

APPENDIX I1
PREIMINARY WATER QUALITY MANAGEMENT PLAN



WATER QUALITY MANAGEMENT PLAN (WQMP)

PLACENTIA SENIOR HOUSING

July 10, 2020



WATER QUALITY MANAGEMENT PLAN (WQMP)

PLACENTIA SENIOR HOUSING

July 10, 2020



WATER QUALITY MANAGEMENT PLAN (WQMP)

PLACENTIA SENIOR HOUSING

July 10, 2020



PRELIMINARY WATER QUALITY MANAGEMENT PLAN (PWQMP)

PLACENTIA SENIOR HOUSING

PLACENTIA, CA

*PREPARED FOR
NATIONAL COMMUNITY RENAISSANCE
9421 Haven Avenue
Rancho Cucamonga, CA 91730
909.483.2444*

*FUSCOE ENGINEERING, INC.
16795 Von Karman, Suite 100
Irvine, California 92606
949.474.1960
www.fuscoe.com*

*PROJECT MANAGER
Josh Ruiz, PE*

DATE PREPARED: July 10, 2020

PROJECT NUMBER: 1653-010-01

PRELIMINARY WATER QUALITY MANAGEMENT PLAN (WQMP)

PLACENTIA SENIOR HOUSING

1314 North Angelina Drive, Placentia, County of Orange

APN: 340-273-25

Prepared for:

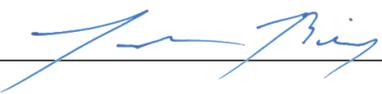
THE NATIONAL COMMUNITY RENAISSANCE
9421 Haven Avenue
Rancho Cucamonga, CA 91730
909-483-2444

Prepared by:

FUSCOE ENGINEERING, INC.
16795 Von Karman, Suite 100
Irvine, CA 92618
949.474.1960
Josh Ruiz, PE

Date Prepared: July 10, 2020

ENGINEER'S CERTIFICATION
WATER QUALITY MANAGEMENT PLAN

Preparer (Engineer) Certification			
Preparer (Engineer): Joshua Ruiz			
Title	Project Manager	PE Registration #	90418
Company	Fusco Engineering, Inc.		
Address	16795 Von Karman Ave		
Email	jruiz@fuscoe.com		
Telephone #	949-474-1960		
I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board.			
Preparer Signature		Date	07/08/2020
Place Stamp Here			

PROJECT OWNER'S CERTIFICATION			
Permit/Application No.:	Pending	Grading Permit No.:	Pending
Tract/Parcel Map and Lot(s)No.:		Building Permit No.:	Pending
Address of Project Site and APN:	1314 North Angelina Drive, Placentia, CA 92870 APN: 340-273-25		

This Water Quality Management Plan (WQMP) has been prepared for BLESSED SACRAMENT CHURCH by FUSCOE ENGINEERING, INC. The WQMP is intended to comply with the requirements of the County of Orange NPDES Stormwater Program requiring the preparation of the plan.

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

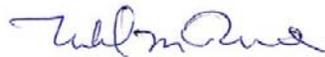
OWNER:			
Name:	Michael Ruane		
Title:	Executive Vice President		
Company:	National Community Renaissance		
Address:	9421 Haven Avenue Rancho Cucamonga, CA 91730		
Email:	mruane@nationalcore.org		
Telephone #:	(909) 204-3451		
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.			
Owner Signature:		Date:	7/9/2020

TABLE OF CONTENTS

SECTION I	DISCRETIONARY PERMITS AND WATER QUALITY CONDITIONS	1
SECTION II	PROJECT DESCRIPTION	3
II.1	Project Description	3
II.2	Potential Storm Water Pollutants	5
II.3	Hydrologic Conditions of Concern	7
II.4	Post Development Drainage Characteristics	8
II.5	Property Ownership/Management	9
SECTION III	SITE DESCRIPTION	10
III.1	Physical Setting	10
III.2	Site Characteristics	10
III.3	Watershed Description	12
SECTION IV	BEST MANAGEMENT PRACTICES (BMPs)	14
IV.1	Project Performance Criteria	14
IV.2	Site Design and Drainage Plan	15
IV.2.1	Site Design BMPs	15
IV.2.2	Drainage Management Areas	16
IV.3	LID BMP Selection and Project Conformance Analysis	16
IV.3.1	Hydrologic Source Controls (HSCs)	17
IV.3.2	Infiltration BMPs	17
IV.3.3	Evapotranspiration, Rainwater Harvesting BMPs	19
IV.3.4	Biotreatment BMPs	20
IV.3.5	Hydromodification Control BMPs	21
IV.3.6	Regional/Sub-Regional LID BMPs	21
IV.3.7	Treatment Control BMPs	21
IV.3.8	Non-Structural Source Control BMPs	22
IV.3.9	Structural Source Control BMPs	24
IV.4	Alternative Compliance Plan	25
IV.4.1	Water Quality Credits	25
IV.4.2	Alternative Compliance Plan Information	26
SECTION V	INSPECTION/MAINTENANCE RESPONSIBILITY FOR BMPs	27
SECTION VI	SITE PLAN AND DRAINAGE PLAN	34
SECTION VII	EDUCATIONAL MATERIALS	36
APPENDICES		37

APPENDICES

Appendix ASupporting Calculations
Appendix BNotice of Transfer of Responsibility
Appendix CEducational Materials
Appendix DBMP Maintenance Supplement / O&M Plan
Appendix EConditions of Approval (Pending Issuance)
Appendix FGeotechnical Report
Appendix G2-Year Hydrology Calculations
Appendix HGrading Plans

EXHIBITS & BMP DETAILS (INCLUDED IN SECTION VI)

- Vicinity Map
- Site Plan
- WQMP Exhibit
- Typical Cross Sections
- Underground Detention BMP Fact Sheet (HU-2)
- Hydrodynamic Separator BMP Fact Sheet (PRE-1)
- Drywell BMP Fact Sheet (INF-5)

EDUCATIONAL MATERIALS (INCLUDED IN APPENDIX C)

- The Ocean Begins at Your Front Door
- Homeowners Guide for Sustainable Water Use
- Household Tips
- Proper Disposal of Household Hazardous Waste
- Recycle at Your Local Used Oil Collection Center (North County)
- Responsible Pest Control
- Tips for Landscaping and Gardening
- Tips for Pet Care
- Tips for Protecting your Watershed
- DF-1 Drainage System Operation & Maintenance
- R-5 Disposal of Pet Waste
- R-6 Disposal of Green Waste

- R-7 Household Hazardous Waste
- R-8 Water Conservation
- SD-10 Site Design & Landscape Planning
- SD-11 Roof Runoff Controls
- SD-12 Efficient Irrigation
- SD-13 Storm Drain Signage
- SD-32 Trash Storage Areas

SECTION I DISCRETIONARY PERMITS AND WATER QUALITY CONDITIONS

PROJECT INFORMATION			
Permit/Application No.:	Pending	Grading or Building Permit No.:	Pending
Address of Project Site (or Tract Map and Lot Number if no address) and APN:	1314 North Angelina Drive, Placentia, CA 92870 APN: 340-273-25		
WATER QUALITY CONDITIONS OF APPROVAL OR ISSUANCE			
Discretionary Permit(s):	Copies of Resolutions will be included in Appendix E.		
Water Quality Conditions of Approval or Issuance applied to this project: (Please list verbatim.)	Pending – to be provided in Final WQMP		
CONCEPTUAL WQMP			
Was a Conceptual Water Quality Management Plan previously approved for this project?	No – This serves as the conceptual Water Quality Management Plan.		
WATERSHED-BASED PLAN CONDITIONS			

Applicable conditions from watershed - based plans including WIHMPs and TMDLs:	<p>Runoff from the project site ultimately drains into Carbon Creek Channel, which confluences with Coyote Creek and San Gabriel River downstream of the project site.</p> <p>No TMDLs have been established for Carbon Creek by the Santa Ana RWQCB. However, the Los Angeles RWQCB has adopted TMDLs for the San Gabriel River that apply to the portions of Orange County that drain to Coyote Creek:</p> <ul style="list-style-type: none">• Indicator Bacteria (2016), Sediment Toxicity (2008), pH(2009), Metals (Copper 2007) <p>Section XII.D5 of the Santa Ana Region MS4 Permit (Order No. R8-2009-0030) requires Watershed Infiltration and Hydromodification Master Plan (WIHMPs) to be developed by the County of Orange for San Diego Creek and other watersheds within the North Orange County permit area. Each WIHMP must include maps to identify areas susceptible to hydromodification, and a hydromodification tool.</p> <p>A Model WIHMP has been developed for the San Gabriel River / Coyote Creek Watershed, and was submitted to the Santa Ana RWQCB on May 23, 2011. The WIHMP includes information related to infiltration feasibility and hydromodification susceptibility at the watershed and sub-watershed scale to aid in BMP selection and design for priority projects.</p>
---	--

SECTION II PROJECT DESCRIPTION

II.1 PROJECT DESCRIPTION

The proposed Placentia Senior Housing project site encompasses approximately 4.0 acres in the City of Placentia. The project site is bounded by North Angelina Drive to the west, single family residences to the north and east, and Morse Avenue to the south. A Vicinity Map is included in Section VI.

Under existing conditions, the project site is occupied by Blessed Sacrament Episcopal Church. There are currently two existing structures, the westerly one is used for church gatherings and the easterly structure is used as a school facility. Associated parking areas are located along the southern boundary with vegetation occupying the remainder of the site. Adjacent land uses include low density residential to the north and east, commercial to the west, and medium density residential to the south.

The table below summarizes the proposed project.

DESCRIPTION OF PROPOSED PROJECT	
Development Category (Model WQMP, Table 7.11-2; or 7.11-3):	<p>Category 6 Parking lots 5,000 square feet or more including associated drive aisle, and potentially exposed to urban stormwater runoff. A parking lot is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.</p> <p>Category 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.</p>
Project Area (ft²):	174,296 ft ² (4.0 acres)
# of Dwelling Units:	65
SIC Code:	N/A
Narrative Project Description:	<p>The proposed project includes Senior Housing on the Church of the Blessed Sacrament property. The development will consist of two residential buildings accommodating 65 units to be managed by the lessee, National Community Renaissance. Building 1, at the north end of the site, is a linear two-story structure. Building 2 is a two-story, L-shaped building located interior to the site with a three-story element at the northern end of the building transitioning to two-stories toward the single-family neighborhood along the eastern property line. Associated parking, underground utilities and a storm water disposal system are also planned. The project will retain the existing Church Sanctuary, classroom space, and children’s play yard and add two residential buildings, a new Parish Hall, church plaza, and children’s picnic/lunch area.</p>

DESCRIPTION OF PROPOSED PROJECT				
Project Area:	Pervious Area	Pervious Area Percentage	Impervious Area	Impervious Area Percentage
Pre-Project Conditions:	2.2 ac	55%	1.8 ac	45%
Post-Project Conditions:	1.0 ac	25%	3.0 ac	75%
Drainage Patterns/ Connections:	<p>Under existing conditions, runoff sheet flows in a southwesterly direction. Some flows enter a ribbon gutter within the existing parking lot which conveys runoff toward the southwest corner of the project. From there flows exit into a catch basin at the corner of North Angelina Drive and Morse Avenue. Flows enter the Carbon Creek Channel, Coyote Creek Channel, San Gabriel River, and eventually the San Gabriel River Estuary out to the Pacific Ocean.</p> <p>Under proposed conditions, runoff from the entire project site will be captured by area drains and routed to a detention system to ensure that stormwater discharges do not exceed the existing conditions for flood control purposes. A diversion structure will divert low flows to a hydrodynamic separator (Contech CDS or similar) for pre-treatment before entering the detention system (Contech CMP or similar) designed to capture water quality and hydromod flows. The detention system will be drawn down by one of five drywells for infiltration. Low flows will be retained onsite while high flows will follow existing drainage patterns with a connection at the existing discharge location at the southwest corner of the site along North Angelina Drive and Morse Avenue. Flows exiting the site will continue to discharge into the Carbon Creek Channel, Coyote Creek, San Gabriel River Reach 1, the San Gabriel River Estuary, and eventually the San Pedro Bay Near/Offshore Zone and the Pacific Ocean. Please see the WQMP exhibit in Section VI for locations of BMPs and direction of flow.</p>			

PROJECT FEATURES				
Building Summary:		One Bedroom	Two Bedroom	Total
	Building 1	28	4	32
	Building 2	31	2	33
	Total	59	6	65
Amenities:	Amenities associated with the residential buildings include laundry, garden and terrace gathering areas, and open landscape and hardscape space.			
Landscaped Areas:	Common area landscaping surrounding the perimeter of buildings will be provided throughout the project site and will comprise of approximately 25% of the entire site.			

PROJECT FEATURES	
Parking Facilities:	The project currently has 85 existing parking spaces for the church and proposes to add an additional 46 for senior housing for a total of 131 parking spaces. A total of 6 ADA stalls will be provided along with 14 EV stalls.
Other Project Features:	The property will include two trash enclosures. One will be located at the northeast corner of the project site and the other will be located north of Building 2 within the parking lot. The trash enclosure will be walled on 3 sides with an access gate comprising the remaining side, and covered to preclude precipitation and runoff consistent with local design standards. The site will not have any loading docks, outdoor storage areas, vehicle/ community car wash racks, vehicle/equipment wash areas, or commercial kitchens/food preparation areas.
Outdoor Activities:	Outdoor areas throughout the residential area of site will be used for recreational and open space purposes. The central recreation area will include a garden and terrace and open lawn and hardscape areas. All other outdoor areas will be used for walkways, common areas and landscaping, and other recreational purposes.
Materials Stored:	No outdoor storage of materials is anticipated (materials will be stored indoors). Materials anticipated to be stored on-site include those associated with residential developments, including cleaning products, maintenance equipment, storage, etc. No hazardous waste will be stored on-site.
Wastes Generated:	The project is not anticipated to generate any wastes other than landscape clippings, typical trash, debris and refuse from the tenants. Outdoor trash receptacles will be provided throughout the common areas of the site for the tenants to dispose of their refuse in a proper manner, and property maintenance will provide trash and waste material removal to maintain a trash-free property. All wastes shall be collected and properly disposed of off-site.

II.2 POTENTIAL STORM WATER POLLUTANTS

The table below, derived from Table 2 of the Countywide Model WQMP Technical Guidance Document (December 2013), summarizes the categories of land use or project features of concern and the general pollutant categories associated with them.

ANTICIPATED & POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE								
Priority Project Categories and/or Project Features	General Pollutant Categories							
	Suspended Solid/ Sediments	Nutrients	Heavy Metals	Pathogens (Bacteria/ Virus)	Pesticides	Oil & Grease	Toxic Organic Compounds	Trash & Debris
Detached Residential Development	E	E	N	E	E	E	N	E

ANTICIPATED & POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE								
Priority Project Categories and/or Project Features	General Pollutant Categories							
	Suspended Solid/ Sediments	Nutrients	Heavy Metals	Pathogens (Bacteria/ Virus)	Pesticides	Oil & Grease	Toxic Organic Compounds	Trash & Debris
Attached Residential Development	E	E	N	E	E	E ⁽²⁾	N	E
Commercial/Industrial Development	E ⁽¹⁾	E ⁽¹⁾	E ⁽⁵⁾	E ⁽³⁾	E ⁽¹⁾	E	E	E
Automotive Repair Shops	N	N	E	N	N	E	E	E
Restaurants	E ⁽¹⁾⁽²⁾	E ⁽¹⁾	E ⁽²⁾	E	E ⁽¹⁾	E	N	E
Hillside Development >5,000 ft ²	E	E	N	E	E	E	N	E
Parking Lots	E	E ⁽¹⁾	E	E ⁽⁴⁾	E ⁽¹⁾	E	E	E
Streets, Highways, & Freeways	E	E ⁽¹⁾	E	E ⁽⁴⁾	E ⁽¹⁾	E	E	E
Retail Gasoline Outlets	N	N	E	N	N	E	E	E

Notes:
 E = expected to be of concern N = not expected to be of concern
 (1) Expected pollutant if landscaping exists on-site, otherwise not expected.
 (2) Expected pollutant if the project includes uncovered parking areas, otherwise not expected.
 (3) Expected pollutant if land use involves food or animal waste products, otherwise not expected.
 (4) Bacterial indicators are routinely detected in pavement runoff.
 (5) Expected if outdoor storage or metal roofs, otherwise not expected.
 Source: County of Orange. (2013, December 20). Technical Guidance Document for the Preparation of Conceptual/ Preliminary and/or Project Water Quality Management Plans (WQMPs). Table 2.1.

Priority Project Categories and/or Features: Attached Residential Development, Parking Lot

POLLUTANTS OF CONCERN		
Pollutant	E = Expected to be of concern N = Not Expected to be of concern	Additional Information and Comments
Suspended Solid/ Sediment	E	
Nutrients	E	303(d) listed impairment for downstream receiving waters.

POLLUTANTS OF CONCERN		
Pollutant	E = Expected to be of concern N =Not Expected to be of concern	Additional Information and Comments
Heavy Metals	E	303(d) listed impairment for downstream receiving waters; TMDL established for San Gabriel River/Coyote Creek
Pathogens (Bacteria/Virus)	E	303(d) listed impairment for downstream receiving waters.
Pesticides	E	303(d) listed impairment for downstream receiving waters.
Oil & Grease	E	
Toxic Organic Compounds	E	303(d) listed impairment for downstream receiving waters.
Trash & Debris	E	

II.3 HYDROLOGIC CONDITIONS OF CONCERN

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2011 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

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

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

or

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

If these conditions do not exist or streams are not potentially susceptible to hydromodification impacts, an HCOC does not exist and hydromodification does not need to be considered further. In the North Orange County permit area, downstream channels are considered not susceptible to hydromodification, and therefore do not have the potential for a HCOC, if all downstream

conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive habitat areas will be affected.

Is the proposed project potentially susceptible to hydromodification impacts?

Yes **No (show map)**

2-YEAR, 24-HOUR STORM SUMMARY				
Condition	Acreage	Tc (min)	Peak Runoff (cfs)	Volume (ac-ft)
Pre-development	4.0	11.08	4.01	0.2724
Proposed	4.0	9.52	5.35	0.5011
Difference	0	-1.56	+1.34	+0.2287
% Change		-14%	+33%	+84%

The proposed project will increase the 2-year volumes compared to existing conditions. The results indicate the 2-year time of concentration (Tc) decreases by 14% and runoff increases by 33% compared to existing conditions.

As depicted in the table above, the post-condition runoff volumes increase by 84%, which is greater than 105% percent of the pre-development runoff volumes. Therefore, the project is subject to HCOCs. Infiltration BMPs to reduce proposed runoff volume rates to within 105% of the existing 2-year storm are proposed, and the hydromodification volumes (delta 2-year volume of at least 9,370 cu-ft) will be retained on-site via detention systems and drywells located on the southwest side of the project site within the parking lot (refer to Section IV.3.2 for further information). Since volumes will be infiltrated and retained onsite and any HCOC will be mitigated by Low Impact Development (LID) design elements, hydromodification does not need to be considered further. Onsite infiltration BMPs are discussed further in Section IV.3.2 of this report.

II.4 POST DEVELOPMENT DRAINAGE CHARACTERISTICS

Under proposed conditions, runoff from the entire project site will be captured by area drains and routed to a detention system to ensure that stormwater discharges do not exceed the existing conditions for flood control purposes. A diversion structure will divert low flows to a hydrodynamic separator (Contech CDS or similar) for pre-treatment before entering the detention system (Contech CMP or similar) designed to capture water quality and hydromod flows. The detention system will be drawn down by one of five drywells for infiltration. Low flows will be retained onsite while high flows will follow existing drainage patterns with a connection at the existing discharge location at the southwest corner of the site along North Angelina Drive and Morse Avenue. Flows exiting the site will continue to discharge into the Carbon Creek Channel, Coyote Creek, San Gabriel River Reach 1, the San Gabriel River Estuary, and eventually the San Pedro Bay Near/Offshore Zone and the Pacific Ocean. Please see the WQMP exhibit in Section VI for locations of BMPs and direction of flow.

II.5 PROPERTY OWNERSHIP/MANAGEMENT

PROPERTY OWNERSHIP/MANAGEMENT	
Public Streets:	City of Placentia
Private Streets:	National Community Renaissance / Church of the Blessed Sacrament
Landscaped Areas:	National Community Renaissance / Church of the Blessed Sacrament
Open Space:	National Community Renaissance / Church of the Blessed Sacrament
Buildings:	National Community Renaissance / Church of the Blessed Sacrament
Structural BMPs:	National Community Renaissance / Church of the Blessed Sacrament

The Owner, Church of the Blessed Sacrament, will maintain existing structures and ultimately be responsible for the project site. A maintenance agreement between the owner and lessee, National Community Renaissance, will be drafted. National Community Renaissance shall assume all BMP maintenance and inspection responsibilities for the proposed project. Inspection and maintenance responsibilities are outlined in Section V of this report.

SECTION III SITE DESCRIPTION

III.1 PHYSICAL SETTING

Planning Area/ Community Name:	Placentia Senior Housing on Church of the Blessed Sacrament
Address:	1314 N. Angelina Drive, Placentia, CA 92870
Project Area Description:	The project site is bounded by North Angelina Drive to the west, single family residences to the north and east, and Morse Avenue to the south.
Land Use:	Existing R-1, Proposed is High Density Residential
Zoning:	Residential; Existing R-1, Proposed R-3
Acreage:	4.0
Predominant Soil Type:	HSG Soils Type D and B (see TGD Figure XVI-2a in Appendix A)
Impervious Conditions:	Existing Impervious: 45% (55% Pervious) Proposed Impervious: 75% (25% Pervious)

III.2 SITE CHARACTERISTICS

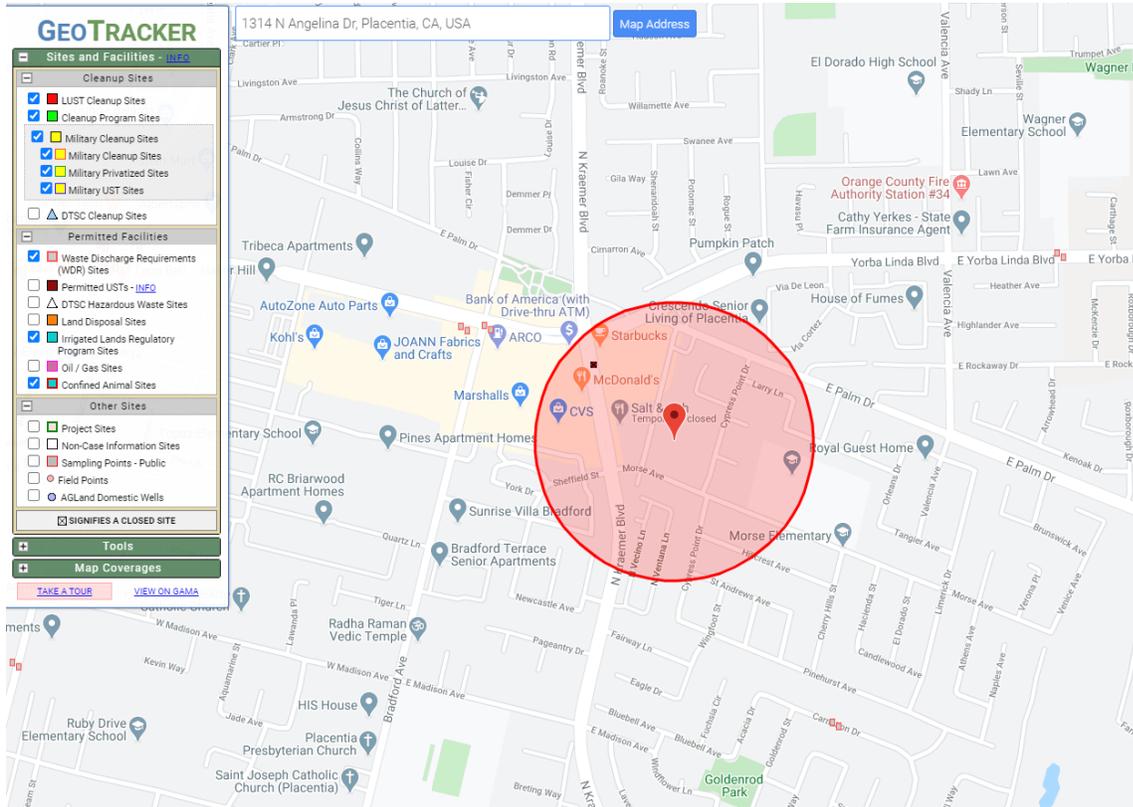
Precipitation Zone:	0.9 inches per TGD Figure XVI-1 (see Appendix A)
Topography:	The site is relatively flat, with the topography sloping westerly and southwesterly direction toward the corner of N. Angelina drive and Morse Avenue.
Existing Drainage Patterns/ Connections:	Under existing conditions, runoff sheet flows in a southwesterly direction. Some flows enter a ribbon gutter within the existing parking lot which conveys runoff toward the southwest corner of the project. From there flows exit into a catch basin at the corner of North Angelina Drive and Morse Avenue. Flows enter the Carbon Creek Channel, Coyote Creek Channel, San Gabriel River, and eventually the San Gabriel River Estuary out to the Pacific Ocean.

<p>Proposed Drainage Patterns/ Connections:</p>	<p>Under proposed conditions, runoff from the entire project site will be captured by area drains and routed to a detention system to ensure that stormwater discharges do not exceed the existing conditions for flood control purposes. A diversion structure will divert low flows to a hydrodynamic separator (Contech CDS or similar) for pre-treatment before entering the detention system (Contech CMP or similar) designed to capture water quality and hydromod flows. The detention system will be drawn down by one of five drywells for infiltration. Low flows will be retained onsite while high flows will follow existing drainage patterns with a connection at the existing discharge location at the southwest corner of the site along North Angelina Drive and Morse Avenue. Flows exiting the site will continue to discharge into the Carbon Creek Channel, Coyote Creek, San Gabriel River Reach 1, the San Gabriel River Estuary, and eventually the San Pedro Bay Near/Offshore Zone and the Pacific Ocean. Please see the WQMP exhibit in Section VI for locations of BMPs and direction of flow.</p>
<p>Soil Type, Geology, and Infiltration Properties:</p>	<p>A geotechnical study was performed for the site in January 2020 by Albus-Keefe & Associates, Inc. Soils within the vicinity of the project site generally consist of artificial fill materials and Quaternary Alluvial. Artificial fill materials consist of sandy clay and was found to a depth of 4 feet bgs. Quaternary Alluvial beneath the artificial fill was found to 51.5 feet bgs and generally consist of layers of damp to moist, reddish brown and light reddish-brown sandy clay, silty sand, clayey sand, silty clay, and sand. The granular alluvial soils are typically medium dense and the fine-grained alluvial soils are typically very stiff to hard.</p>
<p>Hydrogeologic (Groundwater) Conditions:</p>	<p>Groundwater was not encountered to a depth of 51.5 feet below ground surface (bgs) during the geotechnical study. Additional review of the Department of Water Resources groundwater level indicates that groundwater for the area is below 150 feet. Albus-Keefe & Associates, Inc. anticipates groundwater will remain below a depth of 100 feet during the next 50 years.</p>
<p>Geotechnical Conditions (relevant to infiltration):</p>	<p>Infiltration tests were performed in 2020 on the project site and found that soils were favorable for infiltration. The Geotech performed drywell modeling and found a measured infiltration rate of 1.9 in/hr. A steady state analysis was performed to estimate the maximum inflow that the well can accommodate. A static total flow of 0.025 ft³/sec was calculated. The average infiltration rate can be determined by taking the flow rate divided by the wetted surface area. The surface area is equal to 546.64 square feet which includes the side and bottom area. Based on the above flow rate and surface area, the average "measured" infiltration rate across the wetted surface area is 1.9 in/hr. Applying a factor of safety of 2, the design infiltration rate is then 0.95 in/hr and the design flow rate is 0.0125 cfs. Since rates exceeded the 0.3 in/hr minimum outlined in the OC TGD, infiltration is considered feasible for the project site.</p>

Off-Site Drainage:	The project site does not receive any off-site storm water flows onto the property.
Utility and Infrastructure Information:	Dry and wet utilities will be incorporated into the proposed project and will tie into existing facilities associated with the existing development.

III.3 WATERSHED DESCRIPTION

Receiving Waters:	Carbon Creek Channel, Coyote Creek Channel, San Gabriel River 1, San Gabriel River Estuary, San Pedro Bay Near/Offshore Zones
303(d) Listed Impairments:	<ul style="list-style-type: none"> ▪ Carbon Creek Channel: None ▪ Coyote Creek (Region 4): Dissolved Copper, Indicator Bacteria, Iron, Malathion, pH, Sediment Toxicity ▪ San Gabriel River Reach 1 (Region 4): pH, Temperature ▪ San Gabriel River Estuary (Region 4): Copper, Dioxin, Indicator Bacteria, Nickel, Dissolved Oxygen ▪ San Pedro Bay Near/Offshore Zones (Region 4): Chlordane, DDT (tissue & sediment), PCBs, Sediment Toxicity
Applicable TMDLs:	<p>Coyote Creek: Indicator Bacteria (2016), Sediment Toxicity (2008)</p> <p>San Gabriel River Reach 1: pH(2009)</p> <p>San Gabriel River Estuary: Metals (Copper 2007), Indicator Bacteria (2016)</p>
Pollutants of Concern for the Project:	<p>Per Section II.2:</p> <ul style="list-style-type: none"> ▪ Suspended Solids/Sediments, Nutrients, Pathogens/Bacteria/Virus, Heavy Metals, Pesticides, Oil & Grease, Trash & Debris
Hydrologic Conditions of Concern (HCOCs):	Refer to Section II.3 for details.
Environmentally Sensitive and Special Biological Significant Areas:	There are no Environmentally Sensitive Areas (ESAs) or Areas of Special Biological Significance (ASBS) within the project site or within the project's vicinity.
Existing Water Quality Conditions:	No LUST sites were found within 250 feet of the project site. One former Leaking Underground Storage Tank (LUST) site and one DTSC Cleanup site has been identified within 1000 feet of the project site. See location of LUST and DTSC in map below.



SECTION IV BEST MANAGEMENT PRACTICES (BMPs)

IV.1 PROJECT PERFORMANCE CRITERIA

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

PROJECT PERFORMANCE CRITERIA	
<p>Hydromodification Control Performance Criteria: (Model WQMP Section 7.II-2.4.2.2)</p>	<p>If a hydrologic condition of concern (HCOC) exists, priority projects shall implement onsite or regional hydromodification controls such that:</p> <ul style="list-style-type: none"> ▪ Post-development runoff volume for the two-year frequency storm does not exceed that of the predevelopment condition by more than five percent, and ▪ Time of concentration of post-development runoff for the two-year storm event is not less than that for the predevelopment condition by more than five percent. <p>Where the Project WQMP documents that excess runoff volume from the two-year runoff event cannot feasibly be retained and where in-stream controls cannot be used to otherwise mitigate HCOCs, the project shall implement on-site or regional hydromodification controls to:</p> <ul style="list-style-type: none"> ▪ Retain the excess volume from the two-year runoff event to the MEP, and ▪ Implement on-site or regional hydromodification controls such that the post-development runoff two-year peak flow rate is no greater than 110 percent of the predevelopment runoff two-year peak flow rate.
<p>LID Performance Criteria: (Model WQMP Section 7.II-2.4.3)</p>	<p>Infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume).</p> <p>LID BMPs must be designed to retain, on-site, (infiltrate, harvest and use, or evapotranspire) storm water runoff up to 80 percent average annual capture efficiency.</p>
<p>Treatment Control BMP Performance Criteria: (Model WQMP Section 7.II-3.2.2)</p>	<p>If it is not feasible to meet LID performance criteria through retention and/or biotreatment provided on-site or at a sub-regional/regional scale, then treatment control BMPs shall be provided on-site or offsite prior to discharge to waters of the US. Sizing of treatment control BMP(s) shall be based on either the unmet volume after claiming applicable water quality credits, if appropriate.</p>

PROJECT PERFORMANCE CRITERIA	
LID Design Storm Capture Volume:	<p>$DCV = C \times d \times A \times 43560 \text{ sf/ac} \times 1/12 \text{ in/ft}$</p> <p>Where:</p> <p>DCV = design storm capture volume, cu-ft C = runoff coefficient = $(0.75 \times \text{imp} + 0.15)$ Imp = impervious fraction of drainage area (ranges from 0 to 1) d = storm depth (inches) A = tributary area (acres)</p> <p>Imp = 74.8 d = 0.9 inches A = 4.0 acres</p> <p>$DCV = (0.75 \times 0.748 + 0.15) \times 0.9 \text{ inches} \times 4.0 \text{ ac} \times 43560 \text{ sf/ac} \times 1/12 \text{ in/ft}$ $= 9,294 \text{ cu-ft}$</p> <p><i>Refer to Section IV.2.2 for specific Drainage Manage Area (DMA) breakdown and Appendix A for detailed calculations (Worksheet B).</i></p>

IV.2 SITE DESIGN AND DRAINAGE PLAN

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

IV.2.1 Site Design BMPs

Minimize Impervious Area

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

Maximize Natural Infiltration Capacity

Infiltration is deemed feasible based on the geotechnical study performed by Albus-Keefe & Associates, Inc. Refer to Section IV.3.2 for details.

Preserve Existing Drainage Patterns and Time of Concentration

Runoff from the site will continue to flow similar to existing conditions. Low-flows and first-flush runoff will drain to a detention system and infiltrate through drywells for water quality treatment via infiltration.

Disconnect Impervious Areas

Landscaping will be provided adjacent to sidewalks and between the proposed buildings in courtyards. Low-flows and first-flush runoff will drain to a detention system and infiltrate through drywells for water quality treatment via infiltration. Refer to Section IV.3.2 for further details.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

Some existing trees and landscaping will be preserved. There are no sensitive areas to preserve on the project site. All disturbed areas will either be paved or landscaped.

Xeriscape Landscaping

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

IV.2.2 Drainage Management Areas

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

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

DRAINAGE MANAGEMENT AREAS (DMAs)								
DMA/ Drainage Area ID ⁽¹⁾	Tributary Drainage Area (ft ²)	Tributary Drainage Area (ac)	% Imp.	Design Storm Depth ⁽²⁾ (in)	Estimated Tc (min)	Rainfall Intensity ⁽³⁾ (in/hr)	Simple Method DCV ⁽⁴⁾ (ft ³)	Q_{Design} ⁽⁵⁾ (cfs)
DMA 1	174,296	4.0	75	0.9	5	0.26	9,294	0.740

Notes:

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

IV.3 LID BMP SELECTION AND PROJECT CONFORMANCE ANALYSIS

Low Impact Development (LID) BMPs are required in addition to site design measures and source controls to reduce pollutants in storm water discharges. LID BMPs are engineered facilities that are designed to retain or biotreat runoff on the project site. The 4th Term MS4 Storm Water Permit (Order

R8-2009-0030) requires the evaluation and use of LID features using the following hierarchy of treatment: infiltration, evapotranspiration, harvest/reuse, and biotreatment. The following sections summarize the LID BMPs proposed for the project in accordance with the permit hierarchy and performance criteria outlined in Section IV.1.

IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic source controls (HSCs) can be considered to be a hybrid between site design practices and LID BMPs. HSCs are distinguished from site design BMPs in that they do not reduce the tributary area or reduce the imperviousness of a drainage area; rather they reduce the runoff volume that would result from a drainage area with a given imperviousness compared to what would result if HSCs were not used.

HYDROLOGIC SOURCE CONTROLS		
ID	Name	Included?
HSC-1	Localized on-lot infiltration	<input type="checkbox"/>
HSC-2	Impervious area dispersion (e.g. roof top disconnection)	<input type="checkbox"/>
HSC-3	Street trees (canopy interception)	<input type="checkbox"/>
HSC-4	Residential rain barrels (not actively managed)	<input type="checkbox"/>
HSC-5	Green roofs/Brown roofs	<input type="checkbox"/>
HSC-6	Blue roofs	<input type="checkbox"/>
HSC-7	Impervious area reduction (e.g. permeable pavers, site design)	<input type="checkbox"/>

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

IV.3.2 Infiltration BMPs

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

INFILTRATION		
ID	Name	Included?
INF-3	Bioretention Without Underdrains	<input type="checkbox"/>
INF-4	Rain Gardens	<input type="checkbox"/>

INFILTRATION		
ID	Name	Included?
	Porous Landscaping	<input type="checkbox"/>
	Infiltration Planters	<input type="checkbox"/>
	Retention Swales	<input type="checkbox"/>
INF-2	Infiltration Trenches	<input type="checkbox"/>
INF-1	Infiltration Basins	<input type="checkbox"/>
INF-5	Drywells	<input checked="" type="checkbox"/>
INF-7	Subsurface Infiltration Galleries	<input type="checkbox"/>
--	French Drains	<input type="checkbox"/>
INF-6	Permeable Asphalt	<input type="checkbox"/>
	Permeable Concrete	<input type="checkbox"/>
	Permeable Concrete Pavers	<input type="checkbox"/>
	Other:	<input type="checkbox"/>

The results of the infiltration tests and drywell modeling found an infiltration flow rate of 0.025 cfs. A design flow rate of 0.0125 cfs was used for drywell sizing. These rates combined with Geotech drywell modeling deem infiltration feasible. Drywells were selected for infiltrating the DCV. Five (5) Maxwell IV drywell systems are proposed. Each drywell will be a total of 52 feet deep, with the lower 34 feet consisting of the infiltrating drywell, and the upper 18 feet a concrete settling chamber. The MaxWell IV system incorporates pre-treatment of runoff through a settling chamber that traps trash, floating debris, oil and grease, and large sediment. Pre-treated flows are then diverted to the drywell and surrounding soil. With the incorporation of pretreatment and infiltration, drywells have high removal effectiveness for all storm water pollutants of concern (see Section VI for drywell details).

In order to maximize infiltration within the drywells, underground detention systems will be located upstream of the drywells. These systems will temporarily detain the DCV and hydromodification volume and will provide constant head to the drywells during the drawdown process. A detention gallery system (Contech CMP or equivalent) is proposed to provide detention capacity in addition to the storage capacity of the drywell settling chambers (see Section VI for detention details). The detention gallery prior to the five drywells located in DMA 1 will have a total storage of approximately 7,666 cu-ft while the five drywells will have a total storage of approximately 1,734 cu-ft. The total amount of storage provided for infiltration is approximately 9,400 cu-ft, which exceeds the Simple Method DCV of 9,294 cu-ft (refer to Section IV.2.2 for the Simple Method DCV) as well as the volume detained for hydromod purposes (roughly 9,370 cu-ft). This volume will be drawn down within 42 hours by the five drywells at a design rate of 0.0125 cfs each, or a total infiltration flowrate of 0.0625 cfs. Refer to the Maxwell IV Drainage System Calculations in Appendix A for calculations on drywell and detention system sizing and the drywell modeling in the Geotech Report in Appendix F.

Runoff will drain in a southwest direction towards the parking lot south of Building 2. Low flows will be diverted to pretreatment and detention gallery for treatment prior to drywell infiltration while high flows beyond the storage capacity for water quality will be temporarily detained in a separate detention system for flood control purposes and slowly released to an existing catch basin along N. Angelina Drive.

Pre-Treatment BMPs

The most important part of all drywell systems is the incorporation of proper upstream pre-treatment to remove solids and fines from entering the final infiltration chamber. The MaxWell IV drywell system itself includes a pretreatment settling chamber and slotted inlet to provide treatment prior to entering the infiltration chamber. However, in order to provide additional pre-treatment and filtration of runoff prior to infiltrating, the detention systems will include upstream pre-treatment devices (Contech CDS or equivalent) to pre-treat runoff before entering the detention systems and drywells (see Section VI for standard CDS details). The Contech CDS hydrodynamic separator uses swirl concentration and continuous deflective separation to remove trash, debris, and hydrocarbons from stormwater runoff. Treatment of this level would be consistent with the treatment standards required in the Technical Guidance Document for removal of pollutants prior to discharge into the drywell and detention system. The CDS unit will be designed to pre-treat runoff from the Design Capture Storm (85th percentile, 24-hour), consistent with the requirements of the TGD, Section III.3.3 and Worksheet D. The table below shows the water quality flow rate for DMA 1. Further details on the proposed pretreatment systems including sizing calculations and design specifications will be provided in the Final WQMP.

PRETREATMENT BMP SIZING				
DMA/ Drainage Area ID ⁽¹⁾	BMP	Tributary Drainage Area (ac)	% Imp.	Q _{Design} ⁽²⁾ (cfs)
DMA 1	Hydrodynamic Separator	4.0	75	0.740
Notes:				
1 Refer to exhibits in Section VI for locations of each DMA.				
2 Per Section Worksheet D of the Technical Guidance Document.				

IV.3.3 Evapotranspiration & Rainwater Harvesting BMPs

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

EVAPOTRANSPIRATION		
ID	Name	Included?
--	HSCs, see Section IV.3.1	<input type="checkbox"/>

EVAPOTRANSPIRATION		
ID	Name	Included?
--	Surface-based infiltration BMPs	<input type="checkbox"/>
--	Biotreatment BMPs, see Section VI.3.4	<input type="checkbox"/>
	Other:	<input type="checkbox"/>

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

HARVEST & REUSE / RAINWATER HARVESTING		
ID	Name	Included?
HU-1	Above-ground cisterns and basins	<input type="checkbox"/>
HU-2	Underground detention	<input type="checkbox"/>
--	Other:	<input type="checkbox"/>

Since infiltration will be utilized for retaining the design capture volume on-site, evapotranspiration BMPs were not incorporated into the project’s design.

IV.3.4 Biotreatment BMPs

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

BIOTREATMENT		
ID	Name	Included?
BIO-1	Bioretention with underdrains	<input type="checkbox"/>
	Storm Water planter boxes with underdrains	<input type="checkbox"/>

BIOTREATMENT		
ID	Name	Included?
	Rain gardens with underdrains	<input type="checkbox"/>
BIO-5	Constructed wetlands	<input type="checkbox"/>
BIO-2	Vegetated swales	<input type="checkbox"/>
BIO-3	Vegetated filter strips	<input type="checkbox"/>
BIO-7	Proprietary vegetated biotreatment systems	<input type="checkbox"/>
BIO-4	Wet extended detention basin	<input type="checkbox"/>
BIO-6	Dry extended detention basins	<input type="checkbox"/>
--	Other:	<input type="checkbox"/>

Since infiltration will be utilized for retaining the design capture volume on-site, biotreatment BMPs were not incorporated into the project’s design.

IV.3.5 Hydromodification Control BMPs

Not applicable. See Section II.3 for further details.

IV.3.6 Regional/Sub-Regional LID BMPs

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

IV.3.7 Treatment Control BMPs

Treatment control BMPs can only be considered if the project conformance analysis indicates that it is not feasible to retain the full design capture volume with LID BMPs.

TREATMENT CONTROL BMPs		
ID	Name	Included?
TRT-1	Sand Filters	<input type="checkbox"/>
TRT-2	Cartridge Media Filter	<input type="checkbox"/>
PRE-1	Hydrodynamic Separation Device	<input type="checkbox"/>
PRE-2	Catch Basin Insert	<input type="checkbox"/>
	Other:	<input type="checkbox"/>

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

IV.3.8 Non-Structural Source Control BMPs

The table below indicates all BMPs to be incorporated in the project. For those designated as not applicable (N/A), a brief explanation why is provided.

NON-STRUCTURAL SOURCE CONTROL BMPs				
ID	Name	Included?	Not Applicable?	If Not Applicable, Provide Brief Reason
N1	Education for Property Owners, Tenants and Occupants	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N2	Activity Restrictions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N3	Common Area Landscape Management	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N4	BMP Maintenance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N5	Title 22 CCR Compliance (How development will comply)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not applicable – no hazardous materials.
N6	Local Water Quality Permit Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The City of Placentia does not issue water quality permits.
N7	Spill Contingency Plan	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not applicable – no hazardous materials.
N8	Underground Storage Tank Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No underground storage tanks are proposed.
N9	Hazardous Materials Disclosure Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Hazardous materials will not be stored on-site.
N10	Uniform Fire Code Implementation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not applicable – no hazardous materials.
N11	Common Area Litter Control	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N12	Employee Training	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N13	Housekeeping of Loading Docks	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No loading docks are proposed.
N14	Common Area Catch Basin Inspection	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N15	Street Sweeping Private Streets and Parking Lots	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
N16	Retail Gasoline Outlets	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No retail gasoline outlets are proposed.

N1, Education for Property Owners, Tenants and Occupants

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

N2, Activity Restrictions

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

N3, Common Area Landscape Management

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

N4, BMP Maintenance

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

N11, Common Area Litter Control

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

N12, Employee Training

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

N14, Common Area Catch Basin Inspection

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

N15, Street Sweeping Private Streets and Parking Lots

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

IV.3.9 Structural Source Control BMPs

The table below indicates all BMPs to be incorporated in the project. For those designated as not applicable (N/A), a brief explanation why is provided.

STRUCTURAL SOURCE CONTROL BMPs				
ID	Name	Included?	Not Applicable?	If Not Applicable, Provide Brief Reason
S1 SD-13	Provide storm drain system stenciling and signage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
S2 SD-34	Design and construct outdoor material storage areas to reduce pollution introduction	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No outdoor storage areas are proposed.
S3 SD-32	Design and construct trash and waste storage areas to reduce pollution introduction	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
S4 SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
S5	Protect slopes and channels and provide energy dissipation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	There are no slopes or channels on the project site.
S6 SD-31	Properly Design: Dock areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No below-grade loading docks are proposed.
S7 SD-31	Properly Design: Maintenance bays	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No maintenance bays are proposed.
S8 SD-33	Properly Design: Vehicle wash areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No vehicle wash areas are proposed.
S9 SD-36	Properly Design: Outdoor processing areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No outdoor processing areas are proposed.
S10	Properly Design: Equipment wash areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No equipment wash areas are proposed.
S11 SD-30	Properly Design: Fueling areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No fueling areas are proposed.
S12 SD-10	Properly Design: Hillside landscaping	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Project is not located in a hillside area.

STRUCTURAL SOURCE CONTROL BMPs				
ID	Name	Included?	Not Applicable?	If Not Applicable, Provide Brief Reason
S13	Properly Design: Wash water control for food preparation areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
S14	Properly Design: Community car wash racks	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No community car wash racks are proposed.

S1/SD-13, Provide storm drain system stenciling and signage

The phrase “NO DUMPING! DRAINS TO OCEAN”, or an equally effective phrase approved by the City, will be stenciled on all major storm drain inlets within the project site to alert the public to the destination of pollutants discharged into storm water. Stencils shall be in place prior to release of certificate of occupancy. Stencils shall be inspected for legibility on an annual basis and re-stenciled as necessary.

S3/SD-32, Design and construct trash and waste storage areas to reduce pollution introduction

All trash and waste shall be stored in containers that have lids or tarps to minimize direct precipitation into the containers. One trash enclosure will be located in the parking lot northeast of the existing classrooms and a second trash enclosure will be located towards the center of the project west of Building 2. The trash storage areas will be designed to City standards, and will be walled, roofed, have gates and proper drainage per City standards.

S4/SD-12, Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control

The Owner will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. The Owner will be responsible for implementing all efficient irrigation systems for common area landscaping including, but not limited to, provisions for water sensors and programmable irrigation cycles. This includes smart timers, rain sensors, and moisture shut-off valves. The irrigation systems shall be in conformance with water efficiency guidelines. Systems shall be tested twice per year, and water used during testing/flushing shall not be discharged to the storm drain system.

IV.4 ALTERNATIVE COMPLIANCE PLAN

IV.4.1 Water Quality Credits

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

WATER QUALITY CREDITS

Credit	Applicable?
Redevelopment projects that reduce the overall impervious footprint of the project site.	<input type="checkbox"/>
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 water quality if not redeveloped.	<input type="checkbox"/>
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)	<input type="checkbox"/>
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).	<input type="checkbox"/>
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	<input type="checkbox"/>
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).	<input type="checkbox"/>
Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.	<input type="checkbox"/>
Developments in a city center area.	<input type="checkbox"/>
Developments in historic districts or historic preservation areas.	<input type="checkbox"/>
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.	<input type="checkbox"/>
In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.	<input type="checkbox"/>

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

IV.4.2 Alternative Compliance Plan Information

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

SECTION V INSPECTION/MAINTENANCE RESPONSIBILITY FOR BMPs

It has been determined that National Community Renaissance shall assume all BMP inspection and maintenance responsibilities for the Placentia Senior Housing project.

Contact Name:	Michael Ruane
Title:	Executive Vice President
Company:	National Community Renaissance
Address:	9421 Haven Ave, Rancho Cucamonga, CA 91730
Phone:	909-204-3451
Email:	mruane@nationalcore.org

Should the maintenance responsibility be transferred at any time during the operational life of Placentia Senior Housing, such as when an HOA or POA is formed for a project, a formal notice of transfer shall be submitted to the City of Placentia at the time responsibility of the property subject to this WQMP is transferred. The transfer of responsibility shall be incorporated into this WQMP as an amendment.

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

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

Long-term funding for BMP maintenance will be provided by National Community Renaissance.

