104	Building Permit No.	TBD
Address of Project Site and APN (If no address, specify Tract/Parcel Map and Lot Numbers)			433 S. Van Buren Street Placentia, CA 92870 APNs: 346-164-25, 346-164-26, & 346-164-22

This Water Quality Management Plan (WQMP) has been prepared for DeNova Homes, Inc. by C&V Consulting, Inc. The WQMP is intended to comply with the requirements of the City of Placentia 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: Alan Toffoli			
Title	SoCal Division President		
Company	DeNova Homes, Inc.		
Address	3 Hughes, Irvine, CA 92618		
Email	atoffoli@denovahomes.com		
Telephone #	(949) 762-2535		
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): Dane McDougall, P.E.			
Title	Principal	PE Registration #	80705
Company	C&V Consulting, Inc.		
Address	6 Orchard, Suite 200, Lake Forest, CA 92630		
Email	dmcdougall@cvc-inc.net		
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			

Contents

Page No.

Attachments

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

Project Infomation			
Permit/Application No. (If applicable)	TBD	Grading or Building Permit No. (If applicable)	TBD
Address of Project Site (or Tract Map and Lot Number if no address) and APN	433 S. Van Buren Street Placentia, CA 92870 TR 19104		
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?	This is a Conceptual WQMP for the proposed development.		
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">8. All significant redevelopment projects, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety. 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 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.</td></tr>
<tr><td>Project Area (ft²): 242,712</td><td colspan="2">Number of Dwelling Units: 139</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</td><td>Percentage</td><td>Area</td><td>Percentage</td></tr>
<tr><td>Pre-Project Conditions</td><td>4.37 ac</td><td>78%</td><td>1.20 ac</td><td>22%</td></tr>
<tr><td>Post-Project Conditions*</td><td>0.84 ac</td><td>15%</td><td>4.73 ac</td><td>85%</td></tr>
<tr><td>Drainage Patterns/Connections</td><td colspan="4">The proposed project site comprises 5.57 acres and is located directly north of the OCFCD Atwood Channel. The existing site generally slopes in the southerly direction, ranging in elevation between 249 and 238 feet above mean sea level. Site drainage currently sheet flows overland towards the southwestern corner of the site and is captured by an existing onsite grate inlet. Stormwater captured by the existing inlet is conveyed directly to Atwood Channel via an existing City of Placentia 24" storm drain and headwall outlet. Atwood Channel drains to the Miller Retarding Basin which drains to the Santa Ana River and ultimately the Pacific Ocean.

The proposed residential development will design the site to match the existing drainage condition. The proposed drainage system will be designed to collect and convey stormwater runoff to a proposed infiltration system near the southwest corner of the site for treatment and retention of the Design Capture Volume (DCV). Primary overflow from the infiltration system will be conveyed to the existing City 24" storm drain which discharges to Atwood</td></tr>
</table>

	Channel. *Proposed imperviousness is conservatively assumed to be 85% for preliminary engineering. During final engineering, actual project imperviousness will be calculated, and BMP sizing will be verified.
Narrative Project Description:	The project site consists of approximately 5.57 acres and is located southwest of the E. Orangethorpe Avenue and S. Van Buren Street intersection. The site is bound by AT&SF Railway to the northwest, Atwood Channel to the south, and S. Van Buren Street to the east. The existing site is currently occupied by a vehicle junkyard, several office sheds, paved and unpaved drive aisles, and various landscaped areas. The existing site is approximately 22% impervious. The project proposes the construction of twenty-two (22) buildings consisting of 139 attached townhomes. Townhome layouts will include 1-, 2-, and 3-bedroom options. The development will include private drive aisles, resident and guest parking areas, open-space areas, and landscaping throughout. The proposed site will be accessible via one proposed driveway entrance along S. Van Buren Street. The proposed site has been designed as one (1) Drainage Management Area (DMA). BMP selection for storm water treatment for this DMA has been described in Section IV of this report. Implementation of BMPs will address the pollutants of concern generated by multi-family residential development. Refer to Attachment B for the WQMP Exhibit.

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 ☐	Expected by proposed landscaped areas.
Nutrients	E ☒	N ☐	Expected by proposed landscaped areas.
Heavy Metals	E ☒	N ☐	Tributary by uncovered parking areas.
Pathogens (Bacteria/Virus)	E ☒	N ☐	Expected by proposed residence and pets.
Pesticides	E ☒	N ☐	Expected by proposed landscaped areas.
Oil and Grease	E ☒	N ☐	Expected by uncovered parking areas.
Toxic Organic Compounds	E ☒	N ☐	Tributary by uncovered parking areas.
Trash and Debris	E ☒	N ☐	Expected by proposed residence.

II.3 Hydrologic Conditions of Concern

☒ No – Show map

☐ Yes – Describe applicable hydrologic conditions of concern below.

Per the TGD Figure 3, Susceptibility Analysis of the Santa Ana River, HCOC Map located within Attachment A, the project site is located within an HCOC exempt area. Site runoff drains through engineered channels until discharging into the Pacific Ocean. The proposed drainage path of travel has been indicated by arrows on the map.

II.4 Post Development Drainage Characteristics

Post–development drainage will be consistent with a proposed multi-family residential project. The tributary drainage area and direction of run-off flows for the proposed site are based on the preliminary grading and drainage design and delineated on the attached WQMP Exhibit. Refer to the WQMP Exhibit in Attachment B.

In the proposed condition, site drainage will be directed as sheet flow and through a series of area drains towards curb-inlet catch basins within the proposed drive aisles. Drainage will be conveyed via proposed underground storm drain to a proposed underground infiltration gallery near the southwest corner of the site for detention and infiltration of the entire DCV. The infiltration system has been designed to provide enough static storage to temporarily detain 100% of the DCV and enough infiltrating surface area to ensure the DCV infiltrates within a maximum drawdown time of 48 hours. During larger storm events and when the infiltration system is at capacity, an overflow pipe will convey high flows to the existing 24" storm drain which outlets to Atwood Channel. In the event the proposed drainage system becomes clogged, emergency overflow will pond near the proposed catch basin near the ultimate low point (southwest corner of site) and overflow directly to Atwood Channel via proposed wall knockouts along the southerly property line. Upon entering Atwood Channel, site runoff will follow the historic drainage pattern.

II.5 Property Ownership/Management

The property is currently owned by DeNova 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 located in Attachment F of this report and should be executed as part of any ownership transfer after construction is complete.

DeNova Homes, Inc. may appoint a Homeowner's Associated (HOA) to provide long-term BMP maintenance for the proposed development. Refer to Section V of this report for additional information.

Section III Site Description

III.1 Physical Setting

Name of Planned Community/Planning Area (if applicable)	City of Placentia
Location/Address	433 S. Van Buren Street
	Placentia, CA 92870
General Plan Land Use Designation	Industrial
Existing Zoning	Manufacturing
Proposed Zoning	High Density Residential (R-3)
Acreage of Project Site	5.57 ac
Predominant Soil Type	Per TGD, Figure XVI-2a, NRCS Hydrologic Soils Groups the site is located with Soil Type B. Refer to Attachment A for the TGD Figure. **For site specific soil information, refer to Section III.2 and Attachment E of this report.**

III.2 Site Characteristics

Site Characteristics	
Precipitation Zone	The site falls under the 0.90" per the TGD, Figure XVI-1, Rainfall Zones map. Refer to Attachment A for the TGD Figure.
Topography	The project site is generally sloped in the southerly direction with an ultimate low point near the southwest corner. The site ranges in elevation between approximately 249 and 238 feet above mean sea level.
Drainage Patterns/Connections	In the existing condition, drainage from the project site is conveyed as surface flow towards the southwest corner of the site. An existing onsite grate inlet near the southwestern corner of the site captures and conveys stormwater to Atwood Channel via an existing 24" storm drain and headwall outlet. The proposed condition of the site will closely match the historic drainage pattern. Proposed drainage will be conveyed as sheet flow and through a storm drain system towards the southwestern corner of the site. Low flows will be directed to a proposed underground infiltration gallery for retention of the DCV. The existing connection to Atwood Channel will be reutilized in the proposed condition to convey high flows when the infiltration gallery is at capacity.
Soil Type, Geology, and Infiltration Properties	Per the Geotechnical Due Diligence Evaluation prepared by Albus-Keefe & Associates, Inc. dated August 24, 2017, the site geologic properties are as follows: "Soil materials encountered on site generally consisted of alluvial deposits to the maximum depth explored (51.5 feet). Artificial fill ranging in thickness from 3 to 5.5 feet was observed scattered throughout the site (observed in B-1 and B-4). The near surface alluvium typically consisted of coarse-grained material consisting primarily of sand and silty sand. This material was typically dry and loose to medium dense. At greater depths, the alluvium consisted of interlayers of sand, silty sand and silt. Additional artificial fills associated with underground utilities, abandoned oil and gas facilities and previous site developments are likely present beneath portions of the site." Refer to Attachment E for the Geotechnical Due Diligence Evaluation.

<table>
<tr><td>Hydrogeologic (Groundwater) Conditions</td><td>Per the Geotechnical Due Diligence Evaluation prepared by Albus-Keefe & Associates, Inc. dated August 24, 2017, site groundwater characteristics are as follows:

"Groundwater was not encountered during this firm's subsurface exploration to a maximum depth of 51.5 feet below the existing ground surface. A review of the CDMG Seismic Hazard Zone Report 011 indicates that historical high groundwater level for the general site area is approximately 18 feet or more below the existing ground surface."

Refer to Attachment E of this report for a copy of the Geotechnical report.</td></tr>
<tr><td>Geotechnical Conditions (relevant to infiltration)</td><td>Per the Summary of Infiltration Testing prepared by Alta California Geotechnical, Inc. dated February 10, 2020, the site infiltration properties are as follows:

"Three infiltration tests were recently conducted at locations shown on Plate 1, identified as PH-1 through PH-3. The approximate locations of the infiltration tests were assigned by C&V Consulting. The infiltration tests were conducted in a sand layer of the alluvium at approximately ten (10) feet below the ground surface. Logs of the borings are presented in Appendix A. These tests were conducted utilizing deep percolation test methods in general conformance with the County of Orange standards.

A summary of the test results is presented in Table A. The results do <u>not</u> include a factor of safety.

<table>
<tr><th colspan="4">Table A-Summary of Infiltration Testing
(No Factor of Safety)</th></tr>
<tr><td>Test Designation</td><td>PH-1</td><td>PH-2</td><td>PH-3</td></tr>
<tr><td>Approximate Depth of Test</td><td>10 ft</td><td>10 ft</td><td>10 ft</td></tr>
<tr><td>Time Interval</td><td>30 minutes</td><td>30 minutes</td><td>30 minutes</td></tr>
<tr><td>Radius of Test Hole</td><td>4 inches</td><td>4 inches</td><td>4 inches</td></tr>
<tr><td>Tested Infiltration Rate</td><td>5.7 (in/hr)</td><td>6.0 (in/hr)</td><td>6.4 (in/hr)</td></tr>
</table>
"

Per the Summary of Infiltration Testing, Alta California Geotechnical, Inc. provided the following conclusions and recommendations based on the results:

"Based on our testing, use of infiltration WQMP systems at the depths tested are feasible at the subject site. The WQMP designer should review the test results and determine if the proposed WQMP system is</td></tr>
</table>

	appropriate for the site. A factor of safety should be applied to the results that is in accordance with City of Placentia requirements." Refer to Attachment E for the Summary of Infiltration Testing.
Off-Site Drainage	No off-site drainage enters the property.
Utility and Infrastructure Information	Proposed sewer and storm drain will be private and maintained by the owner/appointed HOA. Proposed domestic water will be public and publicly maintained via a proposed onsite easement.

III.3 Watershed Description

Receiving Waters	Site runoff drains towards the southwestern corner of the site and discharges to Atwood Channel. Atwood Channel drains through the Miller Retarding Basin which drains through the Santa Ana River and ultimately to the Pacific Ocean. The site is located within the Santa Ana Watershed.
303(d) Listed Impairments	Santa Ana River Reach 2 – Indicator Bacteria
Applicable TMDLs	Santa Ana River Reach 2 – Alachlor | Atrazine | Azinphos-methyl (Guthion) | Carbaryl | Carbofuran | Chlorpyrifos | DDE (Dichlorodiphenyldichloroethylene) | Diazinon | Dieldrin | Disulfoton | Malathion | Methyl Parathion | Molinate | Simazine | Thiobencarb/Bolero, Cadmium, Copper, Indicator Bacteria, Lead Santa Ana River Reach 1 – Fecal Coliform
Pollutants of Concern for the Project	Anticipated and Potential Pollutants of Concern for Attached Residential Development is Suspended Solid/Sediments, Pathogens (Bacteria/Virus), Nutrients (Oxygen Demanding Substances), Pesticides, Oil & Grease and Trash & Debris.
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.	There are currently no approved WIHMPs for the Santa Ana Watershed.	

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, a project does not have an HCOC if the volumes and time of concentration of stormwater runoff for the post development condition do not significantly exceed those of the predevelopment condition for a two-year frequency storm event (a difference of five percent or less is considered insignificant). The proposed project does not have HCOCs because site runoff does not drain through any downstream natural channels and it is within an HCOC exempt area per TGD Figure 3, Susceptibility Analysis of the Santa Ana River.
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	Per Section 7.II-2.4.3 of the MWQMP Priority Projects must infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume). This project proposes to utilize an underground infiltration gallery for treatment and retention of the entire DCV.
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	If it is not feasible to meet LID performance criteria through retention and/or biotreatment provided on-site or at a sub-regional/regional scale, then treatment control BMPs shall be provided on-site or off-site prior to discharge to waters of the US. The project proposes to satisfy LID performance criteria, therefore treatment control performance criteria is also fully satisfied.
Calculate LID design storm capture volume for Project.	See Attachment A of this report for DCV calculations.

IV.2. Site Design and Drainage

The proposed development consists of one (1) DMA based on the preliminary grading and drainage design. The DMA is indicated on the Exhibit in Attachment B.

The proposed DMA will convey site drainage towards a proposed infiltration gallery near the southwest corner of the site via a combination of surface flow proposed storm drains. Surface drainage will be collected by proposed curb-inlet catch basins within the proposed drive aisles which will be equipped with Oldcastle FloGard catch basin insert filters for pretreatment. Stormwater will be conveyed to a proposed ADS MC-4500 StormTech Chamber infiltration system for treatment and retention of the entire DCV. The ADS MC-4500 StormTech Chamber infiltration system is an underground infiltration gallery consisting of a series of open bottom domes underlain by a bed of gravel which promotes subsurface infiltration. The proposed infiltration system will provide enough storage to statically retain the DCV, and the underlying infiltrating surface area is sized to ensure the DCV will infiltrate entirely within a maximum drawdown of 48 hours. During storm events that produce a greater runoff volume than the DCV, storm water will overflow out of the infiltration gallery via an overflow pipe and be conveyed to the existing City 24" storm drain which discharges to Atwood Channel via an existing headwall. In the event the storm drain system becomes clogged, stormwater will pond near the catch basin at the southwest corner of the site and eventually sheet flow directly to Atwood Channel via proposed wall knockouts along the southerly property line.

Refer the WQMP Exhibit in Attachment B for the location of the proposed BMP and DMA delineation.

IV.3 LID BMP Selection and Project Conformance Analysis

IV.3.1 Hydrologic Source Controls (HSCs)

The full Design Capture Volume (DCV) is being treated with LID BMPs, therefore HSCs are not proposed.

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:	☐

** HSC BMPs are not required since the project is located within an HCOC exempt area. Refer to the Susceptility Analysis Map for Santa Ana, TGD Figure 3 dated February 2013 in Attachment A of this report for project location. In addition, the entire DCV is being retained onsite through use of an underground infiltration gallery.*

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:	☐

Per the Infiltration Feasibility worksheet within Attachment A, onsite infiltration for the entire DCV is feasible for this project. The proposed DMA will utilize one (1) ADS MC-4500 StormTech Chamber infiltration system to treat and retain the entire DCV. The ADS StormTech system is an underground infiltration gallery with several rows of open-bottom domes which are underlain by a gravel bed which promotes soil percolation. The infiltration system is equipped with one (1) isolator row for filtration of suspended solids prior to infiltration. Refer to Appendix C for system details and manufacturer's specifications.

The proposed system will provide enough static storage for temporary detention of the DCV, and the underlying gravel bed will provide enough surface area to infiltrate the entire DCV within a maximum drawdown time of 48 hours. Per the Summary of Infiltration Testing prepared by Alta California Geotechnical, Inc. dated February 10, 2020, site infiltration rates ranged between 5.7-6.4 inches per hour. Based on the locations of the infiltration tests relative to the proposed location of the proposed infiltration system, 6.4 inches per hour was utilized for design purposed. Per Worksheet H within Attachment A, the appropriate factor of safety is 2.25, resulting in a design infiltration rate of 2.8 inches per hour. Refer to Attachment E for the Summary of Infiltration Testing. Refer to the calculations below for infiltration capacity of the system over 48 hours.

*DCV = 14,335 cf**

$V_{48\text{-hour infiltration}}$ = *(1 ft/12 in)(Infiltration Surface Area, sf)(K_{design}, in/hr)(48 hrs)*

K_{design} = *2.8 in/hr*

*Installed system infiltration surface area = 3,634 sf***

$V_{48\text{-hr infiltration}}$ = *(1 ft/12 in)(3,634 sf)(2.8 in/hr)(48 hrs)*

= ***40,700 cf > 14,335 cf*** ✓

Drawdown = 16.9 hrs < 48 hrs ✓

DMA Summary

DCV (cf)	*ADS MC-4500 StormTech Chamber Infiltration System*		*BMP GIS Coordinates*
	*Static Storage (cf)***	*48-hr Infiltration Capacity (cf)*	
14,335	*15,626 cf*	*40,700*	*33.866843°, -117.834351°*

** Refer to Worksheet B within Attachment A for DCV calculations.*

*** Refer to Attachment C for infiltration gallery details.*

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:	☐

Evapotranspiration, Rainwater Harvesting BMPs will not be utilized onsite because the entire DCV will be retained onsite through infiltration BMPs.

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:	☐

Biotreatment BMPs will not be utilized onsite because the entire DCV is being treated and retained onsite via a proposed underground infiltration gallery.

IV.3.5 Hydromodification Control BMPs

Hydromodification Control BMPs	
BMP Name	**BMP Description**
n/a	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**
PRE-2: Catch Basin Insert Filter	Oldcastle FloGard catch basin insert filters will be installed at each proposed catch basin to provide additional pretreatment of stormwater runoff prior to entering the proposed infiltration gallery.

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. Hazardous materials are not proposed to be stored onsite.
N6	Local Industrial Permit Compliance	☐	☒	Proposed residential project.
N7	Spill Contingency Plan	☐	☒	Proposed residential project.
N8	Underground Storage Tank Compliance	☐	☒	Proposed residential project.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Hazardous materials are not proposed to be stored onsite.
N10	Uniform Fire Code Implementation	☒	☐	Hazardous materials are not proposed to be stored onsite.
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	☐	☒	Proposed residential project.

N1: Education for Property Owners, Tenants & Occupants

Project conditions of approval will require that the Property Management Company (HOA) periodically provide environmental awarness education materials, made available by the municipalities, to all of its members. Among other things, these materials will be descrive the use of chemcials (including household type) that should be limited to the property, with no discharge of wastes via hosing or other direct discharge to gutters, catch basins and storm drains. Educational materials available from the County of Orange can be downloaded here:

http://www.ocwatersheds.com/PublicEd/resources/default.aspx

N2: Activity Restrictions

Conditions, covenants and restrictions (CC&Rs) must be prepared by the developer for the appointed HOA for the purpose of surface water quality protection. The CC&Rs shall incorporate the restrictions based on the Project WQMP.

N3: Common Area Landscape Management

All common landscaping and/ or open space areas shall have on-going landscape maintenance by an appointed professional landscaping maintenance company as selected by the HOA. Maintenance shall incorporate all current County Water Conservation Resolution usage and follow the Management Guidelines for Use of Fertilizers per the DAMP Section 5.5. Refer to Section 5 of this report for additional landscape maintenance requirements.

N4: BMP Maintenance

Refer to Section 5 and Attachment C of this report for additional non-structural BMP maintenance requirements, responsibility and frequency.

N11: Common Area Litter Control

HOA to implement trash management and litter control procedures in the common areas aimed at reducing pollution of drainage water. HOA to contract with landscape maintenance company to provide this service during regularly scheduled maintenance, which will consist of litter patrol, emptying of trash receptacles in common areas, and noting trash disposals violations by homeowners, tenants or occupants and reporting the violations to the HOA for investigation.

N12: Employee Training

HOA to provide Educational Materials and Property Management manuals to all employees upon initial hiring. Any updated information shall be provided to employees within a timely manner along with information on implementation.

N14: Common Area Catch Basin Inspections

HOA to inspect, clean and repair common area catch basins within the development to verify that the private drainage system is working properly. All trash/ debris and sediment build up is

removed and any repairs/ replacements are conducted. Cleaning should take place in late summer/ early fall prior to the start of the raining season. Drainage facilities include catch basins (storm drain inlets), detention basins, retention basins, sediment basins, open drainage channels, area drains, and lift stations. Records shall be kept onsite to document the annual maintenance.

N15: Street Sweeping of Private Streets & Parking Lots

HOA to schedule at a minimum street sweeping of private streets and parking areas prior to the start of the rainy seasons, in late summer or early fall. Additional sweeping may be required to remove landscaping foliage and/ or pollution.

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	☐	☒	No proposed trash enclosure areas.
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 or channels.
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☐	☒	Not Applicable.
S6	Dock areas	☐	☒	No proposed dock areas.
S7	Maintenance bays	☐	☒	No proposed maintenance bay areas.
S8	Vehicle wash areas	☐	☒	No proposed vehicle wash areas.
S9	Outdoor processing areas	☐	☒	No proposed outdoor processing areas.
S10	Equipment wash areas	☐	☒	No proposed equipment wash areas.
S11	Fueling areas	☐	☒	No proposed fueling areas.
S12	Hillside landscaping	☐	☒	No proposed hillside landscaping areas.
S13	Wash water control for food preparation areas	☐	☒	No wash water control for food preparation areas.
S14	Community car wash racks	☐	☒	No proposed community car washing racks.

S1 (CASQA Fact Sheet SD-13): Storm Drain Stenciling & Signage

HOA to inspect, repair and/ or replace storm drain stenciling and signage immediately. Inspection of stenciling and signage shall occur at least once per month and prior to the start of the raining season. Storm Drain stenciling and signage with a reference that indicates "Drains to Ocean" per CASQA BMP SD-13 Fact Sheet is required.

S4 (CASQA Fact Sheet SD-12): Use Efficient Irrigation Systems & Landscape Design

HOA shall implement the timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm drain systems. HOA to implement the following methods to reduce excessive irrigation water runoff, where applicable:

- Employ rain shutoff devices to prevent irrigation after precipitation
- Utilizing landscape specific irrigation water requirements
- Utilize flow reducers or shutoff valves triggered by pressure drop to control water loss due to broken sprinkler heads
- Implement landscaping practices per the County Water Conservation Resolution or City agency equivalent
- Group plants or landscaping with similar water consumption in order to promote surface infiltration

Refer to CASQA BMP Fact Sheet SD-12 for additional information.

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">Water Quality credits will not be utilized on this development site.</td></tr>
</table>

IV.4.2 Alternative Compliance Plan Information

Not applicable for this project.

Section V Inspection/Maintenance Responsibility for BMPs

The property is currently owned by DeNova 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 located in Attachment F of this report and should be executed as part of any ownership transfer after construction is complete.

The owner may appoint a Homeowner's Association (HOA) to provide long term BMP maintenance for the proposed development upon completion of construction.

Owner/ Developer:
DeNova Homes, Inc.
3 Hughes
Irvine, CA 92618
Alan Toffoli, SoCal Division President
(949) 762-2535

Homeowner's Association
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.

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
Education for Property Owners, Tenants, Occupants & Employees	Owner/Homeowner's Association (HOA)	HOA to provide education material, a copy of the approved WQMP and Operation & Maintenance Plan (O&M) to new property owners, tenants, occupants & employees.	At time of hiring, leasing and/ or home purchase.
Activity Restrictions	Owner/HOA	HOA employees notified of activities that are prohibited by homeowners.	Restrictions identified in Employee Manual and reviewed yearly by employees.
Common Area Landscape Management	Owner/HOA	HOA to hire professional landscape company to conduct maintenance of landscaping to meet current water efficiency and keep plants healthy and bio areas maintained with proper soil amendments.	Regular maintenance once a week and monthly inspection to determine deficiencies.
BMP Maintenance	Owner/HOA	HOA to hire professional BMP maintenance company to conduct regular inspections, repairs and cleanings per manufacturer's specifications.	A minimum 2 inspections/ cleanings per year per manufacturer's specifications prior to October 1st (before rainy season)

Common Area Litter Control	Owner/HOA	HOA to provide litter removal of site parking lot and landscape areas and to empty common area trash bins.	Once per week.
Employee Training	Owner/HOA	The distribution of these materials will be the reasonability of the HOA at the initial hiring of the employee.	At time of hiring.
Private Street & Parking Lot Sweeping	Owner/HOA	HOA to provide maintenance of Parking Lot and provide Street Sweeping services.	Weekly basis.
Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Owner/HOA	HOA to provide maintenance of landscaping to meet current water efficiency standards and keep plants healthily.	Regular maintenance once a week and monthly inspection to determine any deficiencies.
Common Area Catch Basin Inspections	Owner/HOA	HOA shall inspection common areas where catch basins are located within the surrounding area and remove any trash/ debris.	Inspections/ Cleaning shall occur at least twice per month.
Storm Drain System Stencilling & Signage	Owner/HOA	HOA to inspect and repair as needed all onsite storm drain stencilling & signage.	Inspection should occur at minimum twice per year.
Oldcastle Flogard Catch Basin Insert Filter	Owner/HOA	Owner/HOA to conduct/coordinate regular inspections, cleanings, and filter replacements per manufacturer's specifications.	Inspections/cleanings should occur at least two times per year and before the start of the rainy season (October 1st).

ADS MC-4500 StormTech Chambers	Owner/HOA	Owner/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 routinely.	Inspections should occur at least two times per year and before the start of the rainy season (October 1st). Refer to Attachment C for manufacturer's specifications.

Section VI BMP Exhibit (Site Plan)

VI.1 BMP Exhibit (Site Plan)

Refer to Attachment B of this report for the WQMP Exhibit which provides the location of all proposed BMPs and a site plan of the project.

Refer to the separately prepared preliminary grading plans for BMP cross sectional information and details.

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 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

TGD Worksheets & Figures

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	*Yes*	*No*
1	**Would Infiltration BMPs pose significant risk for groundwater related concerns?** Refer to Appendix VII (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria.		X
Provide basis:			
2	Would Infiltration BMPs **pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level**? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert): • The BMP can only be located less than 50 feet away from slopes steeper than 15 percent • The BMP can only be located less than eight feet from building foundations or an alternative setback. • A study prepared by a geotechnical professional or an available watershed study substantiates that stormwater infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be mitigated to an acceptable level.		X
Provide basis:			
3	Would infiltration of the DCV from drainage area **violate downstream water rights**?		X
Provide basis:			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

	Partial Infeasibility Criteria	*Yes*	*No*
4	Is proposed infiltration facility **located on HSG D soils** or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?		X
Provide basis:			
5	Is **measured infiltration rate below proposed facility less than 0.3 inches per hour**? This calculation shall be based on the methods described in Appendix VII.		X
Provide basis:			
6	Would **reduction of over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:			
7	Would **an increase in infiltration over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

Infiltration Screening Results (check box corresponding to result):		
8	Is there substantial evidence that infiltration from the project would result in a significant increase in I&I to the sanitary sewer that cannot be sufficiently mitigated? (See Appendix XVII) Provide narrative discussion and supporting evidence:	No
9	If any answer from row 1-3 is yes: infiltration of any volume is **not feasible** within the DMA or equivalent. Provide basis:	Feasible
10	If any answer from row 4-7 is yes, infiltration is **permissible but is not presumed to be feasible for the entire DCV.** Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply. Provide basis:	Feasible
11	If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable.	Infiltration of the full DCV is Feasible

DMA 1

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.90	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.00	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.90	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	5.57	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.85	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.79	
4	Calculate runoff volume, $V_{design}= (C \times d_{remainder} \times A \times 43560 \times (1/12))$	V_{design}=	14,335	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)	$K_{measured}$=	6.4	In/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=	2.25	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=	2.8	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	48	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}=	11.2	feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=	1,280	sq-ft

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet

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	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			1.50
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					2.25
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					6.4
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} / K_M$					2.8

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Refer to the Geotechnical Due Diligence Investigation Evaluation prepared by Albus-Keefe & Associates, Inc. dated August 24, 2017 and the Summary of Infiltration Testing prepared by Alta California Geotechnical, Inc. dated February 10, 2020 in Attachment E.

SUBJECT TO FURTHER REVISION

Project Location

LEGEND

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

Rainfall Zones

Design Capture Storm Depth (inches)

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

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

0.65 0.7 0.75 0.8 0.85 0.9 0.95 1 1.05

0 3 6 12 Kilometers
0 1.8 3.6 7.2 Miles

TITLE
RAINFALL ZONES

ORANGE COUNTY
TECHNICAL GUIDANCE
DOCUMENT

JOB
ORANGE CO. CA

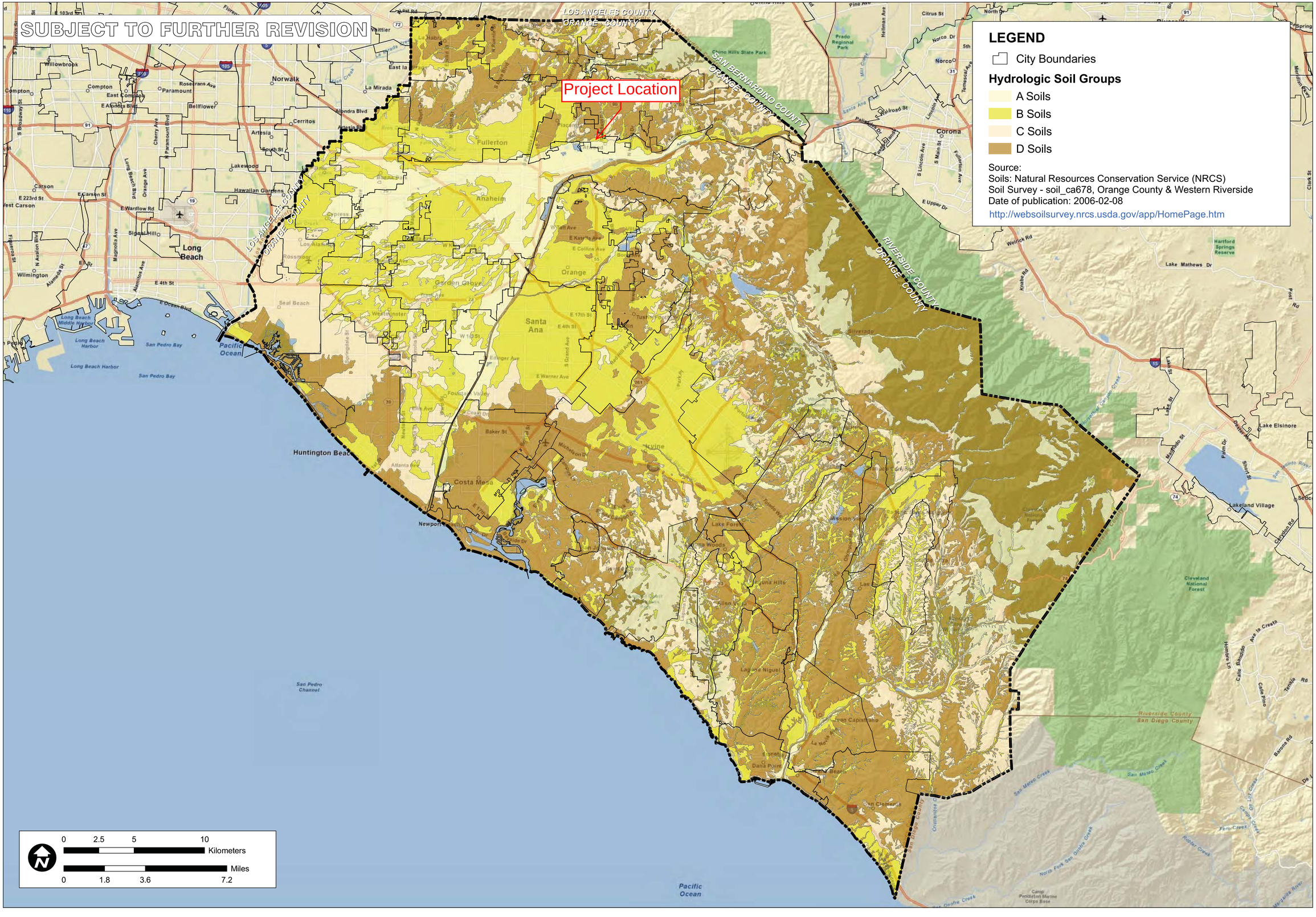
SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-1

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

SUBJECT TO FURTHER REVISION



LEGEND

- City Boundaries

Hydrologic Soil Groups

- A Soils
- B Soils
- C Soils
- D Soils

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

0 2.5 5 10 Kilometers

0 1.8 3.6 7.2 Miles

TITLE

NRCS HYDROLOGIC SOILS GROUPS

JOB

ORANGE COUNTY INFILTRATION STUDY

ORANGE CO. CA

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

PACE
Advanced Water Engineering

FIGURE

XVI-2a

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

SUBJECT TO FURTHER REVISION

LEGEND

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

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

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

Project Location

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

0 2 4 8 Kilometers
0 1.25 2.5 5 Miles

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

SUBJECT TO FURTHER REVISION

Project Location

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

LOS ANGELES COUNTY
ORANGE COUNTY

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

TITLE

NORTH ORANGE COUNTY GROUNDWATER PROTECTION AREAS

ORANGE COUNTY INFILTRATION STUDY

CA

JOB

ORANGE CO.