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

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	Inspection/Maintenance Activities	Minimum Frequency	Responsible Party
INFILTRATION BMPs				
INF-5	Drywell	Performed in accordance with manufacturer’s specifications. Typical maintenance includes conducting routine inspections for accumulation and cleaning/pollutant removal as necessary from the pre-treatment settling chamber. Quarterly inspections will help maintain optimal performance and to determine typical accumulation levels during both dry-weather and wet-weather flows. The pretreatment settling chamber shall be cleaned when sediment accumulation is at or above the “cleanout line” marked inside of the chamber, and at a minimum of once per year, prior to the start of the storm season. Care should be taken to prevent spills during pollutant removal and cleaning. Oil and other hydrocarbons shall be cleaned out of the settling chamber as needed, once per year at a minimum. See Appendix D for additional maintenance information provided by the manufacturer.	Quarterly Inspections Cleanout 2x per year	National Community Renaissance

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	Inspection/Maintenance Activities	Minimum Frequency	Responsible Party
	Contech CMP (or similar) Detention System	The underground detention system shall be inspected annually and after major storm events, and cleaned at a minimum of once per year, prior to the start of the rainy season (October 1st). Cleaning and maintenance will be performed per manufacturer specifications and will typically include removal of any trash and debris and excess sediment within the pipes. Sediment shall be removed when deposits approach within 6 inches of the invert heights of the connecting pipes between the chamber rows or inlet structures. See Appendix D for additional maintenance information provided by the manufacturer.	Annually	National Community Renaissance
PRE-TREATMENT / GROSS SOLIDS REMOVAL BMPs				
PRE-1	Hydrodynamic Separator (Contech CDS or similar)	The hydrodynamic separator should be inspected for oil, sediment, trash and debris. The proposed system will need to be maintained in accordance with the manufacturer's specifications. Buildup of debris may block the inlet or outlet pipe which could result in ineffective operation of the system. Typical maintenance will include removal of sediment and solids using a vacuum truck when system is 75% full.	2x per year	National Community Renaissance
NON-STRUCTURAL SOURCE CONTROL BMPs				
N1	Education for Property Owners, Tenants and Occupants	Educational materials will be provided to tenants annually. Materials to be distributed are found in Appendix C of this WQMP. Tenants will be provided these materials by Property Management prior to occupancy and annually thereafter.	Annually	National Community Renaissance

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	Inspection/Maintenance Activities	Minimum Frequency	Responsible Party
N2	Activity Restrictions	The lessee will prescribe activity restrictions to protect surface water quality, through lease terms or equally effective measure, for the property. Restrictions include but are not limited to prohibiting vehicle maintenance or vehicle washing.	Ongoing	National Community Renaissance
N3	Common Area Landscape Management	Maintenance shall be consistent with County requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP § 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting, and replacement of mulch shall be performed on an as-needed basis to prevent exposure of erodible surfaces. Trimmings, clippings, and other landscape wastes shall be properly disposed of in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Monthly	National Community Renaissance
N4	BMP Maintenance	Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP (Appendix B). Records of inspections and BMP maintenance shall be kept by the lessee and shall be available for review upon request.	Ongoing	National Community Renaissance
N5	Title 22 CCR Compliance (How development will comply)	Not Applicable		
N6	Local Industrial Permit Compliance	Not Applicable		
N7	Spill Contingency Plan	Not Applicable		

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	Inspection/Maintenance Activities	Minimum Frequency	Responsible Party
N8	Underground Storage Tank Compliance	Not Applicable		
N9	Hazardous Materials Disclosure Compliance	Not Applicable		
N10	Uniform Fire Code Implementation	Not Applicable		
N11	Common Area Litter Control	Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities.	Weekly	National Community Renaissance
N12	Employee Training	The lessee shall educate all new employees/managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Materials that may be utilized on BMP maintenance are included in Appendix B.	Annually	National Community Renaissance
N13	Housekeeping of Loading Docks	Not Applicable		
N14	Common Area Catch Basin Inspection	On-site catch basin inlets shall be inspected and, if necessary, cleaned prior to the storm season by October 1 st each year.	Annually	National Community Renaissance
N15	Street Sweeping Private Streets and Parking Lots	All private streets, drive aisles and exposed parking areas within the project shall be swept at a minimum frequency quarterly as well as once per year prior to the storm season, no later than October 1 each year.	Quarterly	National Community Renaissance
N16	Retail Gasoline Outlets	Not Applicable		

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	Inspection/Maintenance Activities	Minimum Frequency	Responsible Party
STRUCTURAL SOURCE CONTROL BMPs				
S1 SD-13	Provide storm drain system stenciling and signage	On-site storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1 st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually	National Community Renaissance
S2 SD-34	Design and construct outdoor material storage areas to reduce pollution introduction	Not Applicable		
S3 SD-32	Design and construct trash and waste storage areas to reduce pollution introduction	Sweep trash area at least once per week and before October 1 st each year. Maintain area clean of trash and debris at all times.	Weekly	National Community Renaissance
S4 SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	In conjunction with routine maintenance, verify that landscape design continues to function properly by adjusting systems to eliminate overspray to hardscape areas and to verify that irrigation timing and cycle lengths are adjusted in accordance to water demands, given the time of year, weather, and day or nighttime temperatures. System testing shall occur twice per year. Water from testing/flushing shall be collected and properly disposed to the sewer system and shall not discharge to the storm drain system.	2x per year	National Community Renaissance
S5	Protect slopes and channels and provide energy dissipation	Not Applicable		
S6 SD-31	Properly Design: Dock areas	Not Applicable		

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	Inspection/Maintenance Activities	Minimum Frequency	Responsible Party
S7 SD-31	Properly Design: Maintenance bays		Not Applicable	
S8 SD-33	Properly Design: Vehicle wash areas		Not Applicable	
S9 SD-36	Properly Design: Outdoor processing areas		Not Applicable	
S10	Properly Design: Equipment wash areas		Not Applicable	
S11 SD-30	Properly Design: Fueling areas		Not Applicable	
S12 SD-10	Properly Design: Hillside landscaping		Not Applicable	
S13	Properly Design: Wash water control for food preparation areas		Not Applicable	
S14	Properly Design: Community car wash racks		Not Applicable	

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

SECTION VI SITE PLAN AND DRAINAGE PLAN

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

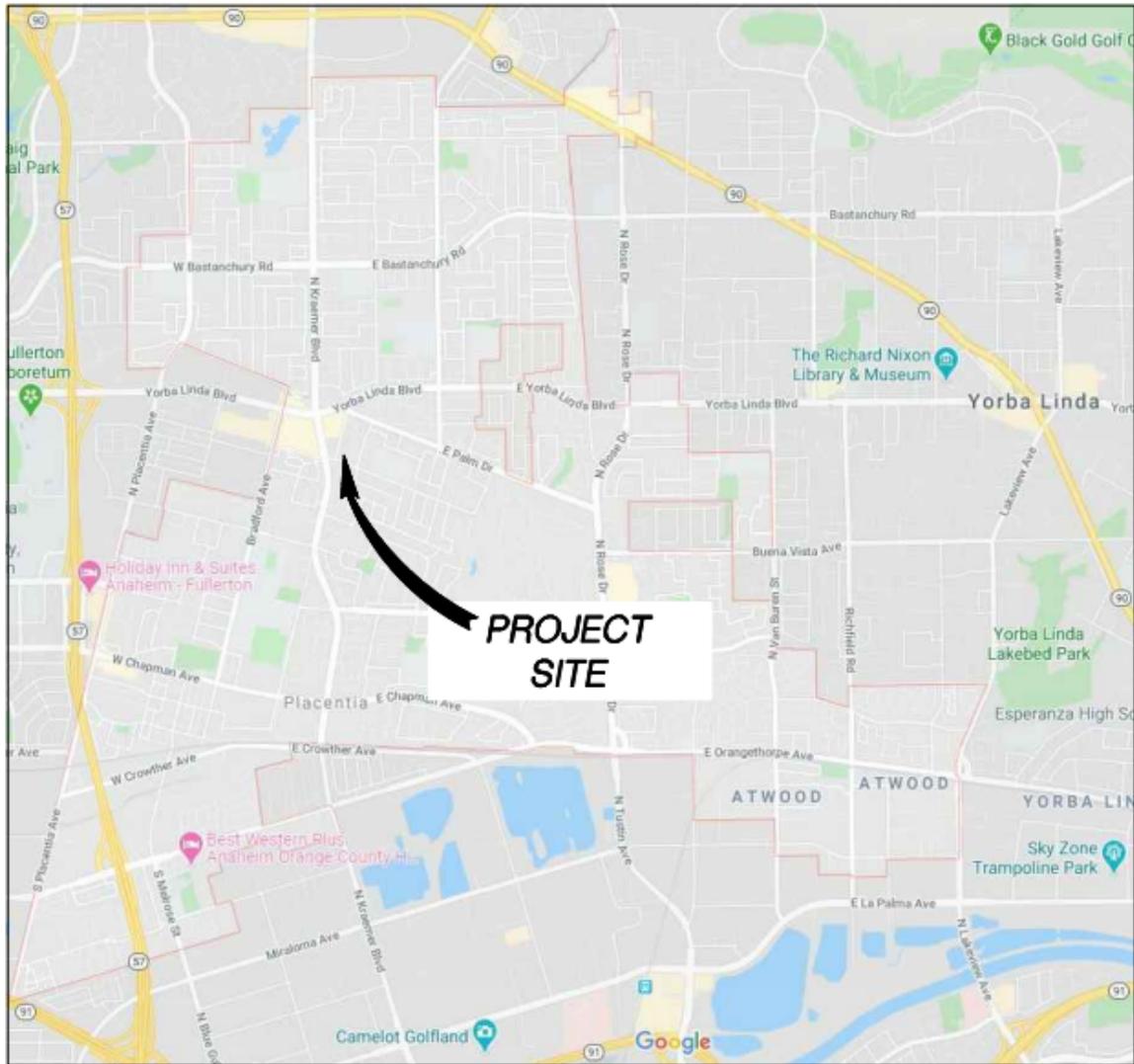
EXHIBITS

- Vicinity Map
- Site Plan
- WQMP Exhibit

BMP DETAILS & FACT SHEETS

- Torrent Drywell Details
- Contech CDS Details
- Contech CMP Details
- Underground Detention BMP Fact Sheet (HU-2)
- Hydrodynamic Separator BMP Fact Sheet (PRE-1)
- Drywell BMP Fact Sheet (INF-5)

VICINITY MAP



VICINITY MAP





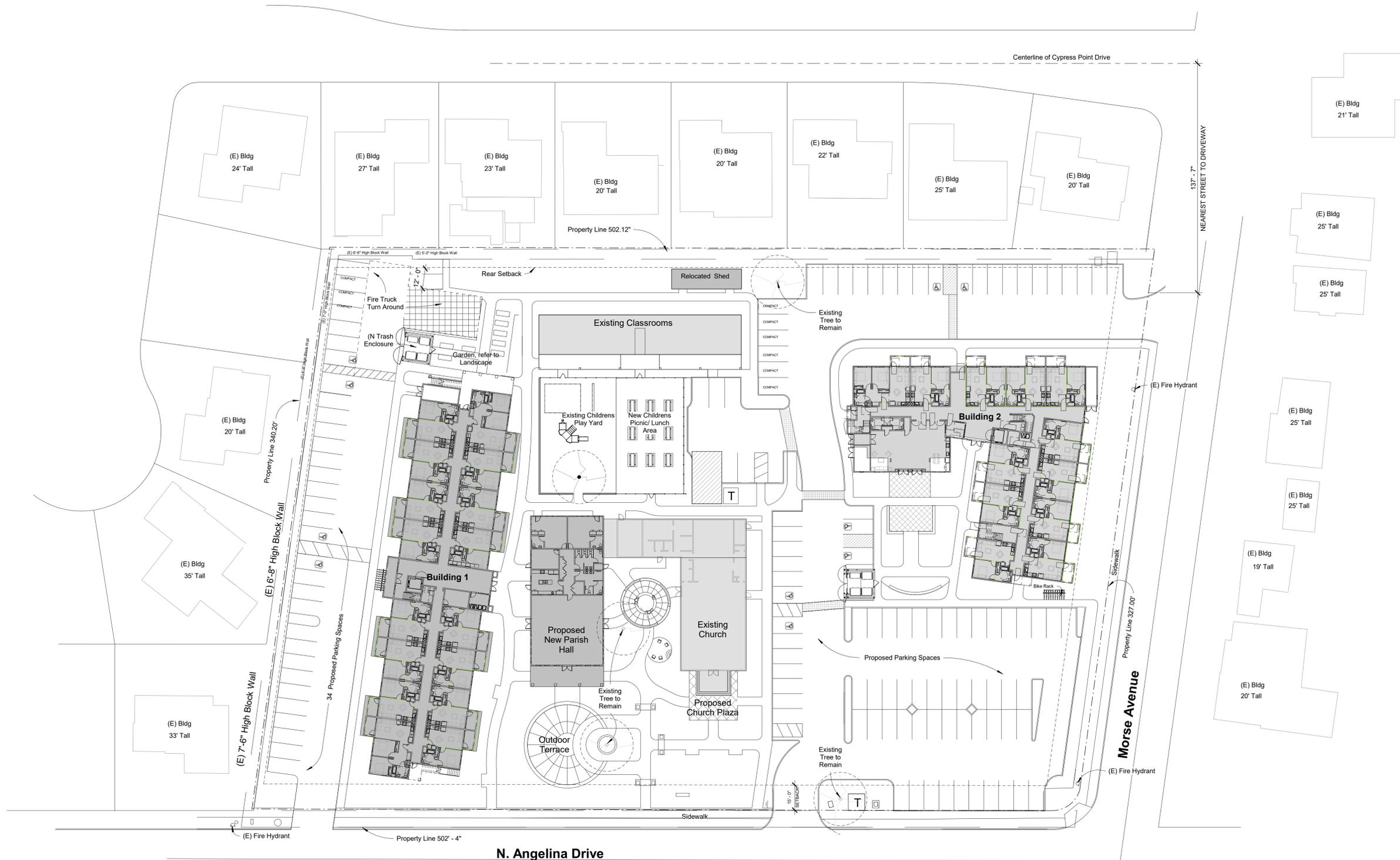
RRM Design Group

10 E. Figueroa St., Suite 1
Santa Barbara, CA 93101

Tel: 805.963.8283
Fax: 805.963.8184
www.rrmdesign.com

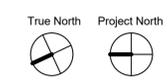


9421 Haven Avenue
Rancho Cucamonga, CA 91730
Tel: 949.394.7996 Fax: 909.483.6524
nationalcore.org



Note:
(E) Surrounding building heights are based off of digital source estimations

1 Site Plan SCALE: 1" = 30'-0"

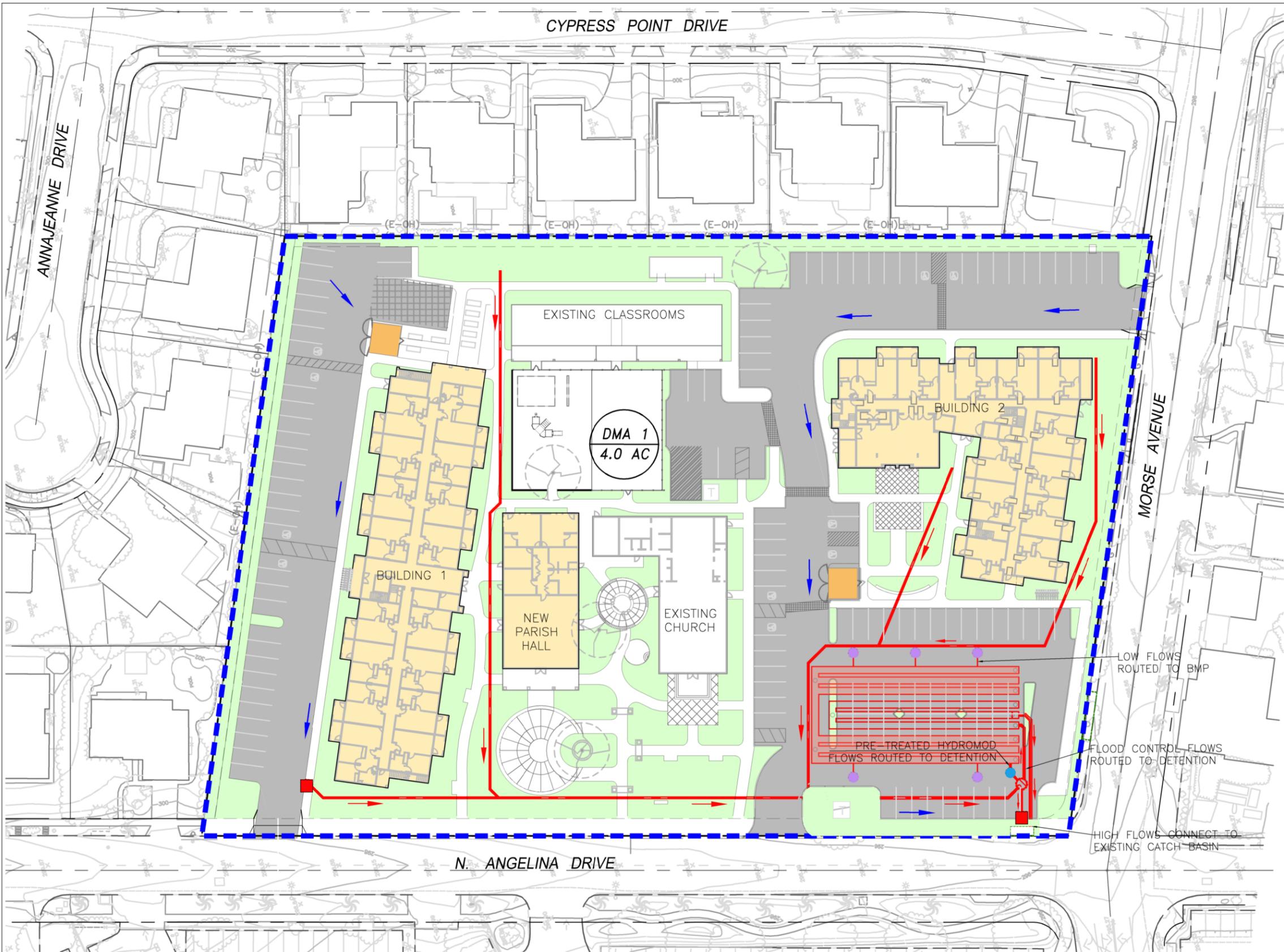


Placentia Senior Housing

A.P.N. 340-273-25

1314 N. Angelina Drive, Placentia CA 92870.

Site Plan



LEGEND

- PROPERTY LINE
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- BMP DRAINAGE AREA BOUNDARY
- PROPOSED COMMON AREA LANDSCAPING
- PROPOSED BUILDING
- STREET SWEEPING PRIVATE STREETS & PARKING LOTS
- PROPOSED DETENTION SYSTEM FOR 2-YEAR FLOWS
- PROPOSED DRYWELL
- PROPOSED PRE-TREATMENT (HYDRODYNAMIC SEPARATOR)
- CATCH BASIN STENCILING & MAINTENANCE
- TRASH ENCLOSURE
- DIRECTION OF SURFACE FLOW
- DIRECTION OF PIPED FLOW
- DRAINAGE MANAGEMENT AREA AND ACREAGE

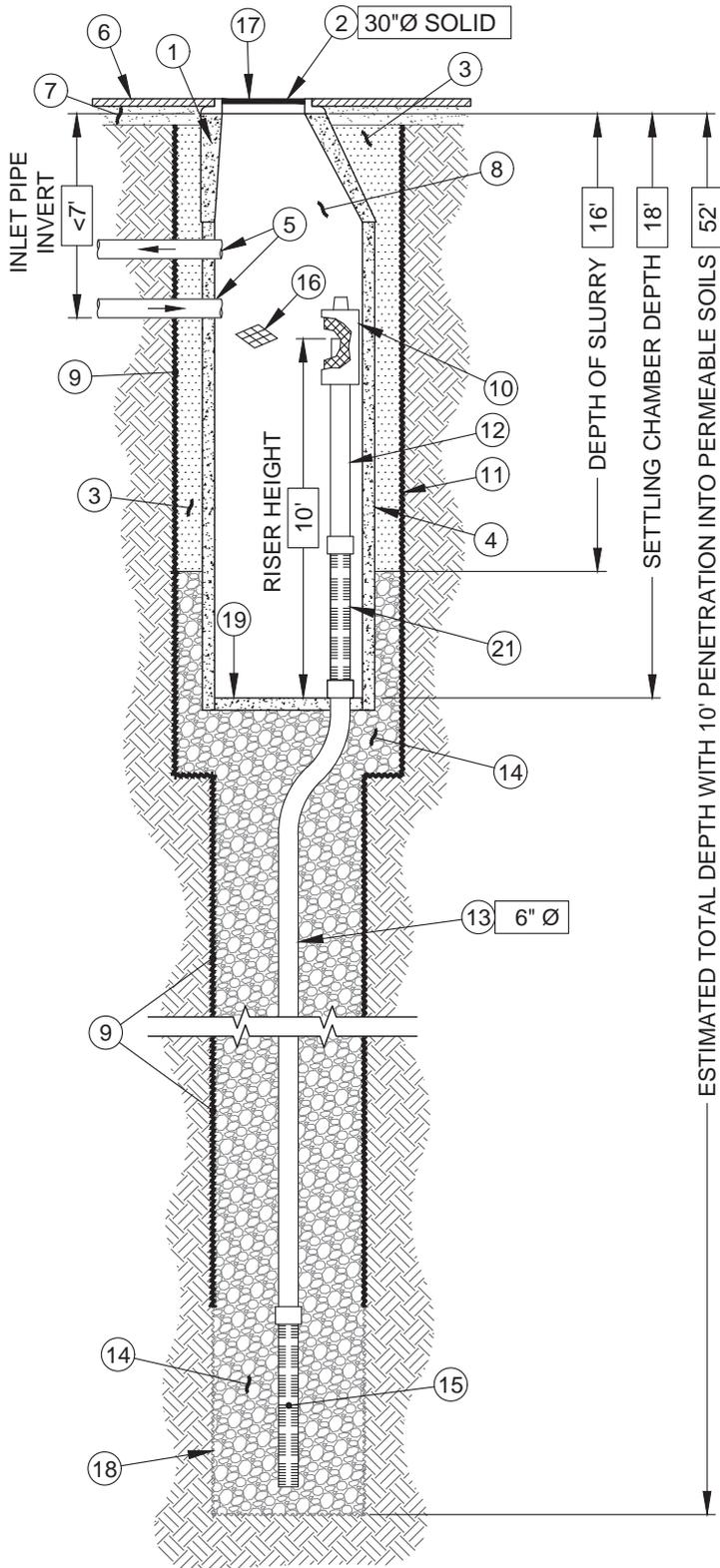


The MaxWell® IV

DRAINAGE SYSTEM DETAILS AND SPECIFICATIONS

1314 N Angelina Drive - DRAFT

Placentia, CA



ITEM NUMBERS

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

AZ Lic. ROC070465 A, ROC047067 B-4, ADWR 363

CA Lic. 886759, C-42, C-57, HAZ.

Also licensed in the following states: MT, NM, NV, OR, TX, UT, and WA.

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

Manufactured and Installed by

TORRENT RESOURCES

An evolution of McGuckin Drilling

www.torrentresources.com

CALIFORNIA 909-829-0740

ARIZONA 602-268-0785

DETAIL: IV-4-SS-OC

REVISED BY: BDJ

DRAWN ON: 08-28-19

REVISED DATE: 07-01-20

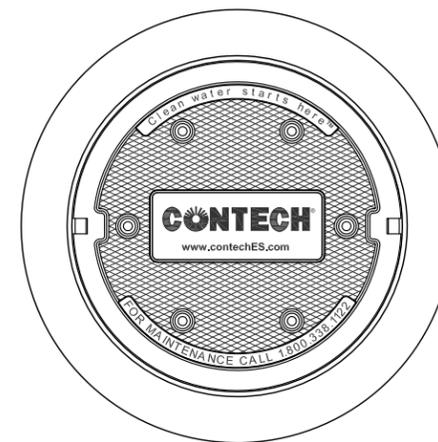
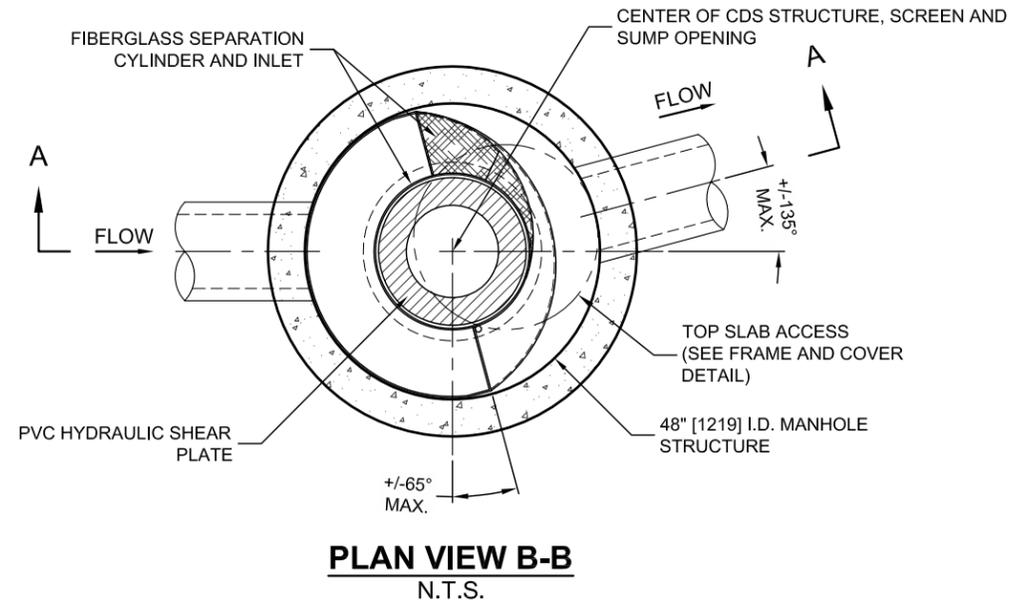
SCALE: N.T.S

CDS2015-4-C DESIGN NOTES

THE STANDARD CDS2015-4-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION

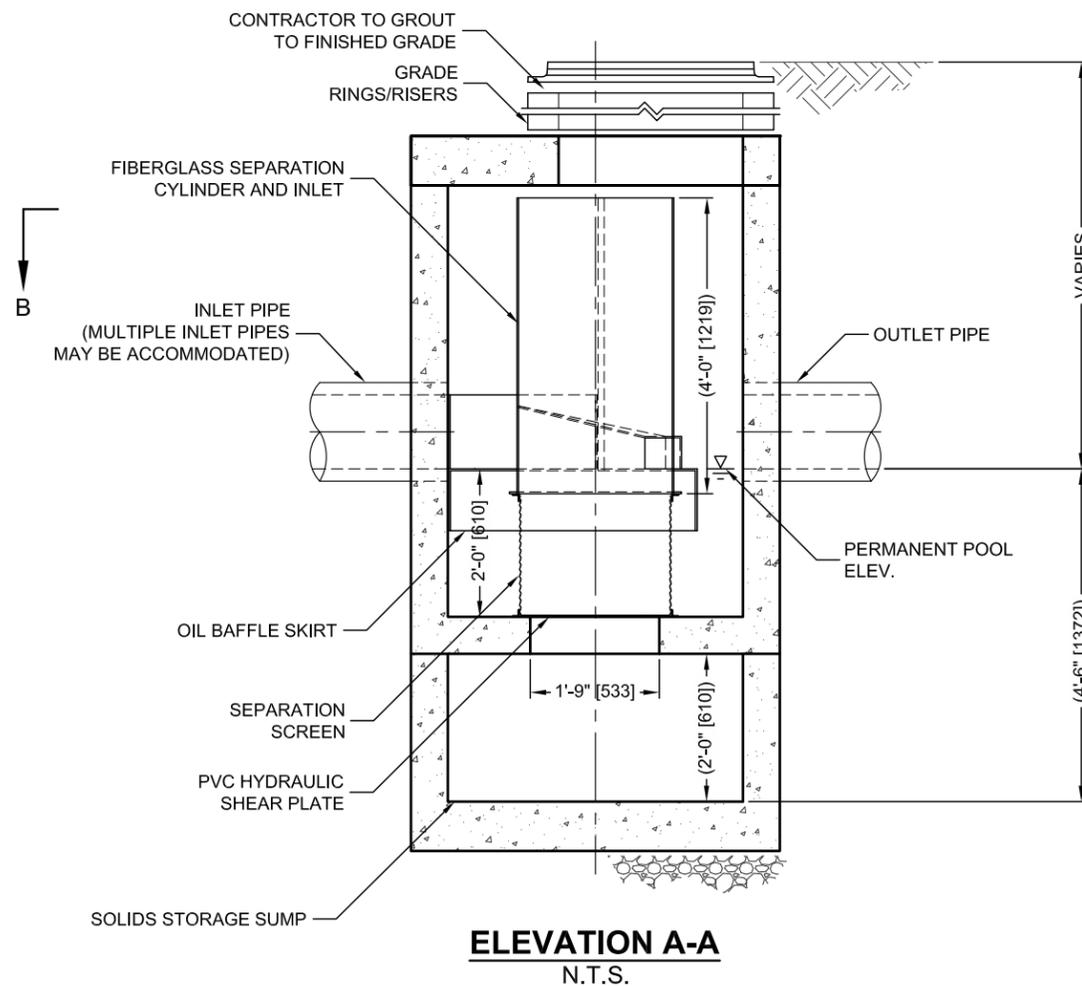
- GRATED INLET ONLY (NO INLET PIPE)
- GRATED INLET WITH INLET PIPE OR PIPES
- CURB INLET ONLY (NO INLET PIPE)
- CURB INLET WITH INLET PIPE OR PIPES
- SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
- SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID				
WATER QUALITY FLOW RATE (CFS OR L/s)				*
PEAK FLOW RATE (CFS OR L/s)				*
RETURN PERIOD OF PEAK FLOW (YRS)				*
SCREEN APERTURE (2400 OR 4700)				*
PIPE DATA:	I.E.	MATERIAL	DIAMETER	
INLET PIPE 1	*	*	*	
INLET PIPE 2	*	*	*	
OUTLET PIPE	*	*	*	
RIM ELEVATION				*
ANTI-FLOTATION BALLAST	*	WIDTH	*	HEIGHT
NOTES/SPECIAL REQUIREMENTS:				
* PER ENGINEER OF RECORD				



ELEVATION A-A
N.T.S.

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES

- A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
- C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
- D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
- E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

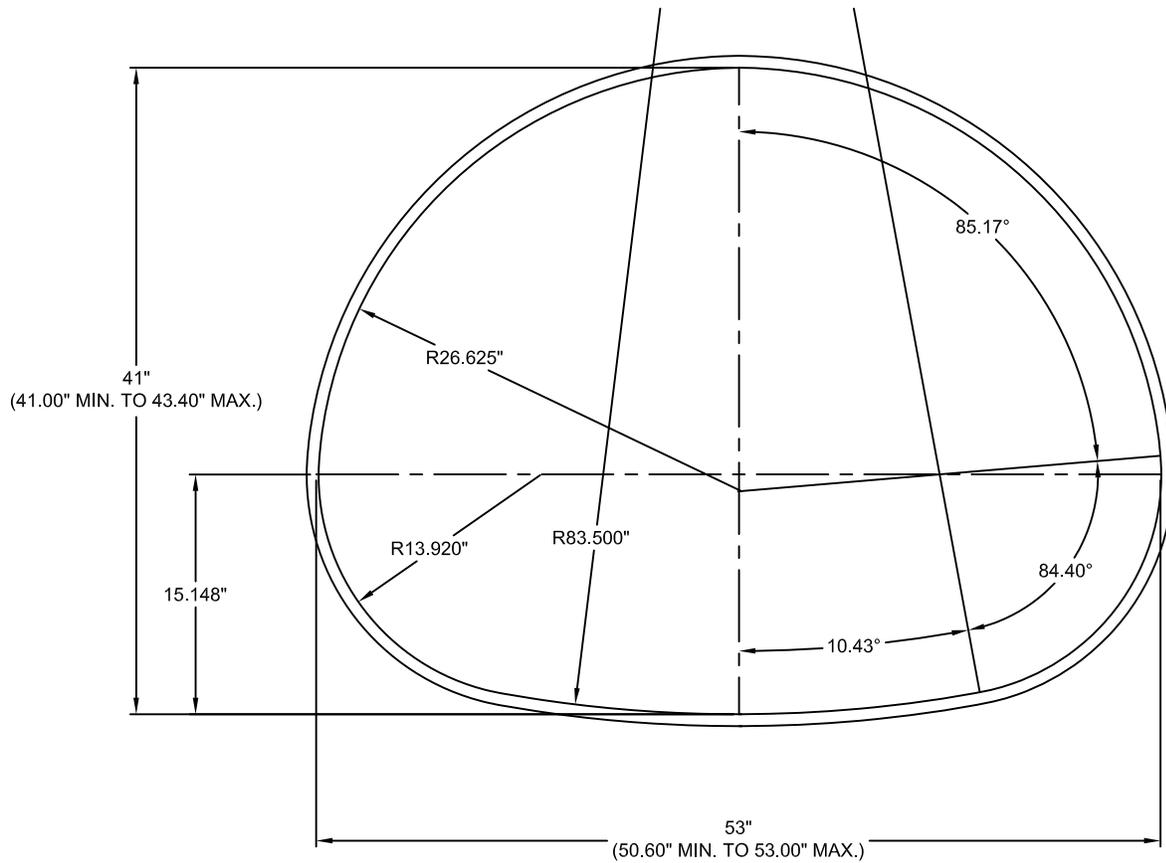
CONTECH
ENGINEERED SOLUTIONS LLC

www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS2015-4-C
INLINE CDS
STANDARD DETAIL



H:\DRAINAGE PLATE AND SPECIALTY ENGINEERING\PRODUCTS\CMP\STANDARD DETAIL\600-SHAPE DETAIL\WORKING\SHAPE FILES\ULTRA FLO\643 - CMP (ULTRA FLO) 48IN PAD\DWG 11/30/2016 10:48 AM



NOMINAL 53" X 41" (48" ROUND EQUIVALENT)

AREA= 12.07 SF

NOTES:

1. ALL DIMENSIONS ARE TO THE INSIDE CORRUGATION CREST UNLESS NOTED OTHERWISE.
2. ALL DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
3. RISE AND SPAN DIMENSIONS ACCOUNT FOR SPECIFICATION TOLERANCES FROM NOMINAL DIMENSIONS.
(AASHTO M 36 STEEL, M 196 ALUMINUM, ASTM A 760 STEEL, B 745 ALUMINUM).

643 - CMP (ULTRA FLO) 48IN PA



9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX



DATE DRAWN: 11/18/16

REV #:

REV DATE:

SCALE: N.T.S.

DRAWING TYPE:

SHAPE DRAWING
ULTRA FLO CMP PIPE ARCH
48" EQ DIA 53"x41"

XIV.4. Harvest and Use BMP Fact Sheets (HU)

HU-1: Above-Ground Cisterns

Cisterns are large rain barrels. While rain barrels are less than 100 gallons, cisterns range from 100 to more than 10,000 gallons in capacity. Cisterns collect and temporarily store runoff from rooftops for later use as irrigation and/or other non-potable uses. The following components are generally required for installing and utilizing a cistern: (1) pipes that divert rooftop runoff to the cistern, (2) an overflow for when the cistern is full, (3) a pump, and (4) a distribution system to supply the intended end uses.

Feasibility screening consideration, opportunity criteria, design criteria, etc. for this BMP are listed below under HU-2: Underground Detention.

HU-2: Underground Detention

Underground detention facilities are subsurface tanks, vaults, or oversized pipes that store stormwater runoff. Similar to cisterns, underground detention facilities can store water for later use as irrigation and/or other non-potable uses.



Above-Ground Cisterns
Source: Sunset Publishing Corporation



Underground detention tank
Source: www.webtecgeos.com

Feasibility Screening Considerations

- The primary feasibility considerations for harvest and use systems for stormwater management is the presence of consistent and reliable demand that is sufficient to drain the systems relatively quickly between storms. [Appendix X](#) provides guidance for calculating harvested water demand.
- Use of harvested water should not conflict with applicable plumbing and health codes at the time of project application.

Opportunity Criteria

- Cisterns may collect rooftop runoff, and if located underground, may collect ground-level runoff.
- Cisterns may be installed in any type of land use provided space is available and adequate water demand exists.
- Stored water may supply non-potable water use demands such as irrigation and toilet flushing.
- Cisterns and underground detention facilities may also be used for peak flow control if active storage volume and hydraulic controls are provided above the retained storage or systems are operated with advanced controllers.

OC-Specific Design Criteria and Considerations for Above-Ground Cisterns

- Cistern systems should include prescreening in the form of screens on gutters and downspouts to remove vegetative debris and sediment from the runoff prior to entering the cistern.

- Above-ground cisterns should be secured in place and comply with applicable building codes.
- Above-ground cisterns should not be located on uneven or sloped surfaces; if installed on a sloped surface, the base where the cistern will be installed should be leveled and designed for the weight of the filled cistern prior to installation.
- Child-resistant covers and mosquito screens should be placed on all water entry holes.
- A first flush diverter may be installed so that initial runoff bypasses the cistern.
- Above-ground cisterns should be installed in a location with easy access for maintenance or replacement.
- Plumbing systems should be installed in accordance with the current California Building and Plumbing Codes (CBC – part of California Code of Regulations, Title 24).
When a potable water supply line is connected to a cistern system to provide dry-season make-up water, cross-contamination should be prevented by providing a backflow prevention system on the potable water supply line and/or an air gap.
- In cases where there is non-potable indoor use demand, proper pretreatment measures should be installed such as pre-filtration, cartridge filtration, and/or disinfection.

OC-Specific Design Criteria and Considerations for Underground Cisterns/Detention Systems

- Access entry covers (36" diameter minimum) should be locking and within 50 feet of all areas of the detention tank.
- In cases where the detention facility provides sediment containment, the facility should be laid flat and there should be at least ½ foot of dead storage within the tank or vault.
- Outlet structures should be designed using the 100-year storm as overflow and should be easily accessible for maintenance activities.
- For detention facilities beneath roads and parking areas, structural requirements should meet H-20 load requirements.
- In cases where shallow groundwater may cause flotation, buoyant forces should be counteracted with backfill, anchors, or other measures.
- Underground detention facilities should be installed on consolidated and stable native soil; if the facility is constructed in fill slopes, a geotechnical analysis should be performed to ensure stability.
- Plumbing systems should be installed in accordance with the current California Building and Plumbing Codes (CBC – part of California Code of Regulations, Title 24).
When a potable water supply line is connected to a cistern system to provide dry-season make-up water, cross-contamination should be prevented by providing a backflow prevention system on the potable water supply line and/or an air gap.
- In cases where there is non-potable indoor reuse demand, proper pretreatment measures should be installed such as pre-filtration, cartridge filtration, and/or disinfection.

Types of Harvested Water Demands

Harvested rainwater can be used for irrigation and other non-potable uses (if local, State, and Federal ordinances allow). The use of captured stormwater allows a reduced demand on the potable water supply.

Irrigation Use

- Subsurface (or drip) irrigation should not require disinfection pretreatment prior to use; other irrigation types, such as spray irrigation, may require additional pretreatment prior to use
- Selecting native and/or drought tolerant plants for landscaped area will reduce irrigation demand, thereby reducing the needed size of the storage facility and the amount of tributary area that can be successfully managed with a harvest and use system.

Indoor Use

- Indoor uses generally require filtration and disinfection and should only be considered if permitted by local, State, or Federal codes and ordinances.
- Domestic uses (single-family uses) may include toilet flushing.
- Offices, commercial developments, and industrial facility indoor uses may use cisterns for toilet and urinal flushing. Demands for these specific land uses are include in [Appendix X](#).
- Pretreatment requirements per local, State, or Federal codes and ordinances should be applied

Other Non-Potable Uses

- Other non-potable uses may include vehicle/equipment washing, evaporative cooling, industrial processes, and dilution water for recycled water systems (if local, State, and Federal ordinances allow)
- Pretreatment requirements per local, State, or Federal codes and ordinances should be applied

Harvested Water Demand Calculations and Feasibility Thresholds

[Appendix X](#) provides guidance for estimating harvesting water demand and determining whether demand is potentially sufficient to provide a significant benefit for stormwater management.

Simple Sizing Method for Cisterns

If the Simple Design Capture Volume Sizing Method described in [Appendix III.3.1](#) is used to size harvest and use systems, the user calculates the DCV and determines whether demand is sufficient to drain the tank in 48 hours following the end of rainfall. The sizing steps are as follows:

Step 1: Determine Cistern DCV

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in [Appendix III.3.1](#). This is the required cistern size.

Step 2: Determine the 48-hour Required Demand

Calculate the daily demand needed to draw down the DCV in 48 hours using the following equation:

$$\text{Demand}_{48} = (\text{DCV}/2) * 7.48$$

Where:

Demand₄₈ = daily demand required (gal/day)

DCV = design capture volume, cu-ft

Use the guidance in [Appendix X](#) determine the non-potable uses needed to generate the required demand.

Designing Cisterns to Achieve the Maximum Feasible Retention Volume

It is rare that cisterns can be sized to capture the full DCV and use this volume in 48 hours. However, if the demand exceeds minimum harvested water demand thresholds, cisterns should be sized to achieve at least 40 percent capture of average annual runoff volume.

Step 1: Determine if the Project Meets the Minimum Harvested Water Demand Thresholds

Determine the Project's design capture storm depth, then use the TUTIA thresholds table ([Appendix X](#)) for indoor uses, or the Irrigated Area thresholds table ([Appendix X](#)) for outdoor uses, to determine whether the project meets the minimum harvested water demand thresholds. If the project does not meet the minimum harvested water demand thresholds, harvest and use does not meet the minimum incremental benefit required to such that its use must be evaluated. .

If the project meets or exceeds the minimum harvested water demand thresholds, continue to Step 2 or Step 3 (equally-allowable pathways).

Step 2: Iteratively Determine the Cistern Volume for 80 percent capture of average annual stormwater runoff volume

Cisterns can be sized using the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See [Appendix III.3.2](#)). This approach requires an iterative sizing process in which the user selects the initial cistern size and the project harvested water demand, then calculates the time required for the cistern to drain. Based on the drain time, the cistern size is increased or decreased and the calculations are done again until the initially assumed size and the required size are within 10 percent.

- a. Calculate wet season harvested water demand using guidance contained in [Appendix X](#).
- b. Select cistern size in terms of the design rainfall depth.
- c. Calculate the cistern volume using hydrologic method described in [Appendix III.1.1](#).
- d. Compute the drawdown time of the cistern as:
$$\text{Drawdown Time (hr)} = [\text{Volume (cu-ft)} \times 7.48 \text{ gal/cu-ft} \times 24\text{hr/day}] / [\text{Demand (gpd)}]$$
- e. Based on design rainfall depth and drawdown time using guidance provided in [Appendix III](#) to calculate long term average capture efficiency.
- f. If capture is between 75 and 85 percent, further iterations are not required.
- g. If capture is less than 80 percent capture of average annual stormwater runoff volume, return to Step (b) and increase design rainfall depth.
- h. If capture is greater than 80 percent, return to Step (b) and increase design rainfall depth.

Step 3: Determine Cistern Volume and Drawdown to Achieve Maximum Practicable Capture Efficiency

The applicant is not required to provide a cistern greater than the DCV to demonstrate that BMPs have been designed to achieve the maximum feasible retention. The following steps should be used to compute the maximum feasible fraction of stormwater than can be retained with harvest and use BMPs:

- a. Calculate wet season harvested water demand using guidance contained in [Appendix X](#), accounting for all applicable demands.
- b. Calculate the DCV using hydrologic method described in [Appendix III.1.1](#) and size the cistern for this volume.

- c. Compute the drawdown time of the cistern as:

$$\text{Drawdown Time (hr)} = [\text{Volume (cu-ft)} \times 7.48 \text{ gal/cu-ft} \times 24\text{hr/day}] / [\text{Demand (gpd)}]$$

- d. Based on $1.0 \times$ design capture storm depth and the drawdown time computed in Step I, calculate the long term average capture efficiency using the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix III.3.2**).
- e. If capture efficiency is less than 40 percent, harvest and use is not required to be considered for use on the project.
- f. If capture efficiency is greater than 40 percent, provide a cistern sized for the DCV and provide volume or flowrate to treat the remaining volume up to 80 percent total average annual capture using biotreatment BMP.

Configuration for Use in a Treatment Train

- Cisterns can be combined into a treatment train to provide enhanced water quality treatment and reductions in the runoff volume and rate. For example, if a green roof is placed upgradient of a cistern, the rate and volume of water flowing to the cistern can be reduced and the water quality enhanced.
- Cisterns can be incorporated into the landscape design of a site and can be aesthetically pleasing as well as functional for irrigation purposes.
- Treatment of the captured rainwater (i.e. disinfection) may be required depending on the end use of the water.
- Cisterns can be designed to overflow to biotreatment BMPs.

Additional References for Design Guidance

Santa Barbara BMP Guidance Manual, Chapter 6:

http://www.santabarbaraca.gov/NR/rdonlyres/91D1FA75-C185-491E-A882-49EE17789DF8/0/Manual_071008_Final.pdf

- County of Los Angeles Low Impact Development Standards Manual, Chapter 5:

http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf

- SMC LID Manual (pp 114):

http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf

San Diego County LID Handbook Appendix 4 (Factsheet 26):

<http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf>

XIV.7. Pretreatment/Gross Solids Removal BMP Fact Sheets (PRE)

PRE-1: Hydrodynamic Separation Device

Hydrodynamic separation devices are inline pretreatment units designed to remove trash, debris, and coarse sediment using screening, gravity settling, and centrifugal forces generated by forcing the influent into a circular motion. Several companies manufacture units with a variety of design components including separate chambers, baffles, sorbent media, screens, and flow control orifices. Therefore, additional constituents may be targeted depending on the design; however, the short residence time and potential for captured materials to be released during high flows limits the acceptable use of this BMP type as a standalone treatment control BMP.

Also known as:

- *Vortex Separators*
- *Swirl Concentrators*
- *Gross solids removal devices (GSRDs)*



Hydrodynamic Separation Device
Source: *Contech Stormwater Solution, Inc.*

Opportunity Criteria

- Hydrodynamic separation devices are effective for the removal of coarse sediment, trash, and debris, and are useful as pretreatment in combination with other BMP types that target smaller particle sizes. They are most effective in urban areas where coarse sediment, trash, and debris are pollutants of concern.
- Hydrodynamic devices represent a wide range of device types that have different unit processes and design elements (e.g., storage versus flow-through designs, inclusion of media filtration, etc.) that vary significantly within the category. These design features likely have significant effects on BMP performance; therefore, generalized performance data for hydrodynamic devices is not practical.

OC-Specific Design Criteria and Considerations

- Proprietary hydrodynamic device BMP vendors are constantly updating and expanding their product lines so refer to the latest design guidance from each of the vendors. General guidelines on the performance, operations and maintenance of proprietary devices are provided by the vendors.
- Operations and maintenance requirements include: clearing trash, debris, and sediment around insert grate and inside chamber, and repairing screens and media if damaged or severely clogged.

Computing Sizing Criteria for Hydrodynamic Devices

- Hydrodynamic separation devices should be adequately sized to pretreat the entire design volume or design flow rate of the downstream BMP.
- The required design flowrate should be calculated based on the Capture Efficiency Method for Flow-based BMPs (See **Appendix III**) to achieve 80 percent capture of the average annual stormwater runoff volume.

Proprietary Hydrodynamic Device Manufacturer Websites

- **Table XIV.1** is a list of manufacturers that provide hydrodynamic separation devices. The inclusion of these manufacturers does not represent an endorse of their products. Other devices and manufacturers may be acceptable for pretreatment.

Table XIV.1: Proprietary Hydrodynamic Device Manufacturer Websites

Device	Manufacturer	Website
Rinker In-Line Stormceptor®	Rinker Materials™	www.rinkerstormceptor.com
FloGard® Dual-Vortex Hydrodynamic Separator	KriStar Enterprises Inc.	www.kristar.com
Contech® CDS ^a ™	Contech® Construction Products Inc.	www.contech-cpi.com
Contech® Vortechs™	Contech® Construction Products Inc.	www.contech-cpi.com
Contech® Vorsentry™	Contech® Construction Products Inc.	www.contech-cpi.com
Contech® Vorsentry™ HS	Contech® Construction Products Inc.	www.contech-cpi.com
BaySaver BaySeparator	Baysaver Technologies Inc.	www.baysaver.com

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment:
<http://www.cabmphandbooks.com/Documents/Development/MP-51.pdf>
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 9:
http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf

INF-5: Drywell

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

<i>Also known as:</i>
<ul style="list-style-type: none"> ➤ Soakaway Pits ➤ Infiltration Sumps ➤ Rock Sumps ➤ Underground Injection Controls

<p>Drywell Source: K&A Enterprises</p>

Feasibility Screening Considerations

- Drywells shall pass infiltration infeasibility screening criteria ([TGD Section 2.4.2.4](#)) to be considered for use.
- Dry wells provide a more direct pathway for stormwater to groundwater, therefore pose a greater risk to groundwater quality than surface infiltration systems.

Opportunity Criteria

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

OC-Specific Design Criteria and Considerations

- Must comply with local, state, and federal UIC regulations; a permit may be required.
- Minimum set-backs from foundations and slopes should be observed

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

Sizing Criteria for Drywells

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

Configuration for Use in a Treatment Train

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

Additional References for Design Guidance

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

SECTION VII EDUCATIONAL MATERIALS

The educational materials included in this WQMP are provided to inform people involved in future uses, activities, or ownership of the site about the potential pitfalls associated with careless storm water management. “The Ocean Begins at Your Front Door” provides users with information about storm water that is/will be generated on site, what happens when water enters a storm drain, and its ultimate fate, discharging into the ocean. Also included are activities guidelines to educate anyone who is or will be associated with activities that have a potential to impact storm water runoff quality, and provide a menu of BMPs to effectively reduce the generation of storm water runoff pollutants from a variety of activities. The educational materials that may be used for the proposed project are included in Appendix C of this WQMP and are listed below.

EDUCATION MATERIALS			
Residential Materials (http://www.ocwatersheds.com)	Check If Attached	Business Materials (http://www.ocwatersheds.com)	Check If Attached
The Ocean Begins at Your Front Door	<input checked="" type="checkbox"/>	Tips for the Automotive Industry	<input type="checkbox"/>
Tips for Car Wash Fund-raisers	<input type="checkbox"/>	Tips for Using Concrete and Mortar	<input type="checkbox"/>
Tips for the Home Mechanic	<input type="checkbox"/>	Tips for the Food Service Industry	<input type="checkbox"/>
Homeowners Guide for Sustainable Water Use	<input checked="" type="checkbox"/>	Proper Maintenance Practices for Your Business	<input type="checkbox"/>
Household Tips	<input checked="" type="checkbox"/>	Other Materials (http://www.ocwatersheds.com) (https://www.casqa.org/resources/bmp-handbooks)	Check If Attached
Proper Disposal of Household Hazardous Waste	<input checked="" type="checkbox"/>		
Recycle at Your Local Used Oil Collection Center (North County)	<input checked="" type="checkbox"/>	DF-1 Drainage System Operation & Maintenance	<input checked="" type="checkbox"/>
Recycle at Your Local Used Oil Collection Center (Central County)	<input type="checkbox"/>	R-1 Automobile Repair & Maintenance	<input type="checkbox"/>
Recycle at Your Local Used Oil Collection Center (South County)	<input type="checkbox"/>	R-2 Automobile Washing	<input type="checkbox"/>
Tips for Maintaining Septic Tank Systems	<input type="checkbox"/>	R-3 Automobile Parking	<input type="checkbox"/>
Responsible Pest Control	<input checked="" type="checkbox"/>	R-4 Home & Garden Care Activities	<input type="checkbox"/>
Sewer Spill	<input type="checkbox"/>	R-5 Disposal of Pet Waste	<input checked="" type="checkbox"/>
Tips for the Home Improvement Projects	<input type="checkbox"/>	R-6 Disposal of Green Waste	<input checked="" type="checkbox"/>
Tips for Horse Care	<input type="checkbox"/>	R-7 Household Hazardous Waste	<input checked="" type="checkbox"/>
Tips for Landscaping and Gardening	<input checked="" type="checkbox"/>	R-8 Water Conservation	<input checked="" type="checkbox"/>
Tips for Pet Care	<input checked="" type="checkbox"/>	SD-10 Site Design & Landscape Planning	<input checked="" type="checkbox"/>
Tips for Pool Maintenance	<input type="checkbox"/>	SD-11 Roof Runoff Controls	<input checked="" type="checkbox"/>
Tips for Residential Pool, Landscape and Hardscape Drains	<input type="checkbox"/>	SD-12 Efficient Irrigation	<input checked="" type="checkbox"/>
Tips for Projects Using Paint	<input type="checkbox"/>	SD-13 Storm Drain Signage	<input checked="" type="checkbox"/>
Tips for Protecting Your Watershed	<input checked="" type="checkbox"/>	SD-31 Maintenance Bays & Docs	<input type="checkbox"/>
Other: Children’s Brochure	<input type="checkbox"/>	SD-32 Trash Storage Areas	<input checked="" type="checkbox"/>

APPENDICES

Appendix ASupporting Calculations
Appendix BNotice of Transfer of Responsibility
Appendix CEducational Materials
Appendix DBMP Maintenance Supplement / O&M Plan
Appendix EConditions of Approval (Pending Issuance)
Appendix FGeotechnical Report
Appendix G2-Year Hydrology Calculations
Appendix HGrading Plans

APPENDIX A

SUPPORTING CALCULATIONS

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
<p>Provide basis:</p> <p>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p>			
2	<p>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):</p> <p>The BMP can only be located less than 50 feet away from slopes steeper than 15 percent</p> <p>The BMP can only be located less than eight feet from building foundations or an alternative setback.</p> <p>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.</p>		X
<p>Provide basis:</p> <p>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p>			
3	Would infiltration of the DCV from drainage area violate downstream water rights?		X
<p>Provide basis:</p> <p>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p>			

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	
<p>Provide basis:</p> <p><i>The site has type D and B soils present. The Geotech performed drywell modeling and found infiltration to be feasible at deeper depths. The use of a dry well is not anticipated to result in worsening any adverse conditions or hazards that may be present for the proposed site development or adjacent properties including subsidence, land sliding, or liquefaction.</i></p> <p>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p>			
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
<p>Provide basis:</p> <p>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p>			
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
<p>Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:</p> <p>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p>			
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

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

<p>Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:</p>		
<p>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p>		
<p>Infiltration Screening Results (check box corresponding to result):</p>		
8	<p>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)</p> <p>Provide narrative discussion and supporting evidence:</p> <p>Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p>	
9	<p>If any answer from row 1-3 is yes: infiltration of any volume is not feasible within the DMA or equivalent.</p> <p>Provide basis:</p> <p>Summarize findings of infeasibility screening</p>	

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

<p>10</p>	<p>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.</p> <p>Provide basis:</p> <p><i>Drywells are proposed on the site. The Geotech performed drywell modeling and found infiltration to be feasible at deeper depths. The use of a dry well is not anticipated to result in worsening any adverse conditions or hazards that may be present for the proposed site development or adjacent properties including subsidence, land sliding, or liquefaction.</i></p> <p>Summarize findings of infeasibility screening</p>	<p>X</p>
<p>11</p>	<p>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.</p>	

Worksheet I: Summary of Groundwater-related Feasibility Criteria

1	Is project large or small? (as defined by Table VIII.2) circle one	<u>Large</u>	Small	
2	What is the tributary area to the BMP?	A	4.0	acres
3	What type of BMP is proposed?	Infiltration		
4	What is the infiltrating surface area of the proposed BMP?	A _{BMP}	546.64	sq-ft
5	What land use activities are present in the tributary area (list all) Residential			
6	What land use-based risk category is applicable?	<u>L</u>	M	H
7	If M or H, what pretreatment and source isolation BMPs have been considered and are proposed (describe all): Hydrodynamic Separator – Contech CDS or similar			
8	What minimum separation to mounded seasonally high groundwater applies to the proposed BMP? See Section VIII.2 (circle one)	5 ft	<u>10 ft</u>	
9	Provide rationale for selection of applicable minimum separation to seasonally high mounded groundwater:			
10	What is separation from the infiltrating surface to seasonally high groundwater?	SHGWT	>10	ft
11	What is separation from the infiltrating surface to mounded seasonally high groundwater?	Mounded SHGWT	>10	ft
12	Describe assumptions and methods used for mounding analysis:			

Worksheet I: Summary of Groundwater-related Feasibility Criteria

13	Is the site within a plume protection boundary (See Figure VIII.2)?	Y	<u>N</u>	N/A
14	Is the site within a selenium source area or other natural plume area (See Figure VIII.2)?	Y	<u>N</u>	N/A
15	Is the site within 250 feet of a contaminated site?	Y	<u>N</u>	N/A
16	If site-specific study has been prepared, provide citation and briefly summarize relevant findings:			
17	Is the site within 100 feet of a water supply well, spring, septic system?	Y	<u>N</u>	N/A
18	Is infiltration feasible on the site relative to groundwater-related criteria?	<u>Y</u>	N	
<p>Provide rationale for feasibility determination:</p> <p><i>Groundwater was not encountered to a depth of 51.5 feet below ground surface (bgs) during the geotechnical study. Additional review of the Department of Water Resources groundwater level indicates that groundwater for the area is below 150 feet. Albus-Keefe & Associates, Inc. anticipates groundwater will remain below a depth of 100 feet during the next 50 years. Since the project site has deep groundwater and rates exceeded the 0.3 in/hr minimum outlined in the OC TGD, infiltration is considered feasible for the project site.</i></p>				

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

Tributary Area Risk Category	Narrative Description of Category	Example Land Use Activities	BMP Selection Requirements
Low Runoff Contamination Potential	BMP receives runoff from a mix of land covers that are expected to have relatively clean runoff; significant spills in tributary area are unlikely.	<ul style="list-style-type: none"> ▪ Rooftops with roofing material and downspouts free of copper and zinc ▪ Patios, sidewalks, and other pedestrian areas ▪ Mixed residential land uses with applicable source controls ▪ Institutional land uses with applicable source controls ▪ Driveways and minor streets 	<ul style="list-style-type: none"> ▪ Any infiltration BMP type may be used ▪ Pretreatment for sediment is strongly recommended, as applicable, to mitigate clogging
Moderate Runoff Contamination Potential	BMP receives runoff from a mix of land covers, more than 10 percent of which have the potential to generate stormwater pollutants at levels that could potentially contaminate groundwater; there is potential for minor spills in the tributary area.	<ul style="list-style-type: none"> ▪ Roadways greater than 5,000 ADT but less than 25,000 ADT ▪ Commercial and institutional parking lots ▪ Commercial land uses ▪ Light industrial that does not include usage of chemicals that are mobile in stormwater and groundwater ▪ Trash storage areas 	<ul style="list-style-type: none"> ▪ Any infiltration BMP type may be used ▪ Pretreatment shall be used ▪ The type of pretreatment shall be selected to address potential groundwater contaminants potentially found in stormwater runoff.
High Runoff Contamination Potential	BMP receives runoff from a mix of land covers, more than 10 percent of which have significant unavoidable potential to generate stormwater pollutants in quantities that could be detrimental to groundwater quality; and/or there is significant potential for major spills that could drain to BMPs.	<ul style="list-style-type: none"> ▪ Roads greater than 25,000 ADT ▪ Heavy and light industrial pollutant source areas, including areas with exposed industrial activity and high use industrial truck traffic, and any areas that cannot be isolated these areas. Does not include lower risk source sources areas within industrial zones (e.g., roofs, offices, and parking areas) that are hydrologically isolated from industrial pollutant source areas ▪ Automotive repair shops ▪ Car washes ▪ Fleet storage areas ▪ Nurseries, agriculture, and heavily managed landscape areas with extensive use of fertilizer ▪ Fueling stations (infiltration prohibited under all conditions) 	<p>Infiltration is prohibited unless advanced pretreatment and spill isolation can be feasibly used and enhanced monitoring and inspection are implemented.</p> <p>Large projects* must evaluate feasibility of advanced pretreatment and spill isolation.</p> <p>Small projects may consider infiltration to be infeasible with narrative discussion</p>

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

Table VIII.2: Definition of Project Site Categories

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

VIII.2. Depth to Groundwater and Mounding Potential

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

- If the depth to unmounded seasonally high groundwater is greater than 15 feet, the depth to groundwater does not constrain infiltration
- If separation to unmounded seasonally high groundwater is greater than 10-feet and the infiltration area is less than 2,000 sq-ft, the depth to groundwater does not constrain infiltration.
- The separation between the infiltrating surface and the seasonally high mounded groundwater table shall not be less than 5 feet for all BMP types. BMPs for which 5-foot minimum separation applies include:
 - Rain gardens and dispersion trenches (small, residential applications)
 - Bioretention and planters
 - Permeable Pavement
 - Similar BMPs infiltrating over an extensive surface area and providing robust pretreatment or embedded treatment processes.
- Separation to mounded seasonally high groundwater shall be at least 10 feet for infiltration devices that inject water below the subsurface and surface infiltration BMPs with tributary area and land use activities that are considered to pose a more significant risk to groundwater quality. BMPs for which the 10-foot separation applies include:
 - Dry wells
 - Subsurface infiltration galleries or vaults
 - Surface Infiltration Basins
 - Infiltration Trenches
 - Other functionally similar devices or BMPs.

Worksheet B: Simple Design Capture Volume Sizing Method

Project: Placentia Senior Housing

Date: 07/10/2020

		DMA =	DMA 1	
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	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)	$A=$	4.001	acres
2	Enter Project Imperviousness, imp (unitless)	$imp=$	74.8%	%
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	$C=$	0.711	
4	Calculate runoff volume, $V_{design} = (C \times d_{remainder} \times A \times 43560 \times (1/12))$	$V_{design}=$	9,293.7	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)	$K_{measured}=$	1.90	in/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	$S_{final}=$	2.00	
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	$K_{design}=$	0.95	in/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, T (max 48 hours)	$T=$	See Drywell Sizing	hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	$D_{max}=$		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	$A_{min}=$		sq-ft

DRAFT

Maxwell® IV Drainage System Calculations Prepared on July 09, 2020

Project: **1314 N Angelina Drive - Placentia, CA**

Contact: Sarah Johnson at Fuscoe - Irvine, CA



Given:

Peak Flow Rate	<u>0.025</u> CFS
Safety Factor	<u>2.00</u>
Design Flow Rate	<u>0.0125</u> CFS
Mitigated Volume	<u>9,400</u> ft ³
Required Drawdown Time	<u>48</u> hours
Depth to Emergency Overflow	<u>5</u> ft
Min. Depth to Infiltration	<u>10</u> ft
Groundwater Depth for Design	<u>80</u> ft

preliminary assumption

Proposed:

Drywell Rock Shaft Diameter	<u>4</u> ft
Drywell Chamber Depth	<u>18</u> ft
Rock Porosity	<u>40</u> %
Depth to Infiltration	<u>13</u> ft
Drywell Bottom Depth	<u>52</u> ft

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

48 hrs: $0.0125 \text{ CFS} \times 48 \text{ hours} \times \frac{3600 \text{ sec}}{1 \text{ hr}} = 2,160$ cubic feet of retained water disposed of.

Chamber diameter = 4 feet. Drywell rock shaft diameter = 4 feet.

Volume provided in each drywell with chamber depth of 18 feet and a depth to overflow of 5 feet.

$13 \text{ ft} \times 12.57 \text{ ft}^2 + 2 \text{ ft} \times 28.27 \text{ ft}^2 \times 40 \% + 32 \text{ ft} \times 12.57 \text{ ft}^2 \times 40 \% = 347 \text{ ft}^3$

The MaxWell System is composed of 5 drywell(s) .

Total volume provided = $1,734 \text{ ft}^3$

Total 48 hour infiltration volume = $10,800 \text{ ft}^3$

Total infiltration flowrate = $0.06250 \frac{\text{ft}^3}{\text{sec}}$

Based on the total mitigated volume of 9400 CF, after subtracting the volume stored in the MaxWell System, the residual volume of 7666 CF could be stored in a separate detention system and connected to the drywell system.

For any questions, please contact Bill De Jong at 909-915-9490 or via email at BDejong@TorrentResources.com

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

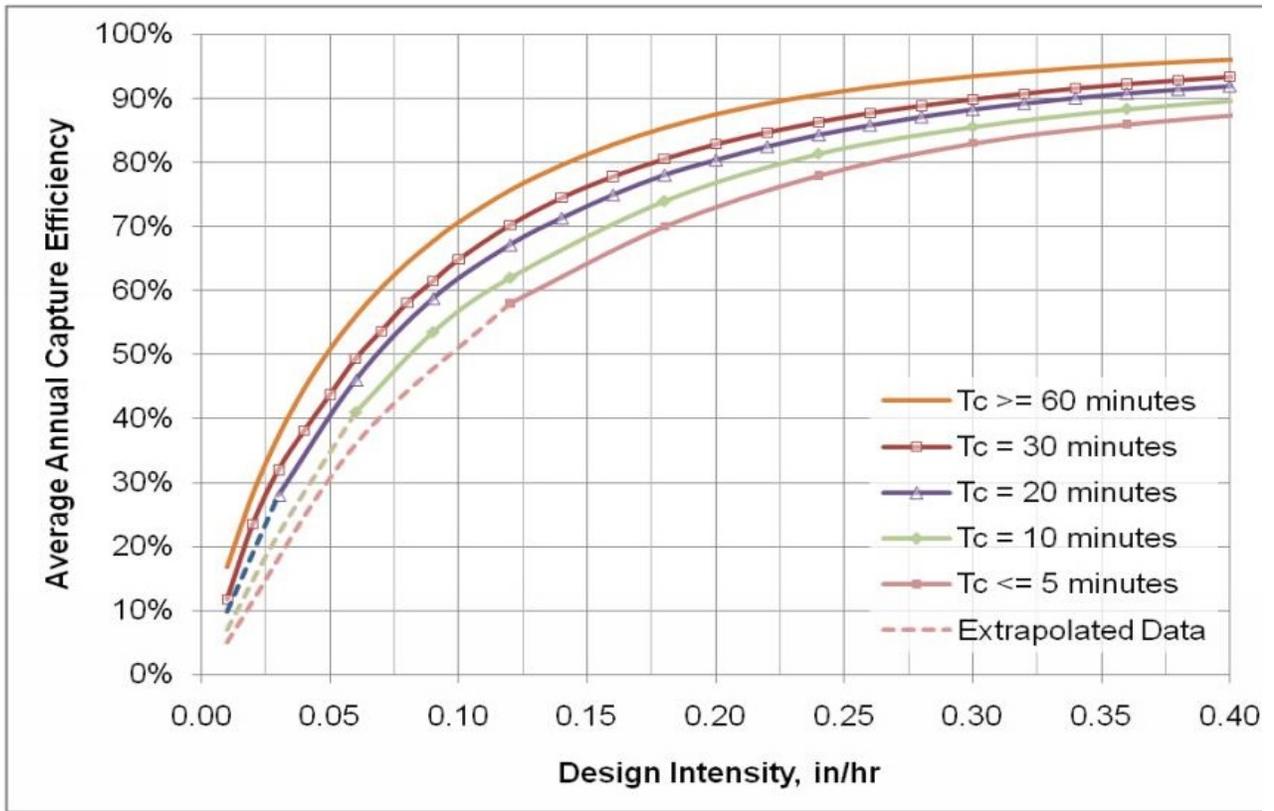
Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Project: Placentia Senior Housing

Date: 07/10/2020

		DMA 1		
Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	$T_c =$	5.0	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	$I_1 =$	0.260	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	$d_{HSC} =$	0	inches
4	Enter capture efficiency corresponding to d_{HSC} , Y_2 (Worksheet A)	$Y_2 =$	0%	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency (Y_2), I_2	$I_2 =$	0	in/hr
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	$I_{design} =$	0.260	in/hr
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP(s), A (acres)	$A =$	4.001	acres
2	Enter Project Imperviousness, imp (unitless)	$imp =$	74.8%	%
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	$C =$	0.711	
4	Calculate design flowrate, $Q_{design} = (C \times I_{design} \times A)$	$Q_{design} =$	0.740	cfs
Supporting Calculations				
Describe System:				
<u>Pre-Treatment Hydrodynamic Separator (PRE-1):</u>				
Unit Size / Model =			0	
Unit Size / Model Treatment Capacity =			0.000	cfs
Provide time of concentration assumptions:				
			5.0	min

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



SUBJECT TO FURTHER REVISION

Project Site

LEGEND

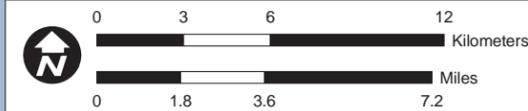
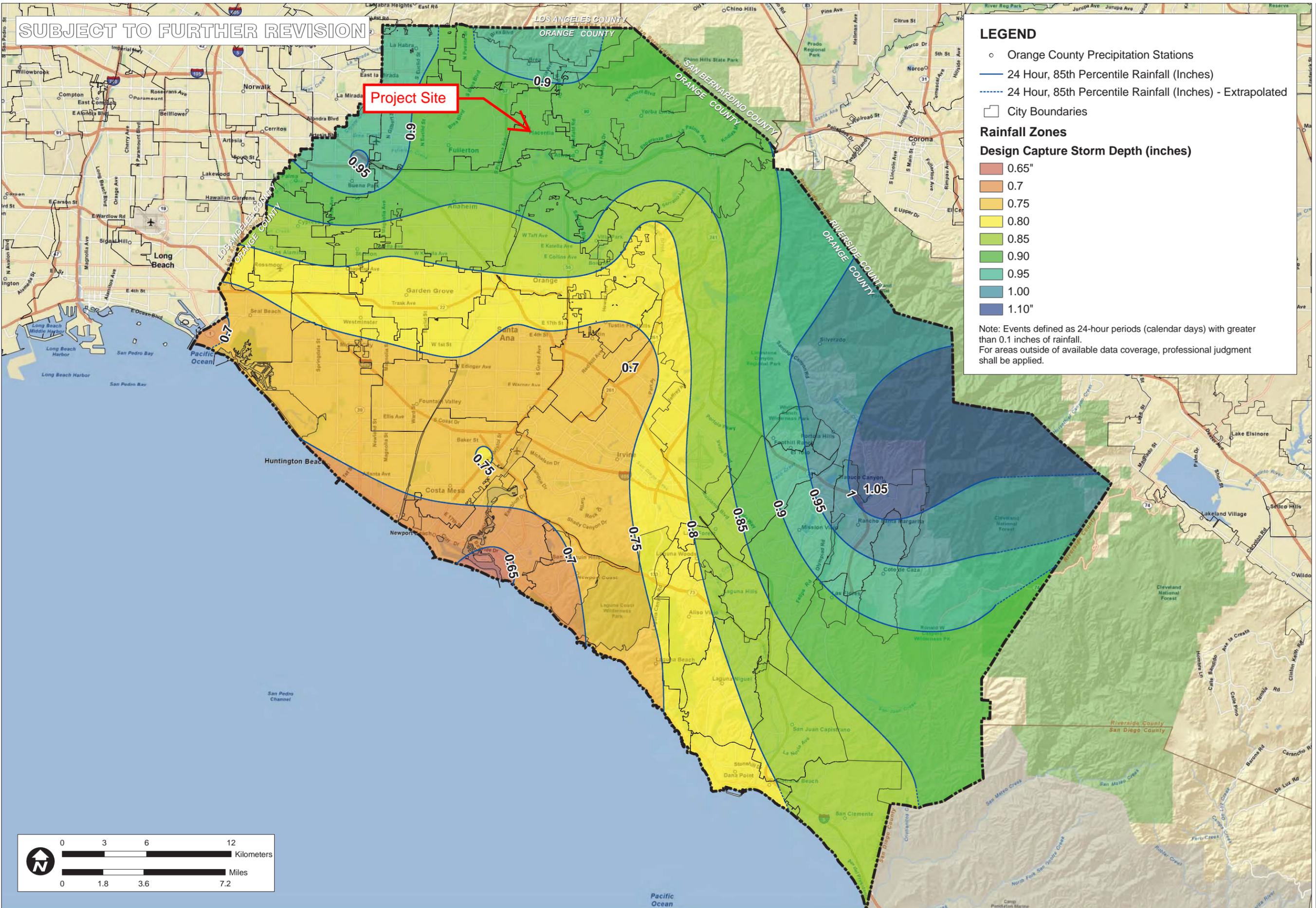
- Orange County Precipitation Stations
- 24 Hour, 85th Percentile Rainfall (Inches)
- - - 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
- City Boundaries

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.



ORANGE COUNTY
TECHNICAL GUIDANCE
DOCUMENT

TITLE

JOB

SCALE 1" = 1.8 miles



FIGURE

XVI-1

CA

ORANGE CO.

DESIGNED TH

DRAWING TH

CHECKED BMP

DATE 04/22/10

JOB NO. 9526-E

P:\9526E\6-GIS\Mxds\Reports\Infiltration\Feasibility_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

SUBJECT TO FURTHER REVISION

Project Site

LEGEND

City Boundaries

Hydrologic Soil Groups

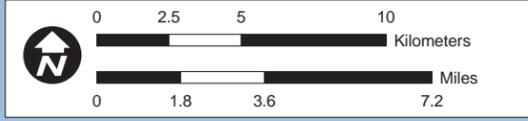
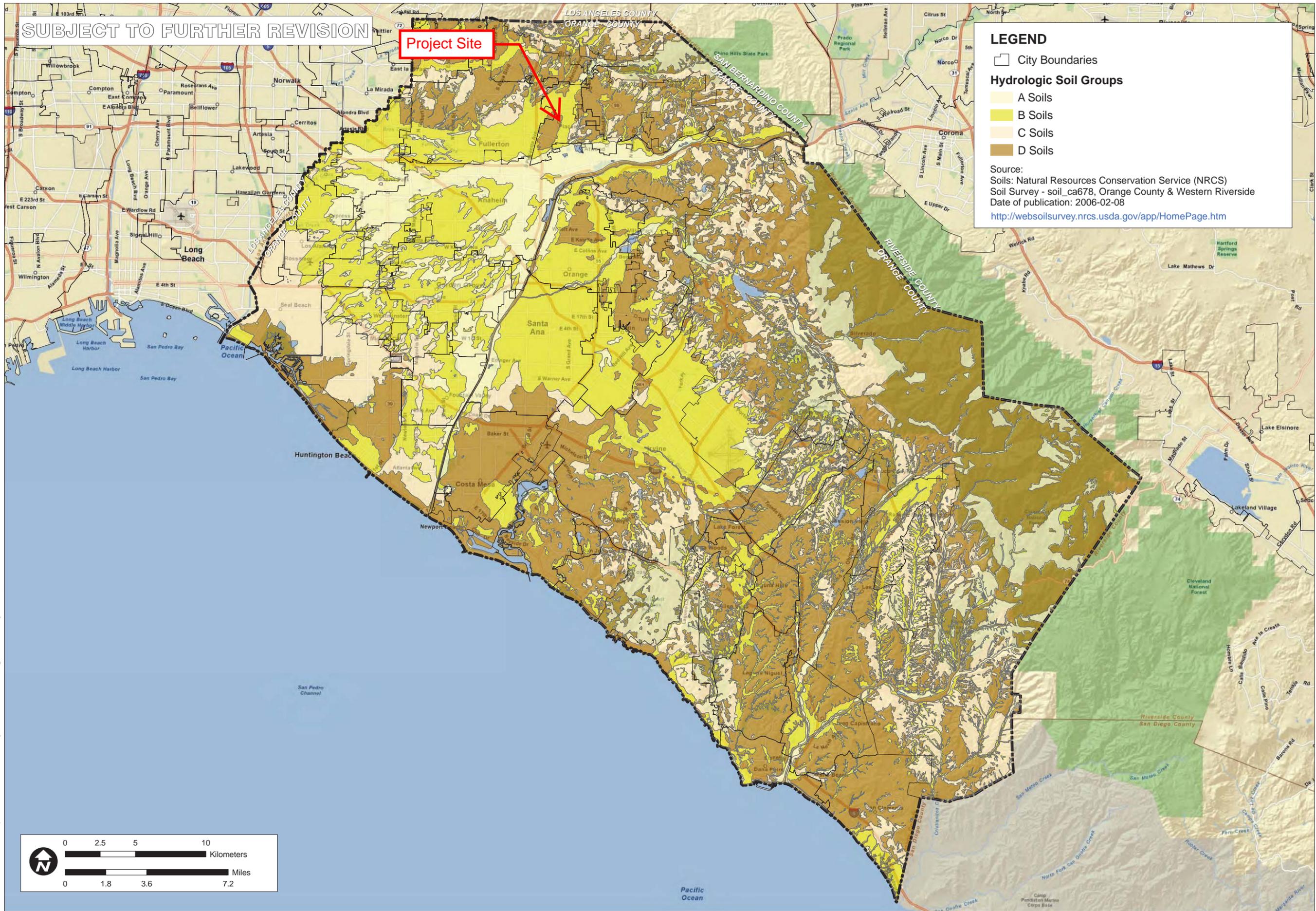
A Soils

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>



NRCS HYDROLOGIC SOILS GROUPS

ORANGE COUNTY INFILTRATION STUDY

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



FIGURE XVI-2a

TITLE

JOB ORANGE CO. CA

P:\9526E\6-GIS\Mxds\Reports\Infiltration\Feasibility_20110215\9526E_FigureXVI-2a_HydroSoils_20110215.mxd

SUBJECT TO FURTHER REVISION

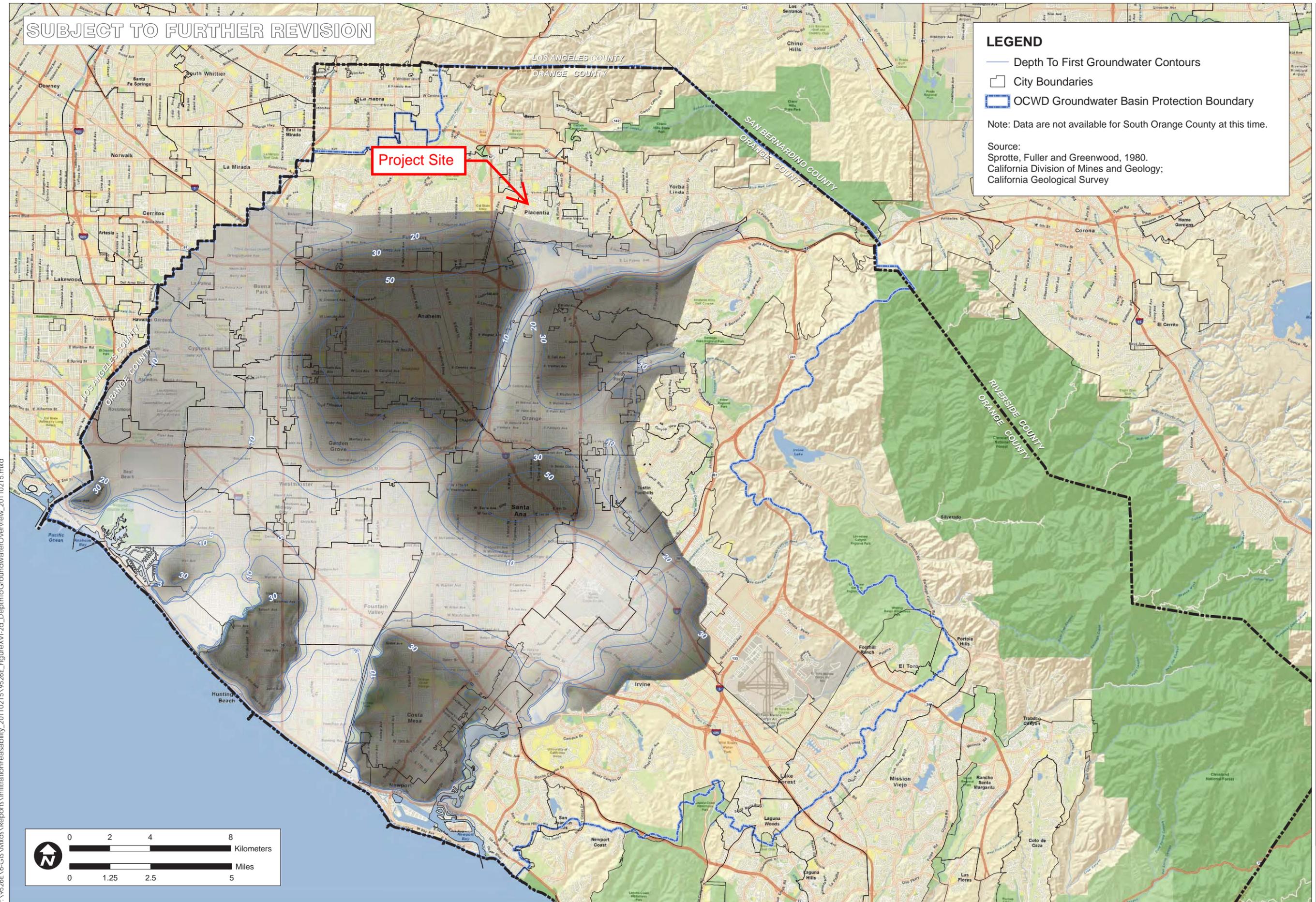
LEGEND

-  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 Site



NORTH ORANGE COUNTY
 MAPPED DEPTH TO FIRST
 GROUNDWATER

ORANGE COUNTY
 INFILTRATION STUDY

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



FIGURE
XVI-2d

P:\9526E\6-GIS\Mxds\Reports\Infiltration\Feasibility_20110215\9526E_FigureXVI-2d_DepthToGroundwaterOverview_20110215.mxd

Susceptibility

- Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility

Channel Type

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

Tidel Influence

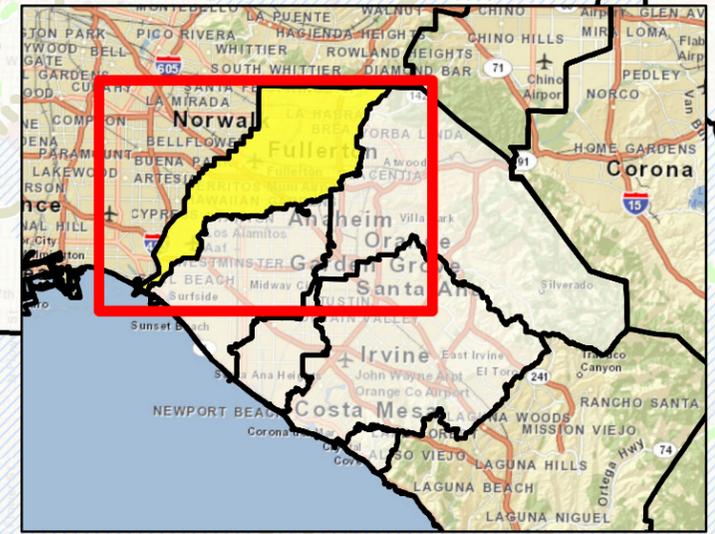
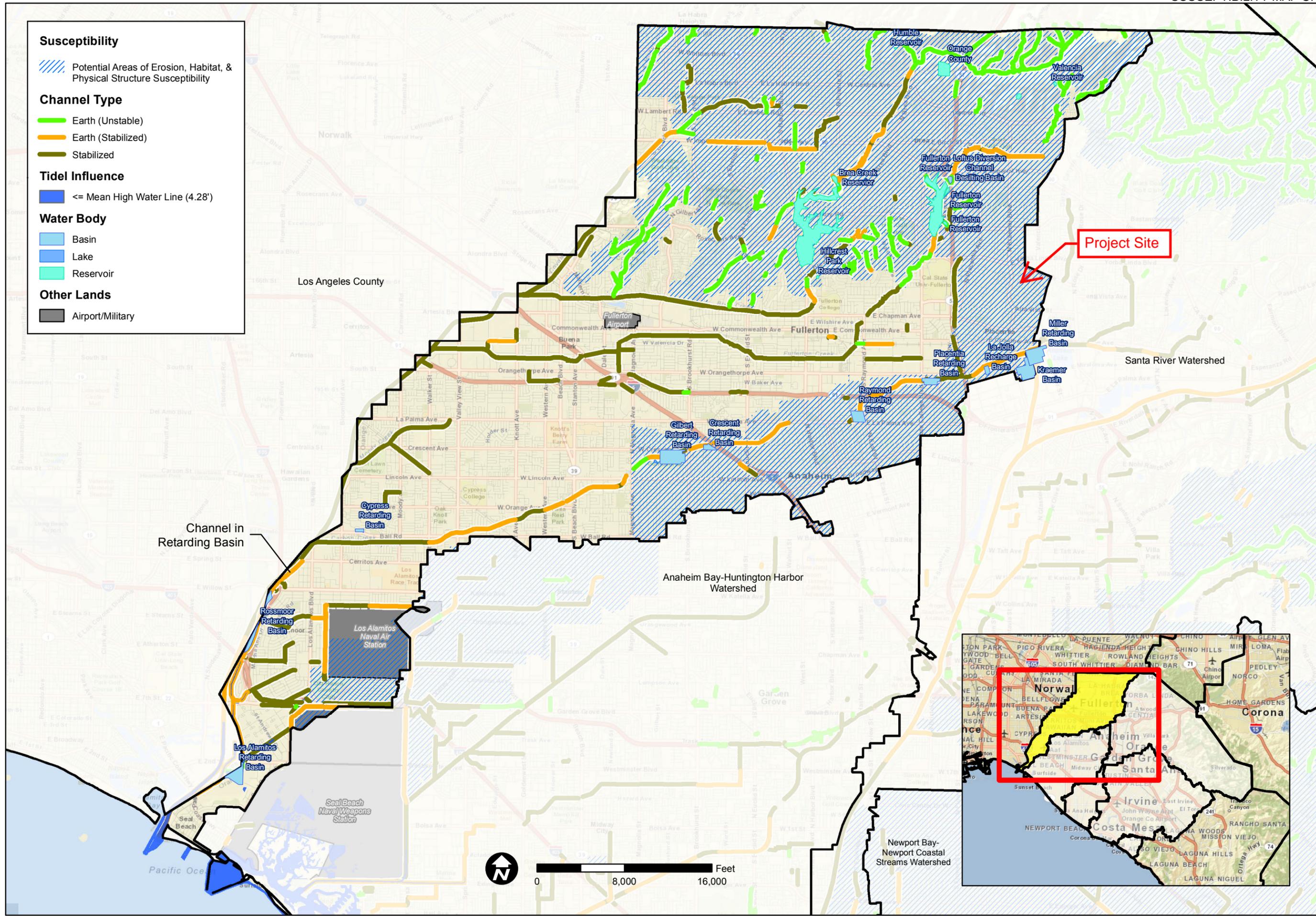
- <= Mean High Water Line (4.28')

Water Body

- Basin
- Lake
- Reservoir

Other Lands

- Airport/Military

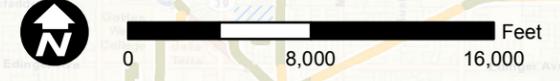


P:\9524E\6-GIS\Susceptibility\Maps_20100505\9524E_SanGabrielCoyoteCreekSusceptibility_20100430.mxd

TITLE
SUSCEPTIBILITY ANALYSIS
SAN GABRIEL-COYOTE CREEK

JOB
ORANGE COUNTY
WATERSHED
MASTER PLANNING
ORANGE CO.
CA

SCALE	1" = 8,000'
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/30/10
JOB NO.	9524 E



APPENDIX B

NOTICE OF TRANSFER OF RESPONSIBILITY

NOTICE OF TRANSFER OF RESPONSIBILITY

WATER QUALITY MANAGEMENT PLAN

Placentia Senior Housing
APN: 340-273-25

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 Responsible Party Information

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

II. Information about Site Transferred

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

III. New Owner/ New Responsible Party Information

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

IV. Ownership Transfer Information

General Description of Site Transferred to New Owner:	General Description of Portion of Project/ Parcel Subject to WQMP Retained by Owner (if any):
---	---

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

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

VI. Certifications

A. Previous Owner

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

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

B. New Owner

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

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

APPENDIX C

EDUCATIONAL MATERIALS



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

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

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



The Effect on the Ocean



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

Sources of Non-Point Source Pollution

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

Where Does It Go?

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

Did You Know?

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

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

For More Information

California Environmental Protection Agency

www.calepa.ca.gov

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

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

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

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

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

Stormwater Best Management Practice Handbook
Visit www.cabmphandbooks.com

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

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

Orange County Stormwater Program

Aliso Viejo	(949)	425-2535
Anaheim Public Works Operations	(714)	765-6860
Brea Engineering	(714)	990-7666
Buena Park Public Works	(714)	562-3655
Costa Mesa Public Services	(714)	754-5323
Cypress Public Works	(714)	229-6740
Dana Point Public Works	(949)	248-3584
Fountain Valley Public Works	(714)	593-4441
Fullerton Engineering Dept.	(714)	738-6853
Garden Grove Public Works	(714)	741-5956
Huntington Beach Public Works	(714)	536-5431
Irvine Public Works	(949)	724-6315
La Habra Public Services	(562)	905-9792
La Palma Public Works	(714)	690-3310
Laguna Beach Water Quality	(949)	497-0378
Laguna Hills Public Services	(949)	707-2650
Laguna Niguel Public Works	(949)	362-4337
Laguna Woods Public Works	(949)	639-0500
Lake Forest Public Works	(949)	461-3480
Los Alamitos Community Dev.	(562)	431-3538
Mission Viejo Public Works	(949)	470-3056
Newport Beach, Code & Water Quality Enforcement	(949)	644-3215
Orange Public Works	(714)	532-6480
Placentia Public Works	(714)	993-8245
Rancho Santa Margarita	(949)	635-1800
San Clemente Environmental Programs	(949)	361-6143
San Juan Capistrano Engineering	(949)	234-4413
Santa Ana Public Works	(714)	647-3380
Seal Beach Engineering	(562)	431-2527 x317
Stanton Public Works	(714)	379-9222 x204
Tustin Public Works/Engineering	(714)	573-3150
Villa Park Engineering	(714)	998-1500
Westminster Public Works/Engineering	(714)	898-3311 x446
Yorba Linda Engineering	(714)	961-7138
Orange County Stormwater Program	(877)	897-7455
Orange County 24-Hour Water Pollution Problem Reporting Hotline 1-877-89-SPILL (1-877-897-7455)		

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



Printed on Recycled Paper

The Ocean Begins at Your Front Door



The Ocean Begins at Your Front Door



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

Follow these simple steps to help reduce water pollution:

Household Activities

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

Automotive

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

Pool Maintenance

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

Landscape and Gardening

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

Trash

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

Pet Care

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

Common Pollutants

Home Maintenance

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

Lawn and Garden

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

Automobile

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

The Pollution Solution

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

1 Pesticides and Fertilizer

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



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

2 Dirt and Sediment

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

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

3 Metals

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

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

DID YOU KNOW?

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

4 Pet Waste

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

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

5 Trash and Debris

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



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

6 Motor Oil / Vehicle Fluids

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

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



A TEAM EFFORT

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

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

Thank you for making water protection a priority!

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

www.mwdoc.com

www.uccemg.com



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

Special Thanks to

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

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



Homeowners Guide for Sustainable Water Use

Low Impact Development, Water Conservation & Pollution Prevention

The Ocean Begins at Your Front Door



Help Prevent Ocean Pollution:

Household Tips



The Ocean Begins at Your Front Door

PROJECT
POLLUTION
PREVENTION



For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)

or visit
www.ocwatersheds.com

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

For emergencies, dial 911.

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

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

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

Litter, oil, chemicals and other substances that are left on your yard or driveway can be blown or washed into storm drains that flow to the ocean. Over-watering your lawn and washing your car can also flush materials into the storm

drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated.

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

REMEMBER THE
WATER IN YOUR
STORM DRAIN
IS NOT TREATED
BEFORE
IT ENTERS OUR
WATERWAYS

GENUINE
RECYCLED
PAPER



50% PRE-CONSUMER
AND
15% POST-CONSUMER



RECYCLE
USED OIL

Pollution Prevention

Household Activities

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

Household Hazardous Wastes include:

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

Gardening Activities

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

Washing and Maintaining Your Car

- Take your car to a commercial car wash whenever possible.
- Choose soaps, cleaners, or detergents labeled “non-toxic,” “phosphate free” or “biodegradable.” Vegetable and citrus-based products are typically safest for the environment, **but even these should not be allowed into the storm drain.**
- Shake floor mats into a trash can or vacuum to clean.

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

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



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

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

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

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

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

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

For emergencies, dial 911.



RECYCLE
USED OIL



Printed on Recycled Paper

Help Prevent Ocean Pollution:

Proper Disposal of Household Hazardous Waste



**The Ocean Begins at
Your Front Door**

**P R O J E C T
Pollution
P R E V E N T I O N**

ORANGE COUNTY

Pollution Prevention

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

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

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

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

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

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

Common household hazardous wastes

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

- Television & monitors (CRTs, flatscreens)

Tips for household hazardous waste

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





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

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

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

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

Please do not mix your oil with other substances!

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

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



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

DTP113 Rev 8/03
printed on recycled paper 

Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center



The Ocean Begins at Your Front Door



NORTH COUNTY

Used Oil Collection Centers

Anaheim

All Seasons Tire and Auto Center, Inc.
817 S Brookhurst St., Anaheim, CA 92804
(714)772-6090()
CIWMB#: 30-C-03177

AutoZone #3317
423 N Anaheim Blvd., Anaheim, CA 92805
(714)776-0787()
CIWMB#: 30-C-05263

AutoZone #5226
2145 W Lincoln Ave., Anaheim, CA 92801
(714)533-6599()
CIWMB#: 30-C-04604

Bedard Automotive
3601 E Miraloma Ave., Anaheim, CA 92806
(714)528-1380()
CIWMB#: 30-C-02205

Classic Chevrolet
1001 Weir Canyon Rd., Anaheim, CA 92807
(714)283-5400()
CIWMB#: 30-C-05223

Econo Lube N' Tune #4
3201 W Lincoln Ave., Anaheim, CA 92801
(714)821-0128()
CIWMB#: 30-C-01485

EZ Lube Inc - Savi Ranch #43
985 N Weir Canyon Rd., Anaheim, CA 92807
(714)556-1312()
CIWMB#: 30-C-06011

Firestone Store #71C7
1200 S Magnolia Ave., Anaheim, CA 92804
(949)598-5520()
CIWMB#: 30-C-05743

Great Western Lube Express
125 N Brookhurst St., Anaheim, CA 92801
(714)254-1300()
CIWMB#: 30-C-05542

HR Pro Auto Service Center
3180 W Lincoln Ave., Anaheim, CA 92801
(714)761-4343()
CIWMB#: 30-C-05927

Ira Newman Automotive Services
1507 N State College Blvd., Anaheim, CA 92806
(714)635-2392()
CIWMB#: 30-C-01482

Jiffy Lube #1028
2400 W Ball Rd., Anaheim, CA 92804
(714)761-5211()
CIWMB#: 30-C-00870

Jiffy Lube #1903
2505 E Lincoln Ave., Anaheim, CA 92806
(714)772-4000()
CIWMB#: 30-C-05511

Jiffy Lube #2340
2181 W Lincoln Ave., Anaheim, CA 92801
(714)533-1000()
CIWMB#: 30-C-04647

Kragen Auto Parts #1303
1088 N State College Blvd., Anaheim, CA 92806
(714)956-7351()
CIWMB#: 30-C-03438

Kragen Auto Parts #1399
2245 W Ball Rd., Anaheim, CA 92804
(714)490-1274()
CIWMB#: 30-C-04094

Kragen Auto Parts #1565
2072 Lincoln Ave., Anaheim, CA 92806
(714)502-6992()
CIWMB#: 30-C-04078

Kragen Auto Parts #1582
3420 W Lincoln Ave., Anaheim, CA 92801
(714)828-7977()
CIWMB#: 30-C-04103

Pep Boys #613
10912 Katella Ave., Anaheim, CA 92804
(714)638-0863()
CIWMB#: 30-C-01756

Pep Boys #663
3030 W Lincoln Anaheim, CA 92801
(714)826-4810()
CIWMB#: 30-C-03417

Pep Boys #809
8205 E Santa Ana Cyn Rd., Anaheim, CA 92808
(714)974-0105()
CIWMB#: 30-C-03443

Pick Your Part
1235 S Beach Blvd., Anaheim, CA 92804
(714)527-1645()
CIWMB#: 30-C-03744

PK Auto Performance
3106 W. Lincoln Ave., Anaheim, CA 92801
(714)826-2141()
CIWMB#: 30-C-05628

Quick Change Lube and Oil
2731 W Lincoln Ave., Anaheim, CA 92801
(714)821-4464()
CIWMB#: 30-C-04363

Saturn of Anaheim
1380 S Auto Center Dr., Anaheim, CA 92806
(714)648-2444()
CIWMB#: 30-C-06332

Sun Tech Auto Service
105 S State College Blvd., Anaheim, CA 92806
(714)956-1389()
CIWMB#: 30-C-06455

Uonic Truck Services
515 S Rose St., Anaheim, CA 92805
(714)533-3333()
CIWMB#: 30-C-01142

Anaheim Hills
Anaheim Hills Car Wash & Lube
5810 E La Palma Ave., Anaheim Hills, CA 92807
(714)777-6605()
CIWMB#: 30-C-01387

Brea

Firestone Store #27A9
891 E Imperial Hwy., Brea, CA 92821
(714)529-8404()
CIWMB#: 30-C-01221

Oil Can Henry's
230 N Brea Blvd., Brea, CA 92821
(714)990-1900()
CIWMB#: 30-C-04273

Buena Park

Firestone Store #71F7
6011 Orangetherpe Buena Park, CA 90620
(714)670-7912()
CIWMB#: 30-C-01218

Firestone Store #71T8
8600 Beach Blvd., Buena Park, CA 90620
(714)827-5300()
CIWMB#: 30-C-02121

Kragen Auto Parts #1204
5303 Beach Blvd., Buena Park, CA 90621
(714)994-1320()
CIWMB#: 30-C-02623

Cypress

AutoZone #5521
5471 Lincoln Ave., Cypress, CA 90630
(714)995-4644()
CIWMB#: 30-C-00836

Big O Tires
6052 Cerritos Ave., Cypress, CA 90630
(714)826-6334()
CIWMB#: 30-C-04245

Econo Lube N' Tune #213
5497 Cerritos Ave., Cypress, CA 90630
(714)761-0456()
CIWMB#: 30-C-06240

Jiffy Lube #851
4942 Lincoln Ave., Cypress, CA 90630
(626)965-9689()
CIWMB#: 30-C-06182

M & N Coastline Auto & Tire Service
4005 Ball Rd., Cypress, CA 90630
(714)826-1001()
CIWMB#: 30-C-04387

Masterlube #103
5904 Lincoln Cypress, CA 90630
(714)826-2323()
CIWMB#: 30-C-01071

Masterlube #104
5971 Ball Rd., Cypress, CA 90630
(714)220-1555()
CIWMB#: 30-C-04682

Metric Motors of Cypress
6042 Cerritos Ave., Cypress, CA 90630
(714)821-4702()
CIWMB#: 30-C-05157

Fullerton

AutoZone #2898
146 N. Raymond Ave., Fullerton, CA 92831
(714)870-9772()
CIWMB#: 30-C-04488

AutoZone #5522
1801 Orangetherpe W. Fullerton, CA 92833
(714)870-8286()
CIWMB#: 30-C-06062

AutoZone #5523
102 N Euclid Fullerton, CA 92832
(714)870-8286()
CIWMB#: 30-C-04755

EZ Lube #17
4002 N Harbor Blvd., Fullerton, CA 92835
(714)871-9980()
CIWMB#: 30-C-03741

Firestone Store #27EH
1933 N Placentia Ave., Fullerton, CA 92831
(714)993-7100()
CIWMB#: 30-C-02122

Fox Service Center
1018 W Orangetherpe Fullerton, CA 92833
(714)879-1430()
CIWMB#: 30-C-02318

Fullerton College Automotive Technology
321 E Chapman Ave., Fullerton, CA 92832
(714)992-7275()
CIWMB#: 30-C-03165

Kragen Auto Parts #0731
2978 Yorba Linda Fullerton, CA 92831
(714)996-4780()
CIWMB#: 30-C-02628

Kragen Auto Parts #4133
904 W Orangetherpe Ave., Fullerton, CA 92832
(714)526-3570()
CIWMB#: 30-C-06256

Pep Boys #642
1530 S Harbor Blvd., Fullerton, CA 92832
(714)870-0700()
CIWMB#: 30-C-01755

Sunnyside 76 Car Care Center
2701 N Brea Blvd., Fullerton, CA 92835
(714)256-0773()
CIWMB#: 30-C-01381

Garden Grove

76 Pro Lube Plus
9001 Trask Ave., Garden Grove, CA 92844
(714)393-0590()
CIWMB#: 30-C-05276

AutoZone #5527
13190 Harbor Blvd., Garden Grove, CA 92843
(714)636-5665()
CIWMB#: 30-C-04760

David Murray Shell
12571 Vly View St., Garden Grove, CA 92845
(714)898-0170()
CIWMB#: 30-C-00547

Express Lube & Wash
8100 Lampson Ave., Garden Grove, CA 92841
(909)316-8261()
CIWMB#: 30-C-06544

Firestone Store #7180
10081 Chapman Ave., Garden Grove, CA 92840
(714)530-4630()
CIWMB#: 30-C-01224

Firestone Store #71W3
13961 Brookhurst St., Garden Grove, CA 92843
(714)590-2741()
CIWMB#: 30-C-03690

Jiffy Lube #1991
13970 Harbor Blvd., Garden Grove, CA 92843
(714)554-0610()
CIWMB#: 30-C-05400

Kragen Auto Parts #1251
13933 N Harbor Blvd., Garden Grove, CA 92843
(714)554-3780()
CIWMB#: 30-C-02663

Kragen Auto Parts #1555
9851 Chapman Ave., Garden Grove, CA 92841
(714)741-8030()
CIWMB#: 30-C-04079

Nissan of Garden Grove
9670 Trask Ave., Garden Grove, CA 92884
(714)537-0900()
CIWMB#: 30-C-06553

Toyota of Garden Grove
9444 Trask Ave., Garden Grove, CA 92844
(714)895-5595()
CIWMB#: 30-C-06555

La Habra

AutoZone #5532
1200 W Imperial Hwy., La Habra, CA 90631
(562)694-5337()
CIWMB#: 30-C-04784

Burch Ford
201 N Harbor Blvd., La Habra, CA 90631
(562)691-3225()
CIWMB#: 30-C-05179

Firestone Store #2736
1071 S Beach Blvd., La Habra, CA 90631
(562)691-1731()
CIWMB#: 30-C-01169

Kragen Auto Parts #1569
1621 W Whittier Blvd., La Habra, CA 90631
(562)905-2538()
CIWMB#: 30-C-04076

Pep Boys #997
125 W Imperial Hwy., La Habra, CA 90631
(714)447-0601()
CIWMB#: 30-C-04026

SpeedDee Oil Change & Tune-Up
1580 W Imperial Hwy., La Habra, CA 90631
(562)697-3513()

Los Alamitos

Jiffy Lube #1740
3311 Katella Ave., Los Alamitos, CA 90720
(562)596-1827()
CIWMB#: 30-C-03529

Midway City

Bolsa Transmission
8331 Bolsa Ave., Midway City, CA 92655
(714)799-6158()
CIWMB#: 30-C-05768

Placentia

Advanced Auto & Diesel
144 S Bradford Placentia, CA 92870
(714)996-8222()
CIWMB#: 30-C-06242

Castner's Auto Service
214 S. Bradford Ave., Placentia, CA 92870
(714)528-1311()
CIWMB#: 30-C-06452

Econo Lube N' Tune
100 W Chapman Ave., Placentia, CA 92870
(714)524-0424()
CIWMB#: 30-C-06454

Fairway Ford
1350 E Yorba Linda Blvd., Placentia, CA 92870
(714)524-1200()
CIWMB#: 30-C-01863

Seal Beach

M & N Coastline Auto & Tire Service
12239 Seal Beach Blvd., Seal Beach, CA 90740
(714)826-1001()
CIWMB#: 30-C-04433

Seal Beach Chevron
12541 Seal Beach Blvd., Seal Beach, CA 90740
(949)495-0774(14)
CIWMB#: 30-C-06425

Stanton

AutoZone #2806
11320 Beach Blvd., Stanton, CA 90680
(714)895-7665()
CIWMB#: 30-C-04563

Joe's Auto Clinic
11763 Beach Blvd., Stanton, CA 90680
(714)891-7715()
CIWMB#: 30-C-03253

Kragen Auto Parts #1742
11951 Beach Blvd., Stanton, CA 90680
(714)799-7574()
CIWMB#: 30-C-05231

Scher Tire #20
7000 Katella Ave., Stanton, CA 90680
(714)892-9924()
CIWMB#: 30-C-05907

USA 10 Minute Oil Change
8100 Lampson Ave., Stanton, CA 92841
(714)373-4432()
CIWMB#: 30-C-05909

Westminster

AutoZone #5543
6611 Westminster Blvd., Westminster, CA 92683
(714)893-2898()
CIWMB#: 30-C-04964

AutoZone #5544
8481 Westminster Blvd., Westminster, CA 92683
(714)891-3511()
CIWMB#: 30-C-04966

City of Westminster Corporate Yard
14381 Olive St., Westminster, CA 92683
(714)895-2876(292)
CIWMB#: 30-C-02008

Honda World
13600 Beach Blvd., Westminster, CA 92683
(714)890-8900()
CIWMB#: 30-C-03639

Jiffy Lube #1579
6011 Westminster Blvd., Westminster, CA 92683
(714)899-2727()
CIWMB#: 30-C-02745

John's Brake & Auto Repair
13050 Hoover St., Westminster, CA 92683
(714)379-2088()
CIWMB#: 30-C-05617

Kragen Auto Parts #0762
6562 Westminster Blvd., Westminster, CA 92683
(714)898-0810()
CIWMB#: 30-C-02590

Midway City Sanitary District
14451 Cedarwood St., Westminster, CA 92683
(714)893-3553()
CIWMB#: 30-C-01626

Pep Boys #653
15221 Beach Blvd., Westminster, CA 92683
(714)893-8544()
CIWMB#: 30-C-03415

Yorba Linda

AutoZone #5545
18528 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)970-8933()
CIWMB#: 30-C-04971

Econo Lube N' Tune
22270 La Palma Ave., Yorba Linda, CA 92887
(714)692-8394()
CIWMB#: 30-C-06513

EZ Lube Inc. #41
17511 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)556-1312()
CIWMB#: 30-C-05739

Firestone Store #27T3
18500 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)779-1966()
CIWMB#: 30-C-01222

Jiffy Lube #1532
16751 Yorba Linda Blvd., Yorba Linda, CA 92886
(714)528-2800()
CIWMB#: 30-C-03777

Mike Schultz Import Service
4832 Eureka Ave., Yorba Linda, CA 92886
(714)528-4411()
CIWMB#: 30-C-04313

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



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

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

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

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

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

For emergencies, dial 911.

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

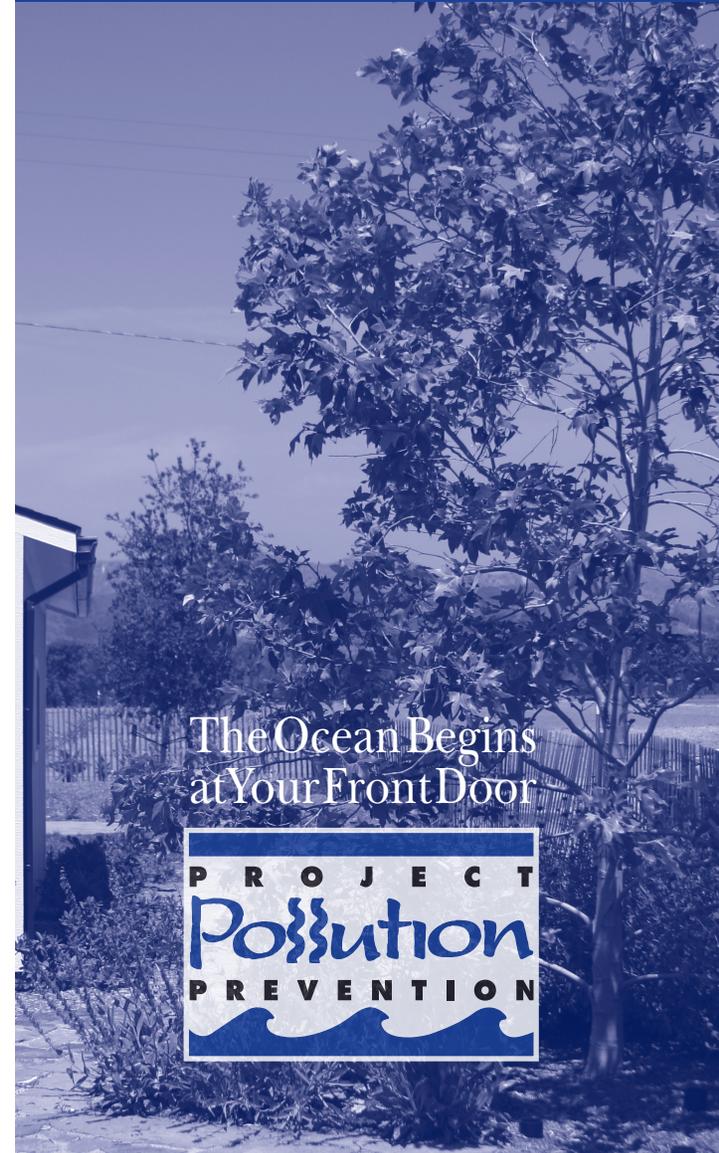
Funding for this brochure has been provided in full
or in part through an agreement with the State Water
Resources Control Board (SWRCB) pursuant to the
Costa-Machado Water Act of 2000 (Prop. 13).



Printed on Recycled Paper

Help Prevent Ocean Pollution:

Responsible
Pest Control



The Ocean Begins
at Your Front Door



Tips for Pest Control

Key Steps to Follow:

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



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

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

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

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



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

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



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

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

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

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

Step 4: Wear appropriate protective clothing.

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

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

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

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

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

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

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

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

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

Step 7: Properly store and dispose of unused pesticides.

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



Store unused chemicals in a locked cabinet.

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

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

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





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

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

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

UCCE Master Gardener Hotline:
(714) 708-1646

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

For emergencies, dial 911.

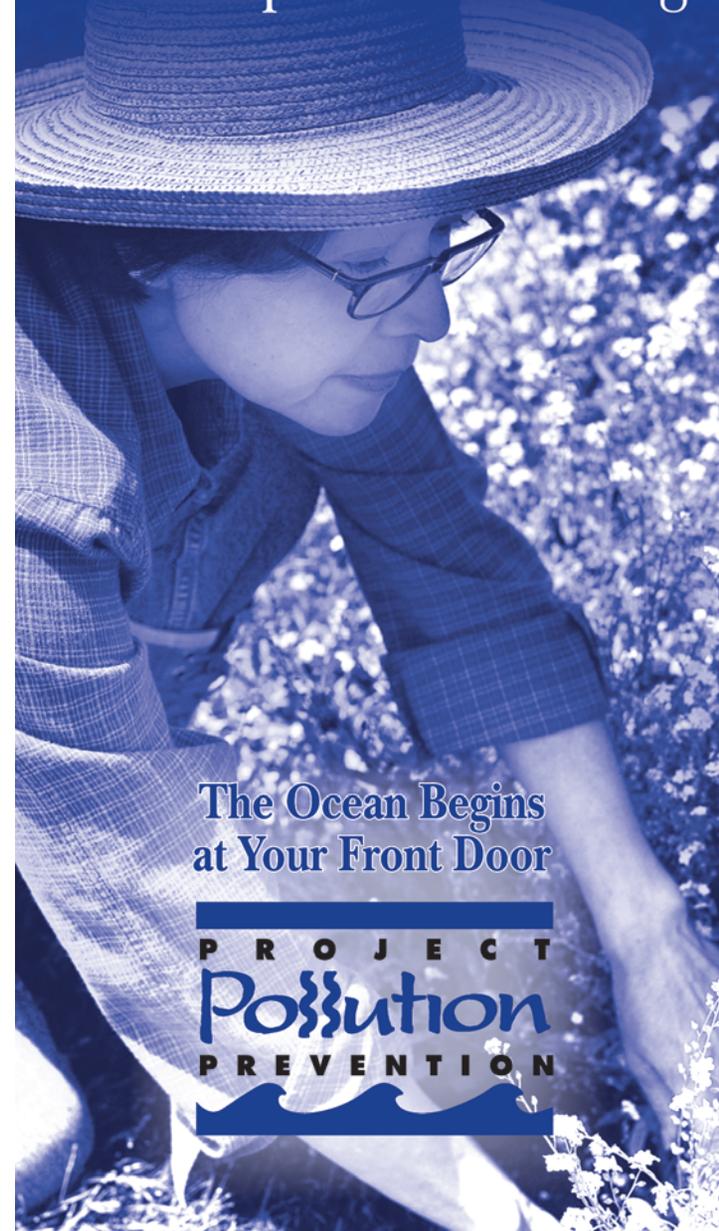
The tips contained in this brochure provide useful information to help prevent water pollution while landscaping or gardening. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.



Printed on Recycled Paper

Help Prevent Ocean Pollution:

Tips for Landscape & Gardening



The Ocean Begins
at Your Front Door



Tips for Landscape & Gardening

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

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers, and pesticide applied to the landscape.
- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.



Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro spray systems. Periodically inspect and fix leaks and misdirected sprinklers.

- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



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



product. Do not dump rinse water down storm drains. Dispose of empty containers in the trash.

- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting. For more information, visit www.ipm.ucdavis.edu.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Hazardous Waste Collection Center to be recycled. Locations are provided below.

Household Hazardous Waste Collection Centers

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

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



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

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

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

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

For emergencies, dial 911.

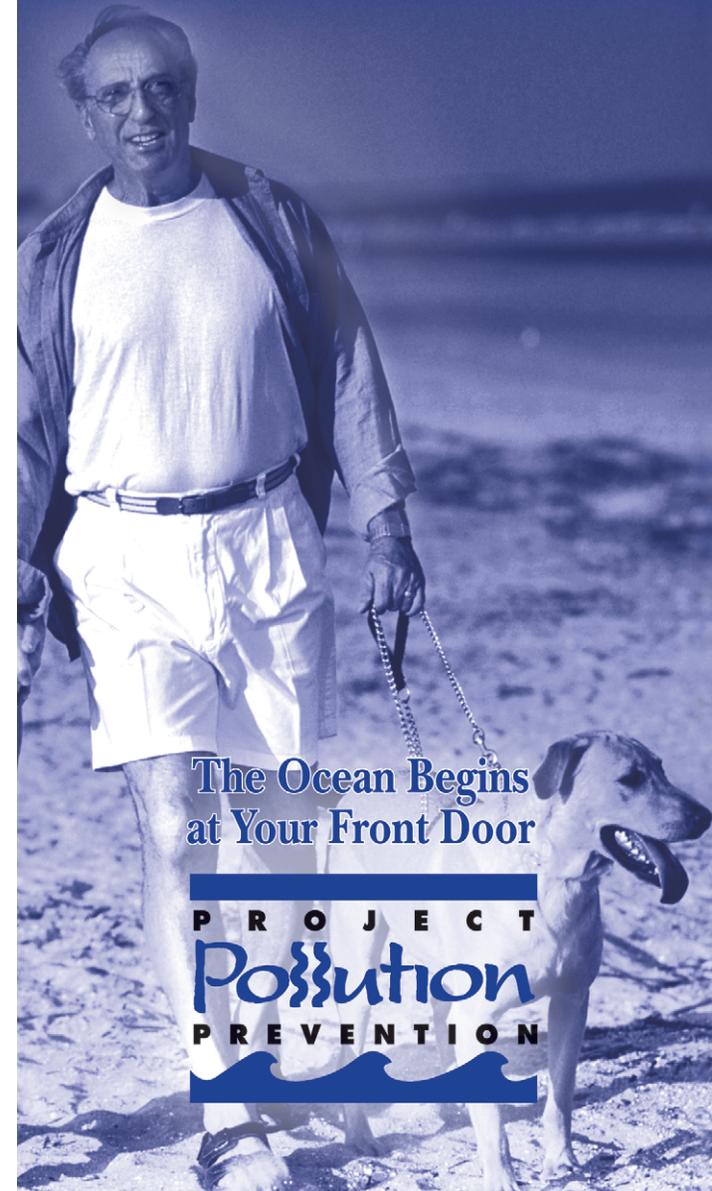
The tips contained in this brochure provide useful information to help prevent water pollution while caring for your pet. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.



Printed on Recycled Paper

Help Prevent Ocean Pollution:

Tips for Pet Care



Tips for Pet Care

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

Washing Your Pets

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

- If possible, bathe your pets indoors using less-toxic shampoos or have your pet professionally groomed. Follow instructions on the products and clean up spills.
- If you bathe your pet outside, wash it on your lawn or another absorbent/permeable surface to keep the washwater from running into the street, gutter or storm drain.



Flea Control

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



Why You Should Pick Up After Your Pet

It's the law! Every city has an ordinance requiring you to pick up after your pet. Besides being a nuisance, pet



waste can lead to water pollution, even if you live inland. During rainfall, pet waste left outdoors can wash into storm drains. This waste flows directly into our waterways and the ocean where it can harm human health, marine life and the environment.

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

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

- Take a bag with you on walks to pick up after your pet.
- Dispose of the waste in the trash or in a toilet.





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

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

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

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

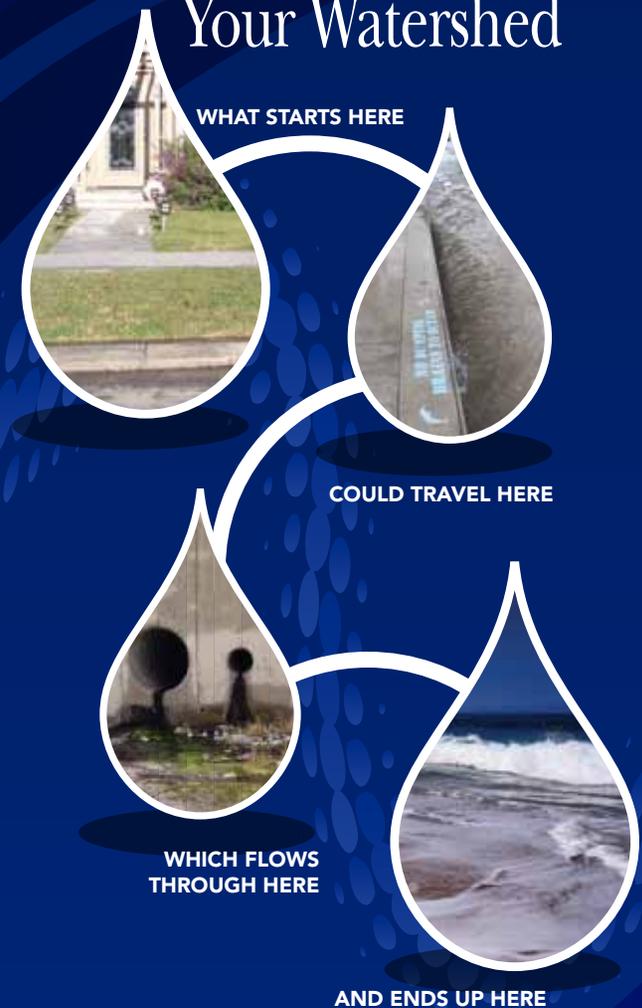
For emergencies, dial 911.

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



Printed on Recycled Paper

Help Prevent Ocean Pollution: Tips For Protecting Your Watershed



The Ocean Begins
at Your Front Door



Tips for Protecting Your Watershed

My Watershed. Our Ocean.

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

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



As water from rain (stormwater) or sprinklers and hoses (urban runoff) runs down your driveway and into your neighborhood streets, sidewalks

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

Water quality can be improved by “Adopting Your Watershed.” Through this effort, we are challenging citizens and



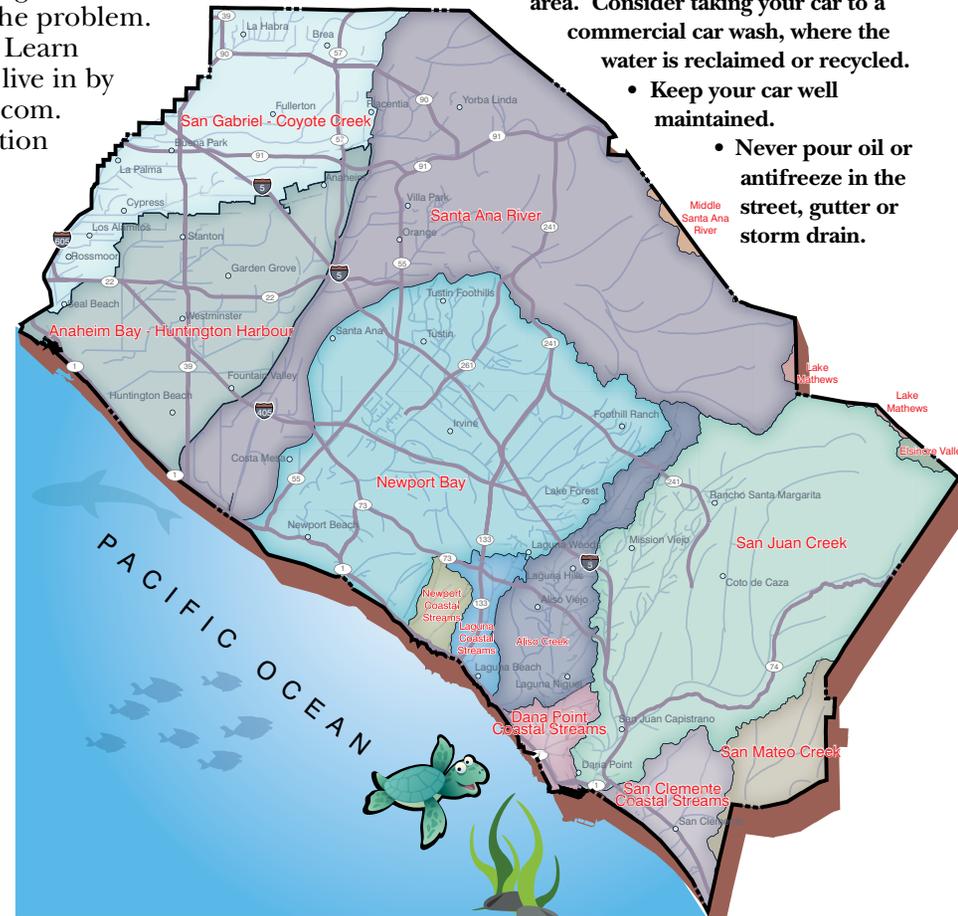
organizations to join the Orange County Stormwater Program and others who are working to protect and restore our creeks, rivers, bays and ocean.