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

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

Susceptibility

Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility

Channel Type

- Earth (Unstable)
- Earth (Stabilized)
- Stabilized

Tidel Influence

- <= Mean High Water Line (4.28')

Water Body

- Basin
- Dam
- Lake
- Reservoir

Forest Areas

- Cleveland National Forest

Federal Lands

- Amarus Salt Marsh

Project Location

Carbon Canyon

Yorba Linda Reservoir

Miller Retarding Basin

Anaheim Lake

Warner Basin

Kraemer Basin

Fletcher Retarding Basin

Olive Hills

Walnut Canyon Reservoir

Villa Park Dam

Peters Canyon Reservoir

Irvine Lake

Cleveland National Forest

Stabilized by Grade Control Structure

SOUTHPARK PUMP STATION

Bartlett Retarding Basin

San Gabriel-Coyote Creek Watershed

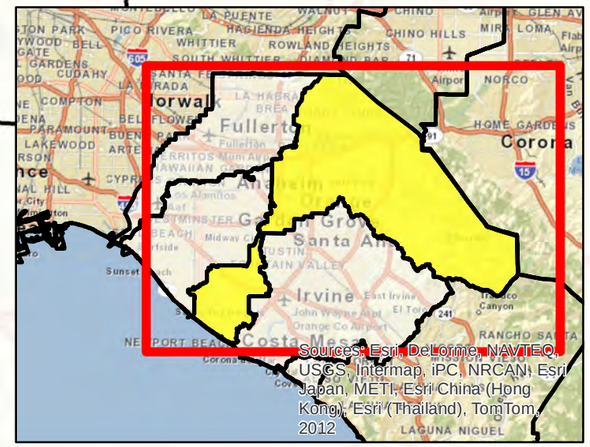
San Bernardino County

Riverside County

AnaheimBay-HuntingtonHarbor Watershed

Newport Bay Watershed

South Orange County



0 12,000 24,000 Feet

Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2012

P:\19526E\16-GIS\Mxds\SuceptabilityMaps_20100505\9526E_SantaAnaRiverSusceptibility_20100430.mxd

TITLE: SUSCEPTIBILITY ANALYIS SANTA ANA RIVER

JOB: ORANGE COUNTY WATERSHED MASTER PLANNING ORANGE CO. CA

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

PACE Advanced Water Engineering

FIGURE 3

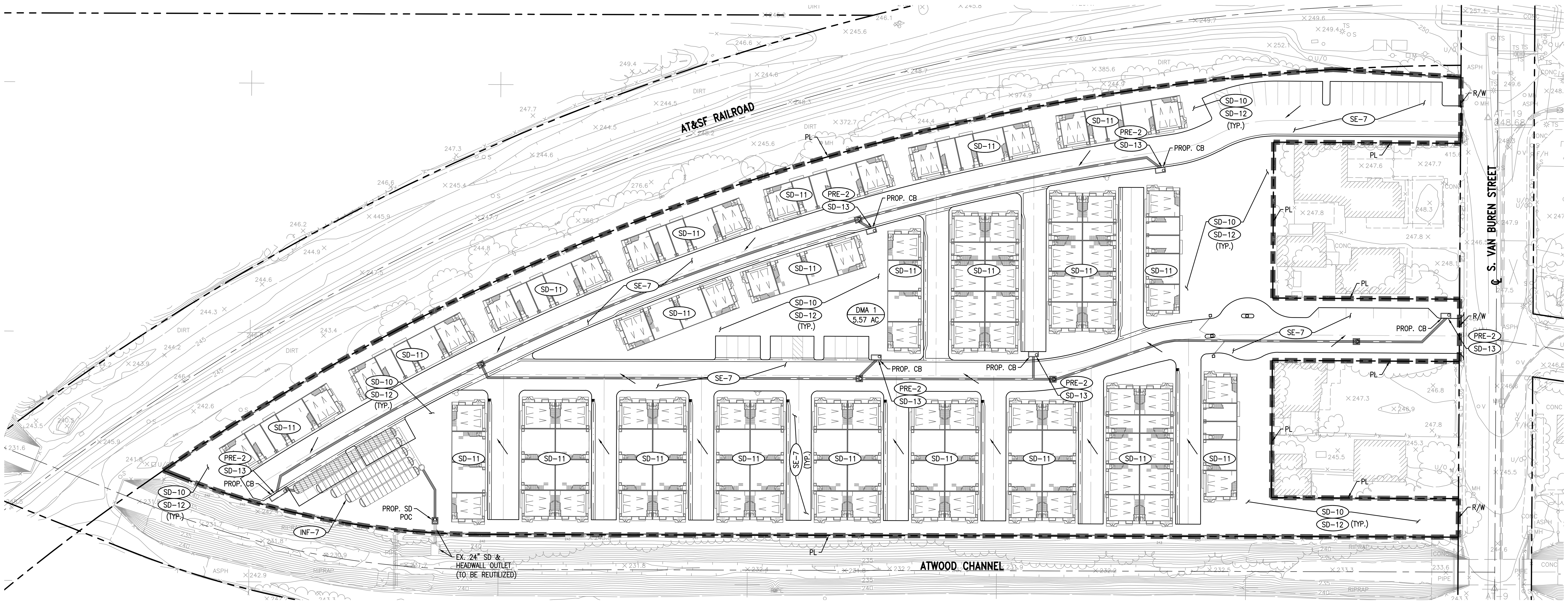
Attachment B

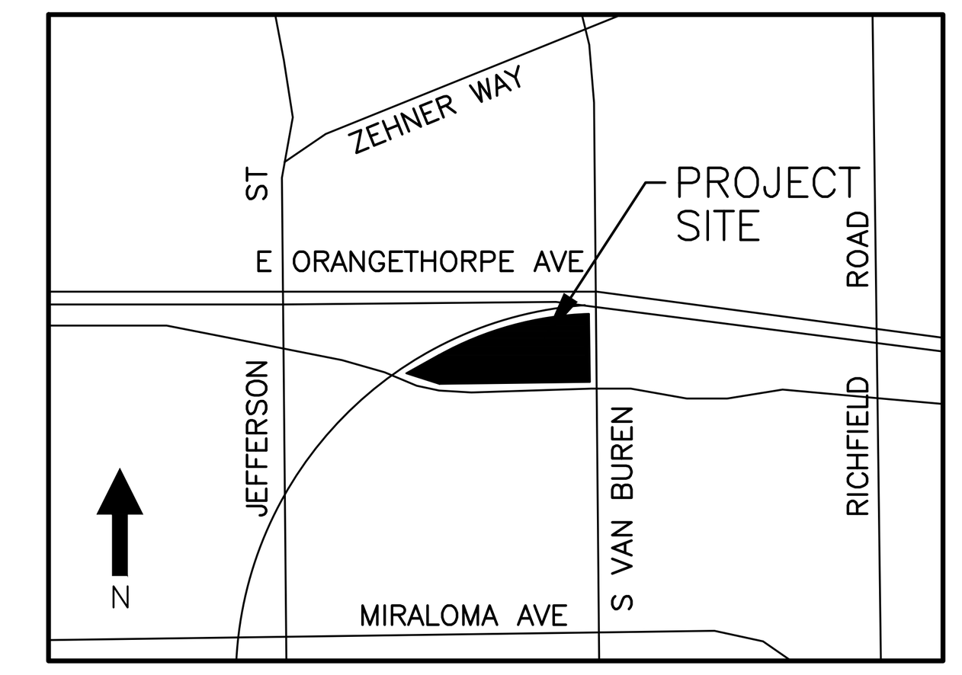
WQMP Exhibit

PRELIMINARY WQMP EXHIBIT

433 S. VAN BUREN STREET

CITY OF PLACENTIA, COUNTY OF ORANGE





VICINITY MAP
NOT TO SCALE

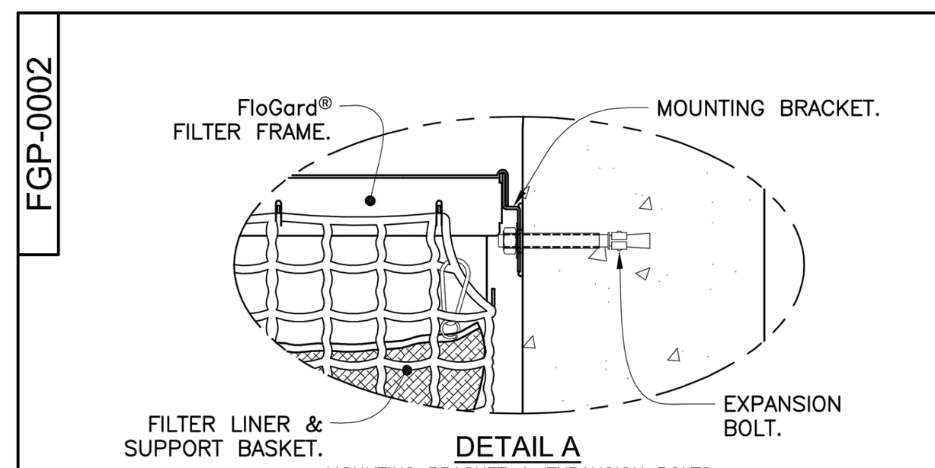
LEGEND

- EXISTING RIGHT-OF-WAY/ BOUNDARY
- DRAINAGE MANAGEMENT AREA (DMA)
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- DRAINAGE FLOW ARROWS
- DMA X / X.XX AC — DRAINAGE MANAGEMENT AREA (DMA) / ACREAGE

BEST MANGEMENT PRACTICES (BMPS)

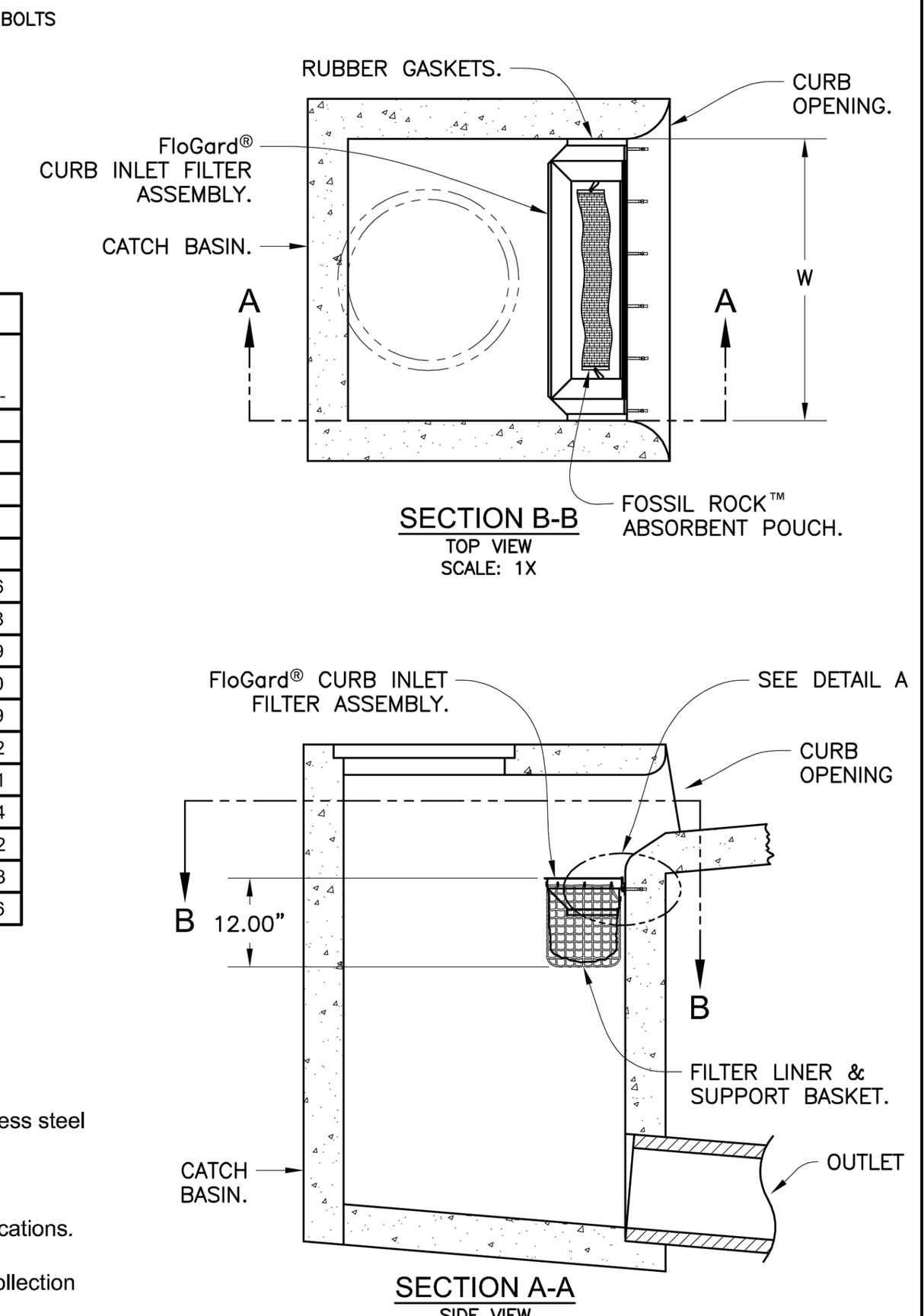
- SD-10 — SITE DESIGN & LANDSCAPE PLANNING
- SD-11 — ROOF RUNOFF CONTROLS
- SD-12 — EFFICIENT IRRIGATION
- SD-13 — STORM DRAIN SIGNAGE
- SE-7 — STREET SWEEPING & VACUUMING
- PRE-2 — CATCH BASIN INSERT FILTER
- INF-7 — UNDERGROUND INFILTRATION – ADS MC-4500 STORMTECH CHAMBER

FGP-0002



DETAIL A
MOUNTING BRACKET & EXPANSION BOLTS
SEE NOTE 2
SCALE: 6X

SPECIFIER CHART				
MODEL NO.	Curb Opening Width - W -	Storage Capacity - Cu. Ft. -	Filtered Flow Rate - GPM/CFS -	Bypass Flow Rate - GPM/CFS -
FGP-24CI	2.0' (24")	.95	338 / .75	2,513 / 5.6
FGP-30CI	2.5' (30")	1.20	450 / 1.00	3,008 / 6.7
FGP-36CI	3.0' (36")	1.50	563 / 1.25	3,547 / 7.9
FGP-42CI	3.5' (42")	1.80	675 / 1.50	3,951 / 8.8
FGP-48CI	4.0' (48")	2.10	768 / 1.76	4,445 / 9.9
FGP-5.0CI	5.0' (60")	2.40	900 / 2.00	5,208 / 11.6
FGP-6.0CI	6.0' (72")	3.05	1,126 / 2.51	6,196 / 13.8
FGP-7.0CI	7.0' (84")	3.65	1,350 / 3.01	7,139 / 15.9
FGP-8.0CI	8.0' (96")	4.25	1,576 / 3.51	8,082 / 18.0
FGP-10.0CI	10.0' (120")	4.85	1,800 / 4.01	9,833 / 21.9
FGP-12.0CI	12.0' (144")	6.10	2,252 / 5.02	11,764 / 26.2
FGP-14.0CI	14.0' (168")	7.30	2,700 / 6.02	13,515 / 30.1
FGP-16.0CI	16.0' (192")	8.55	3.152 / 7.02	15,446 / 34.4
FGP-18.0CI	18.0' (216")	9.45	3,490 / 7.78	17,152 / 38.2
FGP-21.0CI	21.0' (252")	10.95	4,050 / 9.02	19,891 / 44.3
FGP-28.0CI	28.0 (336")	14.60	5,400 / 12.03	26,311 / 58.6



NOTES:

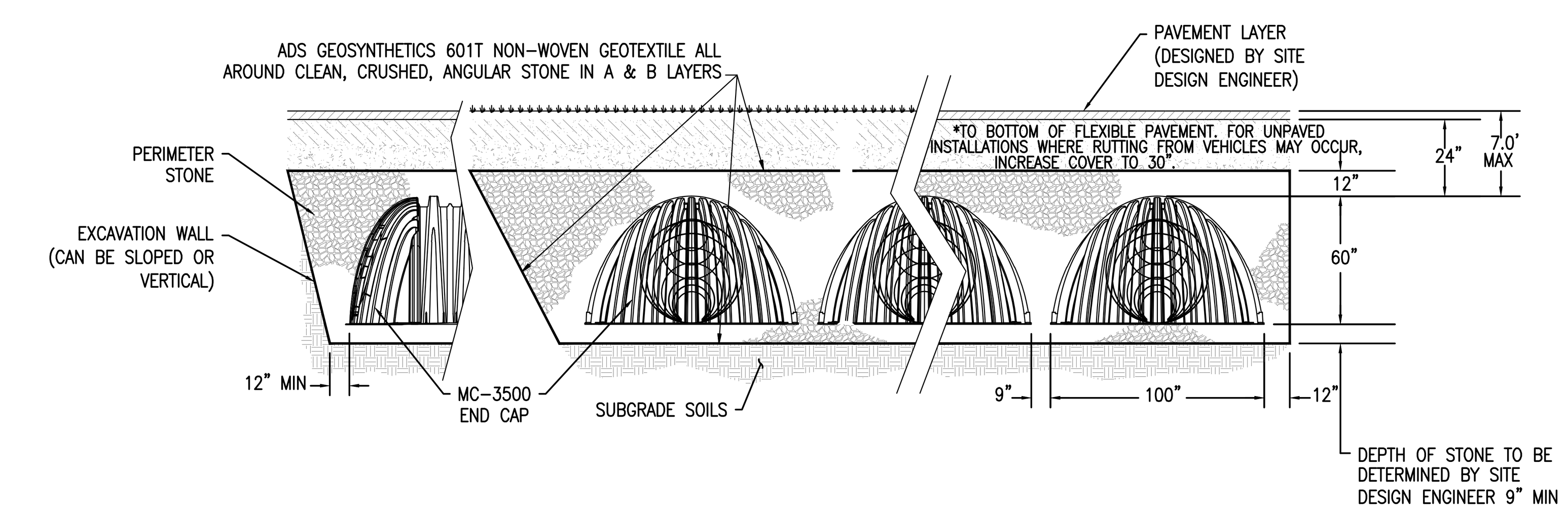
1. Filter insert shall have a high flow bypass feature.
2. Filter support frame shall be constructed from stainless steel Type 304.
3. Filter medium shall be *Fossil Rock* ™, installed and maintained in accordance with manufacturer specifications.
4. Storage capacity reflects 80% of maximum solids collection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

FloGard®
Catch Basin Insert Filter
Curb Inlet Style
Inlet Filtration

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

DRAWING NO.	REV		DATE	
FGP-0002	E	ECO-0127 JPR 5/18/15	JPR 1/3/06	SHEET 1 OF 1

(PRE-2) CATCH BASIN INSERT FILTER TYPICAL DETAIL



(INF-7) ADS MC-4500 STORMTECH CHAMBER TYPICAL DETAIL

PREPARED BY:

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

6 ORCHARD, SUITE 200
LAKE FOREST, CA 92630
T. 949.916.3800
F. 949.916.3805
CVC-INC.NET

REGISTERED PROFESSIONAL ENGINEER
DANE P. MCDOUGALL
C 80705
CIVIL
STATE OF CALIFORNIA

TENTATIVE TRACT MAP 19104
PRELIMINARY WQMP EXHIBIT

DATE: 2/13/2020
SHEET 1 OF 1

SCALE: AS SHOWN | DRAWN BY: BB | CHECKED BY: JC

CITY OF PLACENTIA

Attachment C

Site BMPs

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	EPM NAME EPM NUMBER EPM EMAIL
ADS SALES REP	SALES NAME SALES NUMBER SALES EMAIL
PROJECT NO.	

ADVANCED DRAINAGE SYSTEMS, INC.