There are many opportunities to get involved:

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

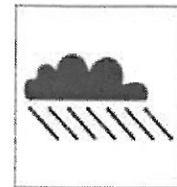
Follow these simple tips to protect the water quality of your watershed:

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





DF-1 DRAINAGE FACILITY OPERATION AND MAINTENANCE



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

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

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

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

Program/Facility Being Inspected: _____

Date: _____ Inspector Name: _____

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

MAINTENANCE PROCEDURES:

1. Inspection and Cleaning of Drainage Facilities

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

Unsatisfactory		OK	
<input type="checkbox"/> _____		<input type="checkbox"/>	<p>General Guidelines (cont.)</p> <ul style="list-style-type: none"> • 1a. Remove trash or debris as needed from open channels. It should be noted that major vegetative debris removal may require other regulatory permits prior to completing the work. (TRASH) • 1b. Consider retrofitting energy dissipaters (e.g. riprap) below culvert outfalls to minimize potential for erosion. (SED) • 1c. Repair any v-ditches that have cracked or displaced in a manner that accelerates erosion. (SED) • 1d. If suspicious conditions appear to exist, test selected samples of the removed wastes for compliance with hazardous waste regulations prior to disposal. (TOX) • 1e. Consider more frequent regular cleaning of selected drainage structures to help address ongoing specific impairments. (SED, BACT, NUT, TRASH) • 1f. Consider structural retrofits to the MS4 to help address ongoing specific impairments (SED, BACT, NUT, TRASH, O&G) • 1g. Consider cleaning out pipes at gradient breaks or other in-pipe debris accumulation points as identified/needed. (ANY, BACT, NUT, TRASH) <p>Storm Drain Flushing</p> <ul style="list-style-type: none"> • 1h. Flushing of storm drains or storm drain inlets should only be done when critically necessary and no other solution is practical. (SED, BACT, TRASH). • 1i. If flushed, to the extent practical the material should be collected (vacuumed), treated with an appropriate filtering device to remove sand and debris and disposed of properly. (SED) <p>Waste Management</p> <ul style="list-style-type: none"> T 1H. Store wastes collected from cleaning activities of the drainage facilities in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain. • 1j. Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device to remove the sand and debris prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not permitted, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream. (SED, TRASH) • 1k. Provide for laboratory analysis of at least one randomly collected sediment (less the debris) sample per year from the storm drain inlet leaning program to ensure that it does not meet the EPA criteria for hazardous waste. If the sample is determined to be hazardous, the sediment must be disposed of as hazardous waste and the source should be investigated. (TOX).
<input type="checkbox"/> _____			

<p>2. Controlling Illicit Connections and Discharges</p>	
<p>Unsatisfactory OK</p> <p><input type="checkbox"/> _____ <input type="checkbox"/></p> <p>_____</p> <p><input type="checkbox"/> _____ <input type="checkbox"/></p> <p>_____</p> <p>_____</p> <p><input type="checkbox"/> _____ <input type="checkbox"/></p> <p>_____</p>	<p>General Guidelines</p> <p>T 2A. Report prohibited discharges such as dumping, paint spills, abandoned oil containers, etc. observed during the course of normal daily activities so they can be investigated, contained, and cleaned up.</p> <p>T 2B. Where field observations and/or monitoring data indicate significant problems, conduct field investigations to detect and eliminate existing illicit connections and improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)). (Refer to Appendices A-10 and A-11.)</p> <p>T 2C. Report all observed illicit connections and discharges to the 24-hour water pollution problem reporting hotline (714) 567-6363.</p> <p>T 2D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.</p> <p>Storm Drain Stenciling (“No Dumping—Drains to Ocean”)</p> <p>T 2E. Implement and maintain a storm drain stenciling program.</p> <ul style="list-style-type: none"> • 2a. Consider adding the hotline number to the storm drain stencils (BACT, TOX, TRASH).
<p>3. Controlling Illegal Dumping</p>	
<p><input type="checkbox"/> _____ <input type="checkbox"/></p> <p>_____</p> <p><input type="checkbox"/> _____ <input type="checkbox"/></p> <p>_____</p> <p>_____</p> <p><input type="checkbox"/> _____ <input type="checkbox"/></p> <p>_____</p>	<p>Field Investigation</p> <p>T 3A. Report prohibited discharges such as dumpings observed during the course of normal daily activities so they can be investigated, contained and cleaned up.</p> <p>T 3B. Conduct field investigations to detect and eliminate improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)).</p> <p>T 3C. Report all observed illegal dumping to the 24-hour water pollution problem reporting hotline (714) 567-6363.</p> <p>T 3D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.</p> <p>T 3E. If perpetrator can be identified, take appropriate enforcement action.</p> <ul style="list-style-type: none"> • 3a. Consider posting “No Dumping” signs in problem areas with a phone number for reporting dumping and disposal. Signs could also indicate fines and penalties for illegal dumping. (ANY)

<p>Unsatisfactory OK</p> <p><input type="checkbox"/> _____ <input type="checkbox"/></p> <p>_____</p> <p><input type="checkbox"/> _____ <input type="checkbox"/></p> <p>_____</p> <p><input type="checkbox"/> _____ <input type="checkbox"/></p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>Training/Education/Outreach</p> <p>T 3F. Verify that appropriate employees and subcontractors are trained to recognize and report illegal dumping.</p> <p>T 3G. Encourage public reporting of illegal dumping by advertising the 24-hour water pollution problem reporting hotline (714) 567-6363.</p> <ul style="list-style-type: none"> • 3b. Take extra steps to educate the public in neighborhoods where illegal dumping has occurred to inform them why illegal dumping is a problem, and that illegal dumping carries a significant financial penalty. (ANY)
---	--

LIMITATIONS:

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



R-5 DISPOSAL OF PET WASTES

Pet wastes left in the environment may introduce solids, bacteria, and nutrients to the storm drain. The type and quantity of waste will dictate the proper disposal method. Small quantities of waste are best disposed with regular trash or flushed down a toilet. Large quantities of wastes from herbivore animals may be composted for subsequent use or disposal to landfill.

Pick up after your pet! It's as easy as 1-2-3. 1) Bring a bag. 2) Clean it up. 3) Dispose of it properly (toilet or trash). The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	
Metals	
Hydrocarbons	
Hazardous Materials	
Pesticides and Herbicides	
Other	

Think before you dispose of any pet wastes. Remember - The ocean starts at your front door.

Required Activities

- All pet wastes must be picked up and properly disposed of. Pet waste should be disposed of in the regular trash, flushed down a toilet, or composted as type and quantities dictate.
- Properly dispose of unused flea control products (shampoo, sprays, or collars).
- Manure produced by livestock in uncovered areas should be removed at least daily for composting, or storage in water-tight container prior to disposal. Never hose down to stream or storm drain. Composting or storage areas should be configured and maintained so as not to allow contact with runoff. Compost may be donated to greenhouses, nurseries, and botanical parks. Topsoil companies and composting centers may also accept composted manure.
- Line waste pits or trenches with an impermeable layer, such as thick plastic sheeting.
- When possible, allow wash water to infiltrate into the ground, or collect in an area that is routed to the sanitary sewer.
- Confine livestock in fenced in areas except during exercise and grazing times. Restrict animal access to creeks and streams, preferably by fencing.

For additional information contact:

County of Orange, OC Watershed

Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL

or visit our website at: www.ocwatersheds.com

- Install gutters that will divert roof runoff away from livestock areas.

Recommended Activities

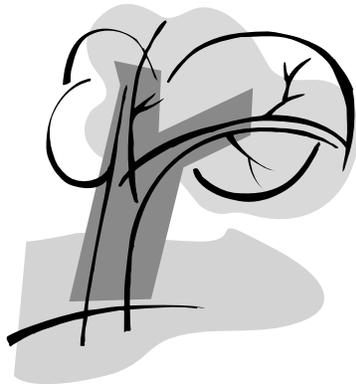
- In order to properly dispose of pet waste, carry bags, pooper-scooper, or equivalent to safely pick up pet wastes while walking with pets.
- Bathe pets indoors and use less toxic shampoos. When possible, have pets professionally groomed.
- Properly inoculate your pet in order to maintain their health and reduce the possibility of pathogens in pet wastes.
- Maintain healthy and vigorous pastures with at least three inches of leafy material.
- Consider indoor feeding of livestock during heavy rainfall, to minimize manure exposed to potential runoff.
- Locate barns, corrals, and other high use areas on portions of property that either drain away from or are located distant from nearby creeks or storm drains.

For additional information contact:

County of Orange, **OC Watershed**

Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL

or visit our website at: www.ocwatersheds.com



R-6 DISPOSAL OF GREEN WASTES

Green wastes entering the storm drain may clog the system creating flooding problems. Green wastes washed into receiving waters create an oxygen demand as they are decomposed, reducing the available oxygen for aquatic life. Pesticide and nutrient residues may be carried to the receiving water with the green wastes. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	
Metals	
Hydrocarbons	
Hazardous Materials	x
Pesticides and Herbicides	x
Other	

Think before disposing of any green wastes – Remember - The ocean starts at your front door.

Required Activities

- Green wastes can not be disposed of in the street, gutter, public right-of-way, storm drain, or receiving water. Dispose of green wastes as a part of the household trash. If the quantities are too large, arrange a pick up with the local waste hauler.
- After conducting yard or garden activities sweep the area and properly dispose of the clippings and waste. Do not sweep or blow out into the street or gutter.

Recommended Activities

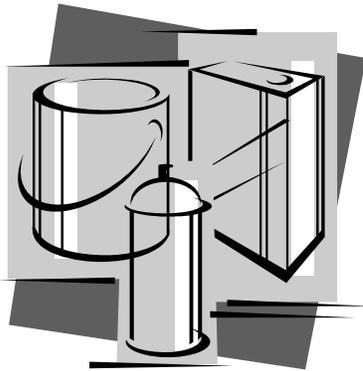
- Utilize a commercial landscape company to conduct the landscape activities and waste disposal.
- Utilize native plants and drought tolerant species to reduce the water use and green waste produced.
- Use a lawn mower that has a mulcher so that the grass clippings remain on the lawn and do not have to be collected and disposed of.
- Compost materials in a designated area within the yard.
- Recycle lawn clippings and greenery waste through local programs if available.

For additional information contact:

County of Orange, **OC Watershed**

Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL

or visit our website at: www.ocwatersheds.com



R-7 HOUSEHOLD HAZARDOUS WASTE

Household hazardous wastes (HHW) are defined as waste materials which are typically found in homes or similar sources, which exhibit characteristics such as: corrosivity, ignitability, reactivity, and/or toxicity, or are listed as hazardous materials by EPA.

List of most common HHW products:

Drain openers
Oven cleaners
Wood and metal cleaners and polishes
Automotive oil and fuel additives
Grease and rust solvents
Carburetor and fuel injection cleaners
Starter fluids
Batteries
Paint Thinners
Paint strippers and removers
Adhesives
Herbicides
Pesticides
Fungicides/wood preservatives

Many types of waste can be recycled, however options for each waste type are limited. Recycling is always preferable to disposal of unwanted materials. All gasoline, antifreeze, waste oil, and lead-acid batteries can be recycled. Latex and oil-based paint can be reused, as well as recycled. Materials that cannot be reused or recycled should be disposed of at a properly permitted landfill.

Think before disposing of any household hazardous waste. Remember - The ocean starts at your front door.

The activities outlined in this fact sheet target the following pollutants:

Sediment	
Nutrients	
Bacteria	
Foaming Agents	X
Metals	X
Hydrocarbons	X
Hazardous Materials	X
Pesticides and Herbicides	X
Other	X



Required Activities

- Dispose of HHW at a local collection facility. Call (714) 834-6752 for the household hazardous waste center closest to your area.
- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers.
- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.

Recommended Activities

- Use non-hazardous or less-hazardous products.
- Participate in HHW reuse and recycling. Call (714) 834-6752 for the participating household hazardous waste centers.

The California Integrated Waste Management Board has a Recycling Hotline (800) 553-2962, that provides information and recycling locations for used oil.

For additional information contact:

County of Orange, **OC Watershed**

Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL

or visit our website at: www.ocwatersheds.com



R-8 WATER CONSERVATION

Excessive irrigation and/or the overuse of water is often the most significant factor in transporting pollutants to the storm drain system. Pollutants from a wide variety of sources including automobile repair and maintenance, automobile washing, automobile parking, home and garden care activities and pet care may dissolve in the water and be transported to the storm drain. In addition, particles and materials coated with fertilizers and pesticides may be suspended in the flow and be transported to the storm drain.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	x
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	x
Other	x

Hosing off outside areas to wash them down not only consumes large quantities of water, but also transports any pollutants, sediments, and waste to the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before using water. Remember - The ocean starts at your front door.

Required Activities

- Irrigation systems must be properly adjusted to reflect seasonal water needs.
- Do not hose off outside surfaces to clean, sweep with a broom instead.

Recommended Activities

- Fix any leaking faucets and eliminate unnecessary water sources.
- Use xeroscaping and drought tolerant landscaping to reduce the watering needs.
- Do not over watering lawns or gardens. Over watering wastes water and promotes diseases.
- Use a bucket to re-soak sponges/rags while washing automobiles and other items outdoors. Use hose only for rinsing.
- Wash automobiles at a commercial car wash employing water recycling.

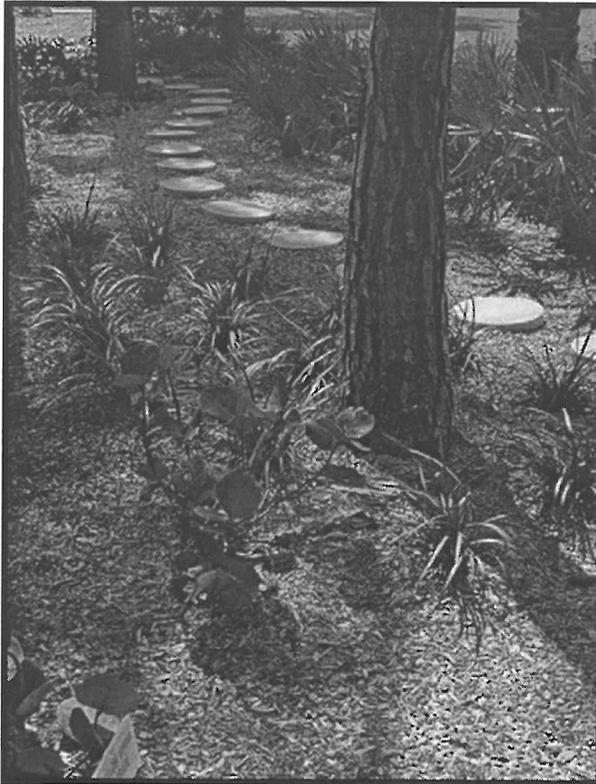
For additional information contact:

County of Orange, OC Watershed

Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL

or visit our website at: www.ocwatersheds.com

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.



SD-10 Site Design & Landscape Planning

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

Site Design & Landscape Planning SD-10

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.

SD-10 Site Design & Landscape Planning

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.



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



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 daylight 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



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.



- 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.



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



- 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.

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

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

Designing New Installations

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

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

Design Objectives

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



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

Redeveloping Existing Installations

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

Additional Information***Maintenance Considerations***

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

Other Resources

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

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

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

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

APPENDIX D

BMP MAINTENANCE SUPPLEMENT / O&M PLAN

Recording requested by and mail to:

Name: City of Placentia
Department of Public Works
ATTN: Director of Public Works

Address: 401 East Chapman Avenue
Placentia, CA 92870

Space Above This Line For Recorder's Use

MASTER COVENANT AND AGREEMENT
REGARDING ON-SITE BMP MAINTENANCE

The undersigned hereby certifies I am (we are) the owner(s) of the hereinafter legally described real property located in the City of Placentia, County of Orange, State of California (please give legal description: assessor's ID, tract no., lot no., etc.):

APN: 340-273-25 _____

Site Address 1314 North Angelina Drive
Placentia, CA 92870

Owner(s) do hereby covenant and agree to and with the City of Placentia to maintain all on-site structural Best Management Practices (BMPs) in accordance with the Site Map and the Operations & Maintenance (O&M) Plan set forth in Attachment 1 hereto and incorporated herein by this reference. The specific structural BMPs are listed as follows:

- (1) Contech CDS, (1) Contech CMP Detention, and (5) Torrent Drywells

Owner(s) shall maintain the listed drainage devices above on the property indicated and as shown on plans permitted by the City of Placentia in a good and functional condition to safeguard the property owners and adjoining properties from damage and pollution.

Owner(s) hereby consent to inspection of the Property by an inspector authorized by the City Manager, or his or her designee, for the purpose for verifying compliance with the provisions of this Agreement.

Owner(s) shall provide printed educational materials with any sale of the property which provide information on what stormwater management facilities are present, the type(s) and location(s) of maintenance signs that are required, and how the necessary maintenance can be performed.

Owner(s) shall provide actual notice of this Agreement and its terms to any respective successor(s) in interest to the Property prior to transfer of said interest to such successor(s) in interest. This covenant and agreement shall run with the land and shall be binding upon any future owners, encumbrances, their successors, heirs or assigns and shall continue in effect until the City of Placentia approves its termination.

(Print Name of Property Owner and Company)

(Print Name of Property Owner and Company)

(Signature of Property Owner)

(Signature of Property Owner)

Dated this _____ day of _____ 20_____.

CALIFORNIA ALL-PURPOSE ACKNOWLEDGEMENT

***** Space Below This Line For Notary's Use *****

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of _____ }
County of _____ }

On _____ before me, _____ personally appeared
(Insert Name of Notary Public and Title)

_____, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf on which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____ (Seal)

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of attached document

Title or type of document: _____

Document Date: _____ Number of Pages: _____

Signer(s) Other than Named Above: _____

ASSESSOR PARCEL NUMBER:
340-273-25

TITLE INFORMATION:
THE TITLE INFORMATION SHOWN HEREON IS PER PRELIMINARY REPORT ORDER NO. 987-30036630-SG9, DATED SEPTEMBER 27, 2019, AS PREPARED BY FIDELITY NATIONAL TITLE COMPANY, RIVERSIDE, CA (TITLE OFFICER: STEVEN GOMEZ, TELEPHONE: 951-710-5900). NO RESPONSIBILITY OF CONTENT, COMPLETENESS OR ACCURACY OF SAID REPORT IS ASSUMED BY THIS MAP OR THE SURVEYOR.

RECORD OWNER:
THE BISHOP OF THE PROTESTANT EPISCOPAL CHURCH IN LOS ANGELES, A CORPORATION SOLE

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

PARCEL 1:
THE WEST 3 ACRES OF LOT 2, OF CLACIUS TRACT, IN THE CITY OF PLACENTIA, COUNTY OF ORANGE, STATE OF CALIFORNIA, AS SHOWN ON A MAP THEREOF RECORDED IN BOOK 29, PAGE 92, OF MISCELLANEOUS RECORDS OF LOS ANGELES COUNTY, CALIFORNIA.

PARCEL 2:
THAT PORTION OF LOT 2, OF CLACIUS TRACT, IN THE CITY OF PLACENTIA, COUNTY OF ORANGE, STATE OF CALIFORNIA, AS SHOWN ON A MAP THEREOF RECORDED IN BOOK 29, PAGE 92, OF MISCELLANEOUS RECORDS OF LOS ANGELES COUNTY, CALIFORNIA, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF SAID LOT 2, AND RUNNING THENCE SOUTH 68° 06' 11" EAST ALONG THE SOUTHERLY LINE OF SAID LOT, 350.33 FEET; THENCE NORTH 14° 00' 00" EAST PARALLEL WITH THE WESTERLY LINE OF SAID LOT, 502.12 FEET TO THE NORTHERLY LINE OF SAID LOT, THENCE NORTH 68° 06' 11" WEST ALONG SAID NORTHERLY LINE, 350.33 FEET TO THE NORTHWEST CORNER OF SAID LOT; THENCE SOUTH 14° 00' 00" WEST 502.12 FEET TO THE POINT OF BEGINNING.

EXCEPTING THEREFROM THE WEST 3.00 ACRES.

TITLE EXCEPTIONS:
ITEMS SHOWN AS (1) HAVE BEEN PLOTTED ON THE SURVEY.

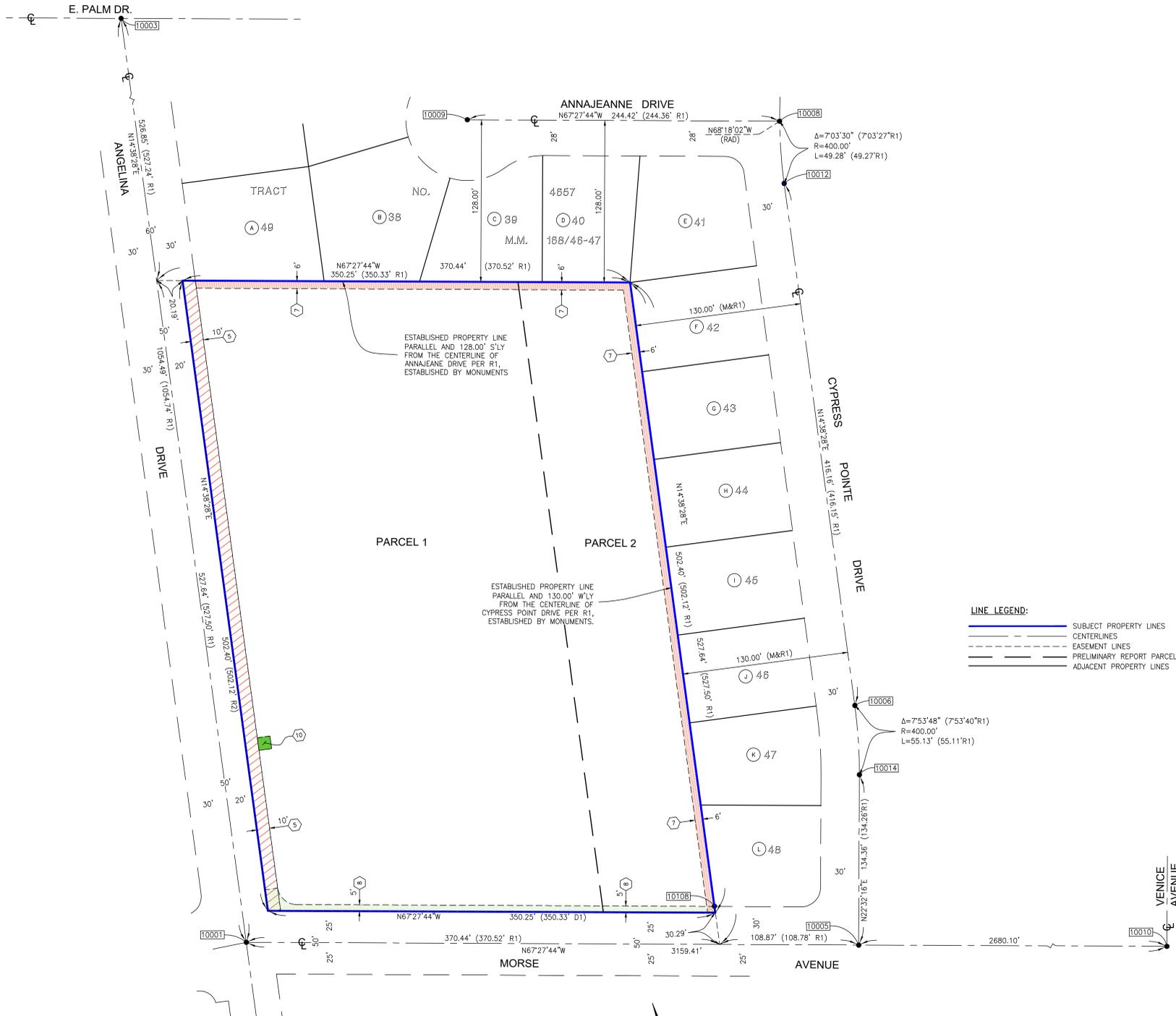
- A.-B. TAXES
- WATER RIGHTS, CLAIMS OR TITLE TO WATER, WHETHER OR NOT DISCLOSED BY THE PUBLIC RECORDS.
 - EASEMENT(S) IN FAVOR OF THE PUBLIC OVER ANY EXISTING ROADS LYING WITHIN SAID LAND.
 - EASEMENT(S) GRANTED TO ANAHEIM UNION WATER COMPANY, A CALIFORNIA CORPORATION, FOR PIPE LINES AND INCIDENTAL PURPOSES, RECORDED NOVEMBER 3, 1922 IN BOOK 438, PAGE 218, OF DEEDS.
(DOCUMENT AFFECTS - NO WIDTH DESCRIBED IN DOCUMENT. CENTERLINE OF EASEMENT IS ALONG THE WESTERLY LINE OF THE PROPERTY)
 - DISCREPANCIES, CONFLICTS IN BOUNDARY LINES, SHORTAGE IN AREA, ENCROACHMENTS, OR ANY OTHER MATTERS SHOWN ON MAP; RECORD OF SURVEY FILED IN RECORD OF SURVEY BOOK 38, PAGE 15.
 - EASEMENT(S) GRANTED TO THE COUNTY OF ORANGE FOR STREET AND HIGHWAY PURPOSES, RECORDED NOVEMBER 21, 1960 IN BOOK 5518, PAGE 431, OF OFFICIAL RECORDS.
(DOCUMENT AFFECTS - PLOTTED HEREON)
 - DISCREPANCIES, CONFLICTS IN BOUNDARY LINES, SHORTAGE IN AREA, ENCROACHMENTS, OR ANY OTHER MATTERS SHOWN ON MAP; RECORD OF SURVEY FILED IN RECORD OF SURVEY BOOK 49, PAGE 35.
 - EASEMENT(S) IN FAVOR OF SOUTHERN CALIFORNIA EDISON COMPANY, A CORPORATION, FOR UTILITIES, INGRESS AND EGRESS, RECORDED JANUARY 14, 1963 IN BOOK 6393, PAGE 912, OF OFFICIAL RECORDS.
(DOCUMENT AFFECTS - PLOTTED HEREON)
 - EASEMENT(S) GRANTED TO THE CITY OF PLACENTIA FOR STREET AND PUBLIC UTILITY PURPOSES, RECORDED AUGUST 25, 1964 IN BOOK 7193, PAGE 311, OF OFFICIAL RECORDS.
(DOCUMENT AFFECTS - PLOTTED HEREON)
 - ANY INTEREST OF THE PERSON SHOWN BELOW, WHOSE POSSIBLE INTEREST IS DISCLOSED BY THEIR JOINER IN EXECUTING THE DOCUMENT RECORDED DECEMBER 16, 1997 AS INSTRUMENT NO. 19970644437, OF OFFICIAL RECORDS.
 - EASEMENT(S) IN FAVOR OF SOUTHERN CALIFORNIA EDISON COMPANY, A CORPORATION, FOR UTILITIES, INGRESS AND EGRESS, RECORDED SEPTEMBER 27, 2017 AS INSTRUMENT NO. 2017000409582, OF OFFICIAL RECORDS.
(DOCUMENT AFFECTS - PLOTTED HEREON)
 - 14. TITLE COMPANY NOTES.

- MONUMENT NOTES:**
- FOUND PUNCHED SPIKE AND WASHER, DN. 0.1", NO REFERENCE, ACCEPTED AS CENTERLINE INTERSECTION.
 - FOUND BOLT PER R1, DN. 0.1". FITS TIES SHOWN ON P.M.B. 136/10.
 - FOUND SPIKE AND WASHER "RCE 16916", NO REFERENCE, DN. 0.1", N67°27'44"W, 0.12' FROM ESTABLISHED INTERSECTION.
 - FOUND SPIKE AND WASHER "LS 5411" PER C.R. 2013-0600, FLUSH WITH PAVEMENT.
 - SET PUNCH MARK ON MANHOLE BY TIES PER C.R. 2013-1453.
 - SET PUNCH MARK ON MANHOLE BY TIES PER CITY ENGINEER TIES FILED FOR TRACT NO. 4657.
 - FOUND SPIKE AND WASHER "LS 5411" PER C.R. 2012-4162, FLUSH WITH PAVEMENT.
 - FOUND SPIKE AND WASHER "LS 5411" PER C.R. 2013-1453, FLUSH WITH PAVEMENT.
 - FOUND SPIKE AND WASHER "LS 5411" PER C.R. 2013-0600, FLUSH WITH PAVEMENT.
 - FOUND 2" I.P., WITH CONCRETE PLUG, NO TAG, N14°38'28"E, 0.23' FROM THE SOUTHWEST CORNER OF LOT 48 OF R1.



VICINITY MAP
NOT TO SCALE

ALTA/NSPS LAND TITLE SURVEY



LINE LEGEND:

	SUBJECT PROPERTY LINES
	CENTERLINES
	EASEMENT LINES
	PRELIMINARY REPORT PARCEL LINE
	ADJACENT PROPERTY LINES

- ALTA/NSPS TABLE A ITEMS:**
- THE SITE ADDRESS OBSERVED WHILE CONDUCTING THE SURVEY IS: 1314 NORTH ANGELINA DRIVE, PLACENTIA, CALIFORNIA
 - THE LAND SHOWN ON THIS SURVEY LIES WITHIN FLOOD ZONE "X" (UNSHADED) BEING DESCRIBED AS AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN, PER FLOOD INSURANCE RATE MAP (FIRM) COMMUNITY PANEL NUMBER 06059C0063J, REVISED DATE: DECEMBER 3, 2009.
 - THE LAND AREA IS:
(GROSS) 174,296 SF / 4.001 ACRES ±
(NET) 167,537 S.F. / 3.846 ACRES ±
 - THE CONTOURS AND ELEVATIONS SHOWN HEREON ARE BASED ON THE FOLLOWING BENCH MARK:
BM No.: 26-26-76 ELEV.: 305.235' (ORANGE COUNTY SURVEYOR BENCH MARK)
DATUM: NAVD 88
DESCRIPTION: DESCRIBED BY OCS 2003 - FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK STAMPED "26-26-76", SET IN THE SOUTHWESTERLY CORNER OF A 5 FT. BY 5 FT. CONCRETE CATCH BASIN. MONUMENT IS LOCATED ALONG THE EASTERLY SIDE OF KRAEMER BOULEVARD, 400 FT. NORTHERLY ALONG KRAEMER FROM THE CENTERLINE OF YORBA LINDA BOULEVARD AND 43 FT. EASTERLY OF THE CENTERLINE OF KRAEMER. MONUMENT IS SET LEVEL WITH THE SIDEWALK.
CONTOUR INTERVAL=1'
 - SEE THE SURVEY PLAT FOR SUBSTANTIAL FEATURES OBSERVED IN THE PROCESS OF CONDUCTING THE SURVEY.
 - SEE THE SURVEY PLAT FOR PARKING STRIPING AND TYPE OF PARKING SPACE. THE PARKING COUNT IS AS FOLLOWS:
REGULAR SPACES 79
HANDICAP SPACES 5
TOTAL SPACES 84
 - SEE THE SURVEY PLAT FOR THE LOCATION OF UTILITY EVIDENCE OBSERVED WHILE CONDUCTING THE SURVEY.
TWO WORKING DAYS BEFORE EXCAVATIONS, CALL UNDERGROUND SERVICE ALERT (USA) OF SOUTHERN CALIFORNIA AT 1-800-227-2600.
 - SEE THE SURVEY PLAT FOR THE NAMES OF ADJOINING OWNERS.
 - SEE THE SURVEY PLAT FOR THE DISTANCE TO THE NEAREST INTERSECTING STREET.
 - THERE IS NO OBSERVABLE EVIDENCE OF EARTH MOVING WORK WITHIN RECENT MONTHS.

BASIS OF BEARINGS AND COORDINATES:
THE BEARINGS AND COORDINATES SHOWN HEREON ARE BASED UPON THE CALIFORNIA COORDINATE SYSTEM OF 1983, CCS83, ZONE #, (2017.50) IN ACCORDANCE WITH THE CALIFORNIA PUBLIC RESOURCES CODE SECTIONS 8801-8819; SAID BEARINGS AND COORDINATES ARE BASED LOCALLY UPON FIELD-OBSERVED TIES TO THE FOLLOWING CALIFORNIA SPATIAL REFERENCE NETWORK, OR EQUIVALENT STATIONS:

STATION	NORTHING (Y)	EASTING (X)	HEIGHT	ACCURACY
CCCS	2261350.670	6071417.810	106.738	FIRST ORDER
SNHS	2285159.690	6052464.860	220.253	FIRST ORDER

- PROPERTY ADJOINERS:**
- APN: 340-273-26
OWNER: ASUNCION R DELPILAR & MARIO DELPILAR
 - APN: 340-273-14
OWNER: TRENERY PETER S TR & TRENERY FAMILY TR
 - APN: 340-273-15
OWNER: FERNANDO GUERRA & GUISELLE CLARK
 - APN: 340-273-16
OWNER: BISHOP OF THE PROTESTANT & EPISCOPAL CHURCH IN LOS
 - APN: 340-273-17
OWNER: NATHANIEL PROCTOR & JESSICA PROCTOR
 - APN: 340-273-18
OWNER: LAWRENCE J GOODSON & CATHERINE M GOODSON
 - APN: 340-273-19
OWNER: JACOB HARVEY & STACIE C HARVEY
 - APN: 340-273-20
OWNER: CARROLL HERBERT G TR
 - APN: 340-273-21
OWNER: MICHAEL W BRIDGFORD & ANGELA E BRIDGFORD
 - APN: 340-273-22
OWNER: GRANTHAM ARMS LLC
 - APN: 340-273-23
OWNER: STEPHEN M HUERTH & LAURA E HUERTH
 - APN: 340-273-23
OWNER: HARDIK DEVRAIBHAI BUNHA

SURVEYOR'S NOTES:

- THE DIFFERENCES BETWEEN MEASURED DATA ON THE SURVEY AND THE LEGAL DESCRIPTION ARE DUE TO BASIS OF BEARINGS ORIENTATION, TOGETHER WITH THE VESTING DEED CONTROLLING CALLS TO SENIOR LINES. THE SENIOR LINES ARE PARAMOUNT TO BEARING AND DISTANCE CALLS IN DEED AND HAVE BEEN DETERMINED PURSUANT TO GOVERNING BOUNDARY LAW PRINCIPALS AND EVIDENCE FOR PROPER RETRACEMENT.

- RECORD REFERENCES:**
- R1 RECORD DATA PER TRACT NO. 4567, M.M. 168/46-47
 - D1 RECORD DATA PER VESTING DEED



SURVEYOR'S CERTIFICATE:
TO: NATIONAL COMMUNITY RENAISSANCE AND FIDELITY NATIONAL TITLE COMPANY:
THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2016 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDES ITEMS 2, 3, 4, 5, 8, 9, 11, 13, 14, AND 16 OF TABLE A THEREOF. THE FIELDWORK WAS COMPLETED ON JANUARY 31, 2020.

GREGORY T. SCHLARBAUM, PLS 6704
EMAIL: gschlarbaum@fuscoe.com



DATE

NO.	DATE	REVISION

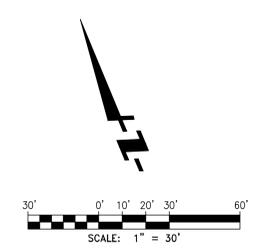
FEI REFERENCE:



ALTA/NSPS LAND TITLE SURVEY
of: 1314 NORTH ANGELINA DRIVE,
PLACENTIA, CALIFORNIA
for: NATIONAL COMMUNITY RENAISSANCE
9421 HAVEN AVENUE
RANCHO CUCAMONGA, CA 91730

DATE: June 27, 2019
FN: 1653-001 ALTA
JN: 1653-001-01
DRAWN BY: GTS
CHECKED BY: KRT
SHEET 1 OF 2

ALTA/NSPS LAND TITLE SURVEY



LINE LEGEND:

	SUBJECT PROPERTY LINES
	CENTERLINES
	EASEMENT LINES
	PRELIMINARY REPORT PARCEL LINE
	ADJACENT PROPERTY LINES
	OVERHEAD UTILITIES
	TREES
	AREA LIGHT
	STREET LIGHT
ASPH	ASPHALT
BFP	BACK FLOW PREVENTER
CATV	CABLE TELEVISION
CB	CATCH BASIN
COMM	COMMUNICATIONS
CONC	CONCRETE
EPB	ELECTRIC PULL BOX
ET	ELECTRIC TRANSFORMER
PB	PULL BOX
TELE	TELEPHONE
TE	TRASH ENCLOSURE
TMH	TELEPHONE MANHOLE
WM	WATER METER

NO.	DATE	REVISION

FEI REFERENCE:

FUSCOE
ENGINEERING

16795 Van Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoecorp.com

ALTA/NSPS LAND TITLE SURVEY
of: 1314 NORTH ANGELINA DRIVE,
PLACENTIA, CALIFORNIA

for: NATIONAL COMMUNITY RENAISSANCE
9421 HAVEN AVENUE
RANCHO CUCAMONGA, CA 91730

DATE: June 27, 2019
FN: 1653-001 ALTA
JN: 1653-001-01
DRAWN BY: GTS
CHECKED BY: KRT
SHEET 2 OF 2

ALTA/NSPS (1653-001) ALTA.DWG (02-14-20)

OPERATIONS AND MAINTENANCE (O&M) PLAN

Water Quality Management Plan

For

PLACENTIA SENIOR HOUSING

1314 North Angelina Drive, Placentia, CA 92870

APN: 340-273-25

This page intentionally left blank

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
NON-STRUCTURAL SOURCE CONTROL BMPs			
Yes	<p>N1. Education for Property Owners, Tenants and Occupants</p> <p>Educational materials will be provided to tenants, including brochures and restrictions to reduce pollutants from reaching the storm drain system. Examples include tips for pet care, household tips, and proper household hazardous waste disposal.</p>	<p>Educational materials will be provided to tenants annually. Materials to be distributed are found in Appendix C of this WQMP. Tenants will be provided these materials by the Property Management prior to occupancy and annually thereafter.</p> <p><u>Frequency:</u> Annually</p>	National Community Renaissance
Yes	<p>N2. Activity Restrictions</p> <p>The owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution.</p>	<p>The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Restrictions include, but are not limited to, prohibiting vehicle maintenance or vehicle washing.</p> <p><u>Frequency:</u> Ongoing</p>	National Community Renaissance

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	<p>N3. Common Area Landscape Management The Owner shall be responsible for ongoing maintenance and management of landscaped areas on the project site, consistent with OC DAMP Section 5.5, Management Guidelines for Use of Fertilizers as well as City standards. Program includes how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices, ongoing trimming and other landscape maintenance activities and proper disposal of landscape wastes by the owner and/or contractors.</p>	<p>Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting, and replacement of mulch shall be performed on an as-needed basis to prevent exposure of erodible surfaces. Trimmings, clippings, and other landscape wastes shall be properly disposed of in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and storm drains inlets. <u>Frequency:</u> Monthly</p>	National Community Renaissance
Yes	<p>N4. BMP Maintenance The Owner will be responsible for the implementation and maintenance of each applicable LID and structural BMP prescribed for the project. Inspection and maintenance will be carried out by property management staff and/or contractors.</p>	<p>Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be kept by the Owner and shall be available for review upon request. <u>Frequency:</u> Ongoing</p>	National Community Renaissance
No	N5. Title 22 CCR Compliance (How development will comply)	Not Applicable	
No	N6. Local Industrial Permit Compliance	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	N7. Spill Contingency Plan	Not Applicable	
No	N8. Underground Storage Tank Compliance	Not Applicable	
No	N9. Hazardous Materials Disclosure Compliance	Not Applicable	
No	N10. Uniform Fire Code Implementation	Not Applicable	
Yes	<p>N11. Common Area Litter Control</p> <p>The property management will be responsible for performing trash pickup and sweeping of littered common areas as needed, and weekly at a minimum. Any trash/debris waste collected shall be properly disposed of in accordance with local regulations. Responsibilities will also include noting improper disposal of materials and reporting such violations for further investigation.</p>	<p>Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities.</p> <p><u>Frequency:</u> Weekly</p>	National Community Renaissance
Yes	<p>N12. Employee Training</p> <p>All employees of the property owner/management and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, and housekeeping practices.</p>	<p>The Owner shall educate all new employees/managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Materials that may be utilized on BMP maintenance are included in Appendix D.</p> <p><u>Frequency:</u> Annually</p>	National Community Renaissance
No	N13. Housekeeping of Loading Docks	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	N14. Common Area Catch Basin Inspection	Catch basin inlets shall be inspected and, if necessary, cleaned prior to the storm season by October 1st each year. <u>Frequency:</u> Annually	National Community Renaissance
Yes	N15. Street Sweeping Private Streets and Parking Lots	Parking lots must be swept at least quarterly (every 3 months), including prior to the start of the rainy season (October 1st). <u>Frequency:</u> Quarterly	National Community Renaissance
No	N16. Retail Gasoline Outlets	Not Applicable	
STRUCTURAL SOURCE CONTROL BMPs			
Yes	S1. Provide storm drain system stenciling and signage	The phrase “NO DUMPING! DRAINS TO OCEAN”, or an equally effective phrase approved by the City, will be stenciled on all major storm drain inlets within the project site to alert the public to the destination of pollutants discharged into storm water. Storm drain stencils shall be inspected for legibility, at minimum, once every five years. Those determined to be illegible will be re-stenciled as soon as possible. <u>Frequency:</u> Annually	National Community Renaissance
No	S2. Design and construct outdoor material storage areas to reduce pollution introduction	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	S3. Design and construct trash and waste storage areas to reduce pollution introduction	Sweep trash area at least once per week and before October 1 st each year. Maintain area clean of trash and debris at all times. <u>Frequency:</u> Weekly	National Community Renaissance
Yes	S4. Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, and day or night time temperatures. Water from testing/flushing shall be collected and properly disposed to the sewer system and shall not discharge to the storm drain system. <u>Frequency:</u> 2x per year	National Community Renaissance
No	S5. Protect slopes and channels and provide energy dissipation	Not Applicable	
No	S6. Dock areas	Not Applicable	
No	S7. Maintenance bays	Not Applicable	
No	S8. Vehicle wash areas	Not Applicable	
No	S9. Outdoor processing areas	Not Applicable	
No	S10. Equipment wash areas	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	S11. Fueling areas		Not Applicable
No	S12. Hillside landscaping		Not Applicable
No	S13. Wash water control for food preparation areas		Not Applicable
No	S14. Community car wash racks		Not Applicable

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
LOW IMPACT DEVELOPMENT BMPs		
<p>Infiltration BMP #1: Maxwell Plus Drywell (or similar)</p>	<p>Performed in accordance with manufacturer’s specifications. Typical maintenance includes conducting routine inspections for accumulation and cleaning/pollutant removal as necessary from the pre-treatment settling chamber. Quarterly inspections will help maintain optimal performance and to determine typical accumulation levels during both dry-weather and wet-weather flows. The pretreatment settling chamber shall be cleaned when sediment accumulation is at or above the “cleanout line” marked inside of the chamber, and at a minimum of once per year, prior to the start of the storm season. Care should be taken to prevent spills during pollutant removal and cleaning. Oil and other hydrocarbons shall be cleaned out of the settling chamber as needed, once per year at a minimum. See attached for additional maintenance information provided by the manufacturer.</p> <p><u>Frequency:</u> 2X per year</p>	<p>National Community Renaissance</p>

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
<p>BMP #2 Underground Detention System (Contech CMP or similar)</p>	<p>The underground detention system shall be inspected annually and after major storm events, and cleaned at a minimum of once per year, prior to the start of the rainy season (October 1st). Cleaning and maintenance will be performed per manufacturer specifications and will typically include removal of any trash and debris and excess sediment within the pipes. Sediment shall be removed when deposits approach within 6 inches of the invert heights of the connecting pipes between the chamber rows or inlet structures.</p> <p><u>Frequency:</u> Annually</p>	<p>National Community Renaissance</p>
<p>Pre-Treatment BMP #3: Hydrodynamic Separator (CDS or similar)</p>	<p>The hydrodynamic separator should be inspected for oil, sediment, trash and debris. The proposed system will need to be maintained in accordance with the manufacturer's specifications. Buildup of debris may block the inlet or outlet pipe which could result in ineffective operation of the system. Typical maintenance will include removal of sediment and solids using a vacuum truck when system is 75% full.</p> <p><u>Frequency:</u> 2x per year</p>	<p>National Community Renaissance</p>

Required Permits

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

Forms to Record BMP Implementation, Maintenance, and Inspection

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

Recordkeeping

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

Waste Management

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

Funding

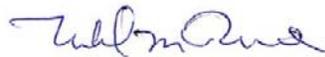
As stated in Section II.5 and Section V of the WQMP, National Community Renaissance will lease part of the property from the Church of the Blessed Sacrament for the residential housing development.

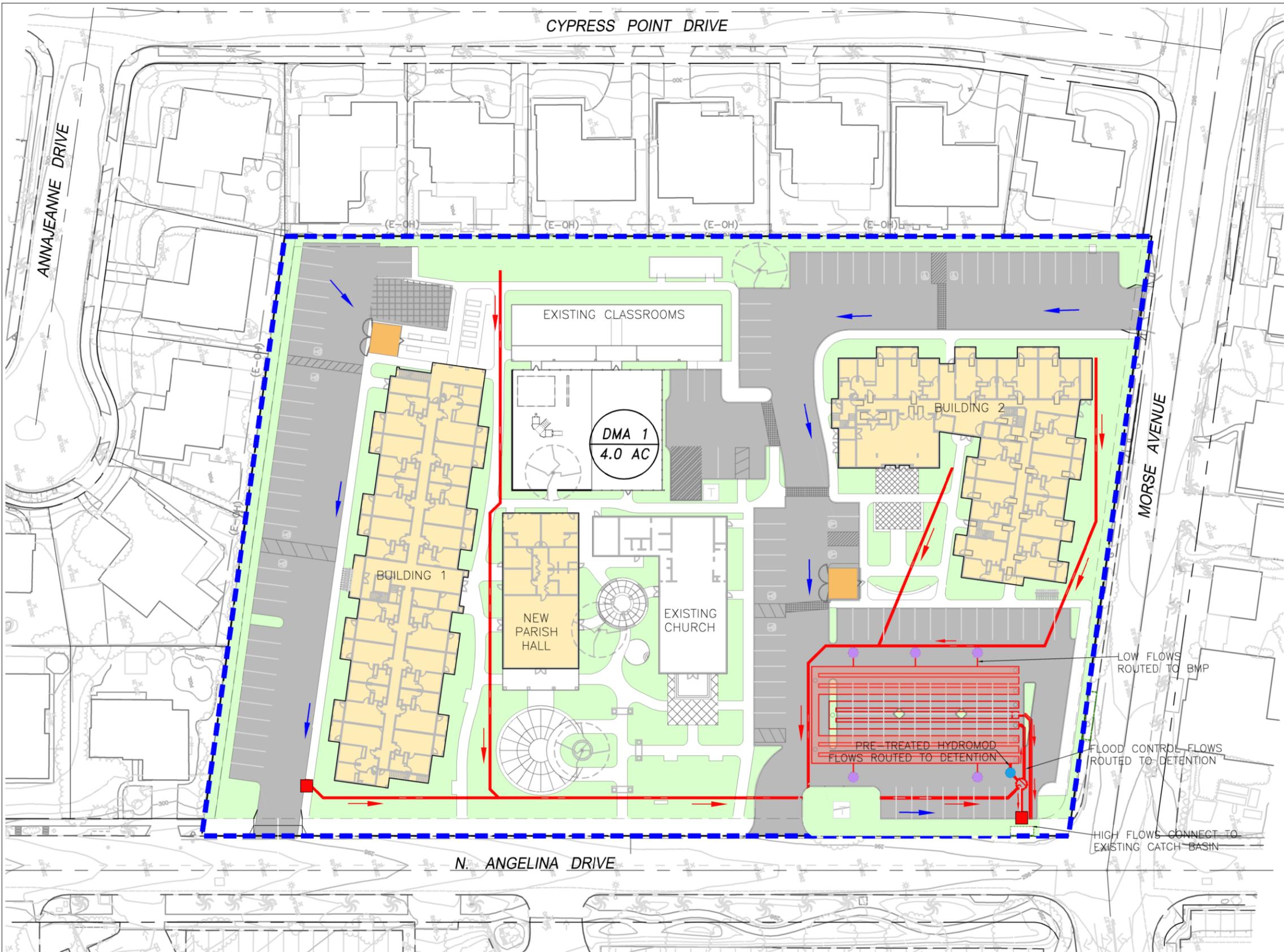
The owner and lessee are aware of the maintenance responsibilities of the proposed BMPs. A funding mechanism is in place to maintain the BMPs at the frequency stated in the WQMP. A maintenance agreement will be drafted between the owner (Church of the Blessed Sacrament) and the lessee (National Community Renaissance). Once established, the lessee will enforce Covenants, Conditions and Restrictions (CC&Rs) related to the property. They be responsible to inform residents of established CC&Rs in compliance with the O&M of the project's WQMP as well as inspect and maintain the structural BMPs outlined in the WQMP.

PROJECT OWNER'S CERTIFICATION			
Permit/Application No.:	Pending	Grading Permit No.:	Pending
Tract/Parcel Map and Lot(s)No.:		Building Permit No.:	Pending
Address of Project Site and APN:	1314 North Angelina Drive, Placentia, CA 92870 APN: 340-273-25		

This Water Quality Management Plan (WQMP) has been prepared for BLESSED SACRAMENT CHURCH by FUSCOE ENGINEERING, INC. The WQMP is intended to comply with the requirements of the County of Orange NPDES Stormwater Program requiring the preparation of the plan.

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

OWNER:			
Name:	Michael Ruane		
Title:	Executive Vice President		
Company:	National Community Renaissance		
Address:	9421 Haven Avenue Rancho Cucamonga, CA 91730		
Email:	mruane@nationalcore.org		
Telephone #:	(909) 204-3451		
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:	7/9/2020



LEGEND

- PROPERTY LINE
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- BMP DRAINAGE AREA BOUNDARY
- PROPOSED COMMON AREA LANDSCAPING
- PROPOSED BUILDING
- STREET SWEEPING PRIVATE STREETS & PARKING LOTS
- PROPOSED DETENTION SYSTEM FOR 2-YEAR FLOWS
- PROPOSED DRYWELL
- PROPOSED PRE-TREATMENT (HYDRODYNAMIC SEPARATOR)
- CATCH BASIN STENCILING & MAINTENANCE
- TRASH ENCLOSURE
- DIRECTION OF SURFACE FLOW
- DIRECTION OF PIPED FLOW
- DRAINAGE MANAGEMENT AREA AND ACREAGE



RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

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

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

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

OPERATION AND MAINTENANCE OF *MaxWell*[®] DRYWELL

The Operation and Maintenance Format will include the following key components:

1.) Inspection Guidelines:

New installations

Newly installed systems should receive a thorough visual examination following the first several significant rainfall events. This assessment will assure that there is no standing water, and that runoff or nuisance water flows are being eliminated within the allowable 48 hour draw-down timeframe.

Ongoing Operations

At a minimum, the drainage structures should be inspected annually, and within 48 hours following a significant storm event to ensure that there is no standing water in the chambers.

2.) Maintenance Format:

After the first 12-months of entering service, it is recommended that an initial cleaning be undertaken. This will help to establish the amount of accumulated particulate matter and debris to be expected on a yearly basis. Thereafter, the systems should receive inspection at least annually, and cleaning should be undertaken when the evaluation reveals that 15% or more of the original chamber volume is occupied by silt and sediment.

During the maintenance operation, all screens and filters should be serviced and the floating absorbent blankets replaced, along with the geo-textile fabric at the bottom of the chambers. Should repair be needed, descriptions of deficiencies and estimated costs for suggested corrections should be provided. The above information shall be submitted in writing to the Owner at the conclusion of the maintenance service. Replacement is recommended for drywells that no longer dispose of ponded water within 48 hours after cleaning.

3.) Maintenance Records:

A written log shall be kept on-site of all inspections and maintenance performed on the drainage systems.

Torrent Resources Incorporated
1509 East Elwood Street
Phoenix Arizona 85040-1391

phone 602-268-0785
fax 602-268-0820

www.TorrentResources.com

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

An evolution of McGuckin Drilling

CDS[®] Inspection and Maintenance Guide



Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allow both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine whether the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS system should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.



CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y ³	m ³
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities



Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

©2017 Contech Engineered Solutions LLC, a QUIKRETE Company

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treatment products. For information, visit www.ContechES.com or call 800.338.1122

NOTHING IN THIS CATALOG SHOULD BE CONSTRUED AS AN EXPRESSED WARRANTY OR AN IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. SEE THE CONTECH STANDARD CONDITION OF SALES (VIEWABLE AT WWW.CONTECHES.COM/COS) FOR MORE INFORMATION.

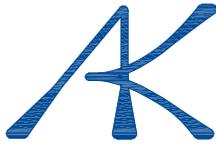
The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; 7,517,450 related foreign patents or other patents pending.

APPENDIX E

CONDITIONS OF APPROVAL (PENDING ISSUANCE)

APPENDIX F

GEOTECHNICAL REPORT



ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

January 10, 2020
J.N.: 2859.00

Ms. Sarah Walker
National Community Renaissance
4322 Piedmont Drive
San Diego, CA 92107

Subject: Preliminary Geotechnical Investigation, Proposed Residential Development, 1314 Angelina Drive, Placentia, California.

Dear Ms. Walker,

Pursuant to your request, *Albus-Keefe & Associates, Inc.* is pleased to present to you our preliminary geotechnical investigation report for the subject development. This report presents the results of our field investigation, laboratory testing, engineering analyses, as well as our preliminary geotechnical recommendations for design and construction of the subject development.

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 this office.

Sincerely,

ALBUS-KEEFE & ASSOCIATES, INC.

Paul Kim
Associate Engineer

TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
1.1 PURPOSE AND SCOPE	1
1.2 SITE LOCATION AND DESCRIPTION.....	1
1.3 PROPOSED DEVELOPMENT	3
2.0 INVESTIGATION.....	3
2.1 RESEARCH	3
2.2 SUBSURFACE EXPLORATION	3
2.3 LABORATORY TESTING	4
3.0 GEOLOGIC CONDITIONS.....	4
3.1 SOIL CONDITIONS.....	4
3.2 GROUNDWATER.....	4
3.3 FAULTING.....	5
4.0 ANALYSES	5
4.1 SEISMICITY AND SEISMIC DESIGN PARAMETERS	5
4.2 STATIC SETTLEMENT	6
5.0 CONCLUSIONS	7
5.1 FEASIBILITY OF PROPOSED DEVELOPMENT.....	7
5.2 GEOLOGIC HAZARDS.....	7
5.2.1 Ground Rupture	7
5.2.2 Ground Shaking	7
5.2.3 Landsliding	7
5.2.4 Liquefaction	8
5.3 STATIC SETTLEMENT	8
5.4 EARTHWORK AND MATERIAL CHARACTERISTICS.....	8
5.5 SHRINKAGE AND SUBSIDENCE.....	9
5.6 SOIL EXPANSION.....	9
6.0 RECOMMENDATIONS.....	10
6.1 EARTHWORK.....	10
6.1.1 General Earthwork and Grading Specifications	10
6.1.2 Pre-Grade Meeting and Geotechnical Observation	10
6.1.3 Site Clearing.....	10
6.1.4 Site Preparation (Removals and Overexcavations).....	11
6.1.5 Fill Placement	11
6.1.6 Import Materials.....	11
6.1.7 Temporary Excavations	12
6.2 SEISMICITY.....	12
6.3 SEISMIC DESIGN PARAMETERS	12
6.4 FOUNDATION DESIGN	13
6.4.1 General.....	13
6.4.2 Soil Expansion	13
6.4.3 Settlement	13
6.4.4 Allowable Bearing Value.....	14
6.4.5 Lateral Resistance.....	14
6.4.6 Conventional Spread Foundations and Slabs on Grade.....	14
6.4.7 Foundation Observations	15

TABLE OF CONTENTS

6.5	RETAINING AND SCREENING WALLS.....	15
6.5.1	General.....	15
6.5.2	Allowable Bearing Value and Lateral Resistance	15
6.5.3	Active Earth Pressures	15
6.5.4	Drainage and Moisture-Proofing	16
6.5.5	Footing Reinforcement and Wall Jointing.....	17
6.5.6	Footing Observations.....	17
6.5.7	Retaining Wall Backfill	17
6.6	EXTERIOR FLATWORK	17
6.7	CONCRETE MIX DESIGN.....	18
6.8	CORROSION	18
6.9	PRELIMINARY PAVEMENT DESIGN	18
6.9.1	Subgrade Preparation	18
6.9.2	Preliminary Pavement Structural Sections.....	18
6.9.1	Subgrade Preparation	19
6.9.2	Aggregate Base	19
6.9.3	Asphaltic Concrete.....	19
6.9.4	Concrete Paver	19
6.9.5	Portland Cement Concrete	20
6.10	POST GRADING CONSIDERATIONS	20
6.10.1	Site Drainage and Irrigation	20
6.10.2	Utility Trenches	21
6.11	PLAN REVIEW AND CONSTRUCTION SERVICES	21
7.0	LIMITATIONS.....	22
8.0	REFERENCES.....	23

FIGURES AND PLATES

Figure 1 – Site Location Map

Plate 1– Geotechnical Map

APPENDICES

APPENDIX A – Exploration Logs

Plates A-2 through A-10 – Exploration Logs

APPENDIX B – Laboratory Test Program

Table B – Summary of Laboratory Test Results

Plates B-1 – Grain Size Distribution Plot

Plates B-2 through B-5 – Consolidation Plots

Plates B-6 – Direct Shear Test Plot

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purposes of our preliminary geotechnical investigation were to evaluate geotechnical conditions within the project area and to provide conclusions and recommendations relevant to the design and construction of the proposed improvements at the subject site. The scope of this investigation included the following:

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

1.2 SITE LOCATION AND DESCRIPTION

The site is located at 1314 North Angelina Drive within the city of Placentia, California. The property is bordered by North Angelina Drive to the West, single-family residences to the North and East, and Morse Avenue to the South. The location of the site and its relationship to the surrounding areas is shown on Figure 1, Site Location Map.