SiteASSIST™ by StormTech

FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

VAN BUREN & ORANGETHORPE

PLACENTIA, CA

MC-4500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-4500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-4500 CHAMBER SYSTEM

1. STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-4500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT

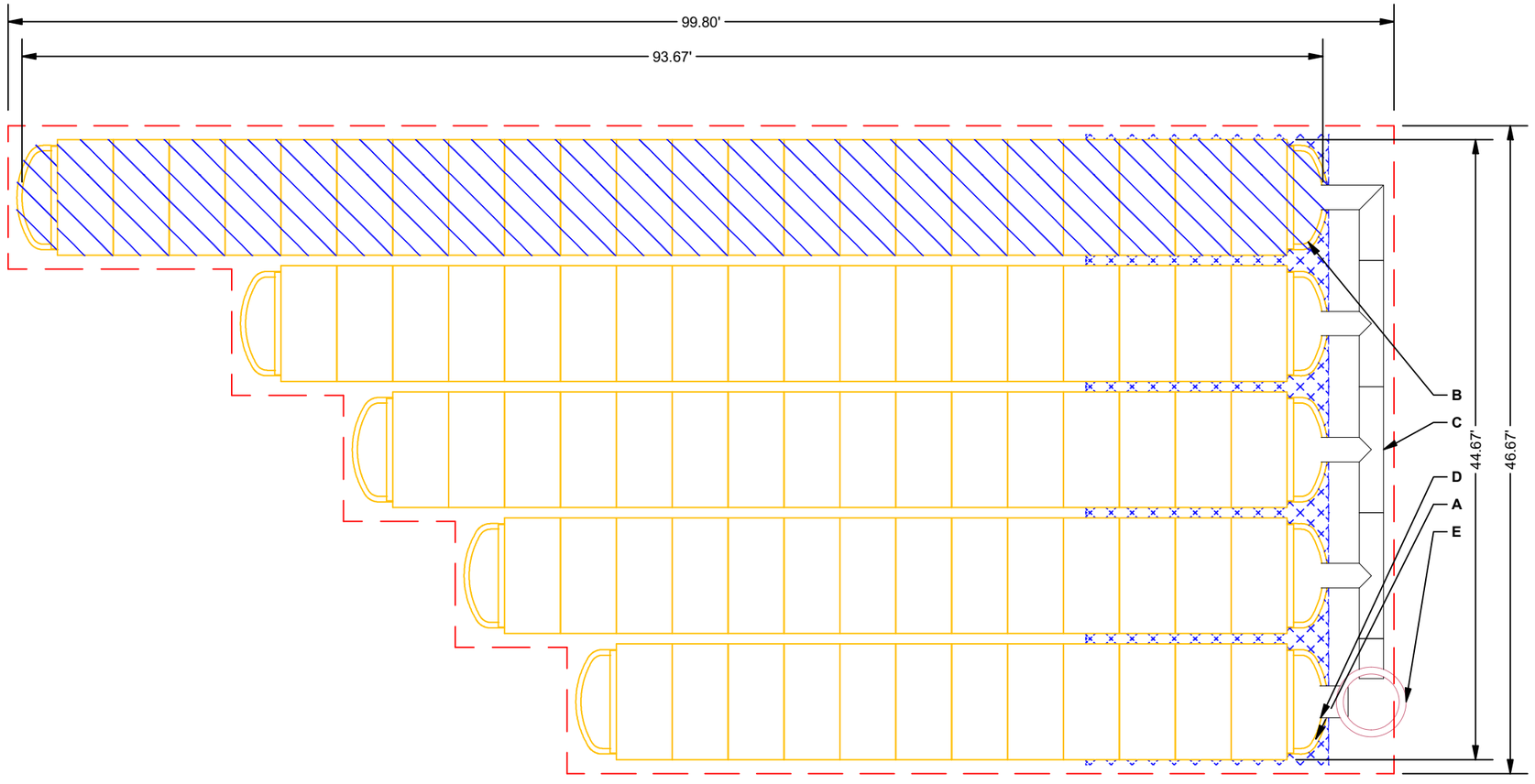
82	STORMTECH MC-4500 CHAMBERS
10	STORMTECH MC-4500 END CAPS
12	STONE ABOVE (in)
12	STONE BELOW (in)
40	% STONE VOID
15626	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
3634	SYSTEM AREA (SF)
292.93	SYSTEM PERIMETER (ft)

CONCEPTUAL ELEVATIONS

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	13.00
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.50
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	8.00
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	8.00
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	8.00
TOP OF STONE:	7.00
TOP OF MC-4500 CHAMBER:	6.00
24" ISOLATOR ROW INVERT:	1.19
18" x 18" BOTTOM MANIFOLD INVERT:	1.16
BOTTOM OF MC-4500 CHAMBER:	1.00
BOTTOM OF STONE:	0.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	24" BOTTOM CORED END CAP/TYP OF ALL 24" BOTTOM CONNECTIONS	2.26"	
PREFABRICATED END CAP	B	18" BOTTOM CORED END CAP/TYP OF ALL 18" BOTTOM CONNECTIONS AND ISOLATOR ROWS	1.97"	
MANIFOLD	C	18" X 18" BOTTOM, ADS N-12	1.97"	
PIPE CONNECTION	D	24" BOTTOM CONNECTION	2.26"	
CONCRETE STRUCTURE	E	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		22.0 CFS IN



ISOLATOR ROW
(SEE DETAIL)

PLACE MINIMUM 17.50' OF ADS GEOSYNTHETICS 315WTM WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH SHEET #7 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- NOT FOR CONSTRUCTION

VAN BUREN & ORANGETHORPE
PLACENTIA, CA

DRAWN: BB
CHECKED: N/A
DATE:
PROJECT #:

REV	DRW	CHK	DESCRIPTION

StormTech®
Detention - Retention - Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 |888-892-2694 | WWW.STORMTECH.COM

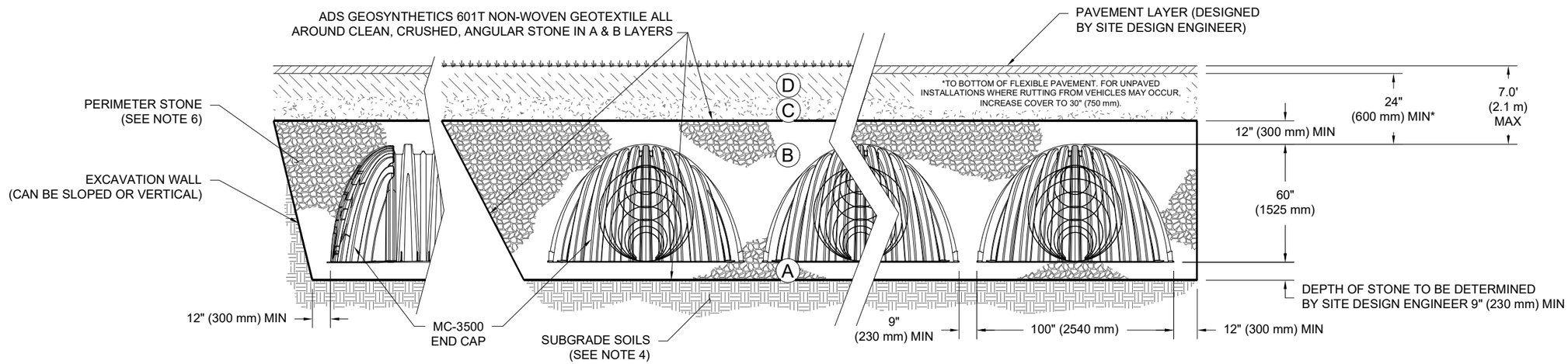
ADS®
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

0 10' 20'

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

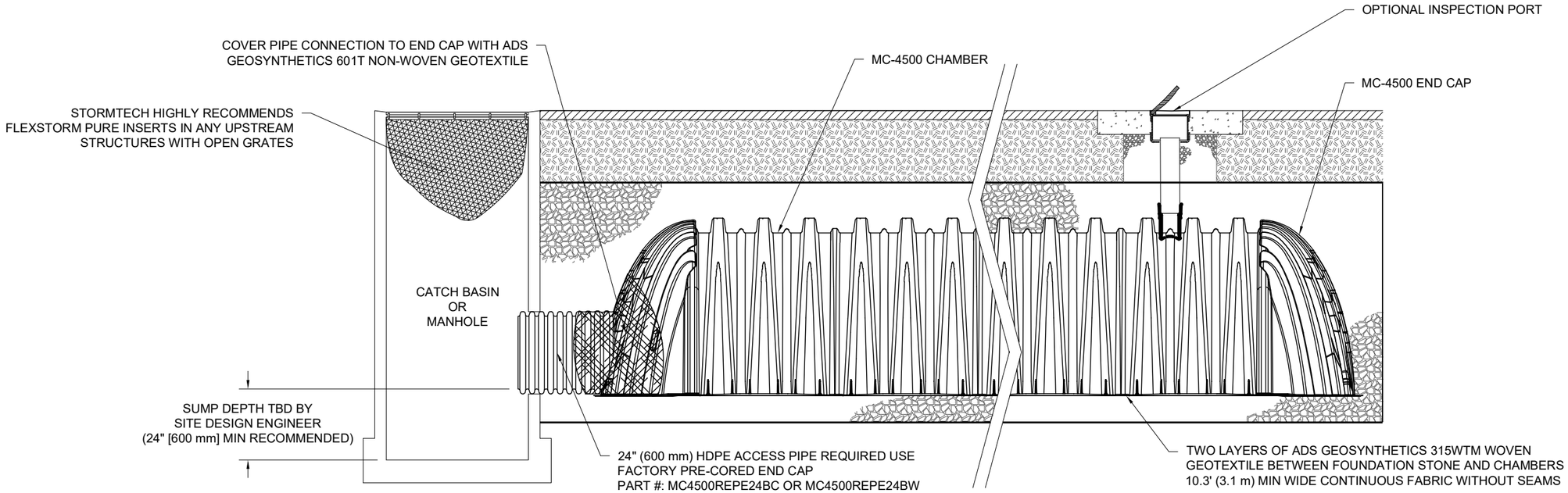
VAN BUREN & ORANGETHORPE
PLACENTIA, CA

DRAWN: BB
CHECKED: N/A
DATE:
PROJECT #:

REV	DRW	CHK	DESCRIPTION

StormTech®
Detention - Retention - Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 |888-892-2694 | WWW.STORMTECH.COM

ADS®
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473



MC-4500 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

VAN BUREN & ORANGETHORPE
PLACENTIA, CA

DATE:
DRAWN: BB
PROJECT #:
CHECKED: N/A

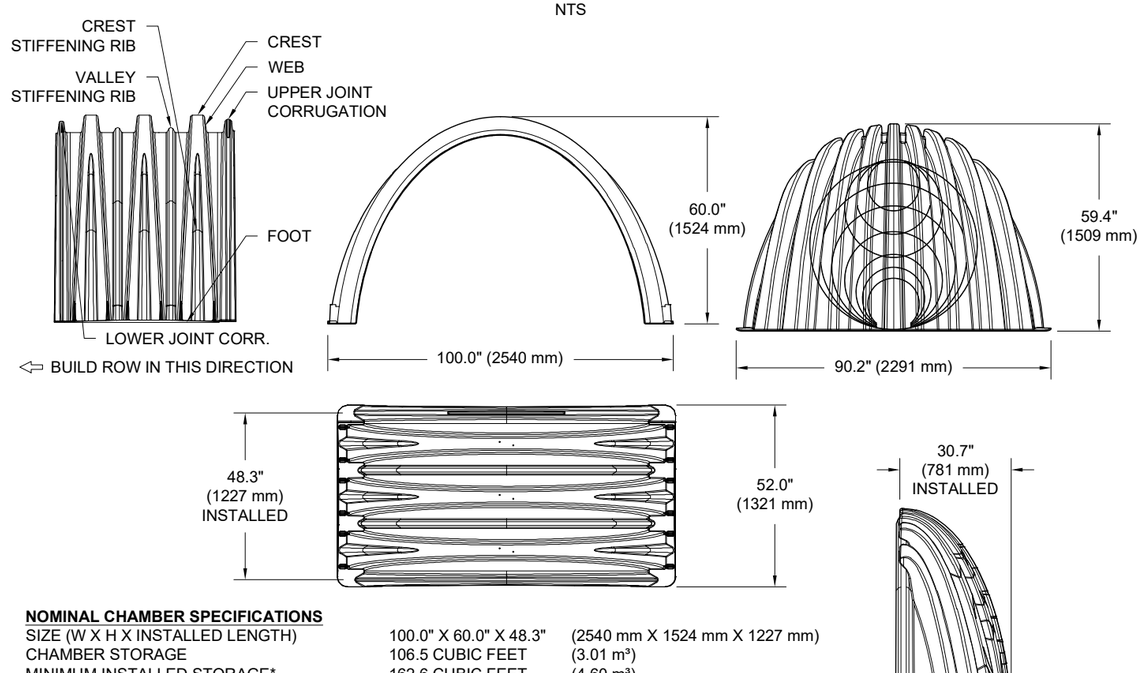
REV	DRW	CHK	DESCRIPTION

StormTech®
Detention - Retention - Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 |888-892-2694 | WWW.STORMTECH.COM

ADS®
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

MC-4500 TECHNICAL SPECIFICATION

NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m³)
WEIGHT	130.0 lbs.	(59.0 kg)

NOMINAL END CAP SPECIFICATIONS

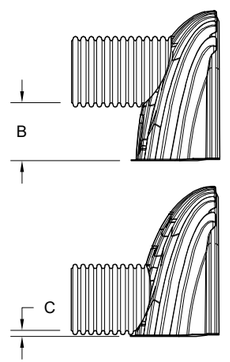
SIZE (W X H X INSTALLED LENGTH)	90.2" X 59.4" X 30.7"	(2291 mm X 1509 mm X 781 mm)
END CAP STORAGE	35.7 CUBIC FEET	(1.01 m³)
MINIMUM INSTALLED STORAGE*	108.7 CUBIC FEET	(3.08 m³)
WEIGHT	135.0 lbs.	(61.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC4500REPE06T	6" (150 mm)	42.54" (1.081 m)	---
MC4500REPE06B		---	0.86" (22 mm)
MC4500REPE08T	8" (200 mm)	40.50" (1.029 m)	---
MC4500REPE08B		---	1.01" (26 mm)
MC4500REPE10T	10" (250 mm)	38.37" (975 mm)	---
MC4500REPE10B		---	1.33" (34 mm)
MC4500REPE12T	12" (300 mm)	35.69" (907 mm)	---
MC4500REPE12B		---	1.55" (39 mm)
MC4500REPE15T	15" (375 mm)	32.72" (831 mm)	---
MC4500REPE15B		---	1.70" (43 mm)
MC4500REPE18TC	18" (450 mm)	29.36" (746 mm)	---
MC4500REPE18TW			
MC4500REPE18BC		---	1.97" (50 mm)
MC4500REPE18BW			
MC4500REPE24TC	24" (600 mm)	23.05" (585 mm)	---
MC4500REPE24TW			
MC4500REPE24BC		---	2.26" (57 mm)
MC4500REPE24BW			
MC4500REPE30BC	30" (750 mm)	---	2.95" (75 mm)
MC4500REPE36BC	36" (900 mm)	---	3.25" (83 mm)
MC4500REPE42BC	42" (1050 mm)	---	3.55" (90 mm)

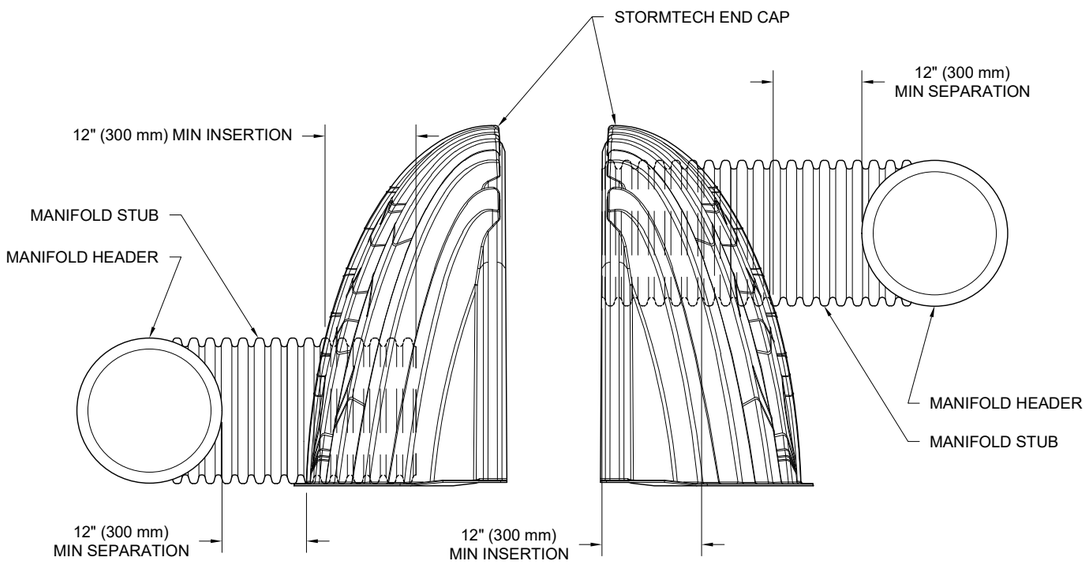
NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

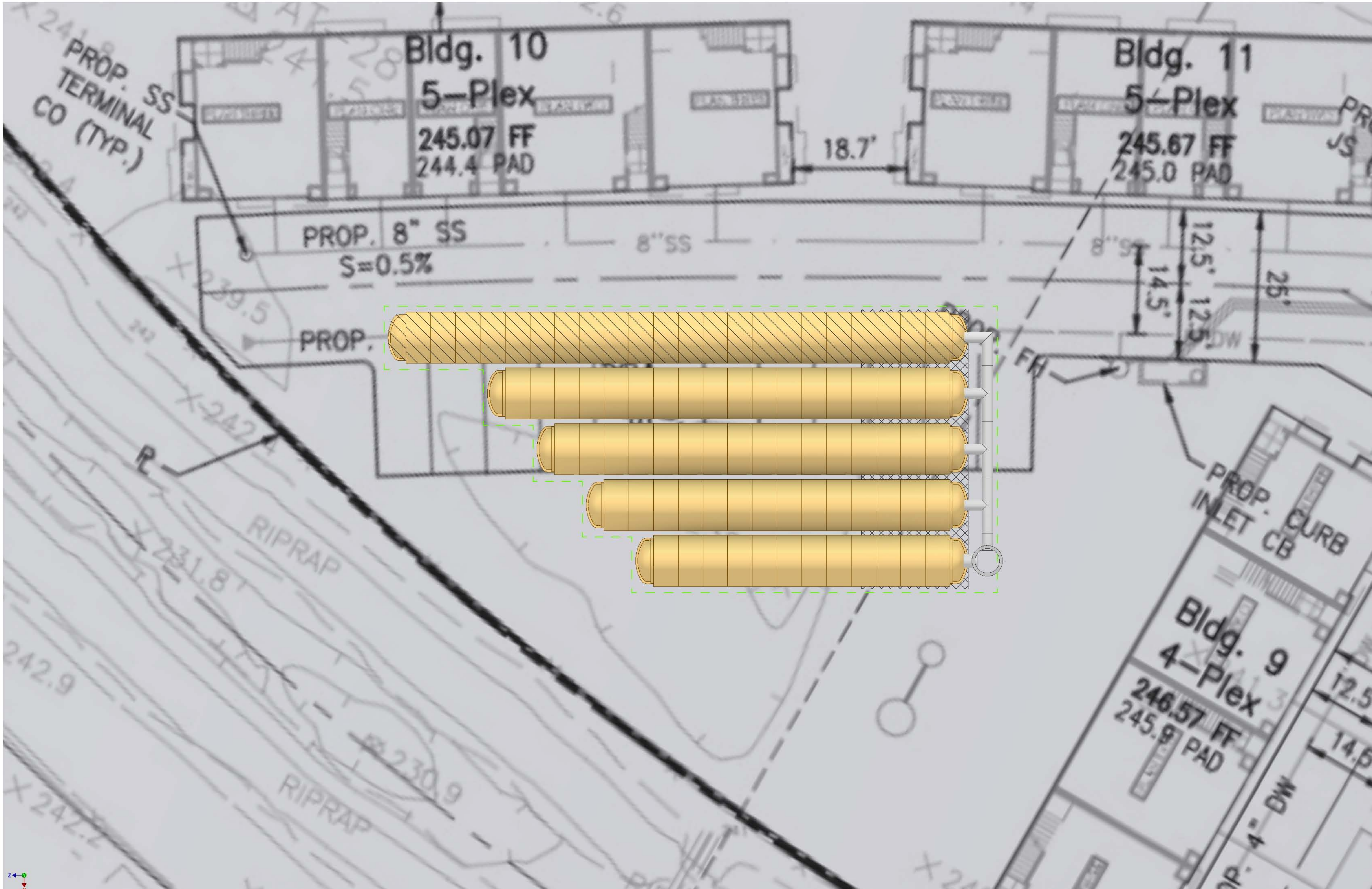
VAN BUREN & ORANGETHORPE
PLACENTIA, CA

DATE: | DRAWN: BB | CHECKED: N/A | PROJECT #:

REV	DRW	CHK	DESCRIPTION

StormTech®
Detention - Retention - Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

ADS®
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473


Bldg. 10
5-Plex
245.07 FF
244.4 PAD
Bldg. 11
5-Plex
245.67 FF
245.0 PAD
18.7'
PROP. SS
TERMINAL
CO (TYP.)
PROP. 8" SS
S=0.5%
8"SS
PROP.
12.5'
12.5'
14.5'
25'
FH
PROP. CURB
INLET CB
RIPRAP
RIPRAP
Bldg. 9
4-Plex
246.57 FF
245.9 PAD
12.5'
14.5'

User Inputs

Chamber Model:	MC-4500
Outlet Control Structure:	No
Project Name:	Van Buren & Orangethorpe
Engineer:	Breeana Best
Project Location:	California
Measurement Type:	Imperial
Required Storage Volume:	25000 cubic ft.
Stone Porosity:	40%
Stone Foundation Depth:	12 in.
Stone Above Chambers:	12 in.
Average Cover Over Chambers:	24 in.
Design Constraint Dimensions:	(150 ft. x 150 ft.)

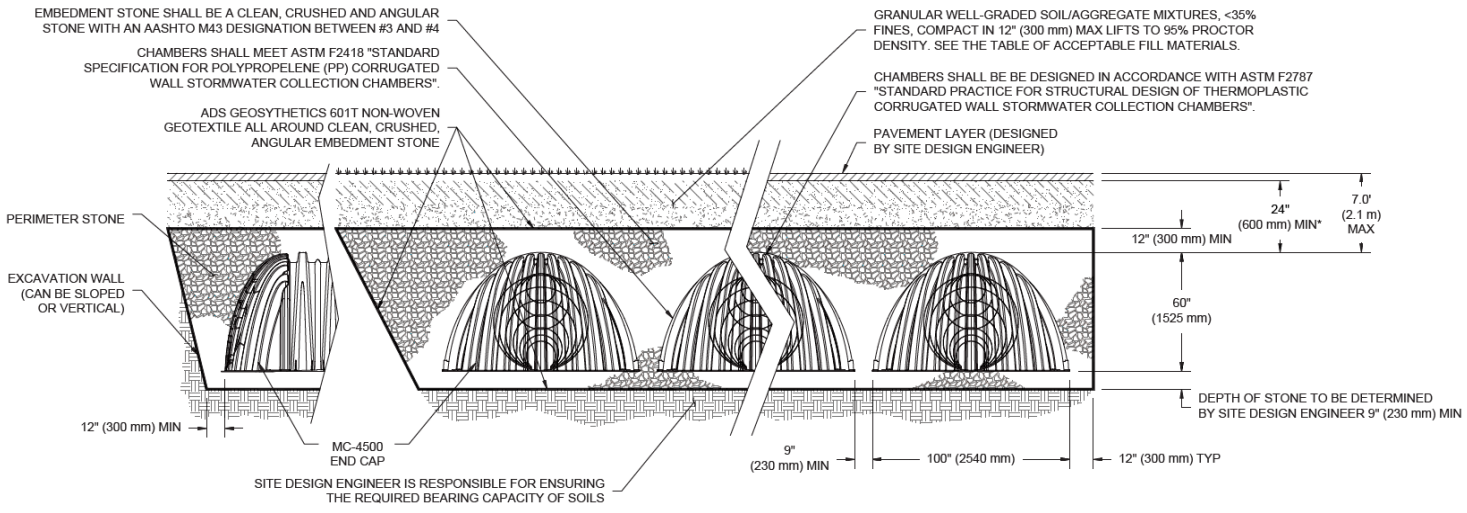
Results

System Volume and Bed Size

Installed Storage Volume:	15628.08 cubic ft.
Storage Volume Per Chamber:	106.50 cubic ft.
Number Of Chambers Required:	82
Number Of End Caps Required:	10
Chamber Rows:	5
Maximum Length:	99.80 ft.
Maximum Width:	46.67 ft.
Approx. Bed Size Required:	3633.60 square ft.

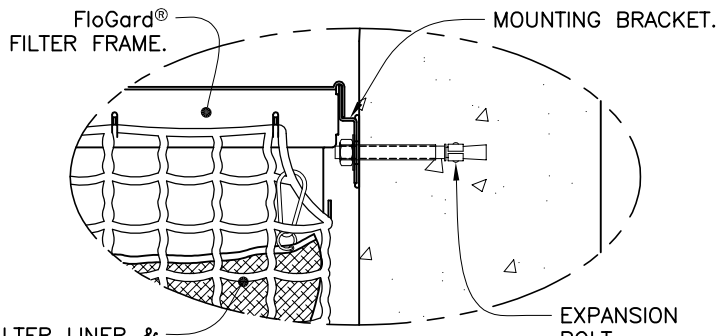
System Components

Amount Of Stone Required:	605.38 cubic yards
Volume Of Excavation (Not Including Fill):	942.04 cubic yards

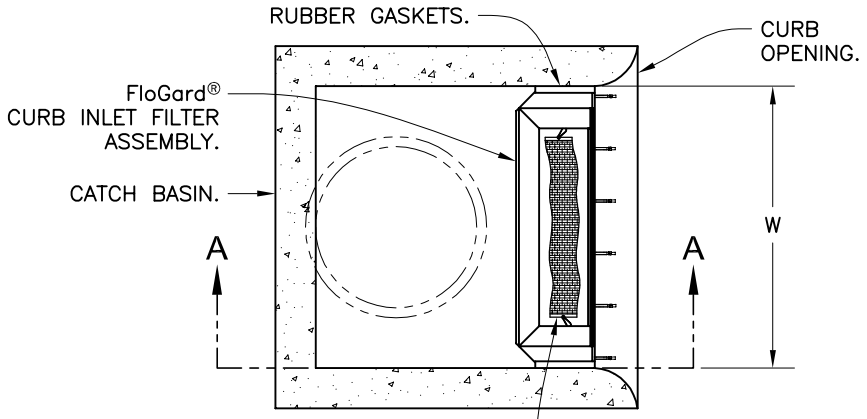


*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

FGP-0002

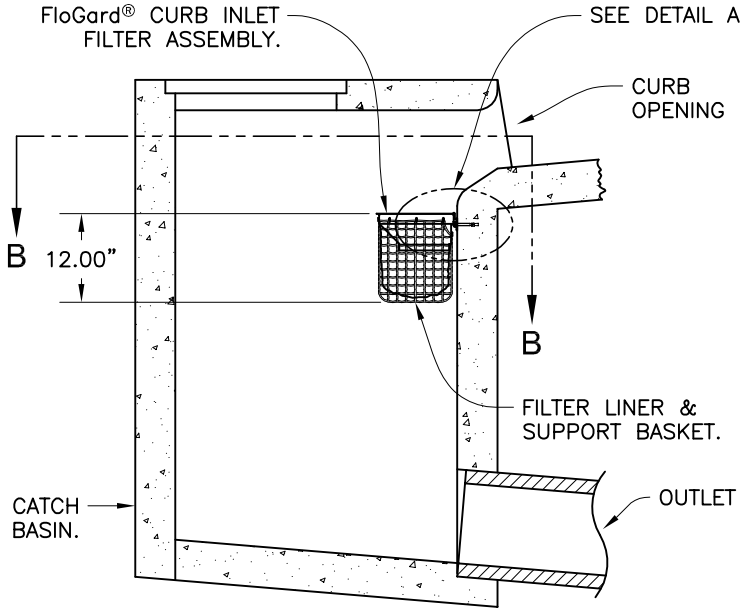


DETAIL A
MOUNTING BRACKET & EXPANSION BOLTS
SEE NOTE 2
SCALE: 6X



SECTION B-B
TOP VIEW
SCALE: 1X

SPECIFIER CHART				
MODEL NO.	Curb Opening Width - W -	Storage Capacity - Cu. Ft. -	Filtered Flow Rate - GPM/CFS -	Bypass Flow Rate - GPM/CFS -
FGP-24CI	2.0' (24")	.95	338 / .75	2,513 / 5.6
FGP-30CI	2.5' (30")	1.20	450 / 1.00	3,008 / 6.7
FGP-36CI	3.0' (36")	1.50	563 / 1.25	3,547 / 7.9
FGP-42CI	3.5' (42")	1.80	675 / 1.50	3,951 / 8.8
FGP-48CI	4.0' (48")	2.10	768 / 1.76	4,445 / 9.9
FGP-5.0CI	5.0' (60")	2.40	900 / 2.00	5,208 / 11.6
FGP-6.0CI	6.0' (72")	3.05	1,126 / 2.51	6,196 / 13.8
FGP-7.0CI	7.0' (84")	3.65	1,350 / 3.01	7,139 / 15.9
FGP-8.0CI	8.0' (96")	4.25	1,576 / 3.51	8,082 / 18.0
FGP-10.0CI	10.0' (120")	4.85	1,800 / 4.01	9,833 / 21.9
FGP-12.0CI	12.0' (144")	6.10	2,252 / 5.02	11,764 / 26.2
FGP-14.0CI	14.0' (168")	7.30	2,700 / 6.02	13,515 / 30.1
FGP-16.0CI	16.0' (192")	8.55	3.152 / 7.02	15,446 / 34.4
FGP-18.0CI	18.0' (216")	9.45	3,490 / 7.78	17,152 / 38.2
FGP-21.0CI	21.0' (252")	10.95	4,050 / 9.02	19,891 / 44.3
FGP-28.0CI	28.0 (336")	14.60	5,400 / 12.03	26,311 / 58.6



SECTION A-A
SIDE VIEW
SCALE: 1X

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

Curb 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-0002	E	ECO-0127 JPR 5/18/15	JPR 1/3/06	SHEET 1 OF 1

INF-7: Underground Infiltration

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

Also known as:

- *Infiltration vault*
- *Recharge vault*

Underground Infiltration

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

Feasibility Screening Considerations

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

Opportunity Criteria

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

OC-Specific Design Criteria and Considerations

- ☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc.)
- ☐ Minimum separation to mounded seasonally high groundwater of 10 feet shall be observed.
- ☐ Minimum pretreatment should be provided upstream of the infiltration facility, and water bypassing pretreatment should not be directed to the facility.
- ☐ Underground infiltration should not be used for drainage areas with high sediment production potential unless preceded by full treatment control with a BMP effective for sediment removal.
- ☐ Design infiltration rate should be determined as described **in Appendix VII**.
- ☐ Inspection ports or similar design features shall be provided to verify continued system performance and identify need for major maintenance.

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

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

Computing Underground Infiltration Device Size

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

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

Additional References for Design Guidance

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

Street Sweeping and Vacuuming SE-7

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.

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

- 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.

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

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

– 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.

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.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- 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.

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

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

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

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.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

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.

Attachment D

Operation & Maintenance Plan

To be provided during final engineering.

Attachment E

Geotechnical Report & Summary of Infiltration Testing

ALTA CALIFORNIA
GEOTECHNICAL INC.

170 North Maple Street, Suite 108
Corona, CA 92880
www.altageotechnical.com

DENOVA HOMES
Three Hughes
Irvine, California 92618

February 10, 2020
Project Number 1-0314

Attention: Mr. Alan Toffoli

Subject: ***SUMMARY OF INFILTRATION TESTING***
Van Buren Street and Orangethorpe Avenue
City of Placentia, California

References:

1. Albus-Keefe & Associates, Inc., 2017, Geotechnical Due Diligence Evaluation, Proposed Residential Development, Van Buren Street and Orangethorpe Avenue, Placentia, California, dated August 24, 2017 (J.N.: 2641.00).
2. Albus-Keefe & Associates, Inc., 2017, Addendum to Geotechnical Due Diligence Evaluation, Proposed Residential Development, Van Buren Street and Orangethorpe Avenue, Placentia, California, dated November 21, 2017 (J.N.: 2641.00)

Dear Mr. Toffoli:

Presented herein is Alta California Geotechnical, Inc.'s (Alta) summary of infiltration testing for the proposed residential development located at the southwest corner of the intersection of Orangethorpe Avenue and Van Buren Street, in the City of Placentia, California. It is our understanding that an infiltration-type WQMP system is being considered for the project. As such, we conducted infiltration tests to assist in the design of the system. Presented below is a summary of our infiltration testing, and conclusions and recommendations based on the testing.

Site Geotechnical Conditions

A subsurface investigation of the site was previously conducted on August 9, 2017 by Albus-Keefe & Associates, Inc (Reference 1). Four (4) hollow-stem auger borings were excavated, logged and sampled as part of the investigation and an additional two (2) borings were installed

for percolation testing. Based on the investigation, the site is underlain by undocumented artificial fill and alluvium. The artificial fill is scattered throughout the site and ranges from approximately 3 to 5.5 feet in thickness. Underlying the artificial fill is alluvium composed primarily of sand and silty sand, which was logged to a maximum depth of 51.5 feet.

Groundwater was not encountered during the previous investigation. Reference 1 indicates that historic groundwater is approximately 18 feet below the ground surface and current groundwater is likely greater than 80 feet below the ground surface.

Infiltration Testing

Three infiltration tests were recently conducted at locations shown on Plate 1, identified as PH-1 through PH-3. The approximate locations of the infiltration tests were assigned by C&V Consulting. The infiltration tests were conducted in a sand layer of the alluvium at approximately ten (10) feet below the ground surface. Logs of the borings are presented in Appendix A. These tests were conducted utilizing deep percolation test methods in general conformance with the County of Orange standards.

A summary of the test results is presented in Table A. The results do not include a factor of safety.

Table A-Summary of Infiltration Testing (No Factor of Safety)

Test Designation	PH-1	PH-2	PH-3
Approximate Depth of Test	10 ft	10 ft	10 ft
Time Interval	30 minutes	30 minutes	30 minutes
Radius of Test Hole	4 inches	4 inches	4 inches
Tested Infiltration Rate	5.7 (in/hr)	6.0 (in/hr)	6.4 (in/hr)

Conclusions and Recommendations

Based on our testing, use of infiltration WQMP systems at the depths tested are feasible at the subject site. The WQMP designer should review the test results and determine if the proposed

WQMP system is appropriate for the site. A factor of safety should be applied to the results that is in accordance with City of Placentia requirements.

Limitations

The conclusions and recommendations presented in this report are based on our infiltration test results and experience with similar soil conditions on similar projects. Materials adjacent to or beneath those observed may have different characteristics than those observed, and no precise representations are made as to the quality or extent of the materials not observed.

Alta appreciates the opportunity to provide geotechnical consulting services for your project.

Respectfully submitted,
Alta California Geotechnical, Inc.

FERNANDO RUIZ
Civil Engineering Associate

Reviewed By:

SCOTT A. GRAY/RGE 2857
Reg. Exp.: 12-31-20
Registered Geotechnical Engineer
Vice President

Distribution: (1) Addressee

FR: SAG: 1-0314, February 10, 2020 (Summary of Infiltration Testing, Van Buren St and Orangethorpe Ave)

APPENDIX A

BORING LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		grf	ltr	Description
Coarse Grained Soils: More than 50% retained on No. 200 sieve	Gravel and Gravelly Soils: More than 50% of coarse fraction retained on No. 4 sieve		GW	Well-graded gravels or gravel sand mixtures, little or no fines
			GP	Poorly-graded gravels or gravel sand mixture, little or no 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 passes on No. 4 sieve		SW	Well-graded sands or gravelly sands, little or no fines
			SP	Poorly-graded sands or gravelly sands, little or no fines
			SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, and-clay mixtures

Major Divisions		grf	ltr	
Fine Grained Soils: More than 50% passes on No. 200 sieve	Silts And Clays LL,<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 silt-clays of low plasticity
	Silts And Clays LL,<50		MH	Inorganic silts, micaceous or diatomaceous fine or silty soils, elastic silts
			VH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat and other highly organic soils

BOUNDARY CLASSIFICATION: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS

U.S. STANDARD SERIES SIEVE: 200 | 40 | 10 | 4

CLEAR SQUARE SIEVE OPENINGS: 3/4" | 3" | 12"

Silts and Clays	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

RELATIVE DENSITY

Sands and Gravels	Blows/Foot (SPT)
Very Loose	<4
Loose	4-10
Medium Dense	11-30
Dense	31-50
Very Dense	>50

CONSISTENCY CLASSIFICATION

Silts and Clays	Criteria
Very Soft	Thumb penetrates soil >1 in.
Soft	Thumb penetrates soil 1 in.
Firm	Thumb penetrates soil 1/4 in.
Stiff	Readily indented with thumbnail
Very Stiff	Thumbnail will not indent soil

HARDNESS

Bedrock
Soft
Moderately Hard
Hard
Very Hard

LABORATORY TESTS

Symbol	Test
DS	Direct Shear
DSR	Direct Shear (Remolded)
CON	Consolidation
SA	Sieve Analysis
MAX	Maximum Density
RV	Resistance (R) Value
EI	Expansion Index
SE	Sand Equivalent
AL	Atterberg Limits
CHEM	Chemical Analysis
HY	Hydrometer Analysis

SOIL MOISTURE

Increasing Visual Moisture Content

Dry - Dry to touch

Moist - Damp, but no visible free water

wet - Visible free water

SIZE PROPORTIONS

Trace - <5%

Few - 5 to 10%

Some - 15 to 25%

KEY TO EXPLORATORY BORING LOGS

ALTA CALIFORNIA GEOTECHNICAL INC.