The site consists of a rectangular-shaped property containing approximately 4 acres of land. The site is relatively flat with elevations ranging from EL. 294 to EL. 297 above mean sea level (based on Google Earth) descending to the south-west. The site is currently occupied by Blessed Sacrament Episcopal Church. There are currently two existing structures and it appears that the structure located westerly is used for church gatherings. The easterly structure is used as a school facility. Associated parking areas are located along the southern boundary with vegetation occupying the remainder to the site. Perimeter walls run along the North and East boundaries and appear to be associated with the single-family residences.

Vegetation includes general landscaping in and around the structures, planters within the parking areas, grass and moderate to large sized trees within the open spaces.



© 2019 Google



SITE LOCATION MAP

**Proposed Residential Development
1314 Angelina Drive
Placentia, California**

NOT TO SCALE

FIGURE 1

1.3 PROPOSED DEVELOPMENT

Based on the conceptual site plan by RRM Design Group, dated September 5, 2019, the proposed project includes the development of two residential buildings accommodating 65 units. Building 1, at the north end of the site, is a linear two-story structure. Building 2 is a two-story, L-shaped building located interior to the site with a three-story element at the northern end of the building transitioning to two-stories toward the single-family neighborhood along the eastern property line. Associated parking, underground utilities and a storm water disposal system are also planned.

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 configuration. We expect the proposed above-grade portion will be of wood-frame construction 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 available historical aerial photographs. The aerial photos indicate that as early 1946, the subject site was part of a larger site and used for agricultural purposes. By 1967, the site was cleared of vegetation and the south half of the existing Church structure was constructed. Additionally, the north- and east-adjacent single-family residences have been constructed. By 1980, the north half of the existing Church structure was constructed. Also, at this time, the parking lot has likely been developed with asphalt. By 2002, the additional asphalt-paved parking appears east of the Church structure. By 2005, the school structure is present. The site has remained relatively unchanged since 2005.

2.2 SUBSURFACE EXPLORATION

Subsurface exploration for this investigation was conducted on December 17, 2019, and consisted of the drilling of four (4) soil borings to depths ranging from approximately 31.5 to 51.5 feet below the existing ground surface (bgs). The borings were drilled using a truck-mounted, continuous flight, hollow-stem-auger drill rig. A representative of Albus-Keefe & Associates, Inc. logged the exploratory borings. 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.

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.

One additional boring was drilled adjacent to boring B-1 for percolation testing. An additional percolation well was also installed in B-3. Details and results of percolation tests are reported under a separate cover.

2.3 LABORATORY TESTING

Selected samples of representative earth materials from our borings were tested in our laboratory. Tests consisted of USCS classification, in-situ moisture content and dry density, expansion index, maximum dry density and optimum moisture content, consolidation/collapse, direct shear strength, grain size analysis, percent passing No. 200 sieve, soluble sulfate content, and corrosivity testing (pH, chloride, and resistivity). Descriptions of laboratory testing and the test results are presented in Appendix B and on the Exploration Logs in Appendix A.

3.0 GEOLOGIC CONDITIONS

3.1 SOIL CONDITIONS

Descriptions of the earth materials encountered during our investigation are summarized below and are presented in detail on the Exploration Logs presented in Appendix A.

Soil materials encountered at the subject site generally consisted of Quaternary-aged alluvium (Qal). However, artificial fill materials were encountered within the parking lot at B-1 with an approximate thickness of 4 feet. The artificial fill consists of a sandy clay, grayish brown, moist, very stiff with fine to medium grained sand.

The alluvial materials were encountered to the maximum depth explored of 51.5 feet and are comprised of interbedded layers of damp to moist, reddish brown and light reddish-brown sandy clay, silty sand, clayey sand, silty clay, and sand. The granular alluvial soils are typically medium dense while the fine-grained alluvial soils are typically very stiff to hard.

A more detailed description of the interpreted soil profile at each of the boring locations, based upon the soil cuttings and soil samples, are presented in Appendix A. The stratigraphic descriptions in the logs represent the predominant materials encountered during investigation. 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 the maximum depth of 51.5 feet. Based on a review of the referenced CDMG Special Report, the historical groundwater for the site is not available. Additional review of the Department of Water Resources groundwater level data for the nearby well 338950N1178554W001 (approximately 2,600 feet to the northeast) indicates that groundwater for the area is below 150 feet in depth between 1970 to present. Review of well data

from the State Water Resources Board GeoTracker database indicates groundwater levels in excess of 110 feet below the ground surface. These wells are estimated to be in generally similar geologic conditions based on review available geologic maps.

3.3 FAULTING

Geologic literature and field exploration do not indicate the presence of active faulting within the site. The site does not lie within an "Earthquake Fault Zone" as defined by the State of California in the Earthquake Fault Zoning Act. Table 3.1 presents a summary of all the known seismically active faults within 10 miles of the site.

TABLE 3.1
Summary of Active Faults

Name	Distance (miles)	Slip Rate (mm/yr.)	Preferred Dip (degrees)	Slip Sense	Rupture Top (km)	Fault Length (km)
Puente Hills (Coyote Hills)	0.91	0.7	26	thrust	2.8	17
Elsinore;W+GI	2.97	n/a	81	strike slip	0	83
Elsinore;W+GI+T+J+C M	2.97	n/a	84	strike slip	0	241
Elsinore;W	2.97	2.5	75	strike slip	0	46
Elsinore;W+GI+T	2.97	n/a	84	strike slip	0	124
Elsinore;W+GI+T+J	2.97	n/a	84	strike slip	0	199
Puente Hills (Santa Fe Springs)	9.57	0.7	29	thrust	2.8	11
Puente Hills (Coyote Hills)	0.91	0.7	26	thrust	2.8	17
Elsinore;W+GI	2.97	n/a	81	strike slip	0	83
Elsinore;W+GI+T+J+C M	2.97	n/a	84	strike slip	0	241
Elsinore;W	2.97	2.5	75	strike slip	0	46
Elsinore;W+GI+T	2.97	n/a	84	strike slip	0	124

4.0 ANALYSES

4.1 SEISMICITY AND SEISMIC DESIGN PARAMETERS

2019 CBC requires seismic parameters in accordance with ASCE 7-16. Unless noted otherwise, all section numbers cited in the following refer to the sections in ASCE 7-16.

Per Section 20.3 the project site was designated as Site Class D. We used USGS seismic design maps web tool developed by SEAOC and OSHPD to obtain the basic mapped acceleration parameters, including short periods (S_s) and 1-second period (S_1) MCE_R Spectral Response Accelerations. Section 11.4.8 requires site-specific ground hazard analysis for structures on Site Class E with S_s greater than or equal to 1.0 or Site Class D or E with S_1 greater than or equal to 0.2. Based on the mapped values of S_s and S_1 the project site falls within this category, requiring site specific hazard analysis in accordance with Section 21.2.

According to Section 21.2.3 (Supplement 1), the site-specific Risk Targeted Maximum Considered Earthquake (MCE_R) spectral response acceleration at any period is the lesser of the probabilistic and the deterministic response accelerations, subject to the exception specified in the same section. The probabilistic response spectrum was developed using USGS Risk Targeted Ground Motion (RTGM) calculator, which implements Method 2 as described on Section 21.2.1.2. The spectral acceleration and annual frequency of exceedance required by the RTGM calculator were extracted from hazard curves produced by USGS Unified Hazard Tool for the project site.

In accordance with Section 21.2.2 (Supplement 1), the deterministic spectral response acceleration at each period was calculated as the 84th percentile, 5% damped, response acceleration, using the NGA-West2 GMPE Worksheet. For this, the information from at least three causative faults with the greatest contribution per deaggregation analysis were used, and the larger acceleration spectrum among these was selected as the deterministic response spectrum. The deterministic spectrum was adjusted per requirements in Section 21.2.2 (Supplement 1) where applicable. Both probabilistic and deterministic spectra were subjected to the maximum direction scale factors specified in Section 21.2 to produce the maximum acceleration spectra.

Design response spectrum was developed by subjecting the site-specific MCE_R response spectrum to the provisions outlined in Section 21.3. This process included comparison with 80% code-based design spectrum determined in accordance with Section 11.4.6. The short period and long period site coefficient (F_a and F_v , respectively) were determined per Section 21.3 in conjunctions with Table 11.4-1. Site specific design acceleration parameters (S_{MS} , S_{M1} , S_{DS} , and S_{D1}) were calculated according to Section 21.4.

Per Section 11.2 (definitions on Page 79 of ASCE7-16) for evaluation of liquefaction, lateral spreading, seismic settlements, and other soil-related issues, Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration PGA_M shall be used. The site-specific PGA_M is calculated per Section 21.5.3, as the lesser of the probabilistic PGA_M (Section 21.5.1) and deterministic PGA_M (Section 21.5.2), but no less than 80% site modified peak ground acceleration, PGA_M , obtained from SEAOC/OSHPD web-based seismic hazard tool.

4.2 STATIC SETTLEMENT

Analyses were performed to evaluate the potential for static settlement of the underlying alluvial soils. Our analyses were based on the results of consolidation tests performed on selected samples from our borings as well as the recorded blow counts during the exploration. Results of our testing indicate the native site materials have low to moderate compressibility. In its current state, the native materials would result in excessive settlement due to the weight of new foundations.

The artificial fill soils were not considered in our settlement analysis as it is considered unsuitable for support of the proposed site development.

Provided remedial removals are performed, total and differential static settlement can likely be limited to a maximum of 1 inch and ½-inch over 30 feet, respectively. These estimated magnitudes of static settlements are considered within tolerable limits for the proposed 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 recommendations presented in this report are incorporated into the design and construction of the project. Furthermore, it is the opinion that the proposed development, if constructed in accordance with the recommendations provided in our referenced report, will be safe against hazards from settlement, slippage, or landslides. The proposed site development will have no adverse effects on the stability of adjacent property if graded in accordance with this firm's recommendations and the approved rough grading plans.

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 bounds of an "Earthquake Fault Zone" as defined by the State of California in the Los Angeles Earthquake Fault Zoning Act. As such, the potential for ground rupture due to fault displacement beneath the site is considered very low. The nearest zoned fault is the Whittier Fault located 3.5 miles to the northeast.

5.2.2 Ground Shaking

The site is located in a seismically active area that has historically been affected by moderate to occasionally high levels of ground motion. The site lies in relatively close proximity to several seismically active faults; therefore, during the life of the proposed development, the property will probably experience 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. Design of proposed structures in accordance with the current CBC is anticipated to adequately mitigate concerns with ground shaking.

5.2.3 Landsliding

Geologic hazards associated with landsliding are not anticipated at the site due to not being located within an area identified by the California Geologic Survey (CGS) as having potential for seismic slope instability. Additionally, the site is relatively level.

5.2.4 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 soils was evaluated by analyzing the potential of 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).

Based on the historically low groundwater level, the potential for liquefaction at the site is considered to be low. Additionally, the site is not mapped within a State-designated zone of potentially liquefiable soils.

5.3 STATIC SETTLEMENT

The existing artificial fills are considered unsuitable for support of the proposed development. Additionally, the near-surficial alluvial soils are compressible which would result in excessive settlements for the proposed development in its current condition. Therefore, removal and recompaction of the existing surficial soils to provide a uniform compacted blanket will be necessary. Provided grading and construction are performed in accordance with the recommendations provided herein, estimated total and differential settlement of proposed site improvements are anticipated to be less than 1 inch and ½ inch over 30 feet, respectively. These magnitudes of settlement are considered within tolerable limits of proposed site development.

5.4 EARTHWORK AND MATERIAL CHARACTERISTICS

All artificial fill is considered unsuitable to support proposed site development. This condition can be mitigated by the removal and re-compaction of the unsuitable soils. The non-engineered fill is estimated to be approximately 3 feet in depth and located in the southwest corner of the site. Although, locally deeper conditions may exist and likely throughout the site, particularly in the vicinity of the existing structures.

Removal and recompaction of the existing surficial materials is anticipated to result in minor shrinkage. Design of site grading will require consideration of this loss when evaluating earthwork balance issues.

Onsite earth materials are anticipated to be relatively easy to excavate with conventional heavy earthmoving equipment. The site earth materials are generally considered suitable for reuse as fill provided they are cleared on deleterious debris and oversized rocks (greater than 12 inches in greatest dimension). Site materials are generally below the optimum moisture content with a few localized

layers above the optimum moisture content. As such, fill soils derived from onsite soils will require the addition of minor amounts of water and mixing in preparation for reuse as compacted fill.

Temporary construction slopes will be required to complete removal of unsuitable soils and for construction of underground utilities. Such excavations will require laybacks where they are surcharged or where they exceed 4 feet in height. Specific recommendations to provide for stable temporary cuts are provided later in this report. The use of appropriate shoring or lay backs will be essential to protect workers and prevent delays due to caving during trenching or temporary backcut activities. These materials will also be very prone to erosion during periods of rain until they are covered by pavement or mature landscaping. Appropriate protection during the rainy season will be required to avoid costly repairs due to erosion.

If encountered, portions of concrete debris and asphalt can likely be reduced in size (4" minus) and incorporated within fill soils during earthwork operations.

Onsite disposal systems, clarifiers, and other underground improvements may also be present beneath the site. If encountered during future demolition or rough grading, these improvements will require proper abandonment or removal.

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. Special grading techniques, such as slot cuttings, will be required adjacent to property lines where offsite structures are nearby. Construction of perimeter site walls may require deepened footings where removals are restricted by property boundaries.

5.5 SHRINKAGE AND SUBSIDENCE

Volumetric changes in earth quantities will occur when excavated onsite soil materials are replaced as properly compacted fill. We estimate that the existing surficial soils will shrink approximately up to 10 percent. Subsidence due to reprocessing of removal bottoms is anticipated to be negligible. The estimates of shrinkage and subsidence 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 shrinkage and subsidence that occurs during the grading process.

5.6 SOIL EXPANSION

Based on our laboratory test results and USCS visual manual classification, the near-surface soils and the anticipated soils at basement subgrade within the site are generally anticipated to possess a **Low to medium** expansion potential. Additional testing for soil expansion will be required subsequent to rough grading and prior to construction of foundations and other concrete flatwork to confirm these conditions.

6.0 RECOMMENDATIONS

6.1 EARTHWORK

6.1.1 General Earthwork and Grading Specifications

All earthwork and grading should be performed in accordance with all applicable requirements of the grading codes of the City of Placentia, California and CAL OSHA, in addition to recommendations presented herein.

6.1.2 Pre-Grade Meeting and Geotechnical Observation

Prior to commencement of earthwork operations and foundation installation, we recommend a meeting be held between the City Inspector, general contractor, civil engineer, and geotechnical consultant to discuss proposed earthwork and logistics.

We also recommend that a geotechnical consultant be retained to provide soil engineering and engineering geologic services during site development. This is to observe compliance with the design specifications and recommendations, and to allow design changes in the event that subsurface conditions differ from those anticipated. If conditions are encountered during construction that appears to be different than those indicated in this report, the project geotechnical consultant should be notified immediately. Design and construction revisions may be required.

6.1.3 Site Clearing

Site improvements, such as asphaltic pavement, structural foundations and underground utilities, should be removed from the areas to be developed prior to any grading activities. Existing underground utility lines within the project area that will be protected in place and that fall within a 1 to 1 (H:V) plane projected down from the edges of footings may be subject to surcharge loads. Under such conditions, this office should be made aware of these conditions for evaluation of potential surcharging. Supplemental recommendations may be required to protect such improvements in place.

In general, seepage pits that are open should be cleared of any fluids and then filled with 2-sack cement slurry up to within 5 feet of proposed grades. Any brick lining that remains in the upper 5 feet should be removed and the remainder of the pit filled with engineered fill in accordance with Section 6.1.5. Seepage pits that are presently backfilled with soil should be removed to a depth of 10 feet below pad grade and be capped with 2-sack cement slurry. The slurry cap should be at least 5 feet thick and should extend at least 12 inches outside the perimeter of the seepage pit. The remaining 5 feet should be filled with engineered fill in accordance with Section 6.1.5.

The project geotechnical consultant should be notified at the appropriate times to provide observation services during clearing operations to verify compliance with the above recommendations. Voids created by clearing and excavation should be left open for observation by the geotechnical consultant. Should any unusual soil conditions or subsurface structures be encountered during site clearing or grading that are not described or anticipated herein, these conditions should be brought to the immediate attention of the project geotechnical consultant for corrective recommendations as needed.

Temporary construction equipment (office trailers, power poles, etc.) should be positioned to allow adequate room for clearing and recommended ground preparation to be performed for proposed structures, pavements, and hardscapes.

6.1.4 Site Preparation (Removals and Overexcavations)

In general, the artificial fill and the near-surface compressible materials are considered unsuitable for support of the proposed development at the site. These materials should be removed from proposed building, street and other “structural” areas, and replaced as engineered compacted fill. The removal depth is anticipated to be up to 4 feet and existing soils should be over-excavated to at least a depth of 2 feet below the bottom of footings for structures supported by conventional spread footings at grade. The actual depth of removal should be determined by the geotechnical consultant during grading.

The removals should extend laterally a distance of at least 5 feet beyond the limits of the proposed structures or a 1:1 projection down and away from the bottom of the footings, whichever is greater. Removals for retaining walls less than 3 feet in height and screen walls may be limited to the edge of the foundations or pavement. Upon review of more detailed site development plans, the depth of removals for short retaining walls and screen walls may be lessened from the general removals described above.

Where removals are limited by existing structures, protected trees or property lines, special considerations may be required in the construction of affected improvements. Under such conditions, specific recommendations should be provided by this firm based on review of site-specific development plans.

Following removals/excavation, the exposed grade should first be scarified to a depth of 6 inches, brought to at least 120 percent of the optimum moisture content, and then compacted to at least 90 percent of the laboratory standard (ASTM D 1557).

6.1.5 Fill Placement

Materials excavated from the site may be reused as fill provided they are free of deleterious materials and particles greater than 4 inches in maximum dimension (oversized materials). Asphaltic and concrete debris generated during site demolition or encountered within the existing fill can be incorporated within new fill soils during earthwork operations provided they are reduced to no more than 4 inches in maximum dimension. Such materials should be mixed thoroughly with fill soils to prevent nesting. All fill should be placed in lifts no greater than 8 inches in loose thickness, moisture conditioned to over the optimum moisture content, then compacted in place to at least 90 percent of the laboratory standard. Each lift should be treated in a similar manner. Subsequent lifts should not be placed until the project geotechnical consultant has approved the preceding lift.

6.1.6 Import Materials

If import materials are required to achieve the proposed finish grades, the proposed import soils should have an Expansion Index (EI, ASTM D 4829) less than 50 and possess negligible soluble sulfate concentrations. Import sources should be indicated to the geotechnical consultant prior to hauling the materials to the site so that appropriate testing and evaluation of the fill materials can be performed in advance.

6.1.7 Temporary Excavations

Temporary construction slopes or trench excavations in site materials may be cut vertically up to a height of 4 feet provided that no surcharging of the excavations is present. Temporary slopes over 4 feet in height but no more than 10 feet in height should be laid back to 1:1 (H:V) or flatter and evaluated by the geotechnical consultant.

Excavations should not be left open for prolonged periods of time. The project geotechnical consultant should observe all temporary cuts to confirm anticipated conditions and to provide alternate recommendations if conditions dictate. All excavations should conform to the requirements of CAL OSHA.

Where temporary excavations cannot accommodate a 1:1 layback or where surcharging occurs, shoring, slot cutting, underpinning, or other methods should be used. Specific recommendations for other options if considered should be provided by the geotechnical consultant based on review of the final design plans.

6.2 SEISMICITY

Following ASCE7-16, Section 21.5.3, we have estimated site-specific Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration $PGAM = 0.745g$. Per Section 11.2, this value should be used for evaluation of liquefaction, lateral spreading, seismic settlements, and other soil-related issues. Based on the results of deaggregation analysis performed using USGS Unified Hazard Tool, the mean event associated with a probability of exceedance equal to 2% over 50 years has a moment magnitude of 6.68 and the mean distance to the seismic source is 5.6 miles.

6.3 SEISMIC DESIGN PARAMETERS

For design of the project in accordance with Chapter 16 of the 2019 CBC, the table below presents the seismic design factors.

TABLE 6.1
CBC 2019 SEISMIC DESIGN PARAMETERS

Parameter	Value
Site Class	D
Mapped MCE Spectral Response Acceleration, short periods, S_S	1.730
Mapped MCE Spectral Response Acceleration, at 1-sec. period, S_1	0.609
Site Coefficient, F_a	1.0
Site Coefficient, F_v	2.5
Adjusted MCE Spectral Response Acceleration, short periods, S_{MS}	1.891
Adjusted MCE Spectral Response Acceleration, at 1-sec. period, S_{M1}	1.465
Design Spectral Response Acceleration, short periods, S_{DS}	1.261
Design Spectral Response Acceleration, at 1-sec. period, S_{D1}	0.977
Long-Period Transition Period, T_L (sec.)	8
Seismic Design Category for Risk Categories I-IV	D
MCE = Maximum Considered Earthquake	

Boldface values: Site-specific values per ASCE7-16; other values are mapped values.

6.4 FOUNDATION DESIGN

6.4.1 General

The following recommendations are provided for preliminary design purposes. These recommendations have been based on the site materials exposed during our investigation, our understanding of the proposed development, and the assumption that the recommendations presented herein are incorporated into the design and construction of the project. Final recommendations should be provided by the project geotechnical consultant following review of final foundation plans as well as observation and testing of site materials during grading. Depending upon the design plans and actual site conditions, the recommendations provided herein may require modification.

6.4.2 Soil Expansion

The recommendations presented herein are based on soils with a **Low to Medium** expansion potential ($EI \leq 60$). Following site grading, additional testing of site soils should be performed by the project geotechnical consultant to confirm the basis of these recommendations. If site soils with higher expansion potentials are encountered or imported to the site, the recommendations contained herein may require modification.

6.4.3 Settlement

Under normal static conditions, the foundation system should be designed to tolerate a total settlement of 1 inch and a differential settlement of 1/2-inch over 30 feet. These estimated magnitudes of settlement should be considered by the structural engineer in design of the proposed structures at the site.

6.4.4 Allowable Bearing Value

Foundations for the basement may utilize a bearing value of 2,100 pounds per square foot (psf) for continuous and pad footings a minimum width of 12 inches and founded at a minimum depth of 12 inches below the lowest adjacent grade. This value may be increased by 230 psf and 650 psf for each additional foot in width and depth, respectively, up to a maximum value of 3,400 psf. Recommended allowable bearing values include both dead and live loads, and may be increased by one-third for wind and seismic forces.

6.4.5 Lateral Resistance

Provided site grading is performed and that foundations are founded in engineered fill, a passive earth pressure of 240 pounds per square foot per foot of depth (psf/ft) up to a maximum value of 2,000 pounds per square foot (psf) may be used to determine lateral bearing for footings. This value may be increased by one-third when designing for wind and seismic forces. A coefficient of friction of 0.31 times the dead load forces may also be used between concrete and the supporting soils to determine lateral sliding resistance. No increase in the coefficient of friction should be used when designing for wind and seismic forces. Footings against property lines should have the above-noted values reduced by 50 percent.

The above values are based on footings placed directly against compacted fill or competent native soils. In the case where footing sides are formed, all backfill against the footings should be compacted to at least 90 percent of the laboratory standard.

6.4.6 Conventional Spread Foundations and Slabs on Grade

All exterior and interior continuous footings should have a minimum width of 12 inches and minimum embedment of 12 inches below lowest adjacent grade. All continuous footings for habitable structures should be reinforced with a minimum of one No. 4 bar on top and one No. 4 bar on the bottom.

All spread footings used to support columns should have a minimum width of 18 inches and minimum embedment of 12 inches below lowest adjacent grade. All spread footings in habitable structures should be tied in both directions with a grade beam having a minimum depth and width of 12 inches. The grade beams should be reinforced with a minimum of one No. 4 bar on top and one No. 4 bar on the bottom. Reinforcing of the grade beams should hook into the footings.

Interior concrete slabs constructed on grade should be a nominal 4 inches thick and should be reinforced with 6-inch by 6-inch, W4 X W4 reinforcing wire mesh or No. 3 bars spaced 12 inches on center, each way. Care should be taken to ensure the placement of reinforcement at mid-slab height. Slabs on grade in habitable structures should be hooked to the underlying grade beams on a minimum spacing of 24 inches or poured monolithically with the grade beams.

Interior grade beams as required by the WRI method should be provided in both directions at a maximum spacing of 20 feet. Design of the slab in accordance with the WRI method may use an effective PI of 23. This value already accounts for the factors for ground slope and over-consolidation.

All slabs on grade that may have moisture sensitive coverings should be underlain with a minimum of 10-mil moisture vapor retarder conforming to ASTM E 1745, Class A. A minimum of four (4) inches

of clean sand having a sand equivalent (SE) of at least 30 should be placed under the membrane. An additional one inch of the sand (SE>30) may be placed over the vapor barrier to aid in the uniform curing of the slab if preferred. This vapor barrier system is anticipated to be suitable for most flooring finishes that can accommodate some vapor emissions. However, this system may emit more than 4 pounds of water per 1000 sq. ft. and therefore, may not be suitable for all flooring finishes. Additional steps should be taken if such vapor emission levels are too high for anticipated flooring finishes.

Prior to placing concrete, the subgrade below all floor slab areas should be moisture-conditioned to achieve a moisture content that is at least 120 percent of the optimum moisture content. This moisture content should be maintained a minimum depth of 12 inches below the bottoms of the slabs.

6.4.7 Foundation Observations

Foundation excavation should be observed by the project geotechnical consultant to verify that they have been excavated into competent bearing soils and to the minimum embedment recommended above. These observations should be performed prior to placement of forms or reinforcement. The excavations should be trimmed neat, level and square. Loose, sloughed or moisture-softened materials and debris should be removed prior to placing concrete.

6.5 RETAINING AND SCREENING WALLS

6.5.1 General

The following preliminary design and construction recommendations are provided for general retaining and screen walls supported by engineered compacted fill or competent native soils. Final wall designs specific to the site development should be provided for review once completed. The structural engineer and architect should provide appropriate recommendations for sealing at all joints and applying moisture-proofing material on the back of the walls.

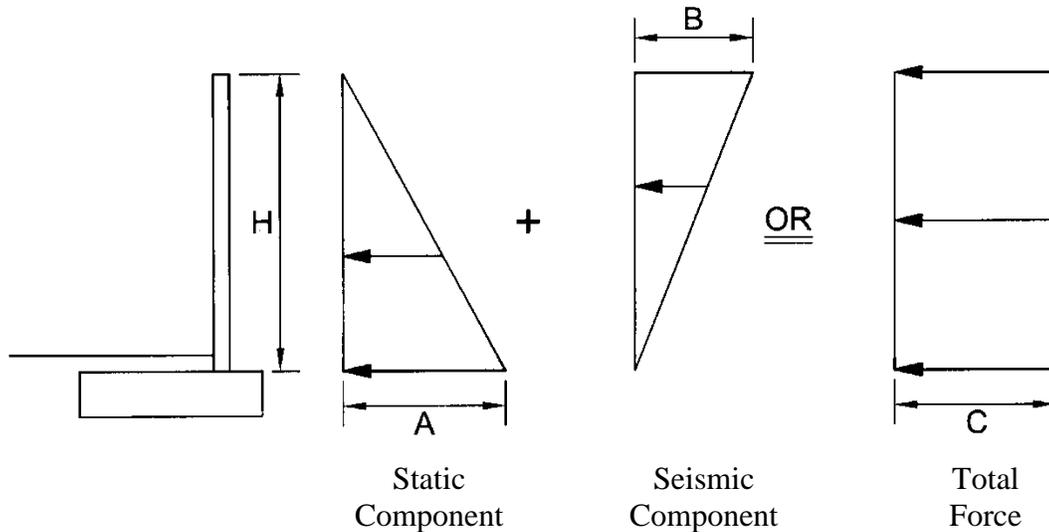
6.5.2 Allowable Bearing Value and Lateral Resistance

Design of retaining and screen walls may utilize the bearing and lateral resistance values provided in Section 0 and 6.4.5. Lateral resistance for walls along property lines, where lateral removals are restricted should be reduced by 50%.

6.5.3 Active Earth Pressures

Static and seismic earth pressures for level and 2:1 (H:V) backfill conditions are provided in Table 6.2. Seismic earth pressures provided herein are based on the method provided by Seed & Whitman (1970) for active condition and Wood (1973) for at-rest condition, both using a peak ground acceleration (PGA) of 0.38g for probability of exceedance of 10% in 50 years. Active condition relates to the unrestrained retaining wall condition where the wall is free to rotate about its base. The at-rest condition should apply to cases where the wall is restrained from rotation, such as the subterranean walls where the movement is restricted by the structural floor members. As indicated in Section 1803.5.12 of the 2019 CBC, retaining walls supporting 6 feet of backfill or less are not required to be designed for seismic earth pressures. In addition, the values are based on drained backfill conditions and do not consider hydrostatic pressure. Furthermore, retaining walls should be designed to support adjacent surcharge loads imposed by other nearby footings or traffic loads in addition to the earth pressure.

TABLE 6.2
SEISMIC EARTH PRESSURES
Pressure Diagram



Pressure Values
Walls Up To 10 Feet High

Value	Backfill Condition	
	Level Active (Unrestrained)	Level At-Rest (Restrained)
A	43H	80H
B	12H	12H
C	28H	46H

Note:
H is in feet and resulting pressure is in psf. Design may utilize either the sum of the static component and the seismic component force diagrams or the total force diagram above. SEAOSC has suggested using a load factor of 1.7 for the static component and 1.0 for the seismic component. The actual load factors should be determined by the structural engineer.

6.5.4 Drainage and Moisture-Proofing

Retaining walls should be constructed with a perforated pipe and gravel subdrain to prevent entrapment of water in the backfill. The perforated pipe should consist of 4-inch-diameter, ABS SDR-35 or PVC Schedule 40 with the perforations laid down. The pipe should be embedded in ¾- to 1½-inch open-graded gravel wrapped in filter fabric. The gravel should be at least one foot wide and extend at least one foot up the wall above the footing and drainage outlet. Drainage gravel and piping should not be placed below outlets and weepholes. Filter fabric should consist of Mirafi 140N, or equal. Outlet pipes should be directed to positive drainage devices.

The use of weepholes may be considered in locations where aesthetic issues from potential nuisance water are not a concern. Weepholes should be 2 inches in diameter and provided at least every 6 feet on center. Where weepholes are used, perforated pipe may be omitted from the gravel subdrain.

Retaining walls supporting backfill should also be coated with a moisture-proofing compound or covered with such material to inhibit infiltration of moisture through the walls. Moisture-proofing material should cover any portion of the back of wall that will be in contact with soil and should lap over and onto the top of footing. A drainage panel should be provided between the soil backfill and water proofing. The panel should extend from the top of the backdrain gravel up to within 12 inches of finish grade. The top of footing should be finished smooth with a trowel to inhibit the infiltration of water through the wall. The project structural engineer should provide specific recommendations for moisture-proofing, water stops, and joint details.

6.5.5 Footing Reinforcement and Wall Jointing

All continuous footings should be reinforced with a minimum of two No. 4 bars, one top and one bottom. Walls should be provided with cold joints spaced no more than 40 feet apart. Wall finishes and capping materials should not extend across the cold joint. The structural engineer may require different reinforcement or jointing and should dictate if greater than the recommendations provided herein. Where recommended removals are limited due to space restrictions, greater reinforcement and closer jointing may be recommended. Specific recommendations should be provided by the geotechnical consultant during grading based on as-built conditions exposed in the field.

6.5.6 Footing Observations

Footing excavations should be observed by the project geotechnical consultant to verify that they have been excavated into competent bearing soils and to the minimum embedment recommended herein. These observations should be performed prior to placement of forms or reinforcement. The excavations should be trimmed neat, level and square. Loose, sloughed or moisture-softened materials and debris should be removed prior to placing concrete.

6.5.7 Retaining Wall Backfill

Onsite soils may generally be used for backfill of retaining walls. The project geotechnical consultant should approve all backfill used for retaining walls. Wall backfill should be moisture-conditioned to slightly over the optimum moisture content; placed in lifts no greater than 12 inches in thickness, and then mechanically compacted with appropriate equipment to at least 90 percent of the laboratory standard. Hand-operated compaction equipment should be used to compact the backfill placed immediately adjacent the wall to avoid damage to the wall. Flooding or jetting of backfill material is not recommended.

6.6 EXTERIOR FLATWORK

Exterior flatwork should be a minimum 4 inches thick. Cold joints or saw cuts should be provided at least every 7 feet in each direction. Flatwork more than 7 feet in width across the minimum dimension should be reinforced with 6" by 6", W4 by W4 welded wire mesh or No 3 bars spaced 12 inches center to center in both directions. Special jointing detail should be provided in areas of block-outs, notches, or other irregularities to avoid cracking at points of high stress. Subgrade soils below flatwork should

be moistened to at least 120 percent of the optimum moisture content to a depth of 12 inches. Moistening should be accomplished by lightly spraying the area over a period of a few days just prior to pouring concrete. The geotechnical consultant should observe and verify the density and moisture content of subgrade soils prior to pouring concrete to ensure that the required compaction and pre-moistening recommendations have been met.

Drainage from flatwork areas should be directed to local area drains and/or other appropriate collection devices designed to carry runoff water to the street or other approved drainage structures. The concrete flatwork should also be sloped at a minimum gradient of 1 percent away from building foundations and retaining walls.

6.7 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.

6.8 CORROSION

Results of preliminary testing of soils for pH, chloride, and minimum resistivity indicate the site is potentially **Moderately Corrosive** to metals that are in contact or close proximity to onsite soils. As such, specific recommendations should be obtained from a corrosion specialist if construction will include metals that will be near or in direct contact with site soils.

6.9 PRELIMINARY PAVEMENT DESIGN

6.9.1 Subgrade Preparation

Prior to placement of paving elements, subgrade soils should be moisture-conditioned to at least 120 percent of the optimum moisture content then compacted to at least 90 percent compaction for asphaltic concrete pavement areas and to at least 95 percent compaction for concrete pavement areas. Areas observed to pump or yield under vehicle traffic should be removed and replaced with firm and unyielding compacted soil or aggregate base materials.

6.9.2 Preliminary Pavement Structural Sections

Based on the soil conditions present at the site and an estimated traffic index, preliminary pavement sections are provided in the table below. An assumed “R-value” of 10 was used for the near-surface soil in this preliminary pavement design. The sections provided below are for planning purposes only and should be re-evaluated subsequent to site grading. Final pavement sections should be based on actual R-value testing of in-place soils and analysis of anticipated traffic.

**TABLE 6.3
PRELIMINARY PAVEMENT STRUCTURAL SECTIONS**

Location	Traffic Index	AC (inches)	Concrete Pavers (mm)	PCC (inches)	AB (inches)
Entry Way and Drives	5.5	3.0	--	--	12.0
		4.0	--	--	9.0
		--	--	8.0	--
		--	80.0	--	13.0
Parking Stalls	--	3.0	--	--	6.0

6.9.1 Subgrade Preparation

Prior to placement of paving elements, subgrade soils should be scarified 6 inches, moisture-conditioned to at least 120 percent of the optimum moisture content then compacted to at least 90 percent of the maximum dry density determined in accordance with ASTM D1557. Areas observed to pump or yield under vehicle traffic should be removed and replaced with firm and unyielding engineered compacted soil or aggregate base materials.

6.9.2 Aggregate Base

Aggregate base materials should be Crushed Aggregate Base or Crushed Miscellaneous Base conforming to Section 200-2 of the Standard Specification for Public Works Construction (Greenbook) or Class 2 Aggregate Base conforming to the Caltrans' Standard Specifications. The materials should be moisture conditioned to slightly over the optimum moisture content then compacted to at least 95 percent of ASTM D 1557.

6.9.3 Asphaltic Concrete

Paving asphalt should be PG 64-10 conforming to the requirements of Section 203-1 of the Greenbook. Asphalt concrete materials should conform to Section 203-6 and construction should conform to Section 302 of the Greenbook.

6.9.4 Concrete Paver

Concrete pavers should conform to the requirements of ASTM C 936. Construction of the pavers, including bedding sand, should follow manufacturer's specifications. Typical thickness of bedding sand is about 1 inch. The gradation of bedding sand should meet the requirement in Table 6.4.

TABLE 6.4
Gradation for Sand Bedding

Sieve Size	Percent Passing
$\frac{3}{8}$ "	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	50 - 85
No. 30	25 - 60
No. 50	5 - 30
No. 100	0 - 10
No. 200	0 - 1

6.9.5 Portland Cement Concrete

Portland cement concrete used to construct concrete paving should conform to Section 201 of the Greenbook and should have a minimum compressive strength of 3,250 pounds per square inch (psi) at 28 days. Reinforcement and jointing of concrete pavement sections should be designed according to the minimum recommendations provided by the Portland Cement Association (PCA). For rigid pavement, transverse and longitudinal contraction joints should be provided at spacing no greater than 15 feet. Score joints may be constructed by saw cutting to a depth of $\frac{1}{4}$ of the slab thickness. Expansion/cold joints may be used in lieu of score joints. Such joints should be properly sealed. Where traffic will traverse over cold joints without keyways or dowels or edges of concrete paving, the edges should be thickened by 20% of the design thickness toward the edge over a horizontal distance of 5 feet.

6.10 POST GRADING CONSIDERATIONS

6.10.1 Site Drainage and Irrigation

The ground immediately adjacent to foundations should be provided with positive drainage away from the structures in accordance with 2019 CBC, Section 1804.4. No rain or excess water should be allowed to pond against structures such as walls, foundations, flatwork, etc.

Excessive irrigation water can be detrimental to the performance of the proposed site development. Water applied in excess of the needs of vegetation will tend to percolate into the ground. Such percolation can lead to nuisance seepage and shallow perched groundwater. Seepage can form on slope faces, on the faces of retaining walls, in streets, or other low-lying areas. These conditions could lead to adverse effects such as the formation of stagnant water that breeds insects, distress or damage of trees, surface erosion, slope instability, discoloration and salt buildup on wall faces, and premature failure of pavement. Excessive watering can also lead to elevated vapor emissions within buildings that can damage flooring finishes or lead to mold growth inside the home.

Key factors that can help mitigate the potential for adverse effects of overwatering include the judicious use of water for irrigation, use of irrigation systems that are appropriate for the type of vegetation and geometric configuration of the planted area, the use of soil amendments to enhance

moisture retention, use of low-water demand vegetation, regular use of appropriate fertilizers, and seasonal adjustments of irrigation systems to match the water requirements of vegetation. Specific recommendations should be provided by a landscape architect or other knowledgeable professional.

6.10.2 Utility Trenches

Trench excavations should be constructed in accordance with the recommendations contained in Section 6.1.7 of this report. Trench excavations must also conform to the requirements of Cal/OSHA.

Trench backfill materials and compaction criteria should conform to the requirements of the local municipalities. As a minimum, utility trench backfill should be compacted to at least 90 percent of the laboratory standard. Materials placed within the pipe zone (6 inches below and 12 inches above the pipe) should consist of particles no greater than $\frac{3}{4}$ inches and have a SE of at least 30. The materials within the pipe zone should be moisture-conditioned and compacted by hand-operated compaction equipment. Above the pipe zone (>1 foot above pipe), the backfill may consist of general fill materials. Trench backfill should be moisture-conditioned to over the optimum moisture content, placed in lifts no greater than 12 inches in thickness, and then mechanically compacted with appropriate equipment to at least 90 percent of the laboratory standard. For trenches with sloped walls, backfill material should be placed in lifts no greater than 8 inches in loose thickness, and then compacted by rolling with a sheepsfoot roller or similar equipment. The project geotechnical consultant should perform density testing along with probing to verify that adequate compaction has been achieved.

Within shallow trenches (less than 18 inches deep) where pipes may be damaged by heavy compaction equipment, imported clean sand having a SE of 30 or greater may be utilized. The sand should be placed in the trench, thoroughly watered, and then compacted with a vibratory compactor. For utility trenches located below a 1:1 (H:V) plane projecting downward from the outside edge of the adjacent footing base or crossing footing trenches, concrete or slurry should be used as trench backfill.

6.11 PLAN REVIEW AND CONSTRUCTION SERVICES

We recommend *Albus-Keefe & Associates, Inc.* be engaged to review any future development plans, including foundation plans prior to construction. This is to verify that the assumptions of this report are valid and that the preliminary conclusions and recommendations contained in this report have been properly interpreted and are incorporated into the project plans and specifications. If we are not provided the opportunity to review these documents, we take no responsibility for misinterpretation of our preliminary conclusions and recommendations.

We recommend that a geotechnical consultant be retained to provide soil engineering services during construction of the project. These services are to observe compliance with the design, specifications or recommendations, and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

If the project plans change significantly from the assumed development described herein, the project geotechnical consultant should review our preliminary design recommendations and their applicability to the revised construction. If conditions are encountered during construction that appear to be different than those indicated in this report or subsequent design reports, the project geotechnical consultant should be notified immediately. Design and construction revisions may be required.

7.0 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 and bedrock 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 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 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 **National Community Renaissance** and his project consultants in the planning and 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. This report is subject to review by the controlling governmental agency.

Respectfully submitted,

ALBUS-KEEFE & ASSOCIATES, INC



Paul Hyun Jin Kim
Associate Engineer
G.E. 3106



8.0 REFERENCES

Publications

- California Geologic Survey, Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California, 2008.
- CDMG, “Seismic Hazard Zone Report for the Yorba Linda 7.5-Minute Quadrangle, Los Angeles, Orange and San Bernardino County, California,” Seismic Hazard Zone Report 010, 2005.
- NCEER, “Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils”, Technical Report NCEER-97-0022, December 31, 1997.
- Seed, HB, and Whitman, RV. "Design of Earth Retaining Structures for Dynamic Loads," ASCE Specialty Conference, Lateral Stresses in the Ground and Design of Earth Retaining Structures, Cornell Univ., Ithaca, New York, 103-147, 1970.
- 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.
- U.S. Geologic Survey. Unified Hazard Tool, <https://earthquake.usgs.gov/hazards/interactive/>
- U.S. Geologic Survey. U.S. Seismic Design Maps, <https://seismicmaps.org/>
- Tokimatsu, K. & Seed, H.B., “Evaluation of Settlement in Sands Due to Earthquake Shaking,” Journal of Geotechnical Engineering, Vol. 113, No. 8, August, 1987.
- 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.

Plans

Conceptual Site Plan, Placentia, California, prepared by rrm design group Architect, dated September 05, 2019, scale: 1” = 30’



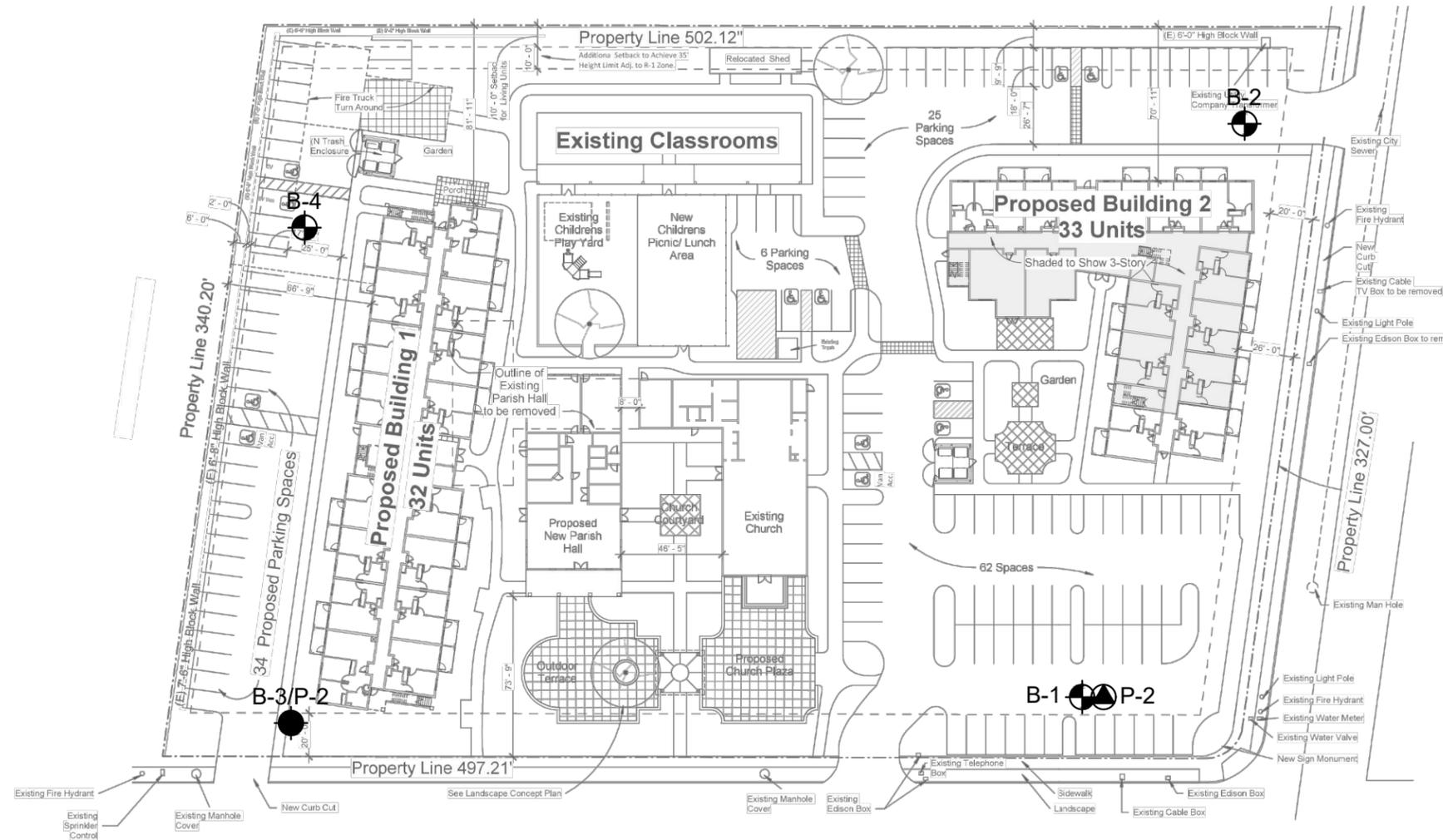
GEOTECHNICAL MAP

Job No.: 2859.00 Date: 12/27/19 Plate: 1

EXPLANATION

(Locations Approximate)

- Exploratory Boring
- Exploratory Percolation Test Boring
- Exploratory Boring and Percolation Test Boring

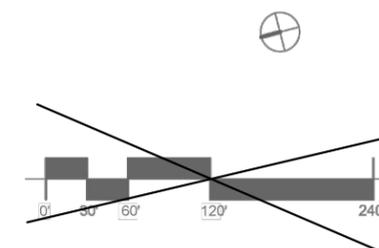


Site Coverage

Name	Area	Percentage
Lot Area (SF) :	169,716 SF/ 3.90 acres	
Maximum Lot Coverage allowed:	60% (101,830 SF)	
Proposed Lot Coverage:	55%	
Building Footprints (Existing and Proposed)	35,631 SF	
Parking and Driveways	53,824 SF	
Covered Patios	3,678 SF	
Total Proposed Lot Coverage	93,133 SF (55%)	
Percentage Open Space Required:	40%	
Percentage Open Space Provided:	45%	

Residential Unit Count

	One Bedroom	Two Bedroom
Building 1	28	4
Building 2	31	2
	59 units	6 units
Total Residential Units:	65	



APPENDIX A
EXPLORATION BORING 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		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		<p><u>EXPLANATION</u></p> <p>Solid lines separate geologic units and/or material types.</p> <p>Dashed lines indicate unknown depth of geologic unit change or material type change.</p> <p>Solid black rectangle in Core column represents California Split Spoon sampler (2.5in ID, 3in OD).</p> <p>Double triangle in core column represents SPT sampler.</p> <p>Vertical Lines in core column represents Shelby sampler.</p> <p>Solid black rectangle in Bulk column represents large bag sample.</p> <p><u>Other Laboratory Tests:</u> Max = Maximum Dry Density/Optimum Moisture Content EI = Expansion Index SO4 = Soluble Sulfate Content 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 Rval = R-Value ATT = Atterberg Limits</p>						
5								
10								
15								
20								

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-1
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 294
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	•••	Asphalt = 3.5" Base = 5"						
	/ / / / /	ARTIFICIAL FILL (Af) <u>Sandy Clay (CL):</u> Grayish brown, moist, very stiff, fine to medium grained sand		25	█	15.9	113.2	
5	/ / / / /	ALLUVIUM (Qal) <u>Sandy Clay (CL):</u> Reddish brown, moist, very stiff, fine to medium grained sand, more sand		34	█	14.4	115	Consol
	<u>Clayey Sand (SC):</u> Reddish brown, moist, medium dense, fine to coarse grained sand, trace pinhole pores		28	█	12.7	119.3	
10	@ 10 ft, trace pinhole pores		21	█	12.8	117.3	
15	<u>Sand (SP):</u> Reddish brown, moist, medium dense, fine to medium grained sand		10	▼			
	/ / / / /	<u>Clayey Sand (SC):</u> Reddish brown, moist, medium dense, fine to medium grained sand			▼			
20	<u>Sandy Clay (CL):</u> Reddish brown, moist, hard, fine grained sand		28	▼			

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-1
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 294
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
30	[Diagonal Hatching]	<u>Silty Clay with Sand (CL)</u> : Light reddish brown, moist, hard, fine grained sand	19	▲				
35	[Diagonal Hatching]	<u>Silty Sand trace Clay (SM)</u> : Light reddish brown, moist, medium dense, fine grained sand	12	▲				200
35	[Diagonal Hatching]	<u>Clayey Sand (SC)</u> : Light reddish brown, moist, medium dense, fine to medium grained sand	10	▲				SA Hydro
35	[Diagonal Hatching]	<u>Sand with Silt (SP)</u> : Light reddish brown, moist, medium dense, fine to medium grained sand						
40	[Diagonal Hatching]	<u>Silty Sand trace Clay (SM)</u> : Light reddish brown, moist, dense, fine grained sand	16	▲				200
45	[Diagonal Hatching]	<u>Sandy Clay (CL)</u> : Reddish brown, moist, hard, fine grained sand	20	▲				

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-1
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 294
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lith- ology	Material Description	Water	Samples		Laboratory Tests			
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		<p><u>Clayey Sand (SC):</u> Light reddish brown, moist, very dense, fine to coarse grained sand</p> <p>Total Depth 51.5 feet No Groundwater Boring backfilled with soil cuttings</p> <p>Percolation Well (10ft offset): 0-30' solid 3" pipe 30-35' perforated 3" pipe caved to 25', no gravel added</p>		28					

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-2
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 296
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	Grass							
	ALLUVIUM (Qal)							
		<u>Sandy Clay (CL):</u> Light reddish brown, dry to damp, hard, fine grained sand, trace pinhole pores and fine roots						
5		@ 4 ft, some medium grained sand, trace pinhole pores and fine roots		58	█	5.7	115.1	
				38	█	10.1	120	Consol
		<u>Silty Sand with Clay (SM):</u> Light reddish brown, moist, medium dense, fine to medium grained sand, some coarse grained sand, trace pinhole pores		20	█	7.3	110.6	Consol
10		<u>Silty Clay with Sand (CL-ML):</u> Light reddish brown to reddish brown, moist, very stiff, fine grained sand, trace pinhole pores		28	█	14.8	109.1	
15		<u>Silty Clay (CL-ML):</u> Light reddish brown to light gray, moist, stiff		8	▼			
20				11	▼			

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-2
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 296
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lith- ology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
30		<p>10</p> <p style="text-align: center;">▼</p> <p style="text-align: center;">▲</p>						
		<p>8</p> <p style="text-align: center;">▼</p> <p style="text-align: center;">▲</p>						
		<p><u>Sandy Clay (CL):</u> Reddish brown, moist, very stiff, fine grained sand</p> <p>Total Depth 31.5 feet No Groundwater Boring backfilled with soil cuttings</p>						

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-3
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 297
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	Grass							
	ALLUVIUM (Qal)							
	Sandy Clay (CL):	Light reddish brown, dry to damp, very stiff, fine grained sand, trace pinhole pores						
5	@ 4 ft, moist, hard			38	█	10	112.1	
	@ 6 ft, Gray to reddish brown, very stiff, less sand			74	█	11.1	119.4	
	@ 10 ft, hard, less gray, more sand			32	█	14.4	117	
10	@ 15 ft, very stiff			37	█	14.3	113.6	
15				10	▼			
20				14	▼			

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-3
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 297
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
30	@ 25 ft, hard, more sand			17	▲			
35	<u>Silty Sand / Sandy Silty trace Clay (SM/ML):</u> Light reddish brown, moist, medium dense / very stiff			8	▲			200
35	<u>Silty Sand trace Clay (SM):</u> Light reddish brown, moist, very stiff			13	▲			200
		Total Depth 36.5 feet No Groundwater Boring backfilled with soil cuttings Percolation Well: 0-30' solid 3" pipe 30-35' perforated 3" pipe caved to 27', no gravel added						

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-4
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 297
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	Grass							
	ALLUVIUM (Qal)							
		<u>Sandy Clay with Silt (CL):</u> Reddish brown, damp to moist, stiff, fine grained sand, trace pinhole pores and fine roots		16	10.6	103.2		Max EI SO4 DS ATT pH Resist Ch
		@ 4 ft, hard		41	10.3	114.5		Consol
5		<u>Clayey Sand (SC):</u> Light reddish brown, moist, dense, fine to medium grained sand						
		<u>Sandy Clay with Silt (CL):</u> Reddish brown, moist, very stiff, fine grained sand, trace pinhole pores		35	19.9	103.7		
		@ 10 ft, trace pinhole pores		29	22.2	98		
		<u>Silty Clay trace Sand (CL):</u> Light reddish brown to light gray, damp, very stiff, fine grained sand		13				
		<u>Silty Sand / Sandy Silt trace Clay (SM/ML):</u> Light reddish brown, damp, medium dense / very stiff, fine grained sand		15				

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 (ASTM D2488). 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 provided in Appendix A.

In Situ Moisture and Density

Moisture content and dry density of in-place soil materials were determined in representative strata. Test data are summarized on the Boring Logs provided in 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.

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.

Grain-Size Analyses

Grain size analyses were performed on selected samples of site materials. These tests were performed in accordance with ASTM D 422. Results are graphically presented on Plate B.

Consolidation

Consolidation tests were performed for selected soil samples in general conformance with ASTM D 2435. Axial loads were applied in several increments to a laterally restrained 1-inch-high sample. Loads were applied in geometric progression by doubling the previous load, and the resulting deformations were recorded at selected time intervals. The test samples were inundated at selected loads to evaluate the effects of a sudden increase in moisture content (hydro-consolidation potential). Results of the tests are graphically presented on Plates B-2 to B-5.

Direct Shear

The Coulomb shear strength parameters, angle of internal friction and cohesion, were determined for a bulk sample obtained from one of our borings. The tests were performed in general conformance with Test Method ASTM D 3080. The sample was remolded to 90 percent of maximum dry density and at the optimum moisture content. 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-6.

Atterberg Limits

Atterberg Limits (Liquid Limit, Plastic Limit, and Plasticity Index) were performed in accordance with Test Method ASTM D4318. Pertinent test values are presented within Table B.

Corrosion

Select samples were tested for minimum resistivity, chloride, and pH in accordance with California Test Method 643. Results of these tests are provided in Table B.

Soluble Sulfate Content

A chemical analysis was performed on a selected soil sample to determine soluble sulfate content. The test was performed in accordance with California Test Method (CTM) 417. The test result is included in Table B.

Percent Passing No. 200 Sieve

Percent of material passing the No. 200 sieve was determined on selected samples to verify visual classifications performed in the field. These tests were performed in accordance with ASTM D 1140. Test results are presented on Table B.