PLATE B

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0314	PROJECT NAME	Van Buren Street and Orangethorpe Avenue		
DATE STARTED	2/6/20	GROUND ELEV.	236	BORING DESIG.	PH-1
DATE FINISHED	2/6/20	GW DEPTH (FT)		LOGGED BY	FR
DRILLER	2R Drilling	DRIVE WT.	140 lbs.	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	235				SM	**ARTIFICIAL FILL-UNDOCUMENTED** (afu): SILTY SAND, very fine to medium grained, brown, dry to slightly moist, medium dense, trace gravel up to 1/4" in diameter.				
5	230				SP	**ALLUVIUM** (Qal): SAND, medium to coarse grained, light brown, slightly moist, medium dense, few gravel up to 1/2" in diameter. @ 5.0 ft. moist, brown, trace gravel up to 3/4" in diameter.				
10						TOTAL DEPTH 10 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
[R] RING (DRIVE) SAMPLE
[S] SPT (SPLIT SPOON) SAMPLE
[B] BULK SAMPLE [T] TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0314 PLATE B-1

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0314	PROJECT NAME	Van Buren Street and Orangethorpe Avenue		
DATE STARTED	2/6/20	GROUND ELEV.	236	BORING DESIG.	PH-2
DATE FINISHED	2/6/20	GW DEPTH (FT)		LOGGED BY	FR
DRILLER	2R Drilling	DRIVE WT.	140 lbs.	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
0	235				SP	3" AC, No Base **ALLUVIUM** (Qal): SAND, medium to coarse grained, brown, moist, medium dense, few gravel up to 1/4" in diameter. @ 2.5 ft. light brown. @ 5.0 ft. fine to medium grained, few silt.				
5	230									
10						TOTAL DEPTH 10 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE [T] TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0314 PLATE B-2

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0314	PROJECT NAME	Van Buren Street and Orangethorpe Avenue		
DATE STARTED	2/6/20	GROUND ELEV.	233	BORING DESIG.	PH-3
DATE FINISHED	2/6/20	GW DEPTH (FT)		LOGGED BY	FR
DRILLER	2R Drilling	DRIVE WT.	140 lbs.	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	30 in.		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
					SM	**ARTIFICIAL FILL-UNDOCUMENTED** (afu): SILTY SAND, very fine to medium grained, brown, dry to slightly moist, medium dense, trace gravel up to 1/4" in diameter.				
	230				SP	**ALLUVIUM** (Qal): SAND, medium to course grained, light brown, moist, medium dense.				
5										
	225									
10						TOTAL DEPTH 10 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE [T] TUBE SAMPLE

▼ GROUNDWATER
► SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0314 PLATE B-3

SITE DATA:

LAND AREA
GROSS: 5.57 ACRES

UNITS

TINY TOWNS	49
CARRIAGE TOWNS	90
TOTAL	139

PROPOSED ZONING:
"R-3" HIGH DENSITY MULTIPLE-FAMILY

SETBACKS

FRONT	-	15 FEET
STREET	-	10 FEET
SIDE	-	5 FEET
REAR	-	10 FEET

HEIGHT: 35' MAX - PROPOSED 39'-8"

MINIMUM DISTANCE BETWEEN BUILDINGS:
20' MIN. DOUBLE ACCESS
12' MIN. SINGLE ACCESS
10' MIN. BETWEEN ALL OTHER BILLINGS

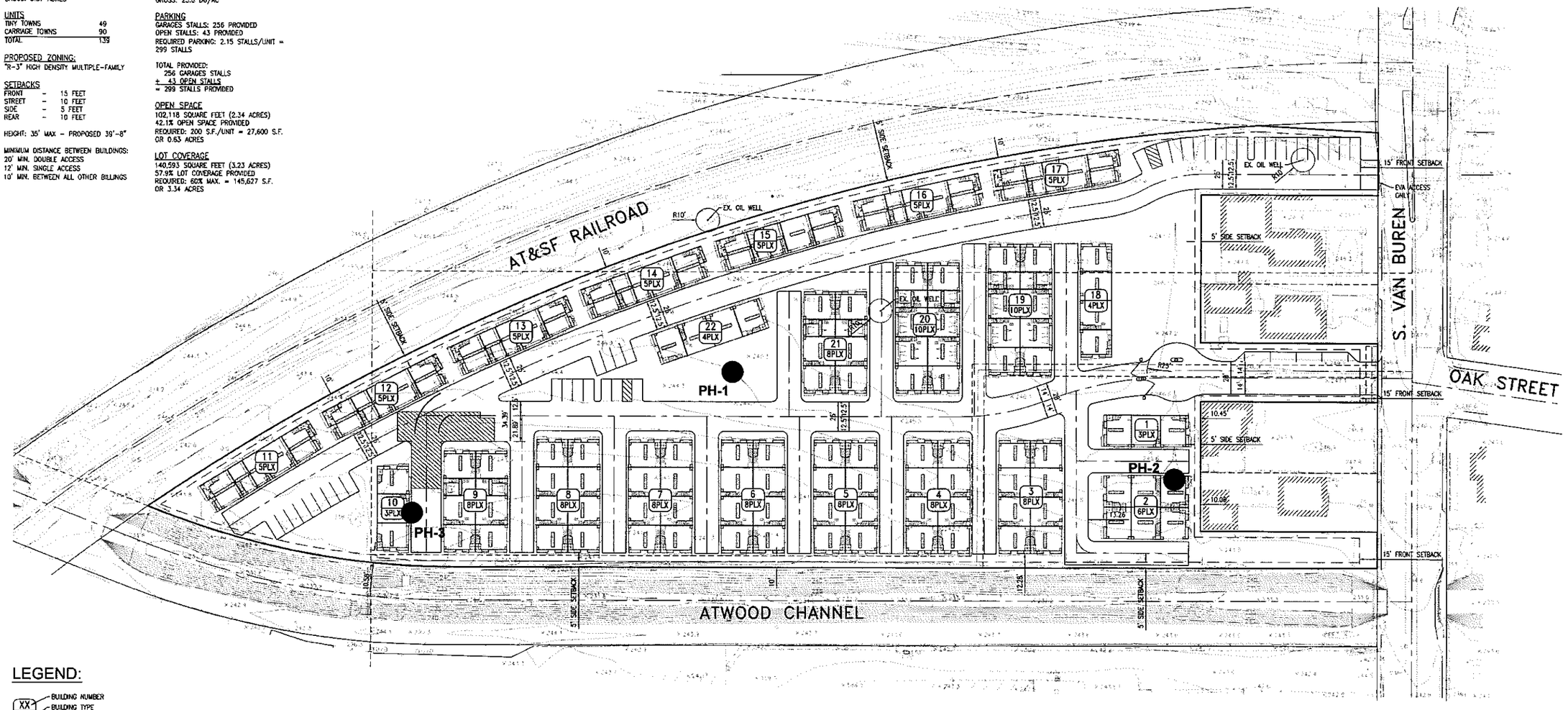
DENSITY
GROSS: 25.0 DU/AC

PARKING
GARAGES STALLS: 256 PROVIDED
OPEN STALLS: 43 PROVIDED
REQUIRED PARKING: 2.15 STALLS/UNIT = 299 STALLS

TOTAL PROVIDED:
256 GARAGES STALLS
+ 43 OPEN STALLS
= 299 STALLS PROVIDED

OPEN SPACE
102,118 SQUARE FEET (2.34 ACRES)
42.1% OPEN SPACE PROVIDED
REQUIRED: 200 S.F./UNIT = 27,600 S.F.
OR 0.63 ACRES

LOT COVERAGE
140,593 SQUARE FEET (3.23 ACRES)
57.9% LOT COVERAGE PROVIDED
REQUIRED: 60% MAX. = 145,627 S.F.
OR 3.34 ACRES



LEGEND:

XX — BUILDING NUMBER
XXXX — BUILDING TYPE

LEGEND

PH-3 — APPROXIMATE LOCATION OF INFILTRATION TEST

PLATE 1

1" = 40'
0 20 40 80

ALTA CALIFORNIA GEOTECHNICAL, INC.
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951) 509-7090

PROJECT NUMBER: 1-0314 DATE: Feb. 10, 2020

DEVELOPER :

REVISIONS

NO.	DATE	INITIAL	DESCRIPTION	APP	DATE

PREPARED FOR:
TOFFOLI INVESTMENTS, LLC
3 HUGHES, IRVINE, CALIFORNIA 92618

PREPARED BY:

C&V CONSULTING, INC.
CIVIL ENGINEERING
LAND PLANNING & SURVEYING
9 ORCHARD, SUITE 200
LAKE FOREST, CA 92630
T. 949.916.3500
F. 949.916.3509
CVC-INC.NET

CONCEPTUAL SITE PLAN

DATE: 1/10/2020
SHEET 1 OF 1
SCALE: AS SHOWN | DRAWN BY: JC | CHECKED BY: DM

CITY OF PLACENTIA

ALBUS-KEEFE & ASSOCIATES, INC
GEOTECHNICAL CONSULTANTS

August 24, 2017
J.N.: 2641.00

Mr. Steve Armanino
The Olson Company
3010 Old Ranch Parkway, Suite 100
Seal Beach, California 90740

Subject: **Geotechnical Due Diligence Evaluation, Proposed Residential Development, Van Buren Street and Orangethorpe Avenue, Placentia, California.**

Dear Mr. Armanino,

Albus-Keefe & Associates, Inc. is pleased to present to you our geotechnical due-diligence report for the proposed residential development at the subject site. This report presents the results of our aerial photo and literature review, subsurface exploration, laboratory testing, and engineering analyses. Conclusions relevant to the feasibility of the proposed site development are also presented herein based on the findings of our work.

We appreciate this opportunity to be of service to you. If you have any questions regarding the contents of this report, please do not hesitate to call.

Sincerely,

ALBUS-KEEFE & ASSOCIATES, INC.

Paul Kim
Associate Engineer

TABLE OF CONTENTS

REPORT

FIGURES AND PLATES

APPENDICES

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of our work was to evaluate the feasibility of proposed site development in order to assist you in your land acquisition evaluation and due-diligence review. The scope of our work for this investigation was focused primarily on the geotechnical issues that we expect to have significant fiscal impacts on future site development. *While this report is comprehensive for the intended purpose, it is not intended for final design purposes. As such, additional geotechnical studies may be warranted based on our review of future rough grading plans and foundation plans.* The scope of our geotechnical due-diligence work included the following:

- Review of published geologic and seismic data for the site and surrounding area
- Review of historical aerial photographs of the site and nearby vicinity
- Exploratory drilling and soil sampling
- Laboratory testing of selected soil samples
- Engineering analyses of data obtained from exploration and laboratory testing
- Evaluation of site seismicity, liquefaction potential, settlement potential
- Preparation of this report

1.2 SITE LOCATION AND DESCRIPTION

The site consists of several parcels of land located at the southwest corner of the Orangethorpe Avenue and Van Buren Street in the city of Placentia, California. Descriptions of the site location and its improvements have been prepared below for each property. The location of the site and its relationship to the surrounding areas are shown on Figure 1, Site Location Map.

The site consists of 5.8 acres of land and is currently occupied by a commercial facility operating as an auto salvage wrecking yard. The facility includes multiple rows of salvage vehicles within the interior portions of the property and several shop buildings along the eastern areas of the property. The western-most corner of the site is vacant with moderate to heavy vegetation. The site is comprised of 3 parcels of land as follows: APN: 346-164-25, APN: 346-164-26 and APN: 364-164-22. The site is bounded to the north and northwest by railroad tracks. The site is bounded to the east by single-family residences and Van Buren Street. The site is bounded to the south by ± 6 feet deep storm drain channel that flows to the west.

Topography within the site is relatively flat with an elevation of approximately 239 to 247 feet above mean sea level (MSL), based on Google Earth. Drainage is generally directed to the south and west. Vegetation consists of large-size trees located along the property line. Some smaller trees are present locally within the interior portions of the site.

1.3 PROPOSED DEVELOPMENT

We understand the site will be developed for residential use. Associated interior driveways, perimeter/retaining walls, underground utilities, and a storm water infiltration system are also anticipated.

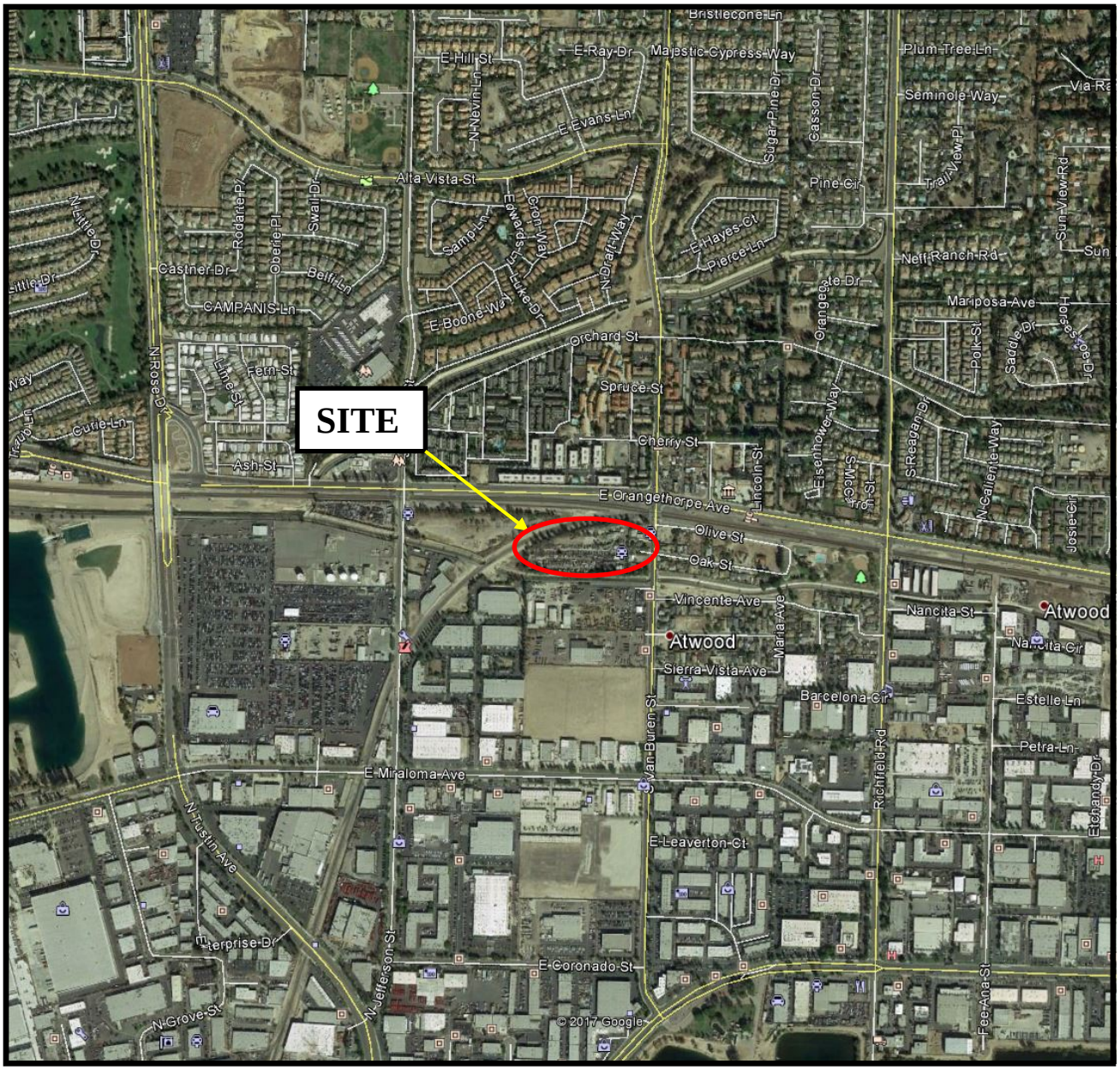
No grading or structural plans were available in preparing of this report. However, we anticipate that minor rough grading of the site will be required to achieve future surface configurations and we expect the proposed residential dwellings will be of wood-frame construction with concrete slabs on grade yielding relatively light foundation loads.

2.0 INVESTIGATION

2.1 RESEARCH

We have reviewed the referenced geologic publications and maps (see references). Data from these sources were utilized to develop some of the findings and conclusions presented herein. We have also reviewed internet sources and our in-house aerial photographs.

Based on our review, the site appears to have been utilized for oil and gas production since at least 1946. Our review of 1946 aerial photos indicates that two possible oil wells existed adjacent the railroad easement along the north-central perimeter of the site, one possible oil well existed within the central interior of the site, and one oil well and a single-family residence existed at the northeast corner of the site. In addition, a small tank farm appears to have existed adjacent the southeasterly boundary of the site. By 1963, other residential structures are present along the eastern boundary of the site and only the northeastern oil well is visible. The tank farm along the southeasterly boundary of the site is no longer visible, however, 2 above-ground tanks are visible adjacent the railroad easement at the northwest boundary. In 1972, rows of vehicles are present on the site and the storm drain channel exists along the southern boundary of the site. During this time, vegetation can be seen on site along the west corner and east side of the site. By 1980, the site appears much like the current site conditions; however, more rows of vehicles and associated parts are present within the site.



© 2016 Google

SITE LOCATION MAP

N

The Olson Company
Proposed Residential Development
Orangethorpe and Van Buren
Placentia, California

NOT TO SCALE

FIGURE 1

2.2 SUBSURFACE EXPLORATION

Subsurface exploration for this investigation was conducted on August 9, 2017. Our exploration consisted of drilling four (4) exploratory borings to depths of about 21.5 to 51.5 feet below the existing ground surface utilizing a truck-mounted, hollow-stem-auger drill rig. An engineer from Albus-Keefe & Associates, Inc. logged the exploratory excavations. Visual and tactile identifications were made of the materials encountered, and their descriptions are presented in the Exploration Logs in Appendix A. The approximate locations of the exploratory excavations completed by this firm are shown on the enclosed Geotechnical Map, Plate 1. The locations of the borings are depicted on Plate 1.