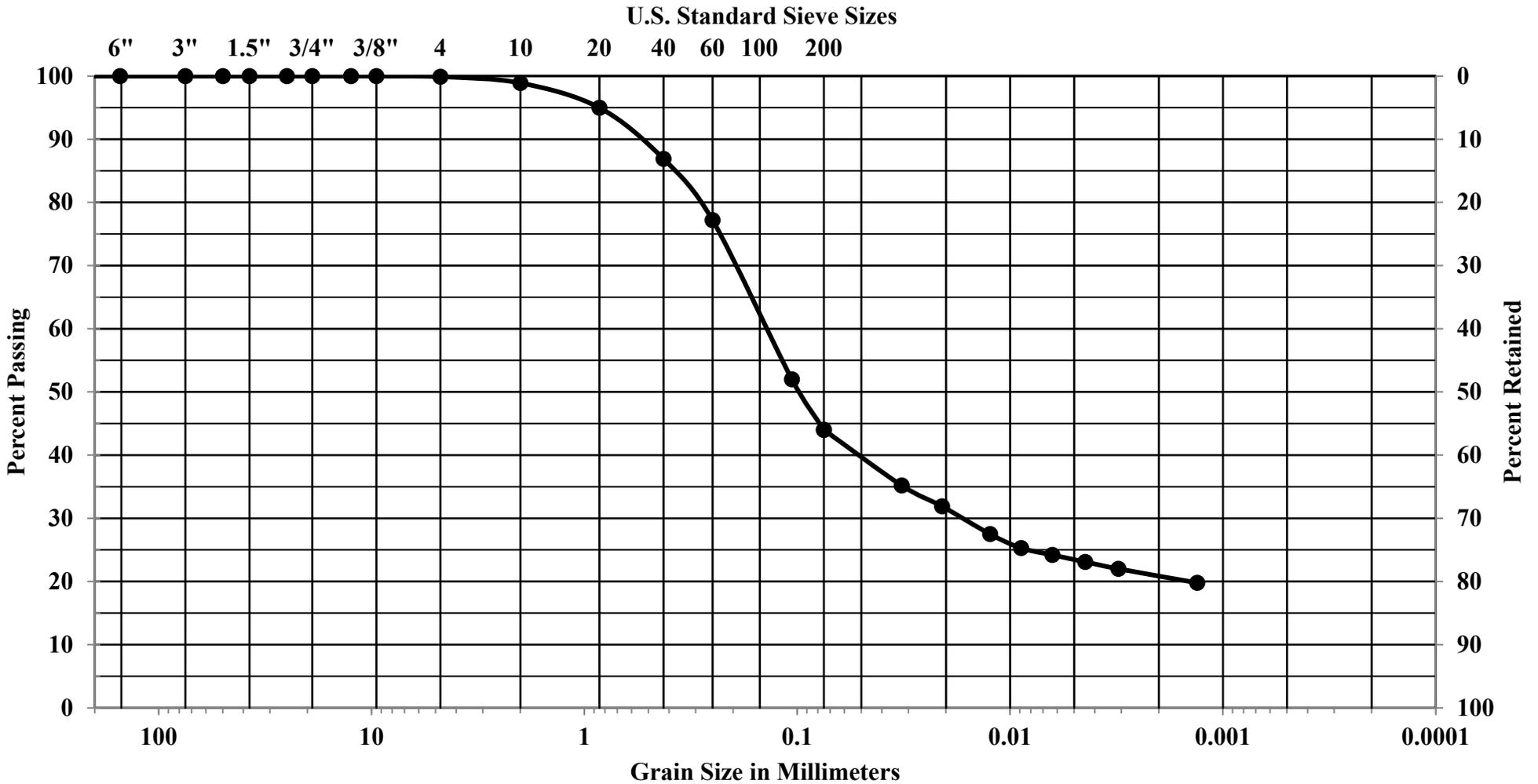
**TABLE B
SUMMARY OF LABORATORY TEST RESULTS**

Boring Number	Depth (feet)	Soil Type	Test Results	
B-1	30	Silty Sand (SM)	Percent Passing #200 Sieve:	45.3%
B-1	40	Silty Sand (SM)	Percent Passing #200 Sieve:	30.5%
B-3	30	Silty Sand/ Sandy Silt (SM/ML)	Percent Passing #200 Sieve:	53.7%
B-3	35	Silty Sand (SM)	Percent Passing #200 Sieve:	33.2 %
B-4	0-5	Sandy Clay (CL)	Maximum Dry Density (pcf):	122.5
			Optimum Moisture (%):	11.5
			Liquid Limit:	32
			Plastic Index:	16
			Soluble Sulfate Content (%):	0.000
			Sulfate Exposure:	Negligible
			pH:	7.36
			Minimum Resistivity:	2500 Ohm-cm
			Chloride:	24.2 ppm
			Expansion Index:	49
			Expansion Potential:	Low

Additional laboratory test results are provided on the boring logs provided in Appendix A and on the Plates that follow.

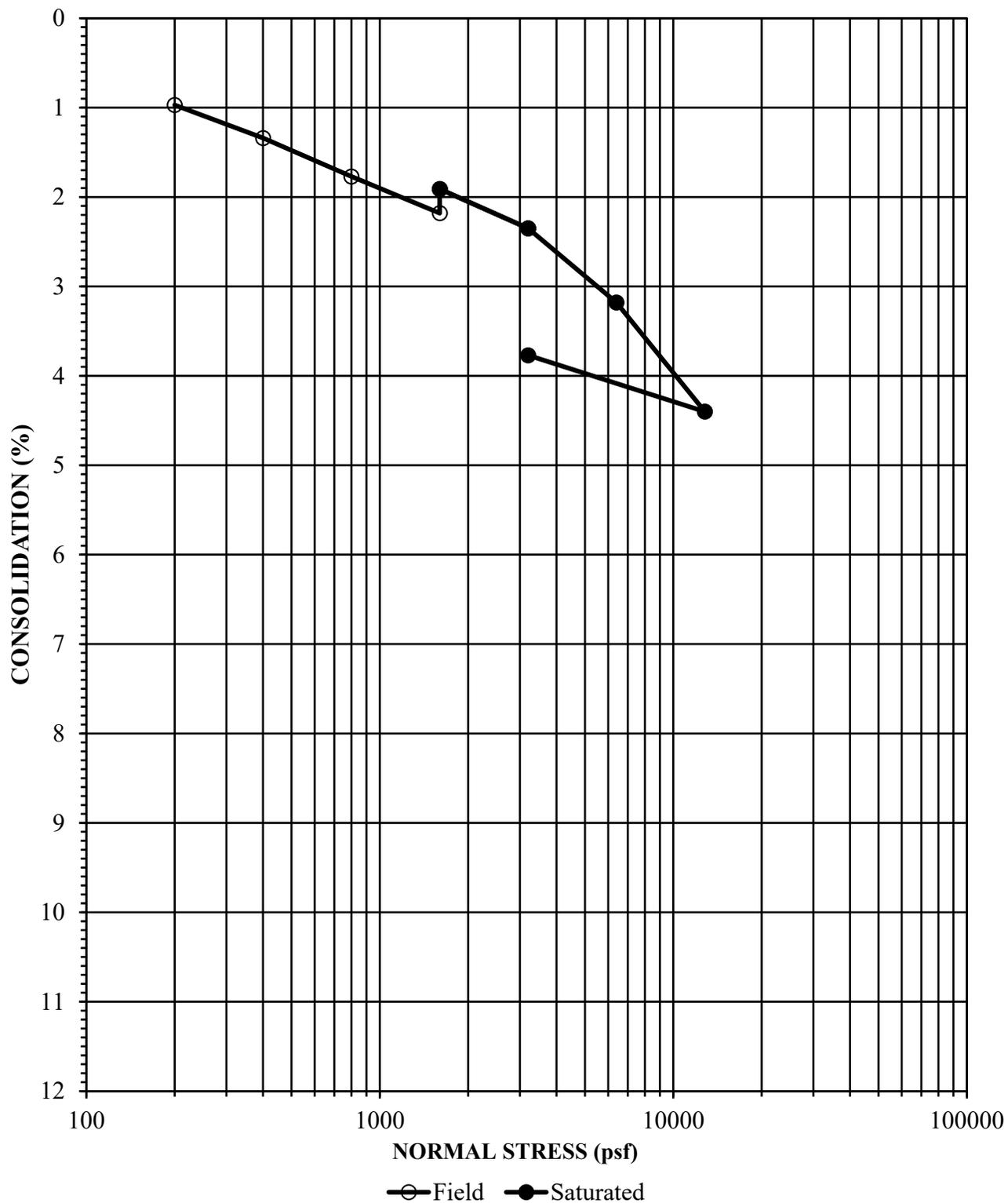
GRAIN SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



Job Number	Location	Depth	Description
2859.00	B-1	35-36.2	Clayey Sand (SC)

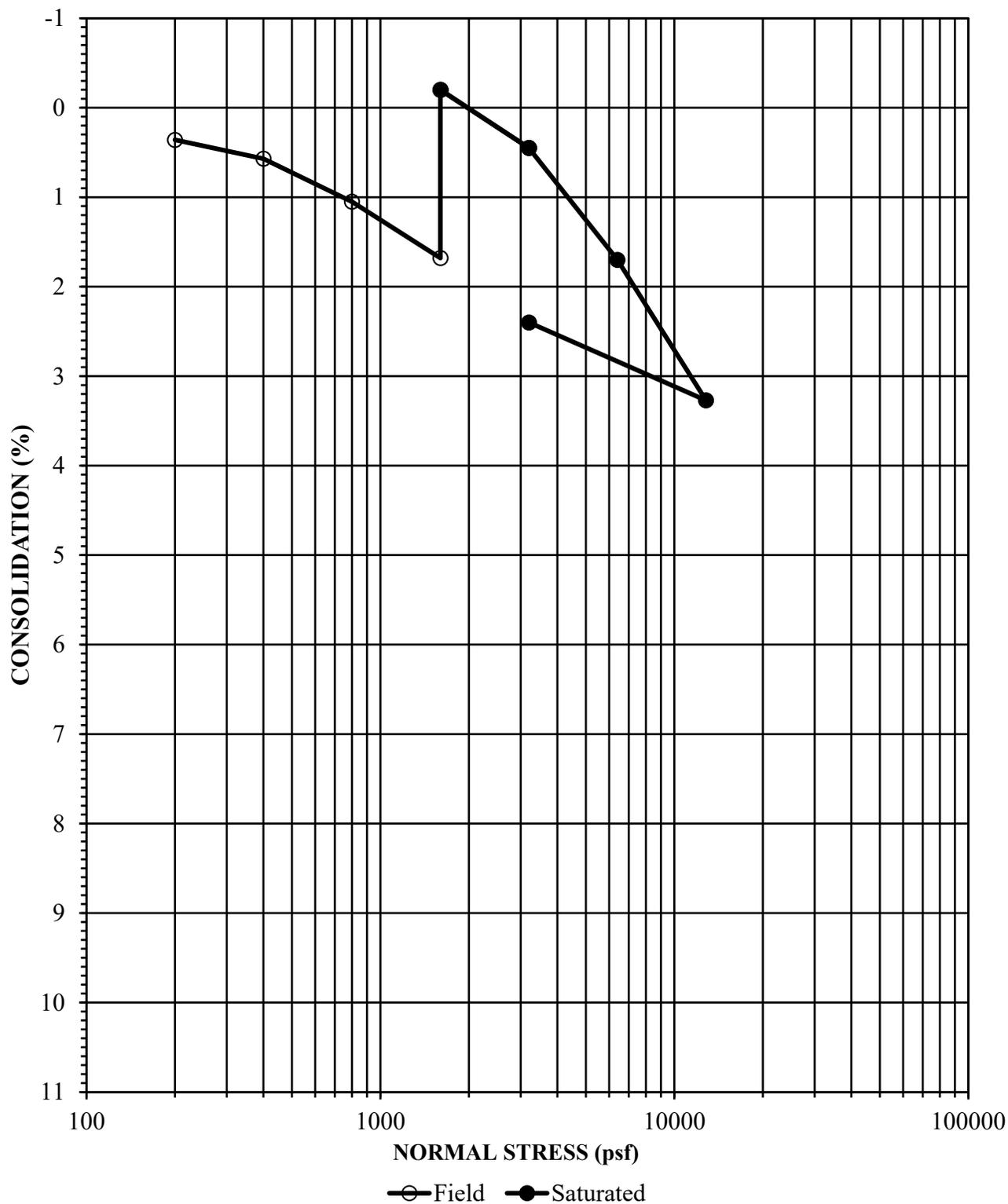
CONSOLIDATION



Job Number	Location	Depth	Description
2859.00	B-1	4	Sandy Clay (CL)

Initial Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)
117.9	11.2	12

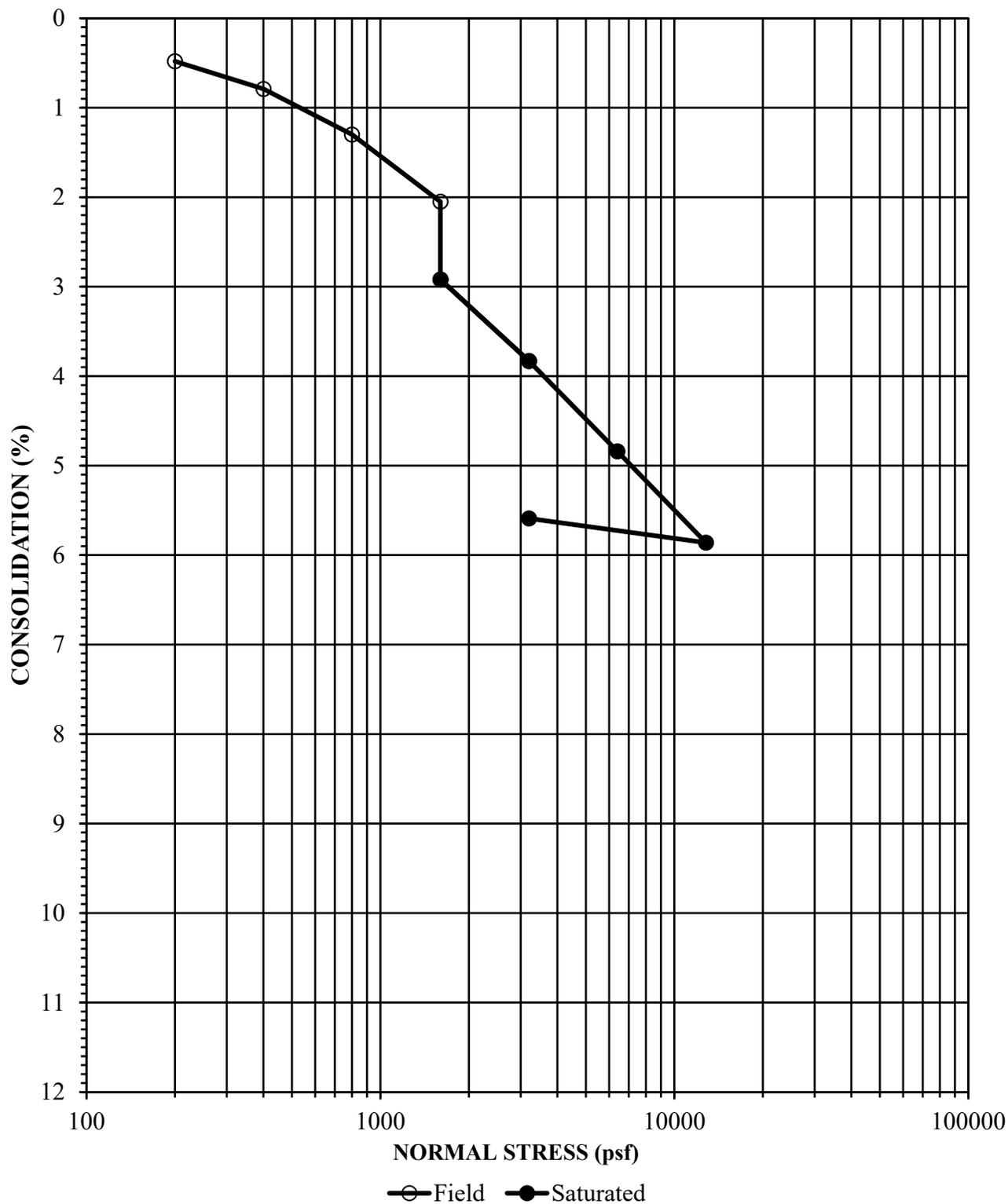
CONSOLIDATION



Job Number	Location	Depth	Description
2859.00	B-2	4	Sandy Clay (CL)

Initial Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)
118.7	7.7	12.7

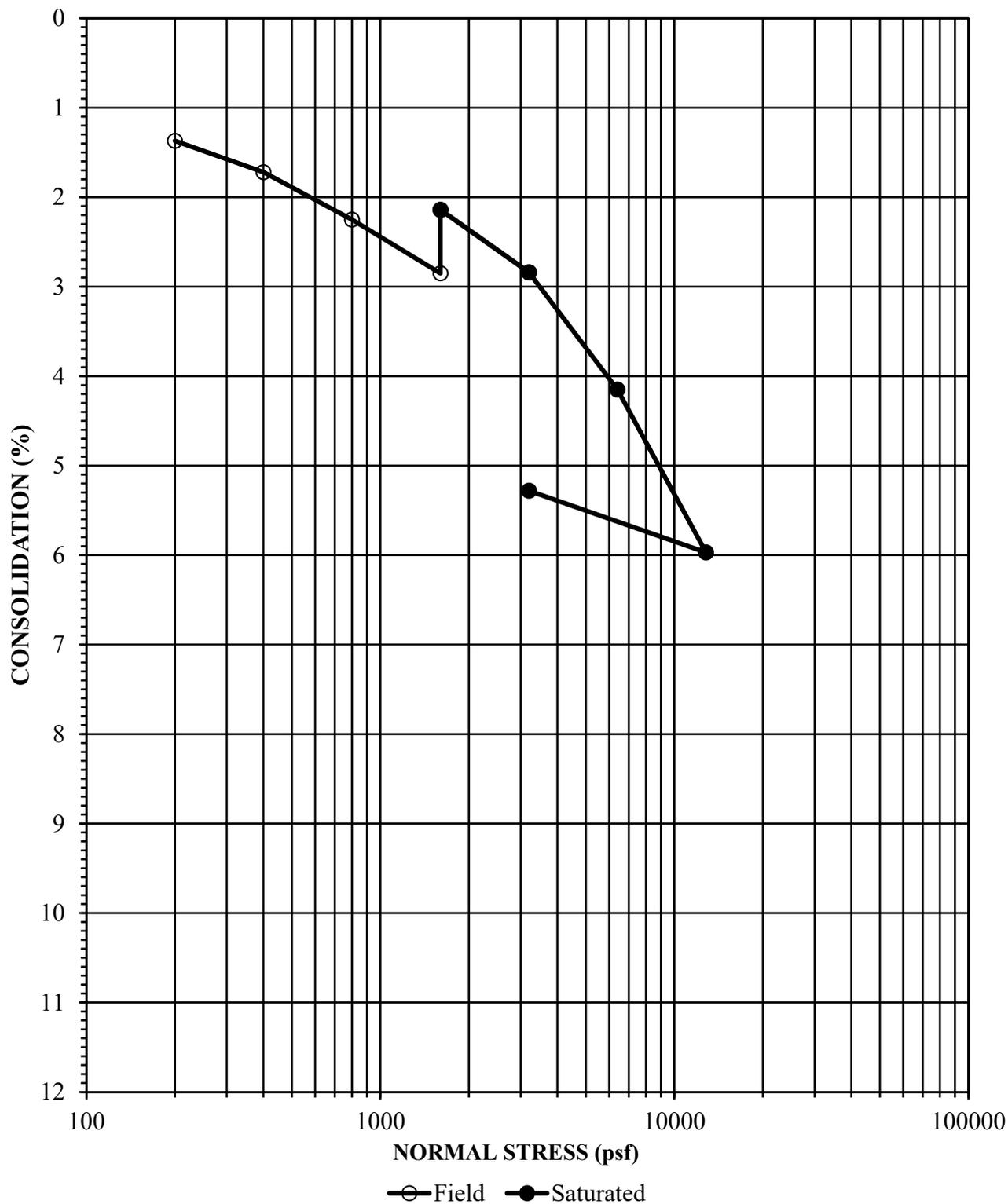
CONSOLIDATION



Job Number	Location	Depth	Description
2859.00	B-2	6	Silty Sand trace Clay (SM)

Initial Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)
110	8.1	14.1

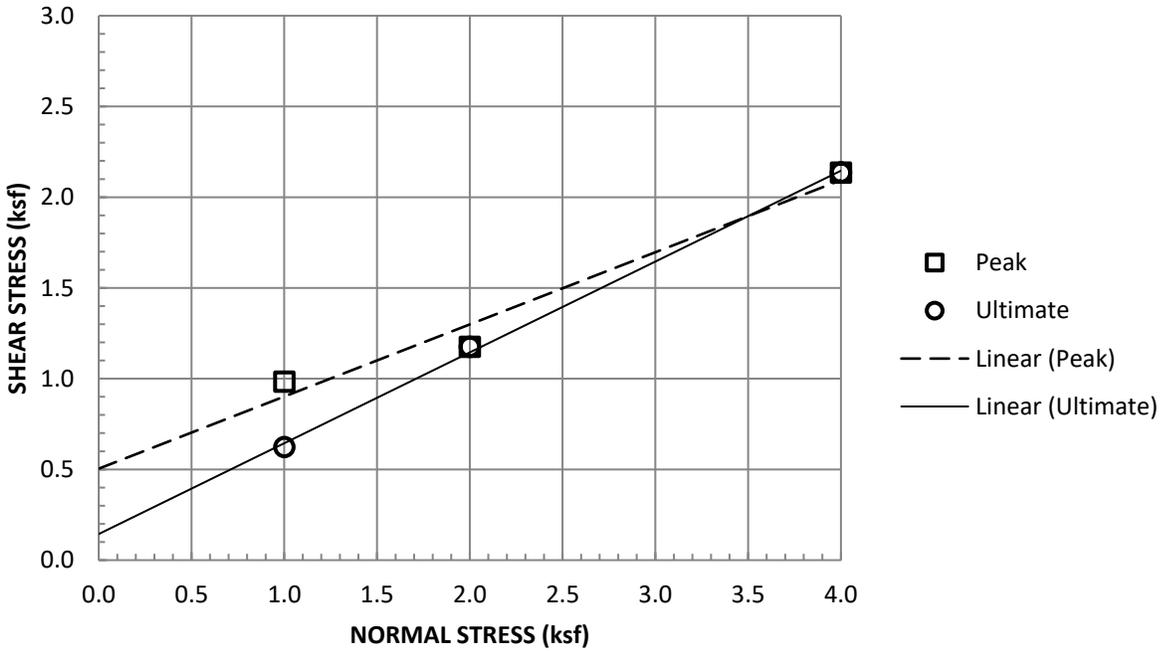
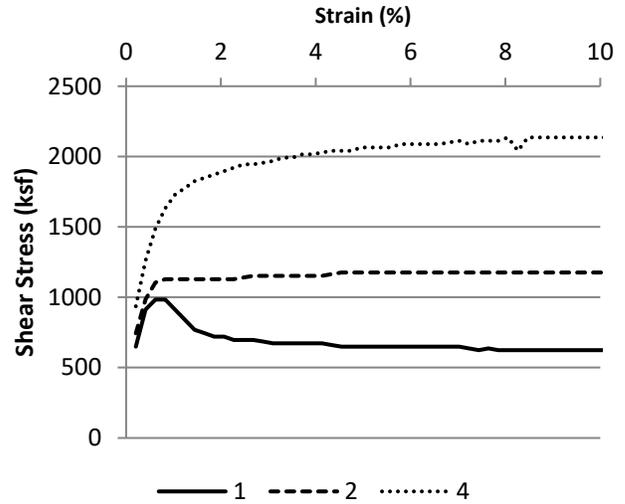
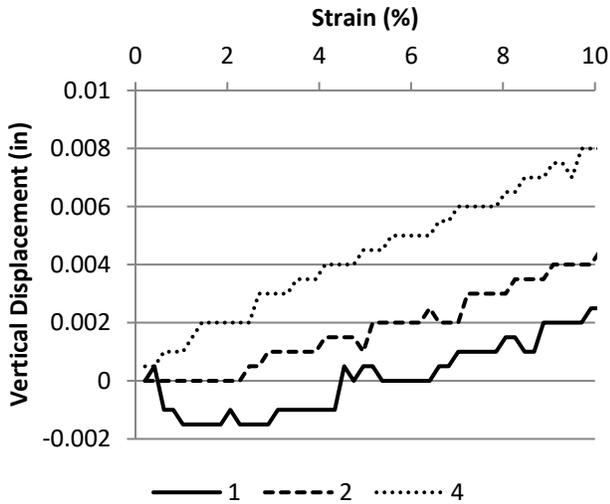
CONSOLIDATION



Job Number	Location	Depth	Description
2859.00	B-4	4	Sandy Clay (CL)

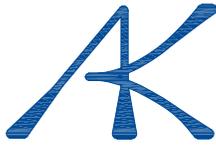
Initial Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)
112	7.8	15.6

DIRECT SHEAR



Sample Type:	Remolded 90% of 122.5 @ 11.5%, Saturate		
Normal Stress (ksf)	1	2	4
Peak Shear Stress (ksf)	0.984	1.176	2.136
Peak Displacement (in)	0.003	0.005	0.008
Ultimate Shear Stress (ksf)	0.624	1.176	2.136
Ultimate Displacement (in)	0.25	0.25	0.25
Initial Dry Density (pcf)	110.3	110.3	110.3
Initial Moisture Content (%)	11.5	11.5	11.5
Final Moisture Content (%)	15.4	16.8	17
Strain Rate (in/min)	.005		

Job Number	Location	Depth	Description
2859.00	B-4	0-5	Sandy Clay (CL)



January 20, 2020
J.N.: 2859.00

Ms. Sarah Walker
National Community Renaissance
4322 Piedmont Drive
San Diego, CA 92107

Subject: Preliminary Percolation Study, Proposed Residential Development, 1314 Angelina Drive, Placentia, California.

Dear Ms. Walker,

Albus-Keefe & Associates, Inc. has completed a geotechnical investigation of the site for evaluation of the percolation characteristics of the site soils. The scope of this investigation consisted of the following:

- Exploratory drilling, soil sampling and test well installation
- Field percolation testing
- Laboratory testing of selected soil samples
- Engineering analysis of the data
- Preparation of this report

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

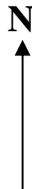
Site Location and Description

The site is located at 1314 North Angelina Drive within the city of Placentia, California. The property is bordered by North Angelina Drive to the West, single-family residences to the North and East, and Morse Avenue to the South. The location of the site and its relationship to the surrounding areas is shown on Figure 1, Site Location Map.

The site consists of a rectangular-shaped property containing approximately 4 acres of land. The site is relatively flat with elevations ranging from EL. 294 to EL. 297 above mean sea level (based on Google Earth) descending to the south-west. The site is currently occupied by Blessed Sacrament Episcopal Church. There are currently two existing structures and it appears the structure located more westerly is used for church gatherings while the more easterly structure is a school facility. Associated parking areas are located along the Southern boundary with vegetation occupying the remainder of the site. Vegetation includes general landscaping in and around the structures, planters within the parking areas, grass and moderate- to large-sized trees within the open spaces. Perimeter walls run along the North and East boundaries and appear to be associated with the single-family residences.



© 2019 Google



SITE LOCATION MAP

**Proposed Residential Development
1314 Angelina Drive
Placentia, California**

NOT TO SCALE

FIGURE 1

Proposed Development

Based on the conceptual site plan by RRM Design Group, dated September 5, 2019, the proposed project includes the development of two residential buildings accommodating 65 units. Building 1 at the north end of the site is a linear two-story structure with double-loaded corridors. Building 2 is a two-story, L-shaped building located interior to the site with a three-story element at the northern end of the building transitioning to two stories toward the eastern property line. Associated parking, underground utilities and a storm water disposal system are also planned.

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 configuration. We expect the proposed structures will be at grade utilize wood-frame construction yielding relatively light foundation loads.

SUMMARY OF FIELD AND LABORATORY WORK

Subsurface Investigation

Subsurface exploration for this investigation was conducted on December 17, 2019, and consisted of drilling four (4) soil borings to depths ranging from approximately 31.5 to 51.5 feet below the existing ground surface (bgs). The borings were drilled using a truck-mounted, continuous flight, hollow-stem-auger drill rig. A representative of Albus-Keefe & Associates, Inc. logged the exploratory borings. 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.

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.

One additional boring was drilled adjacent to boring B-1 for percolation testing (P-1) and one additional percolation well was also installed in B-3 (P-2).

Percolation Testing

Percolation testing was performed on December 17, 2019, in general conformance with the constant-head test procedures outlined in the referenced Well Permeameter Method (USBR 7300-89). A water hose attached to a water source on site was connected to an inline flowmeter to measure the water flow. The flowmeter is capable of measuring flow rates up to 10 gallons per minute and as low as 0.06 gallons per minute. A valve was connected in line with the flowmeter to control the flow rate.

A filling hose was used to connect the flowmeter and the test wells. Water was introduced by the filling hose near the bottom of the test wells. A water level meter with 1/100-foot divisions was used to measure the depths to water surface from the top of well casings.

Flow to the wells was terminated upon either completion of testing of all the pre-determined water levels or the flow rate exceeded the maximum capacity of the flowmeter. Measurements obtained during the percolation testing are provided in Appendix C on Plates C-1 and C-2.

Laboratory Testing

Selected soil samples of representative earth materials were tested to assist in the formulation of conclusions and recommendations presented in this report. Tests consisted of in-situ moisture contents and dry densities, and sieve analyses. Results of laboratory testing relevant to percolation characteristics are presented in Appendix B and on the Exploration Logs in Appendix A.

ANALYSIS OF DATA

Subsurface Conditions

Descriptions of the earth materials encountered during our investigation are summarized below and are presented in detail on the Exploration Logs presented in Appendix A.

Soil materials encountered at the subject site generally consisted of Quaternary Alluvial (Qal). However, artificial fill materials were encountered within the parking lot at B-1 for an approximate depth of 4 feet below ground surface. The fill materials consisted of a sandy clay that was grayish brown, moist, very stiff with fine to medium grained sand.

The Qal materials were encountered to the maximum depth explored of 51.5 feet and are comprised of interbedded layers of damp to moist, reddish brown and light reddish-brown sandy clay, silty sand, clayey sand, silty clay, and sand. The granular alluvial soils are typically medium dense and the fine-grained alluvial soils are typically very stiff to hard.

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

Groundwater

Groundwater was not encountered during this firm's subsurface exploration to the maximum depth of 51.5 feet. Based on a review of the referenced CDMG Special Report, the historical groundwater for the site is not available. Additional review of the Department of Water Resources groundwater level data for the nearby well 338950N1178554W001 indicates that groundwater for the area is below 150 feet from 1970 to present. The last recorded reading at the time of this report was November 13, 2019. From this data we anticipate ground water will remain below a depth of 100 feet during the next 50 years.

Percolation Data

Analyses were performed to evaluate permeability using the flow rate obtained at the end of the constant-head stage of field percolation testing. These analyses were performed in accordance with the procedures provided in the referenced USBR 7300-89. The procedure essentially uses a closed-form solution to the percolation out of a small-diameter well.

Using the USBR method, we calculated a composite permeability value for the head conditions maintained in the wells. The results are summarized in Table 1 below and the supporting analyses are included in Appendix C, Plates C-3 and C-4.

TABLE 1
Summary of Back-Calculated Permeability Coefficient

	Total Depth of Well (ft)	Depth to Water in Well (ft)	Height of Water in Well (ft)	Static Flow Rate (gal./min.)	Estimated Permeability, k_s (in/hr.)
P-1	34.95	31.25	3.7	0.22	0.53
P-2	35	31.5	3.5	0.44	1.15

Design of Dry Well

The *infiltration rate* in a dry well is dependent upon several factors including the soil permeabilities of the various soil layers throughout the soil mass, hydraulic gradient of water pressure head in the soil mass, and depth to groundwater. The infiltration rate is related to the permeability by Darcy's equation:

$$V = ki$$

Where:

V= water velocity (infiltration rate)

k= permeability

i=hydraulic gradient

The presence of differing soil layers with differing permeabilities, the variable head condition in the well shaft, and presence of ground water are factors that make determining the effective infiltration rate of a dry well somewhat complicated. We have performed the Well Permeameter tests in accordance with the test method. This test provides a means to estimate the *Permeability Rate* of the soils influencing the dry well, not the infiltration rate. Therefore, the effective infiltration rate must be determined using the relationship between permeability and infiltration rate as expressed by Darcy's equation. Solution of the Darcy equation essentially requires solving a differential mass balance equation. Due to these complications, the infiltration characteristics of the proposed dry well were modeled using a computer program.

Infiltration in a dry well was modeled using the software Seep/W, version 2007, by Geo-Slope International. The program allows for modeling of both partially-saturated and saturated porous medium using a finite element approach to solve Darcy's Law. The program can evaluate both steady-state and transient flow in planar and axisymmetric cases. Boundaries of the model can be identified with various conditions including fix total head, fix pressure head, fix flow rate, and head as a function of flow. Soil conductivity properties can be modeled with either Fredlund et al (1994), Green and Corey (1971), Van Genuchten (1980), or Saxton et al. (1986). The parameters suggested by Van Genuchten (1980) were selected for use in our model and were based on test results of particle-size analyses and estimated in-place densities.

A Seep/W model was setup with the bottom of the dry well at a depth of 52 feet below ground surface. The top 20 feet of the dry well was assumed to consist of a shaft that is 6 feet in diameter and contains a settling chamber having an inside diameter of 4 feet, outside diameter of 4.5 feet, and length of 18 feet. Below 20 feet, the shaft diameter was 4 feet in diameter. The annular space around the chamber between the depths of 0 and 13 feet was assumed to consist of a cement slurry. Below a depth of 13 feet, the annular space around the chamber and below the chamber is assumed to consist of gravel. A more detailed model of the dry well design can be found on Plate 2.

The model consisted of three zones of material to represent the general soil profile. Material 1 was represented to model fine-grained clayey soils that are essentially impermeable. The saturated conductivity of material 2 was selected based on the coefficient of permeability estimated from percolation tests as well as laboratory gradation test results. The saturated conductivity of material 3 was selected based on correlations with laboratory gradation test results (Plate B-1). The soil parameters are summarized in Table 2.

Water in the well was assumed to be at a depth of 7 feet below the ground surface so a fix-head boundary was set with a total head elevation of 93 feet around the edge of the well (ground surface was set to an elevation of 100 feet).

TABLE 2
Summary of Characteristic Curve Parameters

Material No.	Material Type	Depth (ft)	Sat. Perm., Ks (in/hr)	Van Genuchten Parameters				
				a (psf)	n	m	Sat. Water Content	Residual Water Content
1	Imperm	0-27.5, 42.5-47.5	0.001	208.22	1.10	0.09	0.54	0.01
2	SM	27.5-42.5	0.7	44.025	1.26	0.20	0.40	0.01
3	SC	>47.5	0.5	27.86	1.17	0.15	0.43	0.01

A steady state analysis was performed to estimate the maximum inflow that the well can accommodate. Using a well as described above, we obtain a static total flow of 0.025 ft³/sec. A plot depicting the resulting pressure head contours and flow vectors for the model is provided on Plate C-5. The average

infiltration rate can be determined by taking the flow rate divided by the wetted surface area. The surface area is equal to 546.64 square feet which includes the side and bottom area. Based on the above flow rate and surface area, the average “measured” infiltration rate across the wetted surface area is 1.9 in/hr.

To evaluate the time required to empty the well once no more water is introduced, the model was reanalyzed with a variable head condition that was dependent upon the volume of water leaving the well. As water infiltrates into the surrounding soil, the volume of water remaining in the well is reduced as well as the resulting water head. A graph of the well head versus exit volume is provided in Figure 2. The function assumes a void ratio of 0.4 within the zones occupied by gravel. If some other well configuration is used, then the analyses will require updating.

The analysis was performed as a transient case over a total time of 5.28 hours. The conditions in the model were evaluated in 40 increments of time over the total duration. From our analyses, the water is evacuated from the chamber in approximately 2.5 hours. Plots depicting the resulting pressure head contours and flow vectors at selected times are provided in Appendix C on Plates C-5 through C-8. A plot of time versus water height in the well is shown on Figure 3.

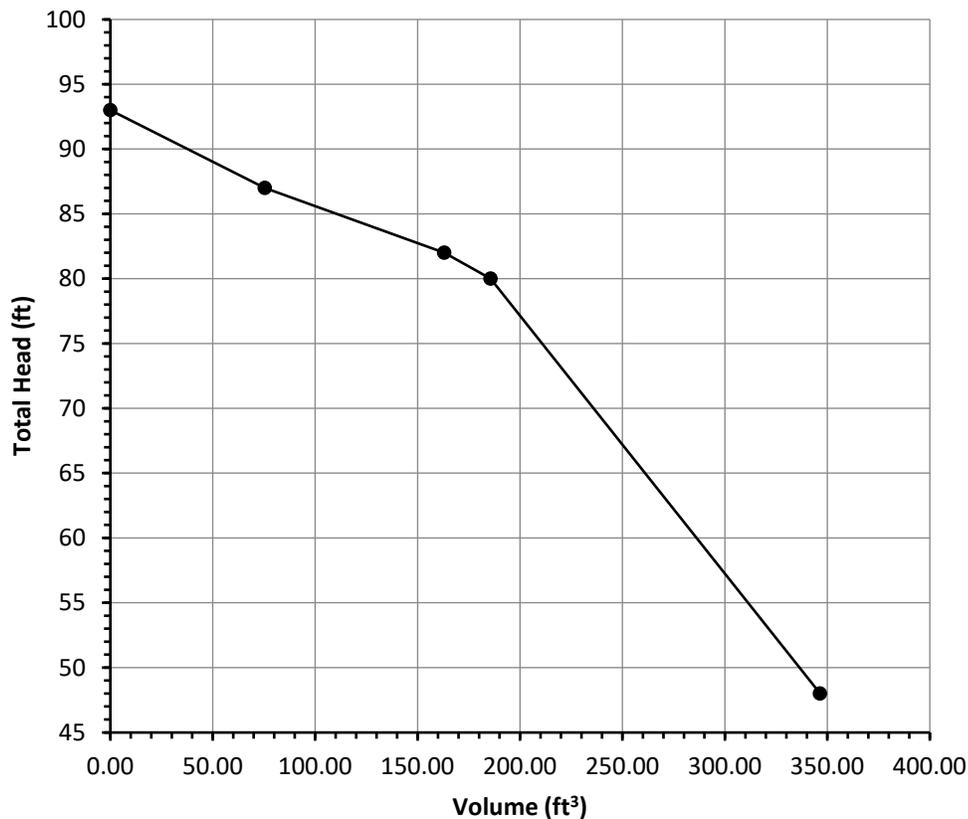


FIGURE 2- Well Head versus Exit Volume

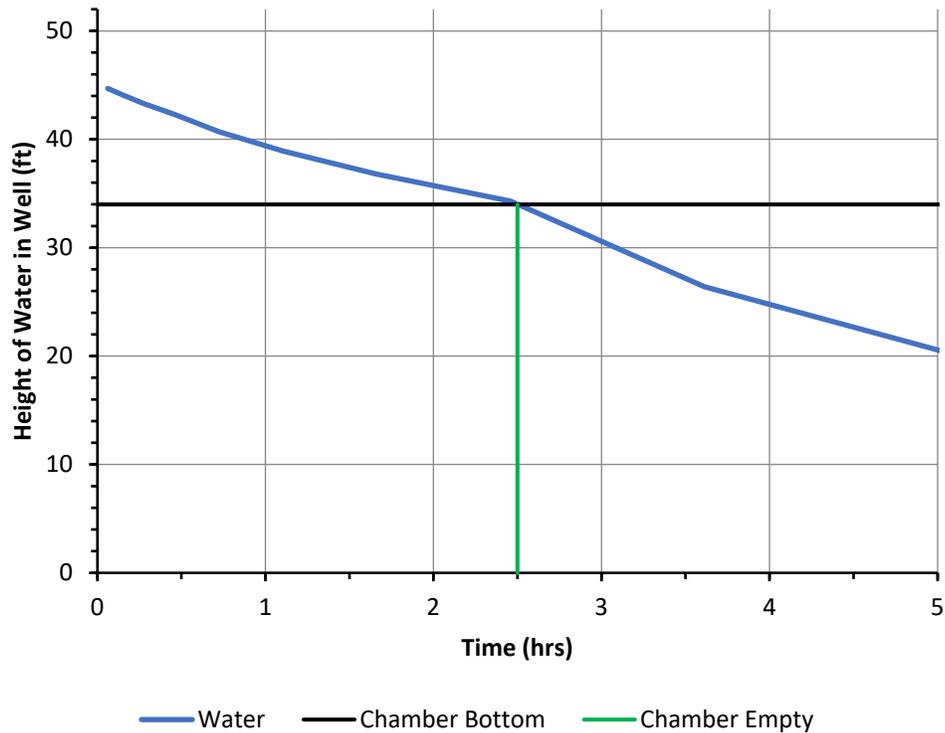


FIGURE 3- Water Head Versus Time

CONCLUSIONS AND RECOMMENDATIONS

Results of our work indicate a storm water disposal system consisting of a dry well is feasible at the site. The use of a dry well is not anticipated to result in worsening any adverse conditions or hazards that may be present for the proposed site development or adjacent properties including subsidence, landsliding, or liquefaction. As discussed above, the historic groundwater level in this area was not available. However, we estimate that groundwater is currently at least 150 feet below ground surface and we anticipate will remain at least 100 feet below ground surface for the life of the project. Therefore, a dry well having a total depth of 52 will maintain a clearance above groundwater greater than the minimum required clearance of 10 feet.

Based on the results of percolation testing and analyses, the well configuration as depicted on Plate 2 may utilize a “measured” peak flow rate of 0.025 ft³/sec. This flow rate corresponds to an average peak infiltration rate of 1.9 in./hr. This flow rate and infiltration rate only apply to the well configuration evaluated and will differ for other configurations. These values are “measured” values and as such, an appropriate factor of safety should be applied to determine the “design” rates.

The “measured” infiltration rates reported above should be adjusted by applying an appropriate factor of safety. Table 3 includes the details of estimating this factor of safety for Factor Category A per requirements of the Santa Ana Regional Water Quality Control Board. The civil engineer should assign appropriate factor values for Factor Category B to obtain the overall factor of safety.

TABLE 3
Factor Values for Factor Category A

Infiltration Facility Safety Factor Determination Worksheet					
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w * v$
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	3	0.75
		Suitability Assessment Safety Factor, $S_A = \sum p$				1.5

Once water flow to the well has ceased, we estimate the chamber will require approximately 2.5 hours to empty. As such, the time to empty the dry well should be considered in the overall draw down time of the storm system.

Should you require multiple dry wells across the site, the wells should be spaced at least 120 feet, center to center, to avoid cross influence. The wells should be located at least 10 feet horizontally from any habitable structure or property line.

The actual flow capacity of the dry well could be less or more than the estimated value. As such, provisions should be made to accommodate excess flow quantities in the event the dry well does not infiltrate the anticipated amount. The design also assumes that sediments will be removed from the inflowing water through an upper chamber or other device. Sediments that are allowed to enter the dry well will tend to degrade the flow capacity by plugging up the infiltration surfaces.

In general, the dry well shaft is anticipated to be adequately stable under temporary construction conditions for uncased drilling. However, layers or lenses of granular materials are present and may be prone to sloughing and caving. In the event of caving, casing will be required to install the well. Workers should not enter the shaft unless the excavation is laid back or shored in accordance with OSHA requirements. The placement and compaction of backfill materials, including the gravel and slurry, should be observed by the project geotechnical consultant.

LIMITATIONS

This report is based on the geotechnical data as described herein. The materials encountered in our boring excavations and utilized in our laboratory testing for this investigation are believed representative of the project area, and the conclusions and recommendations contained in this report are presented on that basis. However, soil and bedrock 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, observations by a geotechnical consultant during the construction phase of the storm water infiltration systems are essential to confirming the basis of this report.

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 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 **National Community Renaissance** 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.

This report is subject to review by the controlling governmental agency.

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

Sincerely,

ALBUS-KEEFE & ASSOCIATES, INC.


David E. Albus
Principal Engineer
GE 2455



Enclosures: Plate 1- Geotechnical Map
Plate 2- Dry Well Diagram
Appendix A - Exploratory Logs
Appendix B - Laboratory Testing
Appendix C - Percolation Testing and Analyses

REFERENCES

Publications and Reports

CDMG, "Seismic Hazard Zone Report for the Yorba Linda 7.5-Minute Quadrangle, Orange County, California", Seismic Hazard Zone Report 010, 2005.

Californian Department of Water Resources Water Data Library (accessed 2019):
<http://wdl.water.ca.gov/waterdatalibrary/>

Procedure for Performing Field Permeability Testing by the Well Permeameter Method, by United States Department of The Interior, Bureau of Reclamation (USBR 7300-89).

Saxton, K.E., W.J. Rawls, J.S. Romberger, and R.I. Papendick. 1986. Estimating generalized soil-water characteristics from texture. *Soil Sci. Soc. Am. J.* 50(4):1031-103.

Department of The Navy, (1982), *Soil Mechanics, Design Manual 7.1*, Naval Facilities Engineering Command (NAVFAC).



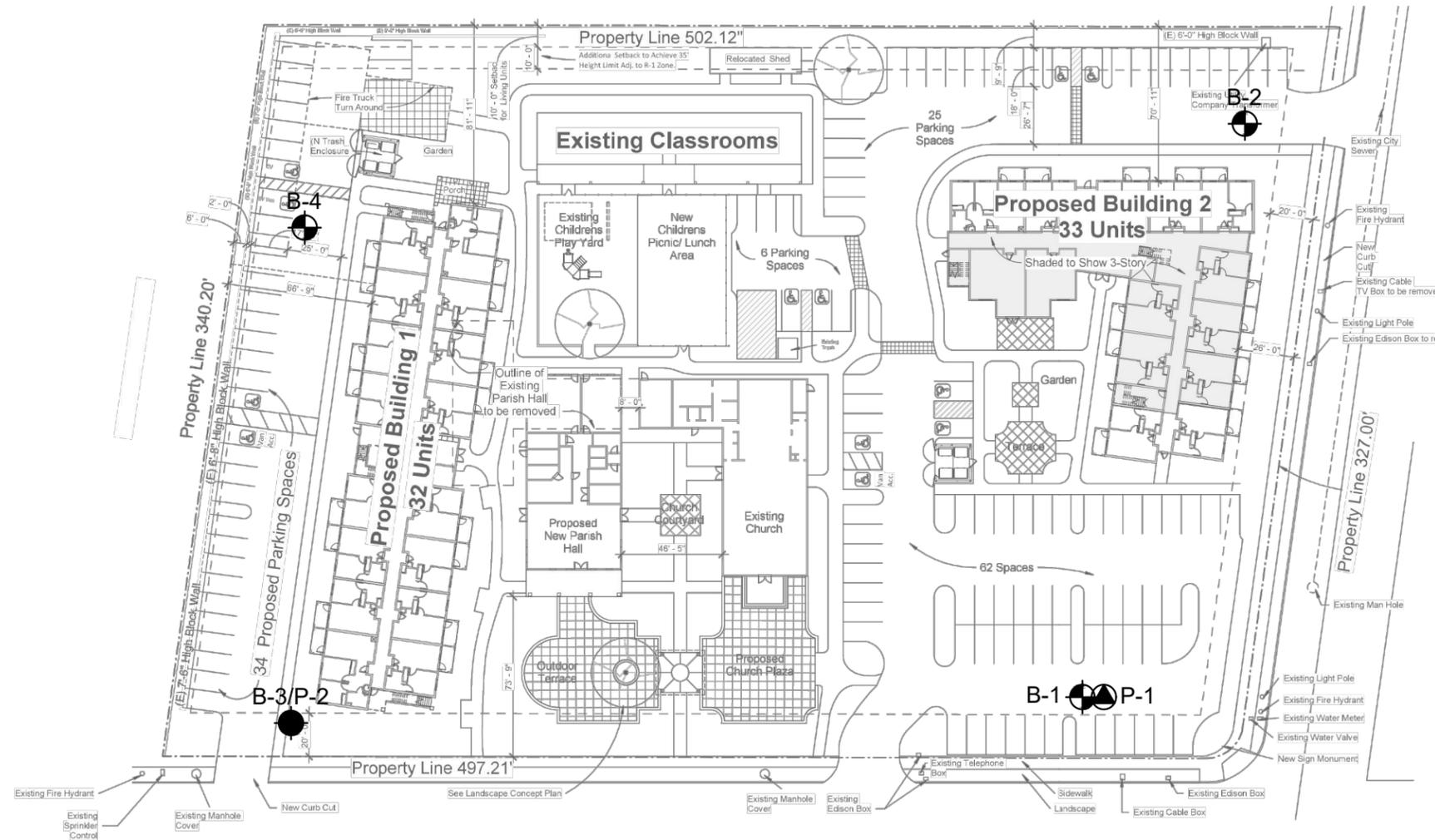
GEOTECHNICAL MAP

Job No.: 2859.00 Date: 1/20/20 Plate: 1

EXPLANATION

(Locations Approximate)

- Exploratory Boring
- Exploratory Percolation Test Boring
- Exploratory Boring and Percolation Test Boring

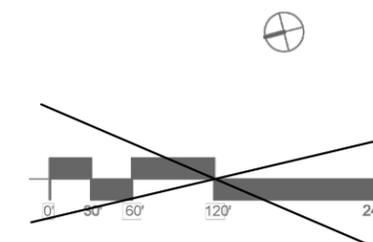


Site Coverage

Name	Area	Percentage
Lot Area (SF) :	169,716 SF/ 3.90 acres	
Maximum Lot Coverage allowed:	60% (101,830 SF)	
Proposed Lot Coverage:	55%	
Building Footprints (Existing and Proposed)	35,631 SF	
Parking and Driveways	53,824 SF	
Covered Patios	3,678 SF	
Total Proposed Lot Coverage	93,133 SF (55%)	
Percentage Open Space Required:	40%	
Percentage Open Space Provided:	45%	

Residential Unit Count

	One Bedroom	Two Bedroom
Building 1	28	4
Building 2	31	2
	59 units	6 units
Total Residential Units:	65	



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 $\pm 0.02'$ of plans.
4. Graded Basin or Paving (by Others).
5. Compacted Base Material - 1-Sack Slurry except in landscaped installations 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" \emptyset 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' \emptyset 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.

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" \emptyset 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.

35 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.

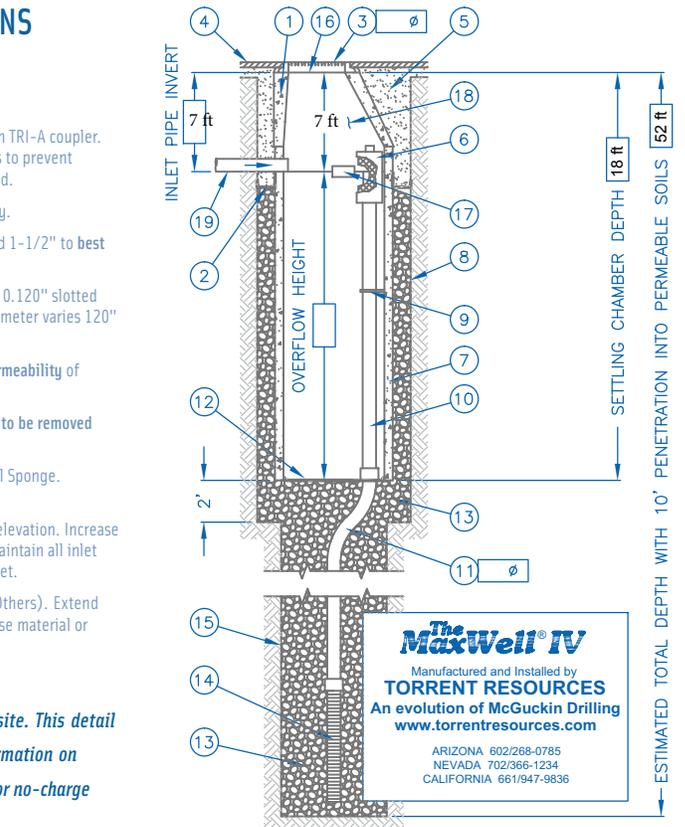
OVERFLOW HEIGHT

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

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



AZ Lic. ROC070465 A, ROC047067 B-4, ADWR 363
CA Lic. 528080 A, C-42, HAZ
NV Lic. 0035350 A - NM Lic. 90504 GF04
U.S. Patent No. 4,923,330 - TM Trademark 1974, 1990, 2004

" \emptyset " 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.

" \emptyset " BOLTED RING & GRATE

Standard models are quality cast iron and available to fit 24" \emptyset or 30" \emptyset 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."