Bulk, relatively undisturbed and Standard Penetration Test (SPT) samples were obtained at selected depths within the exploratory borings for subsequent laboratory testing. Relatively undisturbed samples were obtained using a 3-inch O.D., 2.5-inch I.D., California split-spoon soil sampler lined with brass rings. SPT samples were obtained from the boring using a standard, unlined SPT soil sampler. During each sampling interval, the sampler was driven 18 inches with successive drops of a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler was recorded for each six inches of advancement. The total blow count for the lower 12 inches of advancement per soil sample is recorded on the exploration log. Samples were placed in sealed containers or plastic bags and transported to our laboratory for analyses. The borings were backfilled with auger cuttings upon completion of sampling and capped with cold patch asphaltic-concrete.

Upon completion of drilling, two additional borings (P-1 and P-2) were drilled adjacent to boring B-1 and 2-inch-diameter casings were installed for percolation testing. Details and results of percolation testing can be reported under separate cover; however, a brief discussion of our test results and recommended BMP system are summarized in **Section 5.9**.

2.3 LABORATORY TESTING

Selected samples of representative earth materials from the borings excavated at the site were tested in the laboratory. Tests consisted of in-situ moisture content and density, maximum dry density and optimum moisture content, expansion index, soluble sulfate, direct shear and grain-size analysis. Descriptions of laboratory test criteria and a summary of the test results are presented in Appendix B and on the boring logs in Appendix A.

3.0 SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

Soil materials encountered on site generally consisted of alluvial deposits to the maximum depth explored (51.5 feet). Artificial fill ranging in thickness from 3 to 5.5 feet was observed scattered throughout the site (observed in B-1 and B-4). The near surface alluvium typically consisted of coarse-grained material consisting primarily of sand and silty sand. This material was typically dry and loose to medium dense. At greater depths, the alluvium consisted of interlayers of sand, silty sand

and silt. Additional artificial fills associated with underground utilities, abandoned oil and gas facilities and previous site developments are likely present beneath portions of the site.

A more detailed description of the interpreted soil profile at each of the boring locations, based upon the borehole cuttings and soil samples, are presented in Appendix A. The stratigraphic descriptions in the logs represent the predominant materials encountered and relatively thin, often discontinuous layers of different material may occur within the major divisions.

3.2 GROUNDWATER

Groundwater was not encountered during this firm's subsurface exploration to a maximum depth of 51.5 feet below the existing ground surface. A review of the CDMG Seismic Hazard Zone Report 011 indicates that historical high groundwater level for the general site area is approximately 18 feet or more below the existing ground surface.

We performed research of well records from the State of California, Department of Water Resources. We identified seven groundwater wells located within about three-quarters of a mile of the site that have groundwater data extending back to 1968. One well is located northwest of the project, one well is located to the east, four are located southeast, and one is located south of the project.

The data from the nearby wells suggest that groundwater levels have varied by about 40 feet over the last 50 years. On the basis of this data, we conclude current and future groundwater levels are likely to remain below a depth of 80 feet in the project vicinity.

3.3 FAULTING

Based on our review of the referenced publications and seismic data, no seismic faults are known to project through or immediately adjacent the site and the site does not lie within an "Earthquake Fault Zone" as defined by the State of California in the Alquist-Priolo Earthquake Fault Zoning Act. Table 3.1 presents a summary of known seismic faults within 10 miles of the site based on the 2008 USGS National Seismic Hazard Maps.

TABLE 3.1
Summary of Faults

Name	Dist. (miles)	Slip Rate (mm/yr.)	Preferred Dip (degrees)	Slip Sense	Rupture Top (km)	Fault Length (km)
Puente Hills (Coyote Hills)	3.40	0.7	27	Thrust	2.8	17
Elsinore; W	3.86	2.5	75	Strike slip	0	46
Elsinore; W+GI	3.86	n/a	81	Strike slip	0	83
Elsinore; W+GI+T	3.86	n/a	84	Strike slip	0	124
Elsinore; W+GI+T+J	3.86	n/a	84	Strike slip	0	199
Elsinore; W+GI+T+J+CM	3.86	n/a	84	Strike slip	0	241

4.0 ANALYSES

4.1 SEISMICITY

We have performed probabilistic seismic analyses utilizing the web-based U.S. Seismic Design Maps web application by the U.S. Geological Survey (USGS), we obtain a PGA of 0.65 in accordance with Figure 22-7 of ASCE 7-10. The F_{PGA} factor for site class D is 1.0. Therefore, the PGA_M = 1.0 x 0.65 = 0.65g. The mean event associated with a probability of exceedance equal to 2% over 50 years to have a moment magnitude of 6.69 and the mean distance to the seismic source of 7.0 miles.

4.2 SETTLEMENT

Based on the anticipated foundation loads and provided all undocumented artificial fill materials and the upper 1 to 2 feet of alluvial soils are removed and replaced as engineered compacted fill, the total and differential static settlements are not anticipated to exceed 1 inch and ½-inch over 30 feet, respectively, for the proposed residential structures.

5.0 CONCLUSIONS

5.1 FEASIBILITY OF PROPOSED DEVELOPMENT

From a geotechnical point of view, the proposed site development is considered feasible provided the conclusions presented in this report are incorporated into the design and construction of the project. Furthermore, it is also our opinion that the proposed development will not adversely impact the stability of adjoining properties. Key issues that could have significant fiscal impacts on the geotechnical aspects of the proposed site development are discussed in the following sections of this report.

5.2 GEOLOGIC HAZARDS

5.2.1 Ground Rupture

No active faults are known to project through the site nor does the site lie within the boundaries of an "Earthquake Fault Zone" as defined by the State of California in the Alquist-Priolo Earthquake Fault Zoning Act. The closest known active fault is the Whittier fault located about 3.5 miles from the site. Therefore, potential for ground rupture due to an earthquake beneath the site is considered very low.

5.2.2 Ground Shaking

The site is situated in a seismically active area that has historically been affected by generally moderate to occasionally high levels of ground motion. The site lies in relative close proximity to several seismically active faults; therefore, during the life of the proposed structures, the property will probably experience similar moderate to occasionally high ground shaking from these fault zones, as well as some background shaking from other seismically active areas of the Southern California region. Potential ground accelerations have been estimated for the site and are presented in Section 4.1 of this report. Design and construction in accordance with the current California Building Code (CBC) requirements is anticipated to address the issues related to potential ground shaking at the site.

5.2.3 Liquefaction

Engineering research of soil liquefaction potential (Youd, et al., 2001) indicates that generally three basic factors must exist concurrently in order for liquefaction to occur. These factors include:

- A source of ground shaking, such as an earthquake, capable of generating soil mass distortions.
- A relatively loose silty and/or sandy soil.
- A relative shallow groundwater table (within approximately 50 feet below ground surface) or completely saturated soil conditions that will allow positive pore pressure generation.

The liquefaction susceptibility of the onsite subsurface soils was evaluated by analyzing the potential concurrent occurrence of the above-mentioned three basic factors. The liquefaction evaluation for the site was completed under the guidance of Special Publication 117A: Guidelines for Evaluating and Mitigating Seismic Hazards in California (CDMG, 2008).

As mentioned earlier, groundwater levels within the past 50 years in the vicinity of the site are at least 80 feet below the existing ground surface. Therefore, the potential for liquefaction and subsequently lateral spread to occur beneath the site is considered to be low.

5.3 STATIC SETTLEMENT

As summarize in **Section 4.2**, based on anticipated foundation loads and provided all undocumented artificial fill materials and the existing upper 1 to 2 feet of alluvial soils are removed and replaced as engineered compacted fill, total and differential static settlement under the weight of anticipated residential structures are anticipated to be less than 1inch and 1/2 inch over 30 feet, respectively. These values are considered within tolerable limits of proposed structures and site improvements.

5.4 EXCAVATION AND MATERIAL CHARACTERISTICS

The existing artificial fill (generally 3 to 5.5 feet in thickness) and upper 1 to 2 feet of existing soils are considered unsuitable for support of proposed engineered fill and site improvements. These materials should be removed from below future building sites, retaining walls, screen walls, pavement, and any other "structural" areas, and replaced as engineered compacted fill. The actual depth of removal should be determined by the geotechnical consultant during grading.

Removals should extend laterally beyond the limits of the proposed structure no less than 5 feet or distance equal to the depth of removal (i.e. 1:1 projection) if the removals are greater than 5 feet. Certain portions of the site are bounded on several sides by existing improvements. As such, future grading along the margins of the site will need to be performed in such a manner as to not adversely impact adjacent existing improvements. Where removals for residential structures are limited by existing improvements or property lines, special grading techniques such as slot cutting, shoring or other acceptable design criteria may be required. Under such conditions, specific recommendations should be provided by this firm during review of final grading plan.

Off-site improvements exist near the property lines. The presence of the existing offsite improvements may limit removals of unsuitable materials adjacent the property lines. Therefore, construction of perimeter site walls may require deepened footings and/or additional reinforcement and additional control joints, where removals are restricted by property boundaries.

Temporary construction slopes and trench excavations can likely be cut vertically up to a height of 4 feet within the onsite materials provided that no surcharging of the excavations is present. Temporary excavations greater than 4 feet in height will likely require side laybacks to 1:1 (H:V) or flatter to mitigate the potential for sloughing.

Demolition of the existing site improvements will generate concrete and asphaltic concrete debris. Significant portions of concrete and asphaltic concrete debris can likely be reduced in size to less than 4 inches and incorporated within fill soils during earthwork operations.

Onsite sewage disposal systems, clarifiers and other underground improvements associated with the previous site use may be present beneath the site. As an option, further site exploration may be warranted to identify significant underground structures, such as abandoned oil wells excavations, pipelines and other associated underground utilities prior to future rough grading operations. If encountered during future rough grading, these improvements will require proper abandonment or removal.

Subsurface soils are anticipated to be relatively easy to excavate with conventional heavy earthmoving equipment. Removal and recompaction of the site materials will result in some swelling. Design of site grading will require consideration of this loss when evaluating earthwork balance issues.

Following removals, the exposed grade should first be scarified to a depth of 6 inches; moisture conditioned to at least 100 percent of the optimum moisture content, and then compacted to at least 90 percent of the laboratory determined maximum dry density.

5.5 SHRINGKAGE AND BULKAGE

Volumetric changes in earth quantities will occur when excavated onsite soil materials are replaced as properly compacted fill. We estimate the existing surficial soils will shrink approximately 10 to 20 percent within the upper 5 feet. Subsidence of removal bottoms is anticipated to be negligible. The estimates of shrinkage and bulkage are intended as an aid for project engineers in determining earthwork quantities. However, these estimates should be used with some caution since they are not absolute values. Contingencies should be made for balancing earthwork quantities based on actual swelling and bulkage that occurs during the grading process.

5.6 SOIL EXPANSION

Based on laboratory test results and the USCS visual manual classification, the near-surface soils within the site are generally anticipated to be non-expansive or possess Very Low expansion potentials. Additional testing for soil expansion will be required subsequent to rough grading and prior to construction of foundations and other concrete work to confirm these conditions.

5.7 FOUNDATIONS

Considering the very low/negligible expansion potential of site soils, conventional shallow foundations may be used to support habitable structures and miscellaneous structures at the site.

5.8 CONCRETE MIX DESIGN

Laboratory testing of onsite soil indicates **Negligible** soluble sulfate content. Concrete designed to follow the procedures provided in ACI 318, Section 4.3, Table 4.3.1 for negligible sulfate exposure are anticipated to be adequate for mitigation of sulfate attack on concrete. Upon completion of rough grading, an evaluation of as-graded conditions and further laboratory testing will be required for the site to confirm or modify the conclusions provided in this section.

5.9 PERCOLATION CHARACTERISTICS

Based on the subsurface exploration and percolation testing at the site, the use of dry wells is considered feasible. Preliminary analyses indicate that dry wells could likely provide a peak measured infiltration flow of approximately 0.64 cfs and empty within 48 hours. A typical dry well design model is included on Plate 2. The site is underlain by interbedded layers of sand, and fine-grained soils. The presence of fine-grained interbeds will tend to diminish the effectiveness of infiltration, even by dry wells. Further percolation testing may be necessary based on review of preliminary WQMP design plans.

6.0 LIMITATIONS

This report is based on the proposed development and geotechnical data as described herein. The materials encountered on the project site, described in other literature, and utilized in our laboratory testing for this investigation are believed representative of the total project area, and the conclusions and recommendations contained in this report are presented on that basis. However, soil materials can vary in characteristics between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein. As such, observation and testing by a geotechnical consultant during the grading and construction phases of the project are essential to confirming the basis of this report.

This report summarizes several geotechnical topics that should be beneficial for project planning and budgetary evaluations. *The information presented herein is intended only for a preliminary feasibility evaluation and* ***is not*** *intended to satisfy the requirements of a site specific and detailed geotechnical investigation required for further planning and permitting.*

This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and time period. The contents of this report are professional opinions and as such, are not to be considered as a guaranty or warranty.

This report should be reviewed and updated after a period of one year or if the site ownership or project concept changes from that described herein.

This report has been prepared for the exclusive use of **The Olson Company** to assist the project consultants in the design of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

Respectfully submitted,

ALBUS-KEEFE & ASSOCIATES, INC.

Andrew "AJ" Atry
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
ANDREW J. ATRY
C 84728
CIVIL
STATE OF CALIFORNIA

Paul Hyun Jin Kim
Associate Engineer
P.E. 77214

REGISTERED PROFESSIONAL ENGINEER
HYUN JIN KIM
C 77214
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

REFERENCES

Publications

Abrahamson, N.A., and W.J. Silva, "Summary of the Abrahamson & Silva NGA Ground-Motion Relations", Earthquake Spectra, Vol.24, No.1, 2008.

Campbell, K.W., and Y. Bozorgnia, "NGA Ground Motion Model for the Geometric Mean Horizontal Component of PGA, PGV, PGD, and 5% Damped Linear Elastic Response Spectra for Periods Ranging from 0.01 to 10s", Earthquake Spectra, Vol.24, No.1, 2008.

California Geologic Survey, Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California, 2008.

CDMG, "Seismic Hazard Zone Report for the Orange 7.5-Minute Quadrangles, Los Angeles County, California," Seismic Hazard Zone Report 011, 1997.

Southern California Earthquake Center (SCEC), University of Southern California, "Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California", March 1999.

Youd, T.L., Idriss, I.M., Andrus, R.D., Arango, I., Castro, G., Christian, J., Dobry, R., Finn, W.D.L., Harder, L.F., Hynes, M.E., Ishihara, K., Koester, J.P., Liao, S.S.C., Marcuson, W.F., Martin, G.R., Mitchell, J.K., Moriwaki, Y., Power, M.S., Robertson, P.K., Seed, R.B., and Stokoe, K.H., "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils", Journal of Geotechnical and Geoenvironmental Engineering, October, 2001.

0 40 80 160

APPROX. SCALE : 1" □ 80'

EXPLANATION

(L□□ati□ns A□□r□ximat□)

- Ex□l□rat□r□ B□ring
- P□r□□lati□n W□ll

ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

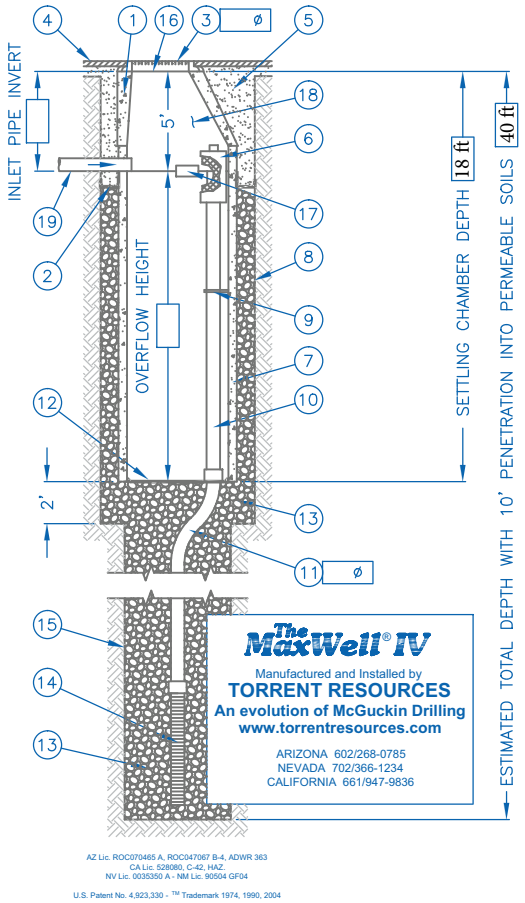
GEOTECHNICAL MAP

Job No.: 2641.00	Date: 08/24/17	Plate: 1

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.

40 feet 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.

18 feet 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
1509 East Elwood Street, Phoenix Arizona 85040~1391
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

APPENDIX A

EXPLORATORY LOGS

EXPLORATION LOG

Project:		Location:
Address:		Elevation:
Job Number:	Client:	Date:
Drill Method:	Driving Weight:	Logged By:

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		EXPLANATION							
		Solid lines separate geologic units and/or material types.							
		Dashed lines indicate unknown depth of geologic unit change or material type change.							
5		**Solid black rectangle** in Core column represents California Split Spoon sampler (2.5in ID, 3in OD).							
		Double triangle in core column represents SPT sampler.							
10		**Solid black rectangle** in Bulk column respresents large bag sample.							
		Other Laboratory Tests: Max = Maximum Dry Density/Optimum Moisture Content EI = Expansion Index SO4 = Soluble Sulfate Content							
15		DSR = Direct Shear, Remolded DS = Direct Shear, Undisturbed SA = Sieve Analysis (1" through #200 sieve) Hydro = Particle Size Analysis (SA with Hydrometer) 200 = Percent Passing #200 Sieve Consol = Consolidation SE = Sand Equivalent							
20		Rval = R-Value ATT = Atterberg Limits							

EXPLORATION LOG

Project: Placentia (Van Buren & Orangethorpe)		Location: B-1
Address: , Placentia, CA 92870		Elevation: 239.5
Job Number: 2641.00	Client: The Olson Company	Date: 8/9/2017
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MP

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ARTIFICIAL FILL (Af) Silty Sand (SM): Brown, dry, medium dense, fine to medium grained sand		23	■	■	3.8		Max EI SO4 DS
		ALLUVIUM (Qal) Sand (SP): Light brown, dry, medium dense, fine to coarse grained sand, trace fine gravel and silt, friable		20	■	■	1.5		
5				26	■		0.8		200
10				15	■		14.2		
		Silt (ML): Light brown, dry, stiff, fine grained sand, caliche stringers, trace pores and mica, slight iron oxide stains, rootlets present							
15		Sand (SP): light brown to reddish brown, dry, medium dense, fine to medium grained sand, trace silt and fine gravel		17	⧗				
		Silty Sand (SM): Medium brown, dry, medium dense, fine to medium grained sand, trace mica and clay		17	⧗		9.9		
20		Sandy Silt (ML): Medium brown, dry, stiff, fine grained sand, trace mica and clay, iron oxide stringers							

Albus-Keefe & Associates, Inc.