" \emptyset " 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 (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.®

PLATE 2



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		Laboratory Tests			
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests	
		<p><u>EXPLANATION</u></p> <p>Solid lines separate geologic units and/or material types.</p> <p>Dashed lines indicate unknown depth of geologic unit change or material type change.</p> <p>Solid black rectangle in Core column represents California Split Spoon sampler (2.5in ID, 3in OD).</p> <p>Double triangle in core column represents SPT sampler.</p> <p>Vertical Lines in core column represents Shelby sampler.</p> <p>Solid black rectangle in Bulk column represents large bag sample.</p> <p><u>Other Laboratory Tests:</u> Max = Maximum Dry Density/Optimum Moisture Content EI = Expansion Index SO4 = Soluble Sulfate Content 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 Rval = R-Value ATT = Atterberg Limits</p>							
5									
10									
15									
20									

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-1
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 294
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	•••	Asphalt = 3.5" Base = 5"						
	/ / / / /	ARTIFICIAL FILL (Af) Sandy Clay (CL): Grayish brown, moist, very stiff, fine to medium grained sand		25		15.9	113.2	
5	/ / / / /	ALLUVIUM (Qal) Sandy Clay (CL): Reddish brown, moist, very stiff, fine to medium grained sand, more sand		34		14.4	115	Consol
	•••	Clayey Sand (SC): Reddish brown, moist, medium dense, fine to coarse grained sand, trace pinhole pores		28		12.7	119.3	
10	•••	@ 10 ft, trace pinhole pores		21		12.8	117.3	
15	•••	Sand (SP): Reddish brown, moist, medium dense, fine to medium grained sand		10	▼			
	•••	Clayey Sand (SC): Reddish brown, moist, medium dense, fine to medium grained sand			▼			
20	•••	Sandy Clay (CL): Reddish brown, moist, hard, fine grained sand		28	▼			
	•••				▼			

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-1
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 294
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
30	[Diagonal Hatching]	<u>Silty Clay with Sand (CL)</u> : Light reddish brown, moist, hard, fine grained sand	19	▲				
35	[Diagonal Hatching]	<u>Silty Sand trace Clay (SM)</u> : Light reddish brown, moist, medium dense, fine grained sand	12	▲				200
35	[Diagonal Hatching]	<u>Clayey Sand (SC)</u> : Light reddish brown, moist, medium dense, fine to medium grained sand	10	▲				SA Hydro
35	[Diagonal Hatching]	<u>Sand with Silt (SP)</u> : Light reddish brown, moist, medium dense, fine to medium grained sand						
40	[Diagonal Hatching]	<u>Silty Sand trace Clay (SM)</u> : Light reddish brown, moist, dense, fine grained sand	16	▲				200
45	[Diagonal Hatching]	<u>Sandy Clay (CL)</u> : Reddish brown, moist, hard, fine grained sand	20	▲				

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-1
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 294
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lith- ology	Material Description	Water	Samples		Laboratory Tests			
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		<p><u>Clayey Sand (SC):</u> Light reddish brown, moist, very dense, fine to coarse grained sand</p> <p>Total Depth 51.5 feet No Groundwater Boring backfilled with soil cuttings</p> <p>Percolation Well (10ft offset): 0-30' solid 3" pipe 30-35' perforated 3" pipe caved to 25', no gravel added</p>		28					

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-2
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 296
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	Grass							
	ALLUVIUM (Qal)							
		<u>Sandy Clay (CL):</u> Light reddish brown, dry to damp, hard, fine grained sand, trace pinhole pores and fine roots						
5		@ 4 ft, some medium grained sand, trace pinhole pores and fine roots		58	█	5.7	115.1	
				38	█	10.1	120	Consol
		<u>Silty Sand with Clay (SM):</u> Light reddish brown, moist, medium dense, fine to medium grained sand, some coarse grained sand, trace pinhole pores		20	█	7.3	110.6	Consol
10		<u>Silty Clay with Sand (CL-ML):</u> Light reddish brown to reddish brown, moist, very stiff, fine grained sand, trace pinhole pores		28	█	14.8	109.1	
15		<u>Silty Clay (CL-ML):</u> Light reddish brown to light gray, moist, stiff		8	▼			
20				11	▼			

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-2
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 296
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
30		<p>10</p> <p style="text-align: center;">▼</p> <p style="text-align: center;">▲</p>						
		<p><u>Sandy Clay (CL):</u> Reddish brown, moist, very stiff, fine grained sand</p> <p>8</p> <p style="text-align: center;">▼</p> <p style="text-align: center;">▲</p>						
		<p>Total Depth 31.5 feet</p> <p>No Groundwater</p> <p>Boring backfilled with soil cuttings</p>						

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-3
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 297
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
	Grass							
	ALLUVIUM (Qal)							
		<u>Sandy Clay (CL):</u> Light reddish brown, dry to damp, very stiff, fine grained sand, trace pinhole pores						
5		@ 4 ft, moist, hard		38	█	10	112.1	
		@ 6 ft, moist, hard		74	█	11.1	119.4	
		@ 6 ft, Gray to reddish brown, very stiff, less sand		32	█	14.4	117	
10		@ 10 ft, hard, less gray, more sand		37	█	14.3	113.6	
15		@ 15 ft, very stiff		10	▼			
20				14	▼			

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-3
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 297
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
30	@ 25 ft, hard, more sand			17	▲			
35	<u>Silty Sand / Sandy Silty trace Clay (SM/ML):</u> Light reddish brown, moist, medium dense / very stiff			8	▲			200
35	<u>Silty Sand trace Clay (SM):</u> Light reddish brown, moist, very stiff			13	▲			200
		Total Depth 36.5 feet No Groundwater Boring backfilled with soil cuttings Percolation Well: 0-30' solid 3" pipe 30-35' perforated 3" pipe caved to 27', no gravel added						

EXPLORATION LOG

Project: Santa Angelina Senior Community		Location: B-4
Address: 1314 N Angelina Dr, Placentia, CA		Elevation: 297
Job Number: 2859.00	Client: National Community Renaissance	Date: 12/17/2019
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: DDA

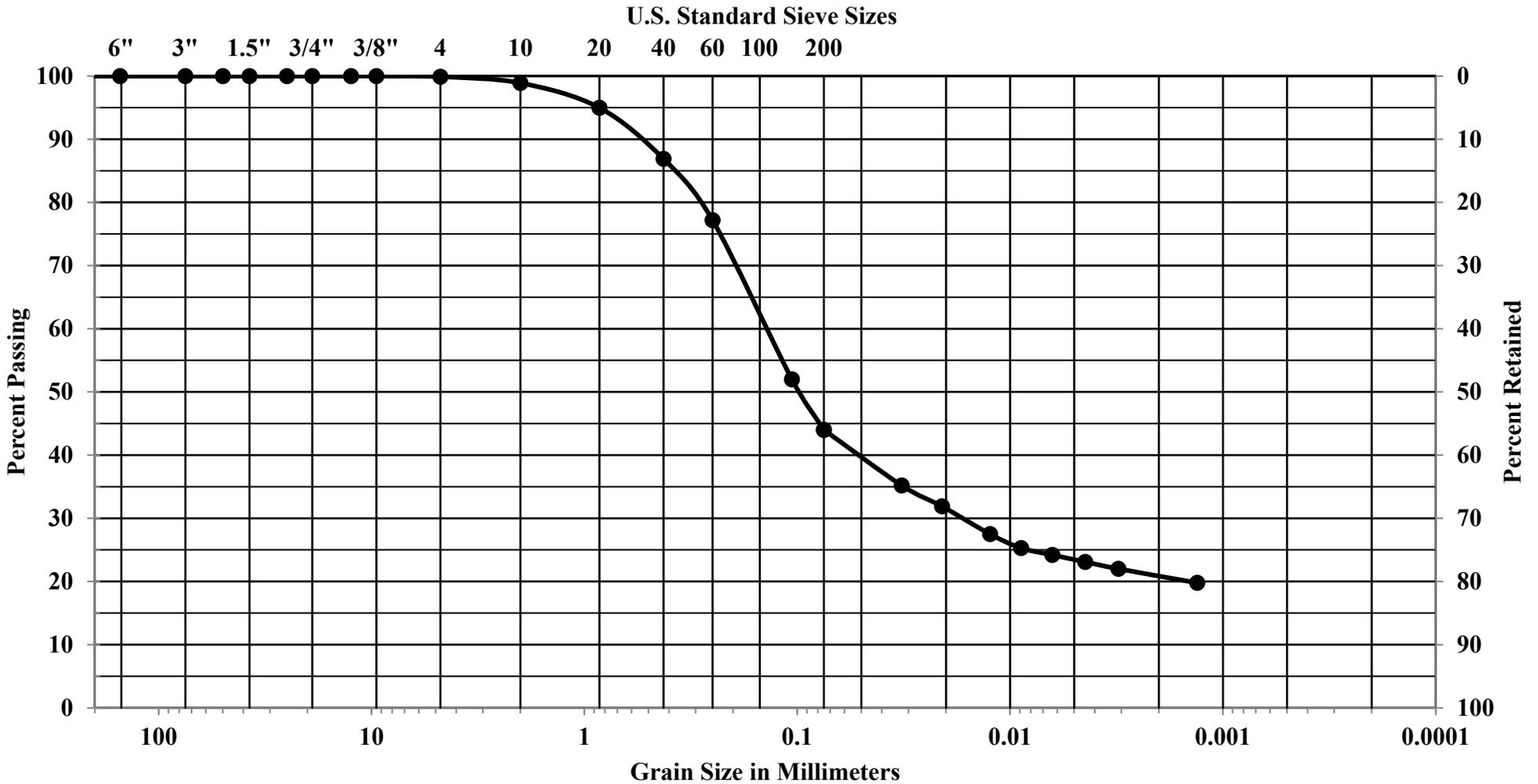
Depth (feet)	Lithology	Material Description	Water	Samples		Laboratory Tests		
				Blows Per Foot	Core Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		Grass						
		ALLUVIUM (Qal) <u>Sandy Clay with Silt (CL):</u> Reddish brown, damp to moist, stiff, fine grained sand, trace pinhole pores and fine roots		16		10.6	103.2	Max EI SO4 DS ATT pH Resist Ch
		@ 4 ft, hard		41		10.3	114.5	Consol
5		<u>Clayey Sand (SC):</u> Light reddish brown, moist, dense, fine to medium grained sand						
		<u>Sandy Clay with Silt (CL):</u> Reddish brown, moist, very stiff, fine grained sand, trace pinhole pores		35		19.9	103.7	
10		@ 10 ft, trace pinhole pores		29		22.2	98	
15		<u>Silty Clay trace Sand (CL):</u> Light reddish brown to light gray, damp, very stiff, fine grained sand		13				
20		<u>Silty Sand / Sandy Silt trace Clay (SM/ML):</u> Light reddish brown, damp, medium dense / very stiff, fine grained sand		15				

APPENDIX B

LABORATORY TEST PROGRAM

GRAIN SIZE DISTRIBUTION

COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	



Job Number	Location	Depth	Description
2859.00	B-1	35-36.2	Clayey Sand (SC)

APPENDIX C
PERCOLATION TESTING AND ANALYSES

Field Percolation Testing - Constant Head

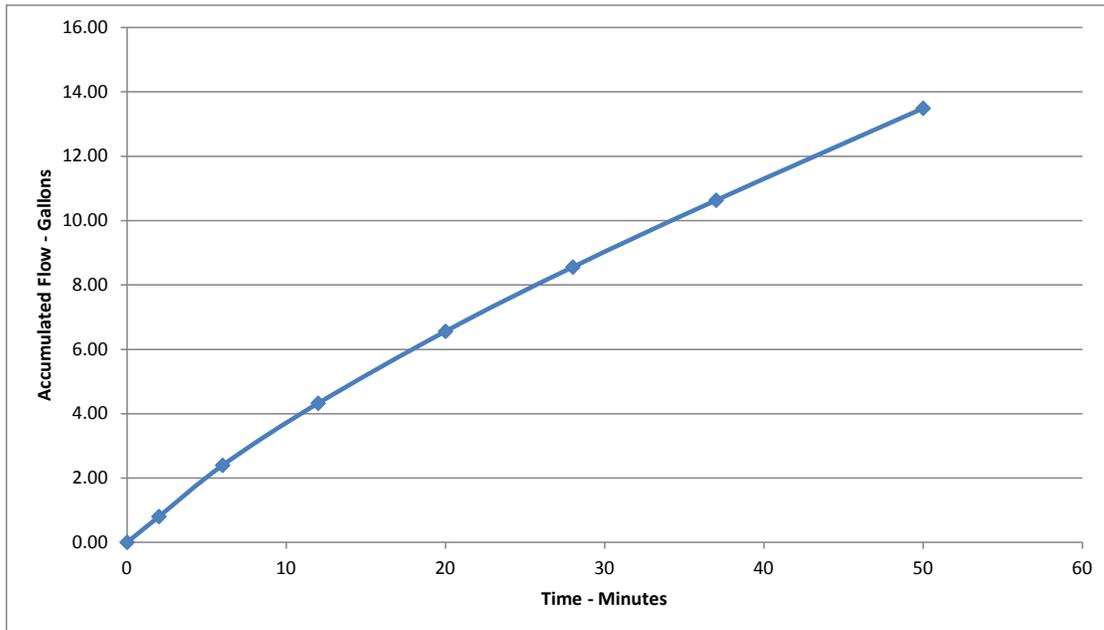
Client: NCR
 Date Tested: 12/17/2019
 Location: B-1 / P-1

Job. No.: 2859.00
 Test by: ddalbus

Top of Casing to Bottom of Well (ft): 35.1
 Elev. of Ground Surface (ft): 294
 Diam. of Test Hole (in): 8
 Diam. of Casing (in): 3
 Ht. to Top of Casing (ft): 0.15
 Water Temperature (C°): 21

Constant Head

Elapsed Time (minutes)	Time	Depth to H ₂ O (ft)	Flow Rate (gal./min.)	Total H ₂ O used (gal)
0	15:40	31.4	0.46	0.00
2	15:42	31.4	0.34	0.80
6	15:46	31.4	0.30	2.40
12	15:52	31.4	0.26	4.32
20	16:00	31.4	0.24	6.56
28	16:08	31.4	0.22	8.56
37	16:17	31.40	0.22	10.63
50	16:30	31.40	0.22	13.49



Field Percolation Testing - Constant Head

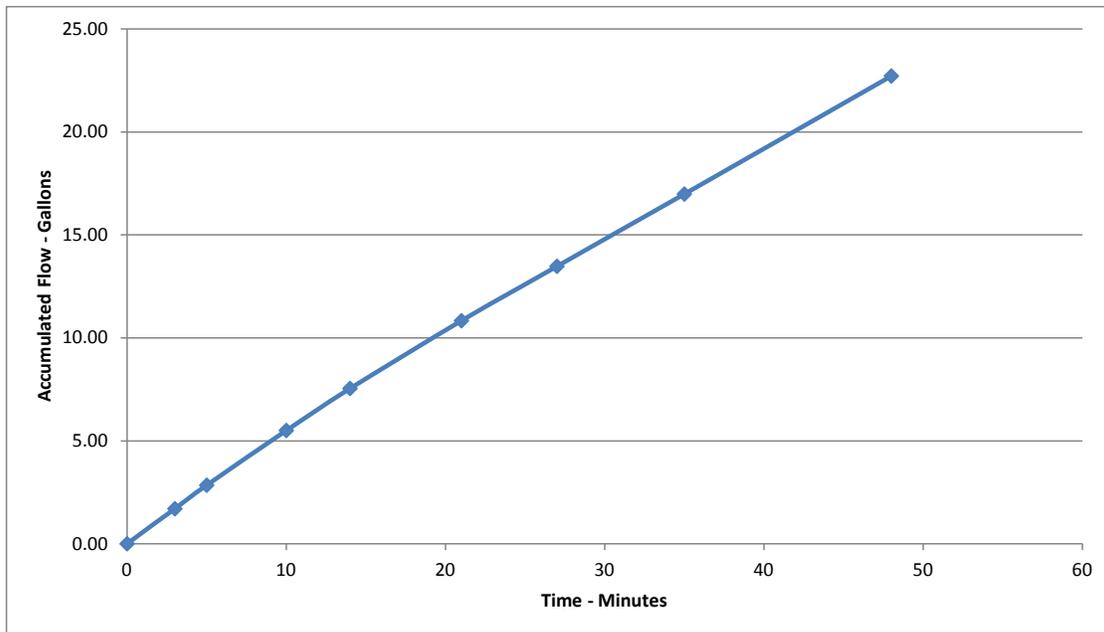
Client: NCR
 Date Tested: 12/17/2019
 Location: B-3 / P-2

Job. No.: 2859.00
 Test by: ddalbus

Top of Casing to Bottom of Well (ft): 35
 Elev. of Ground Surface (ft): 297
 Diam. of Test Hole (in): 8
 Diam. of Casing (in): 3
 Ht. to Top of Casing (ft): 0
 Water Temperature (C°): 21

Constant Head

Elapsed Time (minutes)	Time	Depth to H ₂ O (ft)	Flow Rate (gal./min.)	Total H ₂ O used (gal)
0	14:27	31.5	0.60	0.00
3	14:30	31.5	0.54	1.71
5	14:32	31.5	0.52	2.85
10	14:37	31.5	0.50	5.50
14	14:41	31.5	0.44	7.54
21	14:48	31.5	0.44	10.83
27	14:54	31.50	0.44	13.47
35	15:02	31.50	0.44	16.99
48	15:15	31.50	0.44	22.71



INFILTRATION WELL DESIGN

Constant Head

USB 7300-89 Method

J.N.: 2859.00

Client: NCR

Well No.: B-1 / P-1

Low Water Table	Condition 1	
High Water Table & Water Below Bottom of Well	Condition 2	
High water Table with Water Above the Well Bottom	Condition 3	
		Units:
Enter Condition (1, 2 or 3):	1	
Ground Surface to Bottom of Well (h_1):	34.95	feet
Depth to Water (h_2):	31.25	feet
Height of Water in the Well ($h_1-h_2=h$):	3.7	feet
Radius of Well (r):	4.0	Inches
Minimum Volume Required:	729.4	Gal.
Discharge Rate of Water Into Well for Steady-State Condition (q):	0.22	Gal/min.
Temperature (T):	21	Celsius
(Viscosity of Water @ Temp. T) / (Viscosity of water @ 20° C) (V):	0.9647	ft ³ /min.
Unsaturated Distance Between the Water Surface in the Well and the Water table (T_u):		Ignore T_u
Factor of Safety:	1	
Coefficient of Permeability @ 20° C (k_{20}):	7.29E-04	ft/min.
Design k_{20}:	0.53	in./hr.

The presence or absence of a water table or impervious soil layer within a distance of less than three times that of the water depth in the well (measured from the water surface) will enable the water table to be classified as **Condition I**, **Condition II**, **Condition III**.

Low Water Table-When the distance from the water surface in the test well to the ground water table, or to an impervious soil layer which is considered for test purposes to be equivalent to a water table, is greater than three times the depth of water in the well, classify as **Condition I**.

High Water Table-When the distance from the water surface in the test well to the ground water table or to an impervious layer is less than three times the depth of water in the well, a high water table condition exists. Use **Condition II** when the water table or impervious layer is below the well bottom. Use **Condition III** when the water table or impervious layer is above the well bottom.

INFILTRATION WELL DESIGN

Constant Head

USBR 7300-89 Method

J.N.: 2859.00

Client: NCR

Well No.: B-3 / P-2

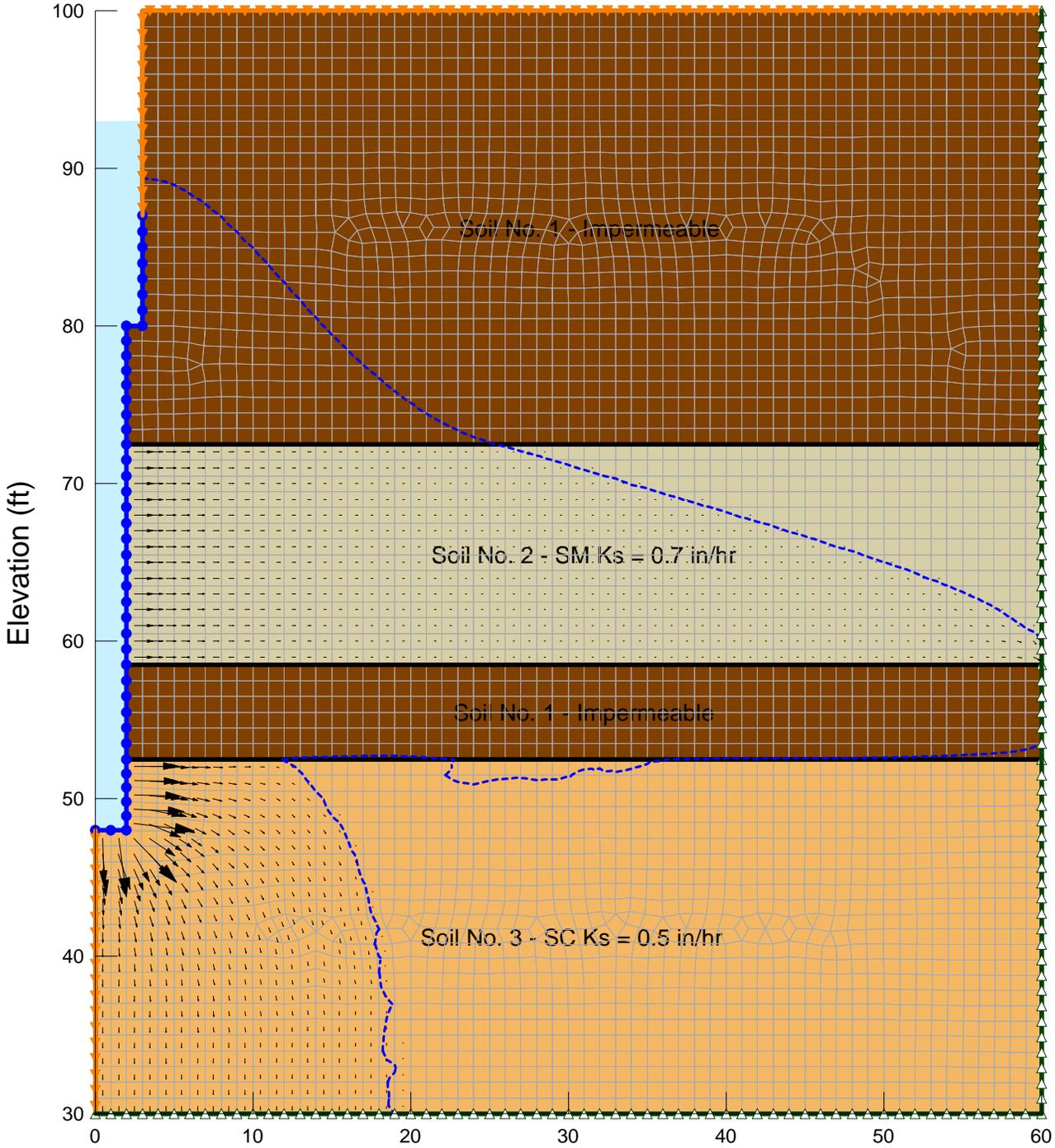
Low Water Table	Condition 1	
High Water Table & Water Below Bottom of Well	Condition 2	
High water Table with Water Above the Well Bottom	Condition 3	
		Units:
Enter Condition (1, 2 or 3):	1	
Ground Surface to Bottom of Well (h_1):	35	feet
Depth to Water (h_2):	31.5	feet
Height of Water in the Well ($h_1-h_2=h$):	3.5	feet
Radius of Well (r):	4.0	Inches
Minimum Volume Required:	642.6	Gal.
Discharge Rate of Water Into Well for Steady-State Condition (q):	0.44	Gal/min.
Temperature (T):	21	Celsius
(Viscosity of Water @ Temp. T) / (Viscosity of water @ 20° C) (V):	0.9647	ft ³ /min.
Unsaturated Distance Between the Water Surface in the Well and the Water table (T_u):		Ignore T_u
Factor of Safety:	1	
Coefficient of Permeability @ 20° C (k_{20}):	1.59E-03	ft/min.
Design k_{20}:	1.15	in./hr.

The presence or absence of a water table or impervious soil layer within a distance of less than three times that of the water depth in the well (measured from the water surface) will enable the water table to be classified as **Condition I**, **Condition II**, **Condition III**.

Low Water Table-When the distance from the water surface in the test well to the ground water table, or to an impervious soil layer which is considered for test purposes to be equivalent to a water table, is greater than three times the depth of water in the well, classify as **Condition I**.

High Water Table-When the distance from the water surface in the test well to the ground water table or to an impervious layer is less than three times the depth of water in the well, a high water table condition exists. Use **Condition II** when the water table or impervious layer is below the well bottom. Use **Condition III** when the water table or impervious layer is above the well bottom.

**STEADY STATE
FLOW ANALYSIS OF 52 ft DEEP DRY WELL**



Arrows indicate direction of flow and relative magnitude of velocity.

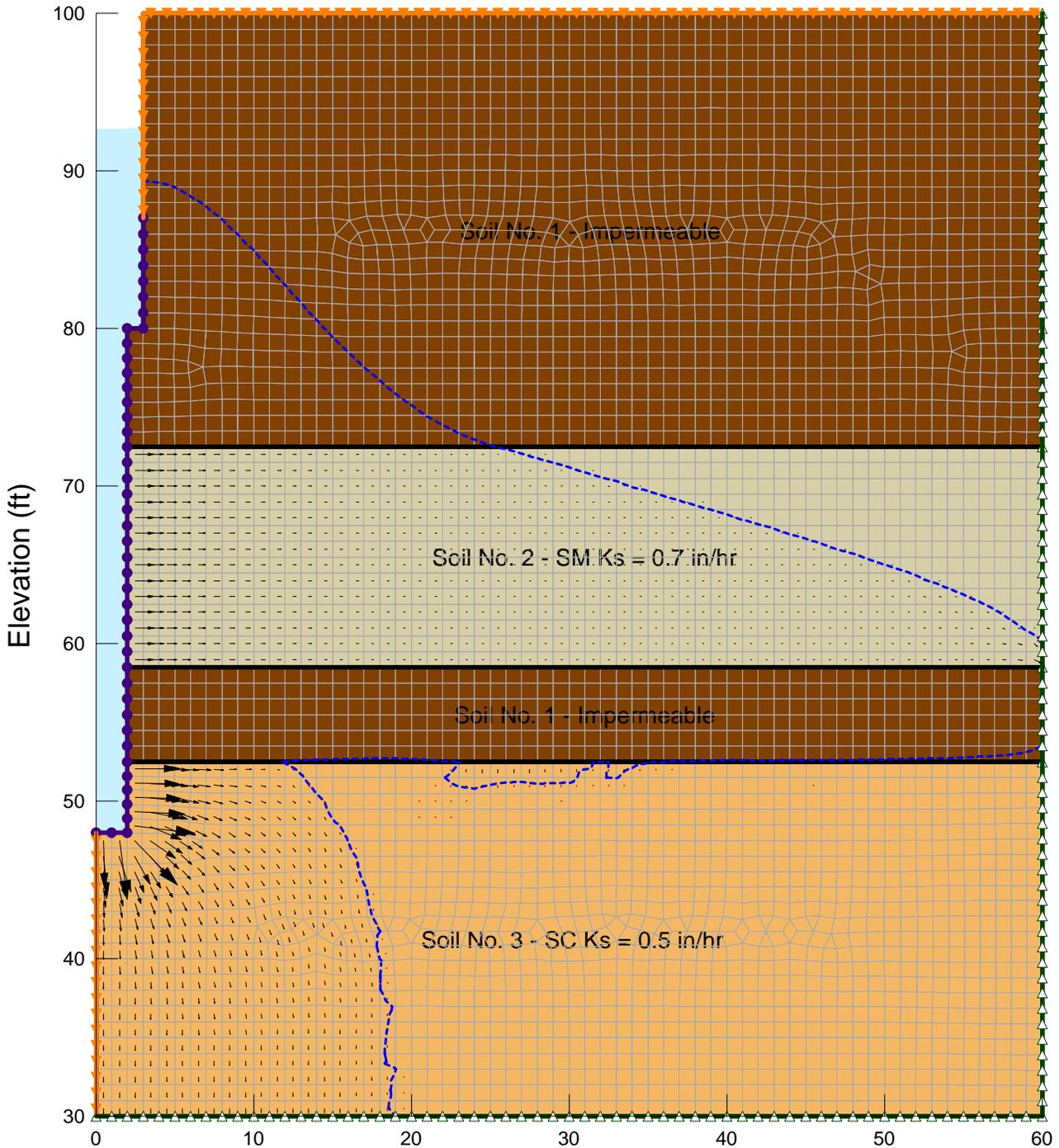
Contours are Pressure Head in Feet.

Radius (ft)

LEGEND

- Zero Flux
- Potential Seepage Face
- Well Head Function
- Fixed Total Head = 93 ft

TRANSIENT @ 0.06 hrs
FLOW ANALYSIS OF 52 ft DEEP DRY WELL



Arrows indicate direction of flow and relative magnitude of velocity.

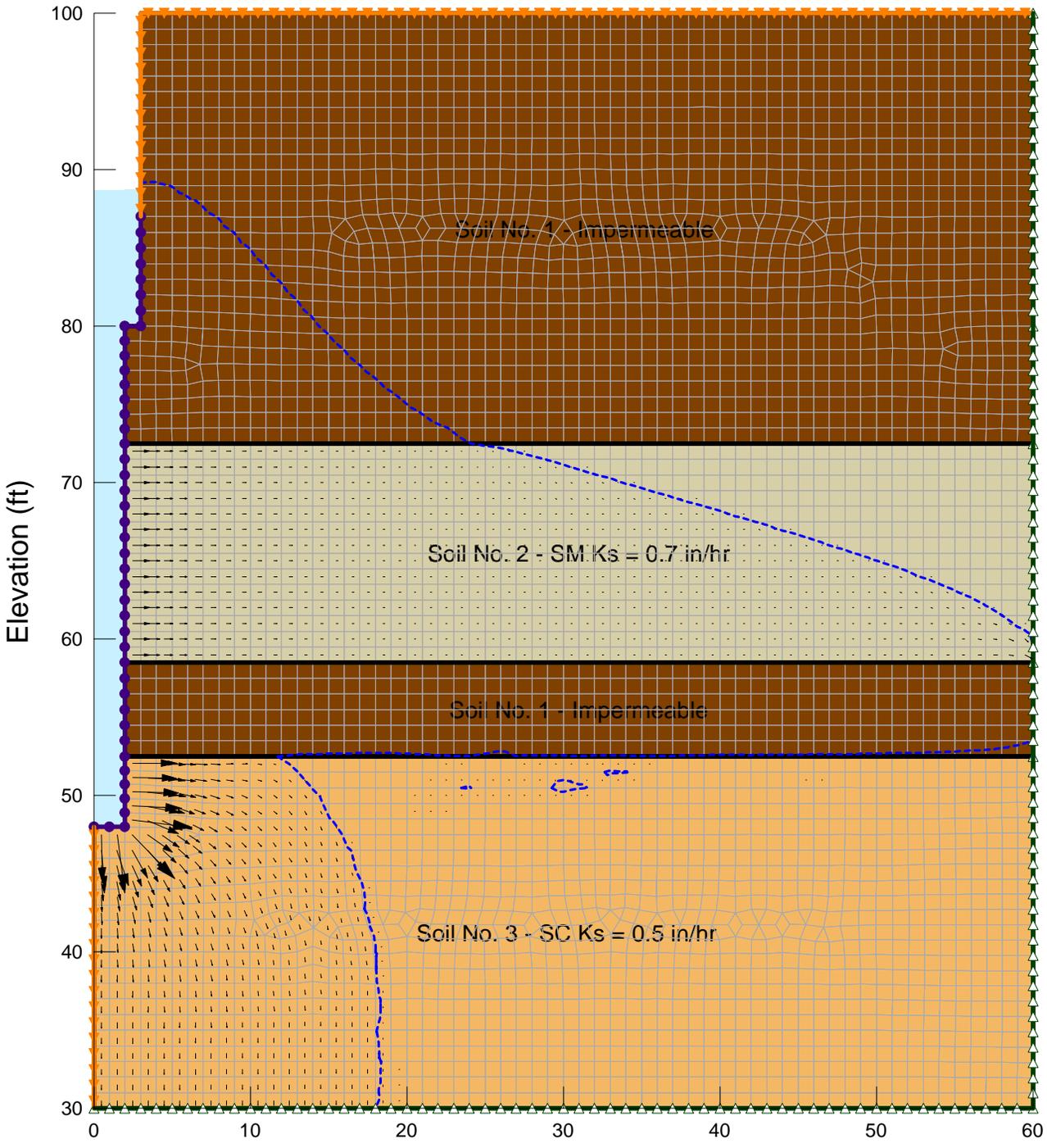
Contours are Pressure Head in Feet.

Radius (ft)

LEGEND

-  Zero Flux
-  Potential Seepage Face
-  Well Head Function
-  Fixed Total Head = 93 ft

TRANSIENT @ 0.72 hrs
FLOW ANALYSIS OF 52 ft DEEP DRY WELL



Arrows indicate direction of flow and relative magnitude of velocity.

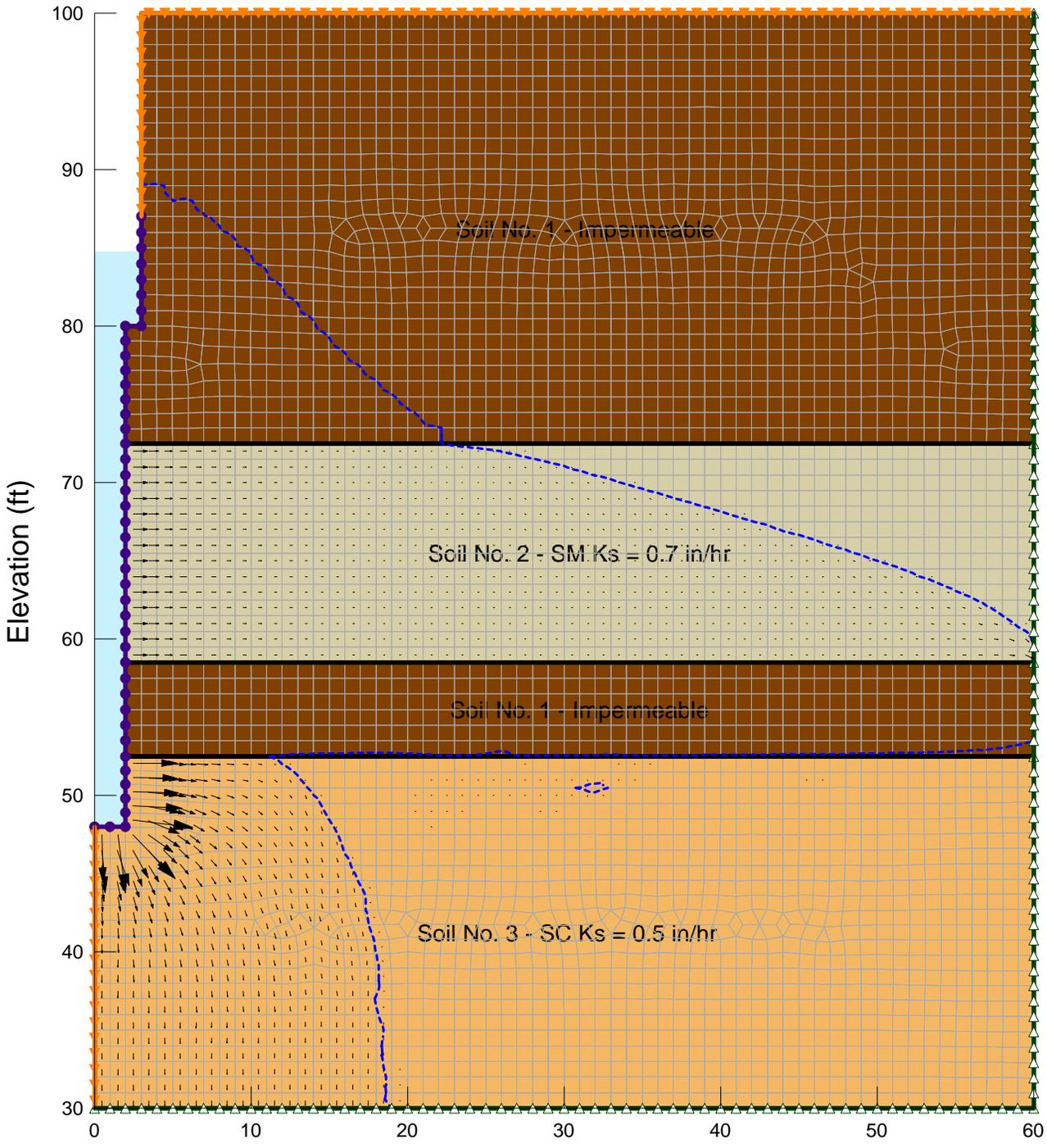
Contours are Pressure Head in Feet.

Radius (ft)

LEGEND

-  Zero Flux
-  Potential Seepage Face
-  Well Head Function
-  Fixed Total Head = 93 ft

TRANSIENT @ 1.66 hrs
FLOW ANALYSIS OF 52 ft DEEP DRY WELL



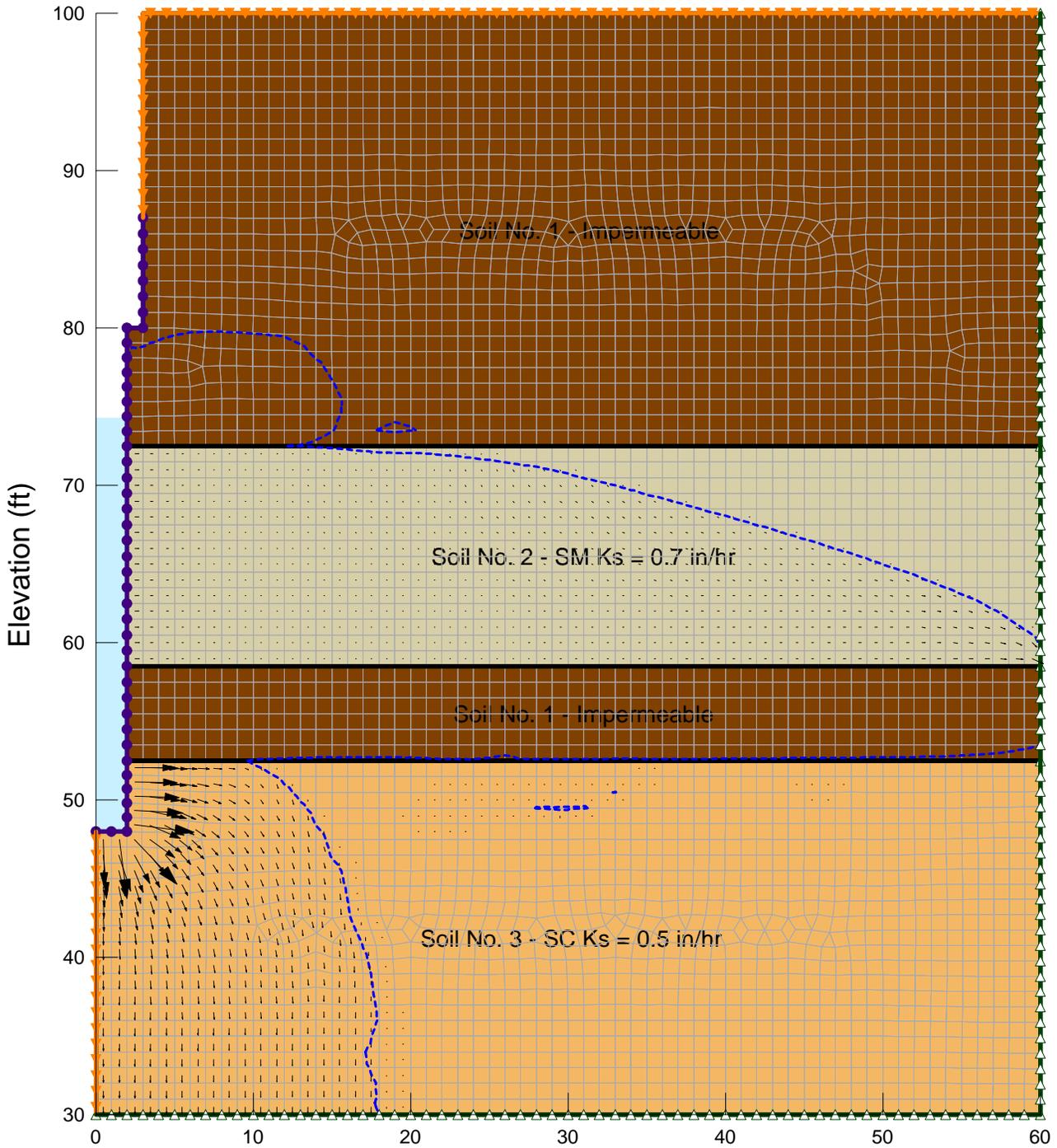
Arrows indicate direction of flow and relative magnitude of velocity.

Contours are Pressure Head in Feet.

Radius (ft)

LEGEND	
	Zero Flux
	Potential Seepage Face
	Well Head Function
	Fixed Total Head = 93 ft

TRANSIENT @ 3.6 hrs
FLOW ANALYSIS OF 52 ft DEEP DRY WELL



Arrows indicate direction of flow and relative magnitude of velocity.

Contours are Pressure Head in Feet.

Radius (ft)

LEGEND

- Zero Flux
- Potential Seepage Face
- Well Head Function
- Fixed Total Head = 93 ft

APPENDIX G

2-YEAR HYDROLOGY CALCULATIONS

 RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
 (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
 (c) Copyright 1983-2016 Advanced Engineering Software (aes)
 Ver. 23.0 Release Date: 07/01/2016 License ID 1355

Analysis prepared by:

fuscoe engineering
 16795 Von Karman
 Suite 100
 Irvine, CA

***** DESCRIPTION OF STUDY *****
 * Placentia Senior Housing *
 * 1314 N. Angelina, Placentia *
 * Existing Condition - 2-year storm event *

FILE NAME: EXANG2.DAT
 TIME/DATE OF STUDY: 10:48 04/14/2020

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00
 SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
 DATA BANK RAINFALL USED
 ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- CROWN TO	STREET-CROSSFALL:	CURB GUTTER-GEOMETRIES:	MANNING				
	WIDTH CROSSFALL				IN- / OUT-/PARK-	HEIGHT	WIDTH LIP HIKE	FACTOR
	(FT)	(FT)	SIDE / SIDE/ WAY	(FT)	(FT)	(FT)	(FT)	(n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
 1. Relative Flow-Depth = 0.00 FEET
 as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)
 *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
 OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
 *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 21

 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<< A1
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
 ELEVATION DATA: UPSTREAM(FEET) = 301.70 DOWNSTREAM(FEET) = 298.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.712

A1

EXANG2

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.389
 SUBAREA Tc AND LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 RESIDENTIAL
 "1 DWELLING/ACRE" B 0.88 0.30 0.800 36 11.71
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.800
 SUBAREA RUNOFF(CFS) = 0.91
 TOTAL AREA(ACRES) = 0.88 PEAK FLOW RATE(CFS) = 0.91

 FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<< A2

=====

ELEVATION DATA: UPSTREAM(FEET) = 298.00 DOWNSTREAM(FEET) = 297.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 72.00 CHANNEL SLOPE = 0.0139
 CHANNEL BASE(FEET) = 10.00 "Z" FACTOR = 20.000
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 2.00
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.317
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 NATURAL GOOD COVER
 "GRASS" B 0.43 0.30 1.000 41
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.11
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.06
 AVERAGE FLOW DEPTH(FEET) = 0.09 TRAVEL TIME(MIN.) = 1.13
 Tc(MIN.) = 12.84
 SUBAREA AREA(ACRES) = 0.43 SUBAREA RUNOFF(CFS) = 0.39
 EFFECTIVE AREA(ACRES) = 1.31 AREA-AVERAGED Fm(INCH/HR) = 0.26
 AREA-AVERAGED Fp(INCH/HR) = 0.30 AREA-AVERAGED Ap = 0.87
 TOTAL AREA(ACRES) = 1.3 PEAK FLOW RATE(CFS) = 1.25

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.09 FLOW VELOCITY(FEET/SEC.) = 1.11
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 103.00 = 402.00 FEET.

 FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 61

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>(STANDARD CURB SECTION USED)<<<<< A3

=====

UPSTREAM ELEVATION(FEET) = 297.00 DOWNSTREAM ELEVATION(FEET) = 294.80
 STREET LENGTH(FEET) = 283.00 CURB HEIGHT(INCHES) = 6.0
 STREET HALFWIDTH(FEET) = 24.00

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

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
 Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0160

EXANG2

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.59
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
STREET FLOW DEPTH(FEET) = 0.30
HALFSTREET FLOOD WIDTH(FEET) = 8.90
AVERAGE FLOW VELOCITY(FEET/SEC.) = 1.75
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.53
STREET FLOW TRAVEL TIME(MIN.) = 2.69 Tc(MIN.) = 15.53
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.181

SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
APARTMENTS C 0.35 0.25 0.200 50
RESIDENTIAL
"8-10 DWELLINGS/ACRE" C 0.35 0.25 0.400 50
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.300
SUBAREA AREA(ACRES) = 0.70 SUBAREA RUNOFF(CFS) = 0.70
EFFECTIVE AREA(ACRES) = 2.01 AREA-AVERAGED Fm(INCH/HR) = 0.20
AREA-AVERAGED Fp(INCH/HR) = 0.29 AREA-AVERAGED Ap = 0.67
TOTAL AREA(ACRES) = 2.0 PEAK FLOW RATE(CFS) = 1.78

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.31 HALFSTREET FLOOD WIDTH(FEET) = 9.34
FLOW VELOCITY(FEET/SEC.) = 1.80 DEPTH*VELOCITY(FT*FT/SEC.) = 0.56
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 104.00 = 685.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 15.53
RAINFALL INTENSITY(INCH/HR) = 1.18
AREA-AVERAGED Fm(INCH/HR) = 0.20
AREA-AVERAGED Fp(INCH/HR) = 0.29
AREA-AVERAGED Ap = 0.67
EFFECTIVE STREAM AREA(ACRES) = 2.01
TOTAL STREAM AREA(ACRES) = 2.01
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.78

FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 300.70 DOWNSTREAM(FEET) = 297.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.615
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.555
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)

EXANG2

RESIDENTIAL

"8-10 DWELLINGS/ACRE" C 0.83 0.25 0.400 50 9.62
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.400
 SUBAREA RUNOFF(CFS) = 1.09
 TOTAL AREA(ACRES) = 0.83 PEAK FLOW RATE(CFS) = 1.09

FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<

>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

A5

=====

ELEVATION DATA: UPSTREAM(FEET) = 297.50 DOWNSTREAM(FEET) = 295.50
 CHANNEL LENGTH THRU SUBAREA(FEET) = 186.00 CHANNEL SLOPE = 0.0108
 CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 24.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.434

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
APARTMENTS	C	0.58	0.25	0.200	50

RESIDENTIAL

"8-10 DWELLINGS/ACRE" C 0.58 0.25 0.400 50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.300
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.80
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.12
 AVERAGE FLOW DEPTH(FEET) = 0.19 TRAVEL TIME(MIN.) = 1.46
 Tc(MIN.) = 11.08
 SUBAREA AREA(ACRES) = 1.16 SUBAREA RUNOFF(CFS) = 1.42
 EFFECTIVE AREA(ACRES) = 1.99 AREA-AVERAGED Fm(INCH/HR) = 0.09
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.34
 TOTAL AREA(ACRES) = 2.0 PEAK FLOW RATE(CFS) = 2.42

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.21 FLOW VELOCITY(FEET/SEC.) = 2.27
 LONGEST FLOWPATH FROM NODE 105.00 TO NODE 107.00 = 516.00 FEET.

FLOW PROCESS FROM NODE 107.00 TO NODE 104.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 11.08
 RAINFALL INTENSITY(INCH/HR) = 1.43
 AREA-AVERAGED Fm(INCH/HR) = 0.09
 AREA-AVERAGED Fp(INCH/HR) = 0.25
 AREA-AVERAGED Ap = 0.34
 EFFECTIVE STREAM AREA(ACRES) = 1.99
 TOTAL STREAM AREA(ACRES) = 1.99
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.42

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap (ACRES)	Ae (ACRES)	HEADWATER NODE
------------------	------------	--------------	------------------------	---------------------	---------------	---------------	-------------------

EXANG2

1	1.78	15.53	1.181	0.29(0.20)	0.67	2.0	101.00
2	2.42	11.08	1.434	0.25(0.09)	0.34	2.0	105.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	4.01	11.08	1.434	0.27(0.13)	0.48	3.4	105.00
2	3.74	15.53	1.181	0.28(0.14)	0.51	4.0	101.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 4.01 Tc(MIN.) = 11.08
 EFFECTIVE AREA(ACRES) = 3.42 AREA-AVERAGED Fm(INCH/HR) = 0.13
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.48
 TOTAL AREA(ACRES) = 4.0
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 104.00 = 685.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 4.0 TC(MIN.) = 11.08
 EFFECTIVE AREA(ACRES) = 3.42 AREA-AVERAGED Fm(INCH/HR)= 0.13
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.479
 PEAK FLOW RATE(CFS) = 4.01

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	4.01	11.08	1.434	0.27(0.13)	0.48	3.4	105.00
2	3.74	15.53	1.181	0.28(0.14)	0.51	4.0	101.00

END OF RATIONAL METHOD ANALYSIS



NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS

=====

(C) Copyright 1989-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1355

Analysis prepared by:

fuscoe engineering
16795 Von Karman
Suite 100
Irvine, CA

Problem Descriptions:

Placentia Senior Housing
1314 N. Angelina, Placentia
Existing Condition 2-year/24-hour hydrograph

=====

*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 2.05 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp (in./hr.)	YIELD
1	0.88	80.00	56. (AMC II)	0.300	0.178
2	0.43	100.00	61. (AMC II)	0.300	0.000
3	0.70	30.00	69. (AMC II)	0.250	0.623
4	0.83	40.00	69. (AMC II)	0.250	0.534
5	1.16	30.00	69. (AMC II)	0.250	0.623

TOTAL AREA (Acres) = 4.00

AREA-AVERAGED LOSS RATE, \bar{F}_m (in./hr.) = 0.141

AREA-AVERAGED LOW LOSS FRACTION, \bar{Y} = 0.560

=====

Problem Descriptions:

Placentia Senior Housing
1314 N. Angelina, Placentia
Existing Condition 2-year/24-hour hydrograph (calib coef: 0.777)

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.78
TOTAL CATCHMENT AREA (ACRES) = 4.00
SOIL-LOSS RATE, F_m , (INCH/HR) = 0.141
LOW LOSS FRACTION = 0.560
TIME OF CONCENTRATION (MIN.) = 11.08
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
RETURN FREQUENCY (YEARS) = 2
5-MINUTE POINT RAINFALL VALUE (INCHES) = 0.19
30-MINUTE POINT RAINFALL VALUE (INCHES) = 0.40
1-HOUR POINT RAINFALL VALUE (INCHES) = 0.53

3-HOUR POINT RAINFALL VALUE (INCHES) = 0.89
 6-HOUR POINT RAINFALL VALUE (INCHES) = 1.22
 24-HOUR POINT RAINFALL VALUE (INCHES) = 2.05

TOTAL CATCHMENT RUNOFF VOLUME (ACRE-FEET) = 0.27
 TOTAL CATCHMENT SOIL-LOSS VOLUME (ACRE-FEET) = 0.41

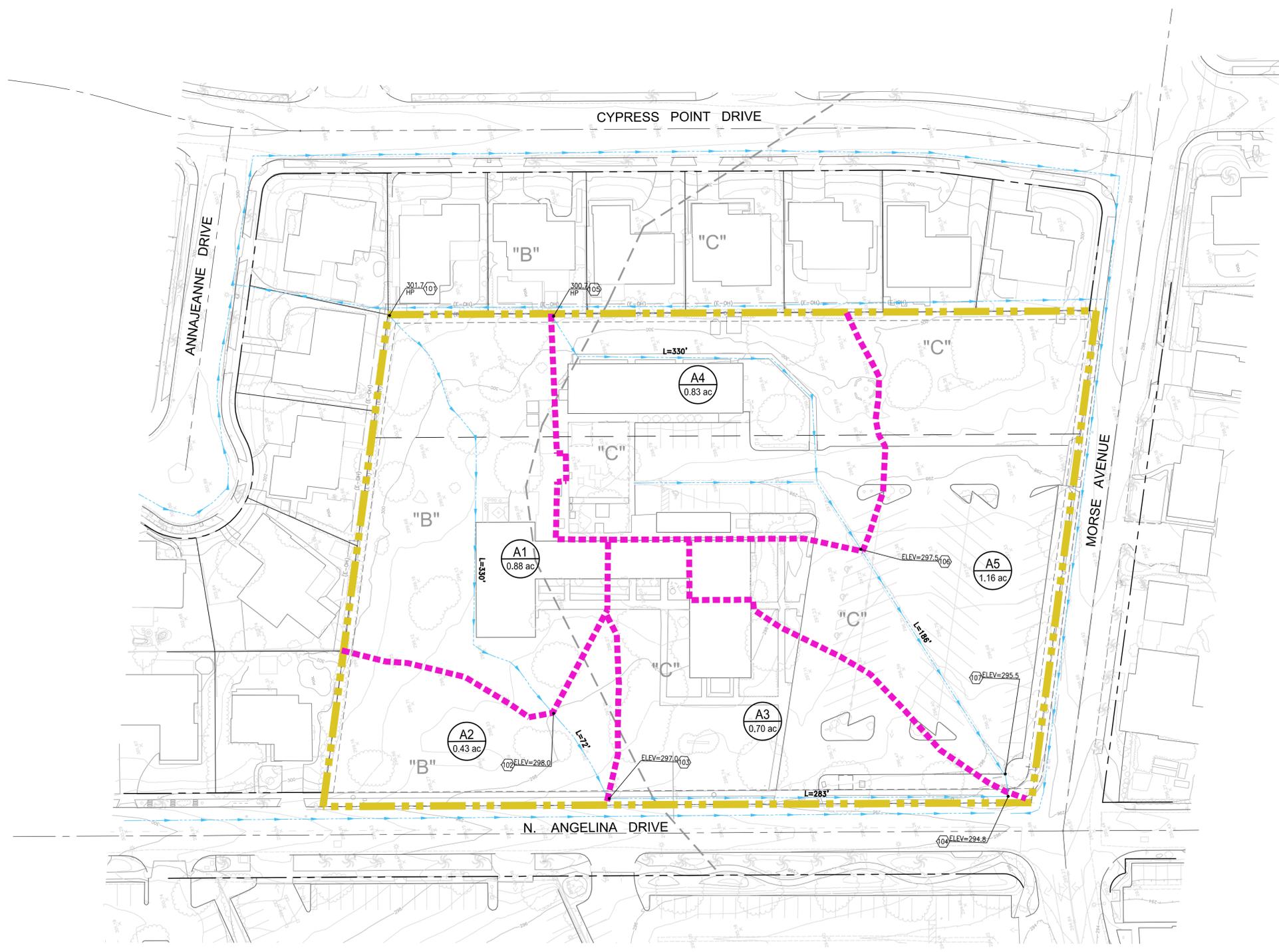
TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.12	0.0000	0.00	Q	.	.	.	.
0.30	0.0003	0.04	Q	.	.	.	.
0.49	0.0010	0.04	Q	.	.	.	.
0.67	0.0017	0.04	Q	.	.	.	.
0.86	0.0024	0.04	Q	.	.	.	.
1.04	0.0031	0.05	Q	.	.	.	.
1.23	0.0038	0.05	Q	.	.	.	.
1.41	0.0045	0.05	Q	.	.	.	.
1.60	0.0052	0.05	Q	.	.	.	.
1.78	0.0059	0.05	Q	.	.	.	.
1.97	0.0066	0.05	Q	.	.	.	.
2.15	0.0073	0.05	Q	.	.	.	.
2.33	0.0080	0.05	Q	.	.	.	.
2.52	0.0088	0.05	Q	.	.	.	.
2.70	0.0095	0.05	Q	.	.	.	.
2.89	0.0103	0.05	Q	.	.	.	.
3.07	0.0110	0.05	Q	.	.	.	.
3.26	0.0118	0.05	Q	.	.	.	.
3.44	0.0125	0.05	Q	.	.	.	.
3.63	0.0133	0.05	Q	.	.	.	.
3.81	0.0141	0.05	Q	.	.	.	.
4.00	0.0149	0.05	Q	.	.	.	.
4.18	0.0157	0.05	Q	.	.	.	.
4.37	0.0165	0.05	Q	.	.	.	.
4.55	0.0173	0.05	Q	.	.	.	.
4.74	0.0181	0.05	Q	.	.	.	.
4.92	0.0189	0.05	Q	.	.	.	.
5.10	0.0198	0.06	Q	.	.	.	.
5.29	0.0206	0.06	Q	.	.	.	.
5.47	0.0215	0.06	Q	.	.	.	.
5.66	0.0224	0.06	Q	.	.	.	.
5.84	0.0232	0.06	Q	.	.	.	.
6.03	0.0241	0.06	Q	.	.	.	.
6.21	0.0250	0.06	Q	.	.	.	.
6.40	0.0259	0.06	Q	.	.	.	.
6.58	0.0268	0.06	Q	.	.	.	.
6.77	0.0277	0.06	Q	.	.	.	.
6.95	0.0287	0.06	Q	.	.	.	.
7.14	0.0296	0.06	Q	.	.	.	.
7.32	0.0306	0.06	Q	.	.	.	.
7.51	0.0316	0.06	Q	.	.	.	.
7.69	0.0326	0.07	Q	.	.	.	.
7.87	0.0336	0.07	Q	.	.	.	.
8.06	0.0346	0.07	Q	.	.	.	.
8.24	0.0356	0.07	Q	.	.	.	.
8.43	0.0366	0.07	Q	.	.	.	.
8.61	0.0377	0.07	Q	.	.	.	.
8.80	0.0388	0.07	Q	.	.	.	.

8.98	0.0399	0.07	Q	.	.	.	.
9.17	0.0410	0.07	Q	.	.	.	.
9.35	0.0421	0.07	Q	.	.	.	.
9.54	0.0433	0.08	Q	.	.	.	.
9.72	0.0444	0.08	Q	.	.	.	.
9.91	0.0456	0.08	Q	.	.	.	.
10.09	0.0468	0.08	Q	.	.	.	.
10.28	0.0481	0.08	Q	.	.	.	.
10.46	0.0493	0.08	Q	.	.	.	.
10.64	0.0506	0.09	Q	.	.	.	.
10.83	0.0519	0.09	Q	.	.	.	.
11.01	0.0533	0.09	Q	.	.	.	.
11.20	0.0547	0.09	Q	.	.	.	.
11.38	0.0561	0.09	Q	.	.	.	.
11.57	0.0575	0.10	Q	.	.	.	.
11.75	0.0590	0.10	Q	.	.	.	.
11.94	0.0605	0.10	Q	.	.	.	.
12.12	0.0621	0.12	Q	.	.	.	.
12.31	0.0640	0.13	Q	.	.	.	.
12.49	0.0660	0.13	Q	.	.	.	.
12.68	0.0681	0.14	Q	.	.	.	.
12.86	0.0702	0.14	Q	.	.	.	.
13.05	0.0724	0.14	Q	.	.	.	.
13.23	0.0746	0.15	Q	.	.	.	.
13.41	0.0769	0.15	Q	.	.	.	.
13.60	0.0794	0.16	Q	.	.	.	.
13.78	0.0819	0.17	Q	.	.	.	.
13.97	0.0845	0.18	Q	.	.	.	.
14.15	0.0873	0.18	Q	.	.	.	.
14.34	0.0902	0.20	Q	.	.	.	.
14.52	0.0934	0.21	Q	.	.	.	.
14.71	0.0968	0.23	Q	.	.	.	.
14.89	0.1004	0.24	Q	.	.	.	.
15.08	0.1042	0.27	.Q	.	.	.	.
15.26	0.1085	0.29	.Q	.	.	.	.
15.45	0.1131	0.32	.Q	.	.	.	.
15.63	0.1181	0.33	.Q	.	.	.	.
15.82	0.1255	0.64	. Q	.	.	.	.
16.00	0.1384	1.05	. Q	.	.	.	.
16.18	0.1770	4.01	.	Q	.	.	.
16.37	0.2109	0.43	.Q	.	.	.	.
16.55	0.2166	0.31	.Q	.	.	.	.
16.74	0.2209	0.25	.Q	.	.	.	.
16.92	0.2245	0.22	Q	.	.	.	.
17.11	0.2277	0.20	Q	.	.	.	.
17.29	0.2305	0.17	Q	.	.	.	.
17.48	0.2330	0.16	Q	.	.	.	.
17.66	0.2354	0.15	Q	.	.	.	.
17.85	0.2376	0.14	Q	.	.	.	.
18.03	0.2396	0.13	Q	.	.	.	.
18.22	0.2414	0.10	Q	.	.	.	.
18.40	0.2429	0.10	Q	.	.	.	.
18.59	0.2444	0.09	Q	.	.	.	.
18.77	0.2457	0.09	Q	.	.	.	.
18.95	0.2470	0.08	Q	.	.	.	.
19.14	0.2483	0.08	Q	.	.	.	.
19.32	0.2495	0.08	Q	.	.	.	.
19.51	0.2507	0.08	Q	.	.	.	.
19.69	0.2518	0.07	Q	.	.	.	.
19.88	0.2529	0.07	Q	.	.	.	.
20.06	0.2540	0.07	Q	.	.	.	.

20.25	0.2550	0.07	Q	.	.	.	.
20.43	0.2560	0.06	Q	.	.	.	.
20.62	0.2570	0.06	Q	.	.	.	.
20.80	0.2579	0.06	Q	.	.	.	.
20.99	0.2589	0.06	Q	.	.	.	.
21.17	0.2598	0.06	Q	.	.	.	.
21.36	0.2606	0.06	Q	.	.	.	.
21.54	0.2615	0.06	Q	.	.	.	.
21.72	0.2624	0.05	Q	.	.	.	.
21.91	0.2632	0.05	Q	.	.	.	.
22.09	0.2640	0.05	Q	.	.	.	.
22.28	0.2648	0.05	Q	.	.	.	.
22.46	0.2656	0.05	Q	.	.	.	.
22.65	0.2663	0.05	Q	.	.	.	.
22.83	0.2671	0.05	Q	.	.	.	.
23.02	0.2678	0.05	Q	.	.	.	.
23.20	0.2686	0.05	Q	.	.	.	.
23.39	0.2693	0.05	Q	.	.	.	.
23.57	0.2700	0.05	Q	.	.	.	.
23.76	0.2707	0.05	Q	.	.	.	.
23.94	0.2714	0.04	Q	.	.	.	.
24.13	0.2720	0.04	Q	.	.	.	.
24.31	0.2724	0.00	Q	.	.	.	.