Plate A-2

EXPLORATION LOG

Project: Placentia (Van Buren & Orangethorpe)		Location: B-1
Address: , Placentia, CA 92870		Elevation: 239.5
Job Number: 2641.00	Client: The Olson Company	Date: 8/9/2017
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MP

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
				10			18.3		SA Hydro
30		@ 30 ft, Very stiff		20			19.7		200
		Silty Sand (SM): Brown, dry, medium dense, fine grained sand, trace mica							
35		Sand with Silt (SP-SM): Light brown, dry, dense, fine to medium grained sand, trace fine gravel and silt		31					SA
40		@ 40 ft, fine to coarse grained sand, increased fine gravel		29					
		@ 42.5 ft, Gravel encountered							
45		@ 45 ft, Grayish brown, very dense, increased fines, cobbles present		52					200

EXPLORATION LOG

Project: Placentia (Van Buren & Orangethorpe)		Location: B-1
Address: , Placentia, CA 92870		Elevation: 239.5
Job Number: 2641.00	Client: The Olson Company	Date: 8/9/2017
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MP

Depth (feet)	Lith-ology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
				51					
		End of boring at 51.5 feet. No groundwater encountered. Installed percolation well (P-1 and P-2) adjacent to boring. Backfilled with soil cuttings upon completion of test.							

EXPLORATION LOG

Project: Placentia (Van Buren & Orangethorpe)		Location: B-2
Address: , Placentia, CA 92870		Elevation: 241.6
Job Number: 2641.00	Client: The Olson Company	Date: 8/9/2017
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MP

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ALLUVIUM (Qal)							
		Sand (SP): Light brown, dry, loose, fine to coarse grained sand, trace fine gravel and silt		11	■	■	1.7		200
		@ 4 ft, nodules of cemented silty sand, no gravel		8	■	■	2.2		
5		@ 6 ft, medium dense, fine grained sand		15	■		3.3		
10		@ 10 ft, fine to coarse grained sand, few coarse gravel, trace mica		17	■		1.5	109	
		Silt (ML): Brown, moist, stiff, few fine grained sand in shoe							
		@ 12.5 ft, Gravel encountered							
15		Silty Sand (SM): Brown, dry, loose, fine grained sand, trace clay and mica		7	⧗				
		Sand (SP): Brown, dry, medium dense, fine grained sand, trace silt							
20				20	⧗				
		End of boring at 21.5 feet. No groundwater encountered. Backfilled with soil cuttings.							

Albus-Keefe & Associates, Inc.

Plate A-5

EXPLORATION LOG

Project: Placentia (Van Buren & Orangethorpe)		Location: B-3
Address: , Placentia, CA 92870		Elevation: 242.4
Job Number: 2641.00	Client: The Olson Company	Date: 8/9/2017
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MP

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		Asphalt Concrete (AC): 6 inches							
		ALLUVIUM (Qal)							
		Sand (SP): Brown, dry, fine to coarse grained sand, trace silt and mica		8			2.9		
				11			2.5		200
5									
		@ 6 ft, fine to medium grained sand		15			3.5		
10				19			1.4	95.7	
		Silty Sand (SM): Brown, dry, fine grained sand							
15				19					
		Sand (SP): Brown, dry, fine grained sand, trace silt							
20				6					
		Sandy Silt (ML): Brown, dry, fine grained sand, trace clay							
		End of boring at 21.5 feet. No groundwater encountered. Backfilled with soil cuttings. Patched with asphalt cold patch.							

EXPLORATION LOG

Project: Placentia (Van Buren & Orangethorpe)		Location: B-4
Address: , Placentia, CA 92870		Elevation: 242.1
Job Number: 2641.00	Client: The Olson Company	Date: 8/9/2017
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: MP

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		ARTIFICIAL FILL (Af) / Possible Backfill Silt (ML): Brown, dry, medium stiff, trace fine sand							
				8			4.8		
		@ 3.7 ft, Light gray, medium stiff, fine to coarse grained sand, Possbile Shading Material		10			2.9		
5		**ALLUVIUM (Qal)** Silty Sand (SM): Light gray, dry, medium dense, fine to coarse grained sand, few coarse gravel		13			1.2		
10		@ 10 ft, Abundant fine to coarse gravel		28			0.8		
		Sandy Silt / Silty Sand (ML/SM): Brown, dry, very stiff / medium dense, fine grained sand							
		Silty Sand (SM): Light gray, dry, dense, fine to coarse grained sand							
15				25					
		Silt (ML): Light brown, dry, very stiff, few fine grained sand							
20				15					
		End of boring at 21.5 feet. No groundwater encountered. Backfilled with cuttings.							

Albus-Keefe & Associates, Inc.

Plate A-8

APPENDIX B

LABORATORY TEST PROGRAM

LABORATORY TESTING PROGRAM

Soil Classification

Soils encountered within the exploratory borings were initially classified in the field in general accordance with the visual-manual procedures of the Unified Soil Classification System (Test Method ASTM D 2488). The samples were re-examined in the laboratory and classifications reviewed and then revised where appropriate. The assigned group symbols are presented in the Boring Logs, Appendix A.

In Situ Moisture and Density

Moisture content and unit dry density of in-place soil materials were determined in representative strata. Test data are summarized in the Boring Logs, Appendix A.

Laboratory Maximum Dry Density

Maximum dry density and optimum moisture content of onsite soils were determined for selected samples in general accordance with Method A of ASTM D 1557. Pertinent test values are given on Table B.

Grain-Size/Hydrometer Analysis

Grain-size/hydrometer analyses were performed on selected samples to verify visual classifications performed in the field. Tests were performed in accordance with ASTM D422. Test results are graphically presented on Plate B-1.

Expansion Potential

An Expansion Index test was performed on a selected sample in accordance with ASTM D 4829. The test result and expansion potential are presented on Table B.

Soluble Sulfate Analysis

Chemical analysis was performed on selected samples to determine soluble sulfate content. These tests were performed in accordance with California Test Method No. 417. The test results are included on Table B.

Direct Shear

The Coulomb shear strength parameters, angle of internal friction and cohesion, were determined for selected bulk samples obtained from our borings. Our laboratory performed these tests in general conformance with Test Method ASTM D 3080. The samples were remolded to 90 percent of maximum dry density and 2 percentage points over optimum. Three specimens were prepared for each test, artificially saturated, and then sheared under varied loads at an appropriate constant rate of strain. Results are graphically presented on Plate B-2.

TABLE B-1
SUMMARY OF LABORATORY TEST RESULTS

Boring No.	Sample Depth (ft)	Soil Description	Test Results	
B-1	0-5	Silty Sand and Sand	Max. Dry Density (pcf):	130.5
			Opt. Moisture Content (%):	8.5
			Expansion Index:	0
			Expansion Potential:	Non-Expansive
			Soluble Sulfate Content (%):	0.004
			Sulfate Exposure:	Negligible

Note: Additional laboratory test results are provided on the boring logs provided in Appendix A.

ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

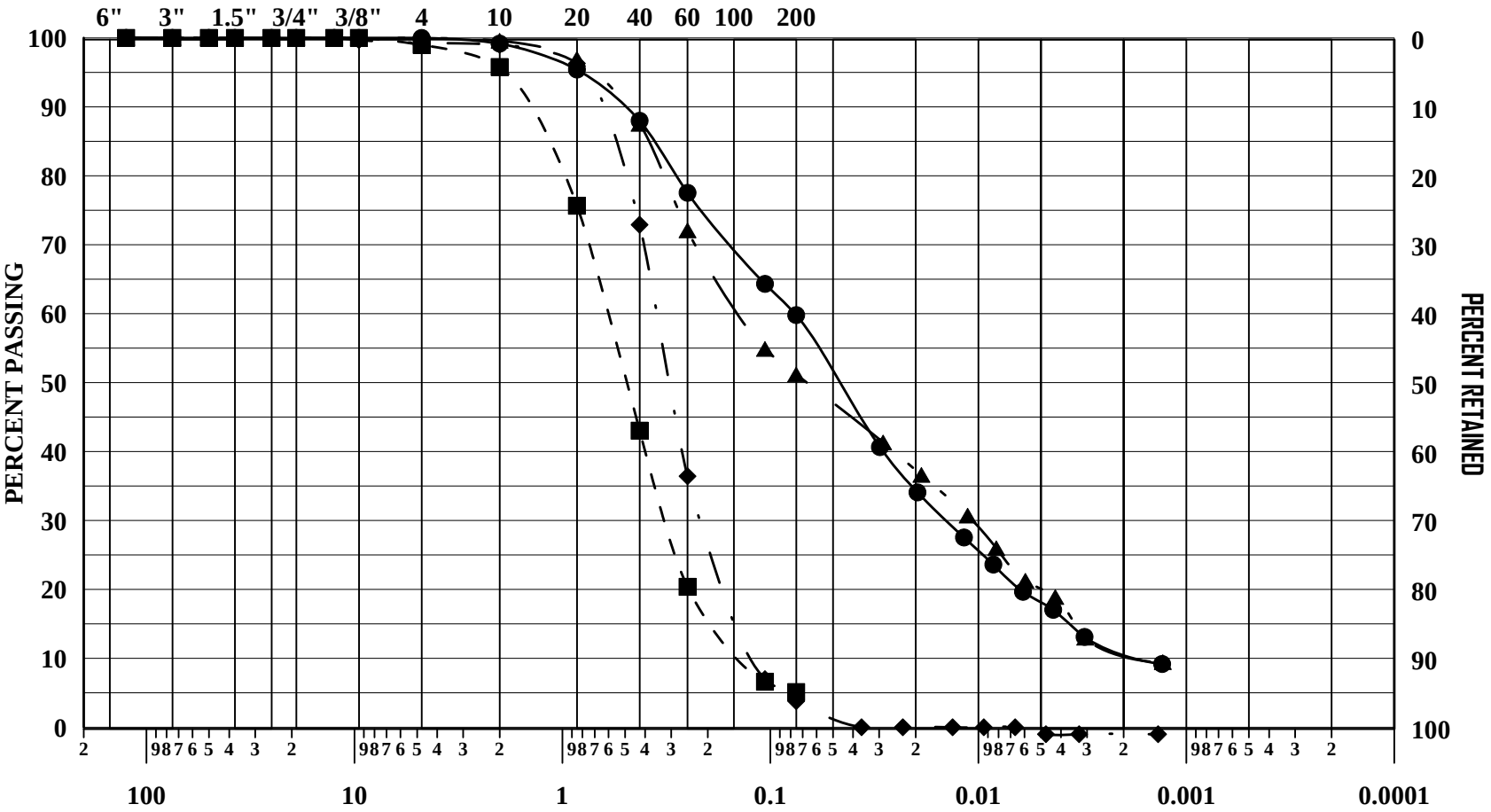
GRAIN SIZE DISTRIBUTION

Job No: 2641.00

Plate No: B-1

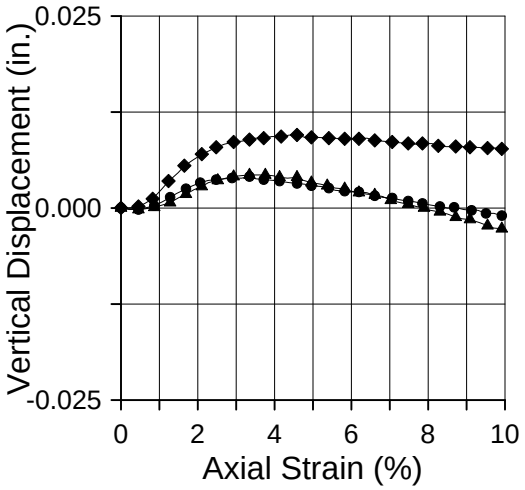
UNIFIED SOIL CLASSIFICATION

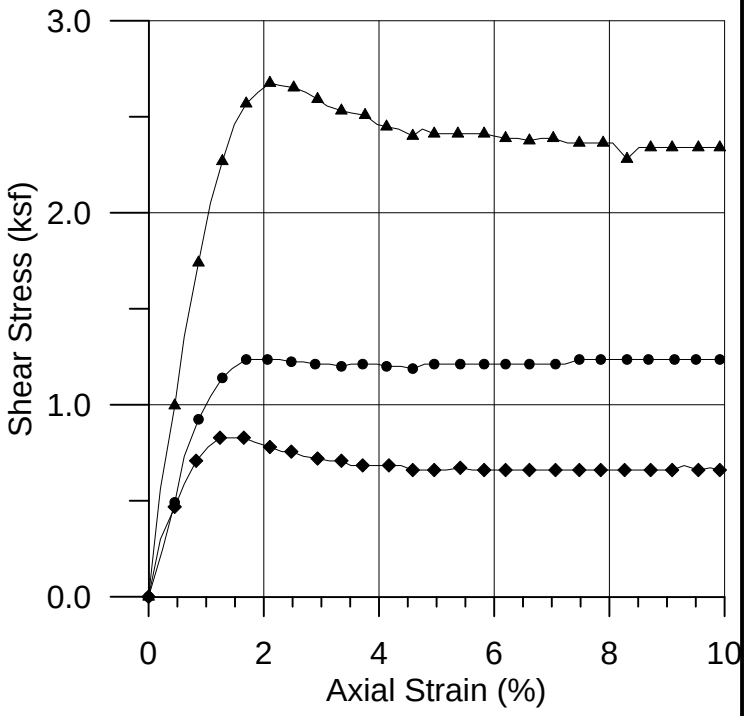
COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

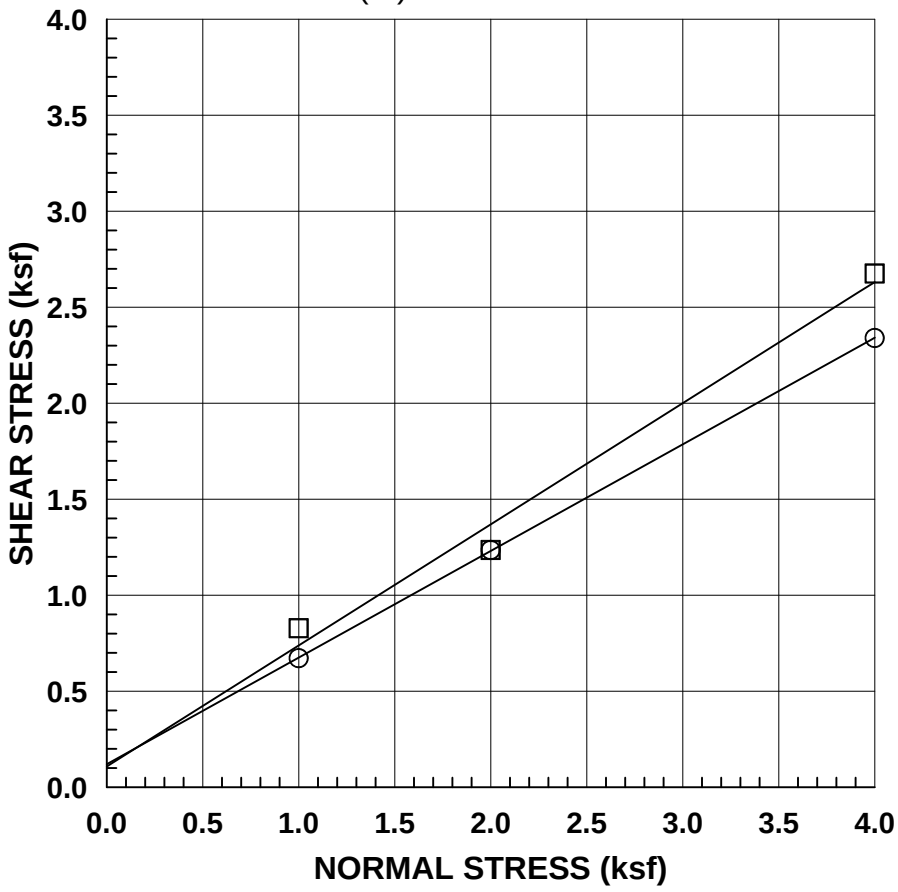


LOCATION	SAMPLE	SYMBOL	LL	PI	CLASSIFICATION
B-1	25 feet				Sandy Silt (ML)
B-1	35 feet				Sand with Silt (SP-SM)
P-1	25 feet				Sandy Silt (ML)
P-2	35 feet				Sand (SP)

Specimen No.	1	2	3
Normal Stress (ksf)	1	2	4
Peak Shear Stress (ksf)	0.828	1.236	2.676
Peak Displacement (in)	0.01	0.004	0.004
Ultimate Shear Stress (ksf)	0.672	1.236	2.34
Ultimate Displacement (in)	0.24	0.25	0.25
Initial Dry Density (pcf)	117.4	117.4	117.4
Initial Moisture Content (%)	8.5	8.5	8.5
Strain Rate (in/min)	0.02		







Strain Legend

◆	1
●	2
▲	4

Strength Legend

□	Peak
○	Ultimate

SAMPLE LOCATION	SAMPLE TYPE	SAMPLE DESCRIPTION
B-1 @ 0-5 feet	SP @ 90% of 130.5 pcf @ 8.5%	Silty Sand (SM)

ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

DIRECT SHEAR

Job No: 2641.00

Plate No: B-2

Attachment F

Notice of Transfer of Responsibility

Water Quality Management Plan
Notice of Transfer of Responsibility

Submission of this Notice of Transfer of Responsibility constitutes notice to the City of Placentia 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

Educational Materials

To be provided during final engineering.