TIME DURATION (minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
 (Note: 100% of Peak Flow Rate estimate assumed to have
 an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1440.4
10%	44.3
20%	22.2
30%	11.1
40%	11.1
50%	11.1
60%	11.1
70%	11.1
80%	11.1
90%	11.1



SITE EXISTING CONDITION			
STORM EVENT	Q (CFS)	T _c (MIN)	VOLUME (AC-FIT)
2-Year	4.01	11.08	0.27
10-Year	7.67	10.90	0.62
25-Year	9.30	10.82	0.80
100-Year	12.06	10.74	1.20

ASSESSOR PARCEL NO.

340-273-25

SITE ADDRESS

1314 N. ANGELINA DRIVE
 PLACENTIA, CALIFORNIA 92870

APPLICANT/OWNER

NATIONAL COMMUNITY RENAISSANCE OF CALIFORNIA
 9421 HAVEN AVENUE
 RANCHO CUCAMONGA, CA 91730
 TEL: (949) 394-7996

CIVIL ENGINEER

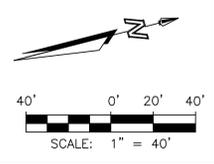
FUSCOE ENGINEERING
 16795 VON KARMAN, SUITE 100
 IRVINE, CA 92606
 TEL: 949.474.1960
 FAX: 949.474.5315

ABBREVIATIONS

- AC ACRE
- AC-FT ACRE-FOOT
- CFS CUBIC FEET PER SECOND
- ELEV ELEVATION
- HP HIGH POINT
- L LENGTH
- MIN MINUTES
- Q₂ FLOW RATE - 2-YEAR STORM
- S SLOPE
- T_c TIME OF CONCENTRATION

LEGEND

- DRAINAGE BOUNDARY
- DRAINAGE SUB-BOUNDARY
- (XX) NODE
- TIME OF CONCENTRATION FLOW PATH
- L=XXX' FLOW PATH LENGTH
- (XX) DRAINAGE BOUNDARY DESIGNATION AND AREA
- X.XXac
- SOIL TYPE DELINEATION



PREPARED BY:

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

**HYDROLOGY MAP
 EXISTING CONDITION**
 PLACENTIA SENIOR HOUSING 1314 N. ANGELINA DRIVE
 CITY OF PLACENTIA, CALIFORNIA

PROJECT NO.	1653-010
SHEET	1
OF	1

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
(c) Copyright 1983-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1355

Analysis prepared by:

fuscoe engineering
16795 Von Karman
Suite 100
Irvine, CA

***** DESCRIPTION OF STUDY *****
* Placentia Senior Housing *
* 1314 N. Angelina Drive *
* Proposed Condition - 2-year storm event *

FILE NAME: PRANG2.DAT
TIME/DATE OF STUDY: 16:31 04/15/2020

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
DATA BANK RAINFALL USED
ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/ SIDE / SIDE/ WAY	PARK- HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)
*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<< A1

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 301.70 DOWNSTREAM(FEET) = 298.20

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.677

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.770
 SUBAREA Tc AND LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL B 0.98 0.30 0.100 36 7.68
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 1.53
 TOTAL AREA(ACRES) = 0.98 PEAK FLOW RATE(CFS) = 1.53

FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 293.20 DOWNSTREAM(FEET) = 292.60
 FLOW LENGTH(FEET) = 112.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 6.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 3.32
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1.53
 PIPE TRAVEL TIME(MIN.) = 0.56 Tc(MIN.) = 8.24
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 103.00 = 442.00 FEET.

FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

=====

MAINLINE Tc(MIN.) = 8.24
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.699
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL C 1.03 0.25 0.100 50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 1.03 SUBAREA RUNOFF(CFS) = 1.55
 EFFECTIVE AREA(ACRES) = 2.01 AREA-AVERAGED Fm(INCH/HR) = 0.03
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 2.0 PEAK FLOW RATE(CFS) = 3.02

FLOW PROCESS FROM NODE 103.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 292.60 DOWNSTREAM(FEET) = 291.60
 FLOW LENGTH(FEET) = 184.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 3.95
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 3.02
 PIPE TRAVEL TIME(MIN.) = 0.78 Tc(MIN.) = 9.02
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 104.00 = 626.00 FEET.

PRANG2

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 9.02
RAINFALL INTENSITY(INCH/HR) = 1.61
AREA-AVERAGED Fm(INCH/HR) = 0.03
AREA-AVERAGED Fp(INCH/HR) = 0.27
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 2.01
TOTAL STREAM AREA(ACRES) = 2.01
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.02

FLOW PROCESS FROM NODE 105.00 TO NODE 106.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<< A3
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 299.10 DOWNSTREAM(FEET) = 297.60

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.094
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.606
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL C 0.72 0.25 0.100 50 9.09
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 1.02
TOTAL AREA(ACRES) = 0.72 PEAK FLOW RATE(CFS) = 1.02

FLOW PROCESS FROM NODE 106.00 TO NODE 107.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<< A4
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 297.60 DOWNSTREAM(FEET) = 297.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 71.00 CHANNEL SLOPE = 0.0085
CHANNEL BASE(FEET) = 0.00 "Z" FACTOR = 24.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 2.00
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.541
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL C 0.18 0.25 0.100 50
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.15
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.76
AVERAGE FLOW DEPTH(FEET) = 0.16 TRAVEL TIME(MIN.) = 0.67
Tc(MIN.) = 9.77
SUBAREA AREA(ACRES) = 0.18 SUBAREA RUNOFF(CFS) = 0.25
EFFECTIVE AREA(ACRES) = 0.90 AREA-AVERAGED Fm(INCH/HR) = 0.03

PRANG2

AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 0.9 PEAK FLOW RATE(CFS) = 1.23

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.17 FLOW VELOCITY(FEET/SEC.) = 1.76
LONGEST FLOWPATH FROM NODE 105.00 TO NODE 107.00 = 401.00 FEET.

FLOW PROCESS FROM NODE 107.00 TO NODE 107.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

A5

MAINLINE Tc(MIN.) = 9.77

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.541

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	C	0.38	0.25	0.100	50

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA(ACRES) = 0.38 SUBAREA RUNOFF(CFS) = 0.52

EFFECTIVE AREA(ACRES) = 1.28 AREA-AVERAGED Fm(INCH/HR) = 0.03

AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 1.3 PEAK FLOW RATE(CFS) = 1.75

FLOW PROCESS FROM NODE 107.00 TO NODE 104.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 292.10 DOWNSTREAM(FEET) = 291.60

FLOW LENGTH(FEET) = 89.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 12.0 INCH PIPE IS 7.3 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 3.47

ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 1.75

PIPE TRAVEL TIME(MIN.) = 0.43 Tc(MIN.) = 10.20

LONGEST FLOWPATH FROM NODE 105.00 TO NODE 104.00 = 490.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 104.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

TOTAL NUMBER OF STREAMS = 2

CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 10.20

RAINFALL INTENSITY(INCH/HR) = 1.50

AREA-AVERAGED Fm(INCH/HR) = 0.03

AREA-AVERAGED Fp(INCH/HR) = 0.25

AREA-AVERAGED Ap = 0.10

EFFECTIVE STREAM AREA(ACRES) = 1.28

TOTAL STREAM AREA(ACRES) = 1.28

PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.75

** CONFLUENCE DATA **

STREAM	Q	Tc	Intensity	Fp(Fm)	Ap	Ae	HEADWATER
--------	---	----	-----------	--------	----	----	-----------

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)	(ACRES)	NODE
1	3.02	9.02	1.614	0.27(0.03)	0.10	101.00
2	1.75	10.20	1.504	0.25(0.03)	0.10	105.00

PRANG2

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap (ACRES)	Ae (ACRES)	HEADWATER NODE
1	4.68	9.02	1.614	0.27(0.03)	0.10	3.1	101.00
2	4.56	10.20	1.504	0.26(0.03)	0.10	3.3	105.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 4.68 Tc(MIN.) = 9.02
 EFFECTIVE AREA(ACRES) = 3.14 AREA-AVERAGED Fm(INCH/HR) = 0.03
 AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 3.3
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 104.00 = 626.00 FEET.

FLOW PROCESS FROM NODE 104.00 TO NODE 108.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 291.60 DOWNSTREAM(FEET) = 291.00
 FLOW LENGTH(FEET) = 118.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 10.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 4.30
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 4.68
 PIPE TRAVEL TIME(MIN.) = 0.46 Tc(MIN.) = 9.47
 LONGEST FLOWPATH FROM NODE 101.00 TO NODE 108.00 = 744.00 FEET.

FLOW PROCESS FROM NODE 108.00 TO NODE 108.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<< A6

=====

MAINLINE Tc(MIN.) = 9.47
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.569
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	C	0.71	0.25	0.100	50

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.71 SUBAREA RUNOFF(CFS) = 0.99
 EFFECTIVE AREA(ACRES) = 3.85 AREA-AVERAGED Fm(INCH/HR) = 0.03
 AREA-AVERAGED Fp(INCH/HR) = 0.26 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 4.0 PEAK FLOW RATE(CFS) = 5.35

FLOW PROCESS FROM NODE 108.00 TO NODE 109.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

PRANG2

ELEVATION DATA: UPSTREAM(FEET) = 291.00 DOWNSTREAM(FEET) = 290.50
FLOW LENGTH(FEET) = 20.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 8.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.09
ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 5.35
PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) = 9.52
LONGEST FLOWPATH FROM NODE 101.00 TO NODE 109.00 = 764.00 FEET.

=====
END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 4.0 TC(MIN.) = 9.52
EFFECTIVE AREA(ACRES) = 3.85 AREA-AVERAGED Fm(INCH/HR) = 0.03
AREA-AVERAGED Fp(INCH/HR) = 0.26 AREA-AVERAGED Ap = 0.100
PEAK FLOW RATE(CFS) = 5.35

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	5.35	9.52	1.565	0.26(0.03)	0.10	3.9	101.00
2	5.18	10.70	1.463	0.26(0.03)	0.10	4.0	105.00

=====
END OF RATIONAL METHOD ANALYSIS



NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS

=====

(C) Copyright 1989-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1355

Analysis prepared by:

fuscoe engineering
16795 Von Karman
Suite 100
Irvine, CA

Problem Descriptions:

Placentia Senior Housing
1314 N. Angelina, Placentia
Proposed Condition 2-year/24-hour hydrograph

=====

*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 2.05 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp (in./hr.)	YIELD
1	0.98	10.00	56. (AMC II)	0.300	0.801
2	3.02	10.00	69. (AMC II)	0.250	0.801

TOTAL AREA (Acres) = 4.00

AREA-AVERAGED LOSS RATE, \bar{F}_m (in./hr.) = 0.026

AREA-AVERAGED LOW LOSS FRACTION, \bar{Y} = 0.199

=====

Problem Descriptions:

Placentia Senior Housing
1314 N. Angelina, Placentia
Proposed Condition 2-year/24-hour hydrograph (calib. coef: 0.869)

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.87
TOTAL CATCHMENT AREA (ACRES) = 4.00
SOIL-LOSS RATE, F_m , (INCH/HR) = 0.026
LOW LOSS FRACTION = 0.199
TIME OF CONCENTRATION (MIN.) = 9.52
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
RETURN FREQUENCY (YEARS) = 2
5-MINUTE POINT RAINFALL VALUE (INCHES) = 0.19
30-MINUTE POINT RAINFALL VALUE (INCHES) = 0.40
1-HOUR POINT RAINFALL VALUE (INCHES) = 0.53
3-HOUR POINT RAINFALL VALUE (INCHES) = 0.89
6-HOUR POINT RAINFALL VALUE (INCHES) = 1.22
24-HOUR POINT RAINFALL VALUE (INCHES) = 2.05

TOTAL CATCHMENT RUNOFF VOLUME (ACRE-FEET) =	0.50
TOTAL CATCHMENT SOIL-LOSS VOLUME (ACRE-FEET) =	0.18

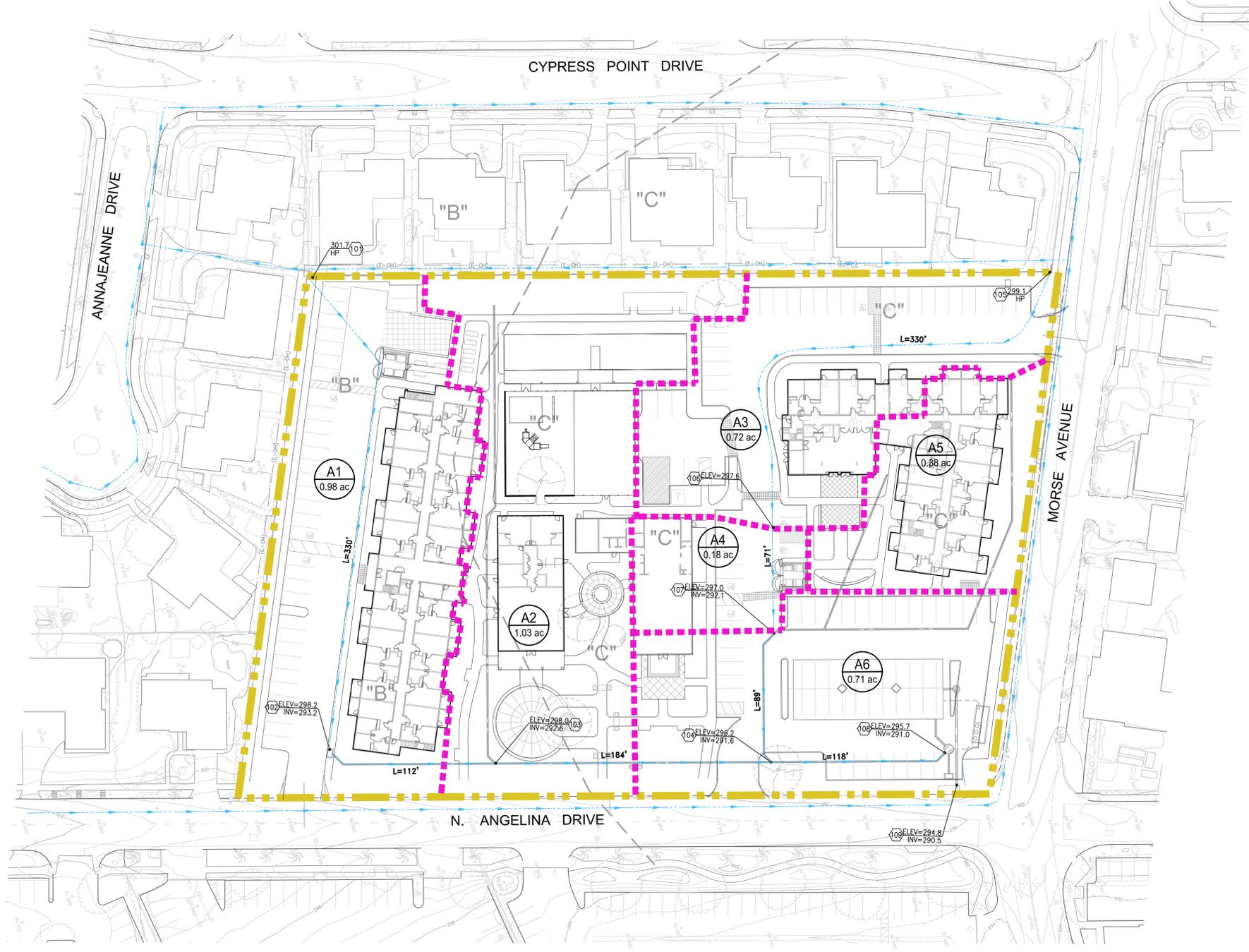
TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.13	0.0006	0.09	Q	.	.	.	.
0.29	0.0018	0.09	Q	.	.	.	.
0.45	0.0029	0.09	Q	.	.	.	.
0.61	0.0041	0.09	Q	.	.	.	.
0.77	0.0053	0.09	Q	.	.	.	.
0.93	0.0065	0.09	Q	.	.	.	.
1.09	0.0077	0.09	Q	.	.	.	.
1.24	0.0089	0.09	Q	.	.	.	.
1.40	0.0102	0.09	Q	.	.	.	.
1.56	0.0114	0.09	Q	.	.	.	.
1.72	0.0126	0.09	Q	.	.	.	.
1.88	0.0139	0.10	Q	.	.	.	.
2.04	0.0152	0.10	Q	.	.	.	.
2.20	0.0164	0.10	Q	.	.	.	.
2.35	0.0177	0.10	Q	.	.	.	.
2.51	0.0190	0.10	Q	.	.	.	.
2.67	0.0203	0.10	Q	.	.	.	.
2.83	0.0216	0.10	Q	.	.	.	.
2.99	0.0229	0.10	Q	.	.	.	.
3.15	0.0242	0.10	Q	.	.	.	.
3.31	0.0256	0.10	Q	.	.	.	.
3.47	0.0269	0.10	Q	.	.	.	.
3.62	0.0283	0.10	Q	.	.	.	.
3.78	0.0296	0.10	Q	.	.	.	.
3.94	0.0310	0.11	Q	.	.	.	.
4.10	0.0324	0.11	Q	.	.	.	.
4.26	0.0338	0.11	Q	.	.	.	.
4.42	0.0352	0.11	Q	.	.	.	.
4.58	0.0366	0.11	Q	.	.	.	.
4.73	0.0381	0.11	Q	.	.	.	.
4.89	0.0395	0.11	Q	.	.	.	.
5.05	0.0410	0.11	Q	.	.	.	.
5.21	0.0425	0.11	Q	.	.	.	.
5.37	0.0440	0.11	Q	.	.	.	.
5.53	0.0455	0.11	Q	.	.	.	.
5.69	0.0470	0.12	Q	.	.	.	.
5.85	0.0485	0.12	Q	.	.	.	.
6.00	0.0501	0.12	Q	.	.	.	.
6.16	0.0516	0.12	Q	.	.	.	.
6.32	0.0532	0.12	Q	.	.	.	.
6.48	0.0548	0.12	Q	.	.	.	.
6.64	0.0564	0.12	Q	.	.	.	.
6.80	0.0580	0.12	Q	.	.	.	.
6.96	0.0597	0.13	Q	.	.	.	.
7.11	0.0613	0.13	Q	.	.	.	.
7.27	0.0630	0.13	Q	.	.	.	.
7.43	0.0647	0.13	Q	.	.	.	.
7.59	0.0664	0.13	Q	.	.	.	.
7.75	0.0682	0.13	Q	.	.	.	.
7.91	0.0699	0.14	Q	.	.	.	.
8.07	0.0717	0.14	Q	.	.	.	.

8.23	0.0735	0.14	Q	.	.	.	.
8.38	0.0753	0.14	Q	.	.	.	.
8.54	0.0772	0.14	Q	.	.	.	.
8.70	0.0791	0.14	Q	.	.	.	.
8.86	0.0810	0.15	Q	.	.	.	.
9.02	0.0829	0.15	Q	.	.	.	.
9.18	0.0848	0.15	Q	.	.	.	.
9.34	0.0868	0.15	Q	.	.	.	.
9.49	0.0888	0.15	Q	.	.	.	.
9.65	0.0909	0.16	Q	.	.	.	.
9.81	0.0929	0.16	Q	.	.	.	.
9.97	0.0950	0.16	Q	.	.	.	.
10.13	0.0972	0.16	Q	.	.	.	.
10.29	0.0994	0.17	Q	.	.	.	.
10.45	0.1016	0.17	Q	.	.	.	.
10.61	0.1038	0.17	Q	.	.	.	.
10.76	0.1061	0.18	Q	.	.	.	.
10.92	0.1084	0.18	Q	.	.	.	.
11.08	0.1108	0.18	Q	.	.	.	.
11.24	0.1133	0.19	Q	.	.	.	.
11.40	0.1157	0.19	Q	.	.	.	.
11.56	0.1183	0.19	Q	.	.	.	.
11.72	0.1208	0.20	Q	.	.	.	.
11.87	0.1235	0.20	Q	.	.	.	.
12.03	0.1262	0.21	Q	.	.	.	.
12.19	0.1292	0.25	.Q	.	.	.	.
12.35	0.1326	0.27	.Q	.	.	.	.
12.51	0.1361	0.27	.Q	.	.	.	.
12.67	0.1397	0.28	.Q	.	.	.	.
12.83	0.1434	0.28	.Q	.	.	.	.
12.99	0.1472	0.29	.Q	.	.	.	.
13.14	0.1511	0.30	.Q	.	.	.	.
13.30	0.1552	0.31	.Q	.	.	.	.
13.46	0.1593	0.32	.Q	.	.	.	.
13.62	0.1636	0.33	.Q	.	.	.	.
13.78	0.1680	0.34	.Q	.	.	.	.
13.94	0.1726	0.36	.Q	.	.	.	.
14.10	0.1774	0.37	.Q	.	.	.	.
14.25	0.1826	0.42	.Q	.	.	.	.
14.41	0.1881	0.43	.Q	.	.	.	.
14.57	0.1940	0.47	.Q	.	.	.	.
14.73	0.2003	0.49	.Q	.	.	.	.
14.89	0.2071	0.54	. Q	.	.	.	.
15.05	0.2144	0.57	. Q	.	.	.	.
15.21	0.2225	0.65	. Q	.	.	.	.
15.37	0.2314	0.70	. Q	.	.	.	.
15.52	0.2407	0.72	. Q	.	.	.	.
15.68	0.2508	0.83	. Q	.	.	.	.
15.84	0.2644	1.24	. Q	.	.	.	.
16.00	0.2838	1.72	. Q	.	.	.	.
16.16	0.3302	5.35	. Q	.	.	.	.
16.32	0.3717	0.98	. Q	.	.	.	.
16.48	0.3829	0.73	. Q	.	.	.	.
16.63	0.3917	0.61	. Q	.	.	.	.
16.79	0.3990	0.52	. Q	.	.	.	.
16.95	0.4054	0.45	.Q	.	.	.	.
17.11	0.4109	0.40	.Q	.	.	.	.
17.27	0.4159	0.35	.Q	.	.	.	.
17.43	0.4203	0.33	.Q	.	.	.	.
17.59	0.4244	0.31	.Q	.	.	.	.
17.75	0.4283	0.29	.Q	.	.	.	.

17.90	0.4321	0.28	.Q	.	.	.	.
18.06	0.4356	0.26	.Q	.	.	.	.
18.22	0.4387	0.21	Q	.	.	.	.
18.38	0.4413	0.20	Q	.	.	.	.
18.54	0.4438	0.19	Q	.	.	.	.
18.70	0.4463	0.18	Q	.	.	.	.
18.86	0.4486	0.17	Q	.	.	.	.
19.01	0.4508	0.17	Q	.	.	.	.
19.17	0.4530	0.16	Q	.	.	.	.
19.33	0.4551	0.16	Q	.	.	.	.
19.49	0.4572	0.15	Q	.	.	.	.
19.65	0.4591	0.15	Q	.	.	.	.
19.81	0.4611	0.14	Q	.	.	.	.
19.97	0.4629	0.14	Q	.	.	.	.
20.13	0.4648	0.14	Q	.	.	.	.
20.28	0.4665	0.13	Q	.	.	.	.
20.44	0.4683	0.13	Q	.	.	.	.
20.60	0.4700	0.13	Q	.	.	.	.
20.76	0.4716	0.13	Q	.	.	.	.
20.92	0.4733	0.12	Q	.	.	.	.
21.08	0.4749	0.12	Q	.	.	.	.
21.24	0.4764	0.12	Q	.	.	.	.
21.39	0.4780	0.12	Q	.	.	.	.
21.55	0.4795	0.11	Q	.	.	.	.
21.71	0.4809	0.11	Q	.	.	.	.
21.87	0.4824	0.11	Q	.	.	.	.
22.03	0.4838	0.11	Q	.	.	.	.
22.19	0.4852	0.11	Q	.	.	.	.
22.35	0.4866	0.10	Q	.	.	.	.
22.51	0.4880	0.10	Q	.	.	.	.
22.66	0.4893	0.10	Q	.	.	.	.
22.82	0.4906	0.10	Q	.	.	.	.
22.98	0.4919	0.10	Q	.	.	.	.
23.14	0.4932	0.10	Q	.	.	.	.
23.30	0.4944	0.10	Q	.	.	.	.
23.46	0.4957	0.09	Q	.	.	.	.
23.62	0.4969	0.09	Q	.	.	.	.
23.77	0.4981	0.09	Q	.	.	.	.
23.93	0.4993	0.09	Q	.	.	.	.
24.09	0.5005	0.09	Q	.	.	.	.
24.25	0.5011	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
 (Note: 100% of Peak Flow Rate estimate assumed to have
 an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1447.0
10%	114.2
20%	28.6
30%	19.0
40%	9.5
50%	9.5
60%	9.5
70%	9.5
80%	9.5
90%	9.5



STORM EVENT	SITE PROPOSED CONDITION			
	Q (un-mitigated) (GFS)	Q (mitigated) (GFS)	T _c (MIN)	VOLUME (AC-FT)
2-Year	5.35	4.0	9.52	0.50
10-Year	9.79	7.2	9.27	0.96
25-Year	11.74	8.6	9.22	1.19
100-Year	15.11	10.6	9.12	1.53

ASSESSOR PARCEL NO.

340-273-25

SITE ADDRESS

1314 N. ANGELINA DRIVE
PLACENTIA, CALIFORNIA 92870

APPLICANT/OWNER

NATIONAL COMMUNITY RENAISSANCE OF CALIFORNIA
9421 HAVEN AVENUE
RANCHO CUCAMONGA, CA 91730
TEL: (949) 394-7996

CIVIL ENGINEER

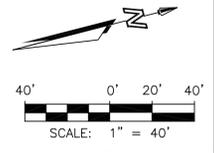
FUSCOE ENGINEERING
16795 VON KARMAN, SUITE 100
IRVINE, CA 92606
TEL: 949.474.1960
FAX: 949.474.5315

ABBREVIATIONS

- AC ACRE
- AC-FT ACRE-FOOT
- CFS CUBIC FEET PER SECOND
- ELEV ELEVATION
- HP HIGH POINT
- L LENGTH
- MIN MINUTES
- Q₂ FLOW RATE - 2-YEAR STORM
- S SLOPE
- T_c TIME OF CONCENTRATION

LEGEND

- DRAINAGE BOUNDARY
- DRAINAGE SUB-BOUNDARY
- NODE
- TIME OF CONCENTRATION FLOW PATH
- FLOW PATH LENGTH
- DRAINAGE BOUNDARY DESIGNATION AND AREA
- SOIL TYPE DELINEATION



PREPARED BY:

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

**HYDROLOGY MAP
PROPOSED CONDITION**
PLACENTIA SENIOR HOUSING 1314 N. ANGELINA DRIVE
CITY OF PLACENTIA, CALIFORNIA

PROJECT NO.	1653-010
SHEET	1
OF	1

1314 N. Angelina Drive Detention & Outflow Summary				
diameter (in)	area (ft2)	length (ft)		Q (cfs) 18" sd orifice
48	12.57	325		
depth in 48" pipe (ft)	area (ft2)	volume (cf)	volume (ac-ft)	
0.25	0.79	255	0.006	1.0
0.50	1.57	511	0.012	2.0
0.75	2.36	766	0.018	3.0
1.00	3.14	1021	0.023	4.4
1.25	3.93	1276	0.029	6.2
1.50	4.71	1532	0.035	7.5
1.75	5.50	1787	0.041	8.7
2.00	6.28	2042	0.047	9.7
2.25	7.07	2297	0.053	10.7
2.50	7.85	2553	0.059	11.5
2.75	8.64	2808	0.064	12.3
3.00	9.42	3063	0.070	13.1
3.25	10.21	3318	0.076	13.8
3.50	11.00	3574	0.082	14.5
3.75	11.78	3829	0.088	15.1
4.00	12.57	4084	0.094	15.7

SMALL AREA UNIT HYDROGRAPH MODEL

=====

(C) Copyright 1989-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1355

Analysis prepared by:

fuscoe engineering
16795 Von Karman
Suite 100
Irvine, CA

Problem Descriptions:

Placentia Senior Housing
1314 N. Angelina Drive
Proposed 2-year/24-hour storm event (calib coef: 0.869)

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.87
TOTAL CATCHMENT AREA (ACRES) = 4.00
SOIL-LOSS RATE, Fm, (INCH/HR) = 0.026
LOW LOSS FRACTION = 0.199
TIME OF CONCENTRATION (MIN.) = 9.52
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
RETURN FREQUENCY (YEARS) = 2
5-MINUTE POINT RAINFALL VALUE (INCHES) = 0.19
30-MINUTE POINT RAINFALL VALUE (INCHES) = 0.40
1-HOUR POINT RAINFALL VALUE (INCHES) = 0.53
3-HOUR POINT RAINFALL VALUE (INCHES) = 0.89
6-HOUR POINT RAINFALL VALUE (INCHES) = 1.22
24-HOUR POINT RAINFALL VALUE (INCHES) = 2.05

TOTAL CATCHMENT RUNOFF VOLUME (ACRE-FEET) = 0.50
TOTAL CATCHMENT SOIL-LOSS VOLUME (ACRE-FEET) = 0.18

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
0.13	0.0006	0.09 Q	.	.	.	.	.
0.29	0.0018	0.09 Q	.	.	.	.	.
0.45	0.0029	0.09 Q	.	.	.	.	.
0.61	0.0041	0.09 Q	.	.	.	.	.
0.77	0.0053	0.09 Q	.	.	.	.	.
0.93	0.0065	0.09 Q	.	.	.	.	.
1.09	0.0077	0.09 Q	.	.	.	.	.
1.24	0.0089	0.09 Q	.	.	.	.	.
1.40	0.0102	0.09 Q	.	.	.	.	.
1.56	0.0114	0.09 Q	.	.	.	.	.
1.72	0.0126	0.09 Q	.	.	.	.	.
1.88	0.0139	0.10 Q	.	.	.	.	.
2.04	0.0152	0.10 Q	.	.	.	.	.

2.20	0.0164	0.10	Q	.	.	.	.
2.35	0.0177	0.10	Q	.	.	.	.
2.51	0.0190	0.10	Q	.	.	.	.
2.67	0.0203	0.10	Q	.	.	.	.
2.83	0.0216	0.10	Q	.	.	.	.
2.99	0.0229	0.10	Q	.	.	.	.
3.15	0.0242	0.10	Q	.	.	.	.
3.31	0.0256	0.10	Q	.	.	.	.
3.47	0.0269	0.10	Q	.	.	.	.
3.62	0.0283	0.10	Q	.	.	.	.
3.78	0.0296	0.10	Q	.	.	.	.
3.94	0.0310	0.11	Q	.	.	.	.
4.10	0.0324	0.11	Q	.	.	.	.
4.26	0.0338	0.11	Q	.	.	.	.
4.42	0.0352	0.11	Q	.	.	.	.
4.58	0.0366	0.11	Q	.	.	.	.
4.73	0.0381	0.11	Q	.	.	.	.
4.89	0.0395	0.11	Q	.	.	.	.
5.05	0.0410	0.11	Q	.	.	.	.
5.21	0.0425	0.11	Q	.	.	.	.
5.37	0.0440	0.11	Q	.	.	.	.
5.53	0.0455	0.11	Q	.	.	.	.
5.69	0.0470	0.12	Q	.	.	.	.
5.85	0.0485	0.12	Q	.	.	.	.
6.00	0.0501	0.12	Q	.	.	.	.
6.16	0.0516	0.12	Q	.	.	.	.
6.32	0.0532	0.12	Q	.	.	.	.
6.48	0.0548	0.12	Q	.	.	.	.
6.64	0.0564	0.12	Q	.	.	.	.
6.80	0.0580	0.12	Q	.	.	.	.
6.96	0.0597	0.13	Q	.	.	.	.
7.11	0.0613	0.13	Q	.	.	.	.
7.27	0.0630	0.13	Q	.	.	.	.
7.43	0.0647	0.13	Q	.	.	.	.
7.59	0.0664	0.13	Q	.	.	.	.
7.75	0.0682	0.13	Q	.	.	.	.
7.91	0.0699	0.14	Q	.	.	.	.
8.07	0.0717	0.14	Q	.	.	.	.
8.23	0.0735	0.14	Q	.	.	.	.
8.38	0.0753	0.14	Q	.	.	.	.
8.54	0.0772	0.14	Q	.	.	.	.
8.70	0.0791	0.14	Q	.	.	.	.
8.86	0.0810	0.15	Q	.	.	.	.
9.02	0.0829	0.15	Q	.	.	.	.
9.18	0.0848	0.15	Q	.	.	.	.
9.34	0.0868	0.15	Q	.	.	.	.
9.49	0.0888	0.15	Q	.	.	.	.
9.65	0.0909	0.16	Q	.	.	.	.
9.81	0.0929	0.16	Q	.	.	.	.
9.97	0.0950	0.16	Q	.	.	.	.
10.13	0.0972	0.16	Q	.	.	.	.
10.29	0.0994	0.17	Q	.	.	.	.
10.45	0.1016	0.17	Q	.	.	.	.
10.61	0.1038	0.17	Q	.	.	.	.
10.76	0.1061	0.18	Q	.	.	.	.
10.92	0.1084	0.18	Q	.	.	.	.
11.08	0.1108	0.18	Q	.	.	.	.
11.24	0.1133	0.19	Q	.	.	.	.
11.40	0.1157	0.19	Q	.	.	.	.
11.56	0.1183	0.19	Q	.	.	.	.
11.72	0.1208	0.20	Q	.	.	.	.

11.87	0.1235	0.20	Q	.	.	.	.
12.03	0.1262	0.21	Q	.	.	.	.
12.19	0.1292	0.25	.Q	.	.	.	.
12.35	0.1326	0.27	.Q	.	.	.	.
12.51	0.1361	0.27	.Q	.	.	.	.
12.67	0.1397	0.28	.Q	.	.	.	.
12.83	0.1434	0.28	.Q	.	.	.	.
12.99	0.1472	0.29	.Q	.	.	.	.
13.14	0.1511	0.30	.Q	.	.	.	.
13.30	0.1552	0.31	.Q	.	.	.	.
13.46	0.1593	0.32	.Q	.	.	.	.
13.62	0.1636	0.33	.Q	.	.	.	.
13.78	0.1680	0.34	.Q	.	.	.	.
13.94	0.1726	0.36	.Q	.	.	.	.
14.10	0.1774	0.37	.Q	.	.	.	.
14.25	0.1826	0.42	.Q	.	.	.	.
14.41	0.1881	0.43	.Q	.	.	.	.
14.57	0.1940	0.47	.Q	.	.	.	.
14.73	0.2003	0.49	.Q	.	.	.	.
14.89	0.2071	0.54	. Q	.	.	.	.
15.05	0.2144	0.57	. Q	.	.	.	.
15.21	0.2225	0.65	. Q	.	.	.	.
15.37	0.2314	0.70	. Q	.	.	.	.
15.52	0.2407	0.72	. Q	.	.	.	.
15.68	0.2508	0.83	. Q	.	.	.	.
15.84	0.2644	1.24	. Q	.	.	.	.
16.00	0.2838	1.72	. Q	.	.	.	.
16.16	0.3302	5.35	.	.	.Q	.	.
16.32	0.3717	0.98	. Q	.	.	.	.
16.48	0.3829	0.73	. Q	.	.	.	.
16.63	0.3917	0.61	. Q	.	.	.	.
16.79	0.3990	0.52	. Q	.	.	.	.
16.95	0.4054	0.45	.Q	.	.	.	.
17.11	0.4109	0.40	.Q	.	.	.	.
17.27	0.4159	0.35	.Q	.	.	.	.
17.43	0.4203	0.33	.Q	.	.	.	.
17.59	0.4244	0.31	.Q	.	.	.	.
17.75	0.4283	0.29	.Q	.	.	.	.
17.90	0.4321	0.28	.Q	.	.	.	.
18.06	0.4356	0.26	.Q	.	.	.	.
18.22	0.4387	0.21	Q	.	.	.	.
18.38	0.4413	0.20	Q	.	.	.	.
18.54	0.4438	0.19	Q	.	.	.	.
18.70	0.4463	0.18	Q	.	.	.	.
18.86	0.4486	0.17	Q	.	.	.	.
19.01	0.4508	0.17	Q	.	.	.	.
19.17	0.4530	0.16	Q	.	.	.	.
19.33	0.4551	0.16	Q	.	.	.	.
19.49	0.4572	0.15	Q	.	.	.	.
19.65	0.4591	0.15	Q	.	.	.	.
19.81	0.4611	0.14	Q	.	.	.	.
19.97	0.4629	0.14	Q	.	.	.	.
20.13	0.4648	0.14	Q	.	.	.	.
20.28	0.4665	0.13	Q	.	.	.	.
20.44	0.4683	0.13	Q	.	.	.	.
20.60	0.4700	0.13	Q	.	.	.	.
20.76	0.4716	0.13	Q	.	.	.	.
20.92	0.4733	0.12	Q	.	.	.	.
21.08	0.4749	0.12	Q	.	.	.	.
21.24	0.4764	0.12	Q	.	.	.	.
21.39	0.4780	0.12	Q	.	.	.	.

2-year proposed peak flow

21.55	0.4795	0.11	Q	.	.	.	.
21.71	0.4809	0.11	Q	.	.	.	.
21.87	0.4824	0.11	Q	.	.	.	.
22.03	0.4838	0.11	Q	.	.	.	.
22.19	0.4852	0.11	Q	.	.	.	.
22.35	0.4866	0.10	Q	.	.	.	.
22.51	0.4880	0.10	Q	.	.	.	.
22.66	0.4893	0.10	Q	.	.	.	.
22.82	0.4906	0.10	Q	.	.	.	.
22.98	0.4919	0.10	Q	.	.	.	.
23.14	0.4932	0.10	Q	.	.	.	.
23.30	0.4944	0.10	Q	.	.	.	.
23.46	0.4957	0.09	Q	.	.	.	.
23.62	0.4969	0.09	Q	.	.	.	.
23.77	0.4981	0.09	Q	.	.	.	.
23.93	0.4993	0.09	Q	.	.	.	.
24.09	0.5005	0.09	Q	.	.	.	.
24.25	0.5011	0.00	Q	.	.	.	.

TIME DURATION (minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
 (Note: 100% of Peak Flow Rate estimate assumed to have
 an instantaneous time duration)

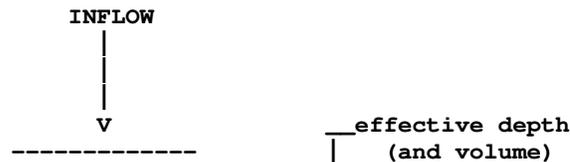
Percentile of Estimated Peak Flow Rate	Duration (minutes)
=====	=====
0%	1447.0
10%	114.2
20%	28.6
30%	19.0
40%	9.5
50%	9.5
60%	9.5
70%	9.5
80%	9.5
90%	9.5

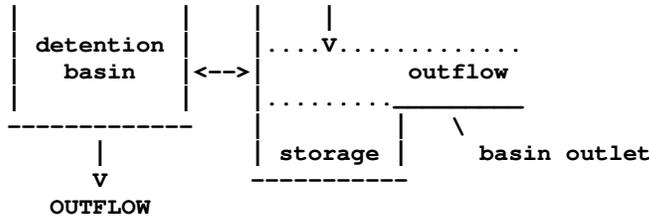
Problem Descriptions:

Placentia Senior Housing
 1314 N. Angelina Drive
 Proposed 2-year/24-hour storm event (calib coef: 0.869)

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
 CONSTANT HYDROGRAPH TIME UNIT (MINUTES) = 9.520
 DEAD STORAGE (AF) = 0.00
 SPECIFIED DEAD STORAGE (AF) FILLED = 0.00
 ASSUMED INITIAL DEPTH (FEET) IN STORAGE BASIN = 0.00





Detention System:
325 lineal feet of 48"
pipe storage w/ 18"
diameter outlet

DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:

TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 17

* (FEET)	* (ACRE-FEET)	OUTFLOW (CFS)	** (FEET)	** (ACRE-FEET)	OUTFLOW (CFS)	*
* 0.000	0.000	0.000**	0.250	0.006	1.000*	*
* 0.500	0.012	2.000**	0.750	0.018	3.000*	*
* 1.000	0.023	4.400**	1.250	0.029	6.200*	*
* 1.500	0.035	7.500**	1.750	0.041	8.700*	*
* 2.000	0.047	9.700**	2.250	0.053	10.700*	*
* 2.500	0.059	11.500**	2.750	0.064	12.300*	*
* 3.000	0.070	13.100**	3.250	0.076	13.800*	*
* 3.500	0.082	14.500**	3.750	0.088	15.100*	*
* 4.000	0.094	15.700**				

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL NUMBER	DEPTH (FEET)	{S-O*DT/2} (ACRE-FEET)	{S+O*DT/2} (ACRE-FEET)
1	0.00	0.00000	0.00000
2	0.25	-0.00056	0.01256
3	0.50	-0.00111	0.02511
4	0.75	-0.00167	0.03767
5	1.00	-0.00585	0.05185
6	1.25	-0.01165	0.06965
7	1.50	-0.01417	0.08417
8	1.75	-0.01604	0.09804
9	2.00	-0.01660	0.11060
10	2.25	-0.01715	0.12315
11	2.50	-0.01640	0.13440
12	2.75	-0.01664	0.14464
13	3.00	-0.01589	0.15589
14	3.25	-0.01448	0.16648
15	3.50	-0.01307	0.17707
16	3.75	-0.01100	0.18700
17	4.00	-0.00894	0.19694

WHERE S=STORAGE (AF) ; O=OUTFLOW (AF/MIN.) ; DT=UNIT INTERVAL (MIN.)

DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED (AF)	INFLOW (CFS)	EFFECTIVE DEPTH (FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME (AF)
0.133	0.000	0.09	0.02	0.05	0.001
0.292	0.000	0.09	0.02	0.09	0.001
0.451	0.000	0.09	0.02	0.09	0.001
0.609	0.000	0.09	0.02	0.09	0.001
0.768	0.000	0.09	0.02	0.10	0.001
0.927	0.000	0.09	0.02	0.10	0.001
1.085	0.000	0.09	0.02	0.10	0.001

1.244	0.000	0.09	0.02	0.10	0.001
1.403	0.000	0.09	0.02	0.10	0.001
1.561	0.000	0.09	0.02	0.10	0.001
1.720	0.000	0.09	0.02	0.10	0.001
1.879	0.000	0.10	0.03	0.10	0.001
2.037	0.000	0.10	0.03	0.10	0.001
2.196	0.000	0.10	0.03	0.10	0.001
2.355	0.000	0.10	0.03	0.10	0.001
2.513	0.000	0.10	0.03	0.10	0.001
2.672	0.000	0.10	0.03	0.10	0.001
2.831	0.000	0.10	0.03	0.10	0.001
2.989	0.000	0.10	0.03	0.10	0.001
3.148	0.000	0.10	0.03	0.11	0.001
3.307	0.000	0.10	0.03	0.11	0.001
3.465	0.000	0.10	0.03	0.11	0.001
3.624	0.000	0.10	0.03	0.11	0.001
3.783	0.000	0.10	0.03	0.11	0.001
3.941	0.000	0.11	0.03	0.11	0.001
4.100	0.000	0.11	0.03	0.11	0.001
4.259	0.000	0.11	0.03	0.11	0.001
4.417	0.000	0.11	0.03	0.11	0.001
4.576	0.000	0.11	0.03	0.11	0.001
4.735	0.000	0.11	0.03	0.11	0.001
4.893	0.000	0.11	0.03	0.12	0.001
5.052	0.000	0.11	0.03	0.12	0.001
5.211	0.000	0.11	0.03	0.12	0.001
5.369	0.000	0.11	0.03	0.12	0.001
5.528	0.000	0.11	0.03	0.12	0.001
5.687	0.000	0.12	0.03	0.12	0.001
5.845	0.000	0.12	0.03	0.12	0.001
6.004	0.000	0.12	0.03	0.12	0.001
6.163	0.000	0.12	0.03	0.12	0.001
6.321	0.000	0.12	0.03	0.13	0.001
6.480	0.000	0.12	0.03	0.13	0.001
6.639	0.000	0.12	0.03	0.13	0.001
6.797	0.000	0.12	0.03	0.13	0.001
6.956	0.000	0.13	0.03	0.13	0.001
7.115	0.000	0.13	0.03	0.13	0.001
7.273	0.000	0.13	0.03	0.13	0.001
7.432	0.000	0.13	0.03	0.14	0.001
7.591	0.000	0.13	0.03	0.14	0.001
7.749	0.000	0.13	0.03	0.14	0.001
7.908	0.000	0.14	0.04	0.14	0.001
8.067	0.000	0.14	0.04	0.14	0.001
8.225	0.000	0.14	0.04	0.14	0.001
8.384	0.000	0.14	0.04	0.15	0.001
8.543	0.000	0.14	0.04	0.15	0.001
8.701	0.000	0.14	0.04	0.15	0.001
8.860	0.000	0.15	0.04	0.15	0.001
9.019	0.000	0.15	0.04	0.15	0.001
9.177	0.000	0.15	0.04	0.16	0.001
9.336	0.000	0.15	0.04	0.16	0.001
9.495	0.000	0.15	0.04	0.16	0.001
9.653	0.000	0.16	0.04	0.16	0.001
9.812	0.000	0.16	0.04	0.16	0.001
9.971	0.000	0.16	0.04	0.17	0.001
10.129	0.000	0.16	0.04	0.17	0.001
10.288	0.000	0.17	0.04	0.17	0.001
10.447	0.000	0.17	0.04	0.18	0.001
10.605	0.000	0.17	0.05	0.18	0.001
10.764	0.000	0.18	0.05	0.18	0.001

10.923	0.000	0.18	0.05	0.19	0.001
11.081	0.000	0.18	0.05	0.19	0.001
11.240	0.000	0.19	0.05	0.19	0.001
11.399	0.000	0.19	0.05	0.20	0.001
11.557	0.000	0.19	0.05	0.20	0.001
11.716	0.000	0.20	0.05	0.21	0.001
11.875	0.000	0.20	0.05	0.21	0.001
12.033	0.000	0.21	0.05	0.22	0.001
12.192	0.000	0.25	0.07	0.24	0.002
12.351	0.000	0.27	0.07	0.27	0.002
12.509	0.000	0.27	0.07	0.28	0.002
12.668	0.000	0.28	0.07	0.29	0.002
12.827	0.000	0.28	0.07	0.29	0.002
12.985	0.000	0.29	0.08	0.30	0.002
13.144	0.000	0.30	0.08	0.31	0.002
13.303	0.000	0.31	0.08	0.32	0.002
13.461	0.000	0.32	0.08	0.33	0.002
13.620	0.000	0.33	0.09	0.34	0.002
13.779	0.000	0.34	0.09	0.35	0.002
13.937	0.000	0.36	0.09	0.37	0.002
14.096	0.000	0.37	0.10	0.38	0.002
14.255	0.000	0.42	0.11	0.41	0.003
14.413	0.000	0.43	0.11	0.44	0.003
14.572	0.000	0.47	0.12	0.47	0.003
14.731	0.000	0.49	0.13	0.50	0.003
14.889	0.000	0.54	0.14	0.54	0.003
15.048	0.000	0.57	0.15	0.58	0.004
15.207	0.000	0.65	0.17	0.64	0.004
15.365	0.000	0.70	0.18	0.71	0.004
15.524	0.000	0.72	0.19	0.74	0.005
15.683	0.000	0.83	0.22	0.81	0.005
15.841	0.000	1.24	0.32	1.08	0.008
16.000	0.000	1.72	0.45	1.55	0.011
16.159	0.000	5.35	1.26	4.02	0.029
16.317	0.000	0.98	0.26	3.63	0.006
16.476	0.000	0.73	0.19	0.89	0.005
16.635	0.000	0.61	0.16	0.70	0.004
16.793	0.000	0.52	0.13	0.59	0.003
16.952	0.000	0.45	0.12	0.50	0.003
17.111	0.000	0.40	0.10	0.44	0.003
17.269	0.000	0.35	0.09	0.39	0.002
17.428	0.000	0.33	0.09	0.35	0.002
17.587	0.000	0.31	0.08	0.33	0.002
17.745	0.000	0.29	0.08	0.31	0.002
17.904	0.000	0.28	0.07	0.29	0.002
18.063	0.000	0.26	0.07	0.28	0.002
18.221	0.000	0.21	0.05	0.24	0.001
18.380	0.000	0.20	0.05	0.21	0.001
18.539	0.000	0.19	0.05	0.20	0.001
18.697	0.000	0.18	0.05	0.19	0.001
18.856	0.000	0.17	0.05	0.19	0.001
19.015	0.000	0.17	0.04	0.18	0.001
19.173	0.000	0.16	0.04	0.17	0.001
19.332	0.000	0.16	0.04	0.17	0.001
19.491	0.000	0.15	0.04	0.16	0.001
19.649	0.000	0.15	0.04	0.16	0.001
19.808	0.000	0.14	0.04	0.15	0.001
19.967	0.000	0.14	0.04	0.15	0.001
20.125	0.000	0.14	0.04	0.15	0.001
20.284	0.000	0.13	0.04	0.14	0.001
20.443	0.000	0.13	0.03	0.14	0.001

2-year inflow

2-year outflow

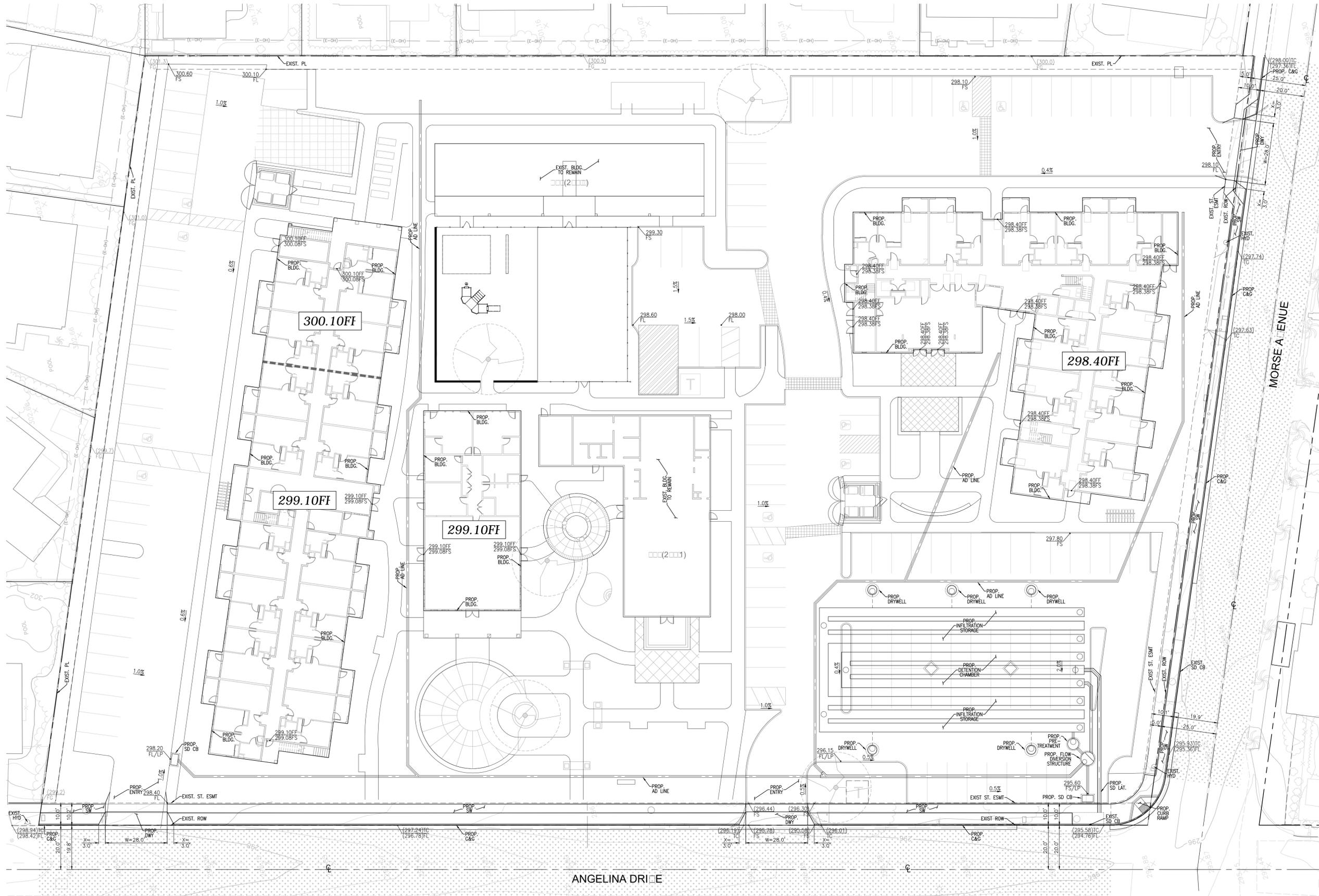
storage

depth in detention tank

20.601	0.000	0.13	0.03	0.14	0.001
20.760	0.000	0.13	0.03	0.13	0.001
20.919	0.000	0.12	0.03	0.13	0.001
21.077	0.000	0.12	0.03	0.13	0.001
21.236	0.000	0.12	0.03	0.12	0.001
21.395	0.000	0.12	0.03	0.12	0.001
21.553	0.000	0.11	0.03	0.12	0.001
21.712	0.000	0.11	0.03	0.12	0.001
21.871	0.000	0.11	0.03	0.12	0.001
22.029	0.000	0.11	0.03	0.11	0.001
22.188	0.000	0.11	0.03	0.11	0.001
22.347	0.000	0.10	0.03	0.11	0.001
22.505	0.000	0.10	0.03	0.11	0.001
22.664	0.000	0.10	0.03	0.11	0.001
22.823	0.000	0.10	0.03	0.10	0.001
22.981	0.000	0.10	0.03	0.10	0.001
23.140	0.000	0.10	0.03	0.10	0.001
23.299	0.000	0.10	0.02	0.10	0.001
23.457	0.000	0.09	0.02	0.10	0.001
23.616	0.000	0.09	0.02	0.10	0.001
23.775	0.000	0.09	0.02	0.10	0.001
23.933	0.000	0.09	0.02	0.10	0.001
24.092	0.000	0.09	0.02	0.09	0.001
24.251	0.000	0.00	0.00	0.05	0.000
24.409	0.000	0.00	0.00	0.00	0.000

APPENDIX H

GRADING PLANS



NOTES

1. ANY PROPOSED DRIVEWAY, CURB, GUTTER, CURB RAMP AND/OR SIDEWALK TO BE CONSTRUCTED PER ORANGE COUNTY PUBLIC WORKS AND CITY OF PLACENTIA DEPARTMENT OF PUBLIC WORKS STANDARDS.
2. ALL DRIVEWAYS AND SIDEWALKS SHALL BE ADA COMPLIANT.
3. THE SITE WILL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD SANTA ANA REGION ORDER NO. R8-2009-0030 DISCHARGE REQUIREMENTS (MS4 PERMIT).

ABBREVIATIONS

AC	ASPHALT CONCRETE	OHW	OVERHEAD WIRE
ACR	APPROXIMATE	MWS	MODULAR WETLAND SYSTEM
BLDG.	BUILDING	NAP	NOT A PART
BW	BACK OF WALK	PL	PROPERTY LINE
CB	CATCH BASIN	PROP.	PROPOSED
C&G	CURB & GUTTER	R/W	RIGHT-OF-WAY
CLR.	CLEARANCE	SD	STORM DRAIN
DNY	DRIVEWAY	SF	SQUARE FEET
ESMT.	EASEMENT	SS	SANITARY SEWER
EXIST.	EXISTING	ST.	STREET
FF	FINISHED FLOOR	SW	SIDEWALK
FL	FLOW LINE	TC	TOP OF CURB
FS	FINISHED SURFACE	TYP.	TYPICAL
HYD	HYDRANT		

LEGEND

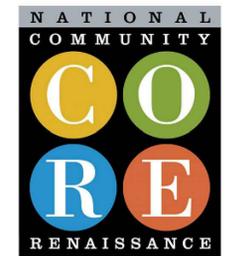
	EXISTING PROPERTY LINE
	EXISTING CENTERLINE
	EXISTING EASEMENT LINE
	EXISTING ELEVATION
	PROPOSED BUILDING OUTLINE
	PROPOSED ELEVATION
	PROPOSED 2-IN GRIND AND AC OVERLAY



RRM Design Group

10 E. Figueroa St., Suite 1
Santa Barbara, CA 93101

Tel: 805.963.8283
Fax: 805.963.8184
www.rrmdesign.com



9421 Haven Avenue
Rancho Cucamonga, CA 91730
Tel: 949.394.7996 Fax: 909.483.652

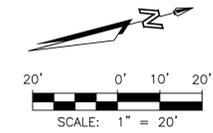


Placentia Senior Housing

A.P.N. 340-273-25

1314 N. Angelina Drive, Placentia CA 92870

SITE PLAN - IMPROVEMENTS



C2

07/10/2020