CA ENGINEERING

RUSSELL AVENUE TOWNHOMES (TTM 19447)

9822 Russell Avenue
Garden Grove, CA 92844

Preliminary Water Quality Management Plan

Prepared By:

CA Engineering, Inc.
4101 Birch Street, Suite 140
Newport Beach, CA 92660
949.724.9480 / fcornwell@ca-eng.net

Prepared For:

Melia Homes, Inc.
9860 Irvine Center Drive
Irvine, CA 92618
949.759.4367

Date Prepared: October 30, 2025
Date Revised: January 13, 2026

County of Orange/Santa Ana Region
Priority Project

Preliminary Water Quality Management Plan
(P-WQMP)

Project Name:

RUSSELL AVENUE TOWNHOMES

APN 098-081-19
TTM 19447

9822 RUSSELL AVENUE
GARDEN GROVE, CA 92844

Prepared for:
Melia Homes, Inc.
9860 Irvine Center Drive
Irvine, CA 92618
949-759-4367

Prepared by:
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Date Prepared: October 30, 2025
Date Revised: January 13, 2026

Fred Cornwell, RCE #45591

REGISTERED PROFESSIONAL ENGINEER
FRED CORNWELL
NO. 45591
CIVIL
STATE OF CALIFORNIA

Project Owner's Certification

Planning Application No. (If applicable)	**PUD-020-2026**	Grading Permit No.	**Pending**
Tract/Parcel Map and Lot(s) No.	**TTM 19447**	Building Permit No.	**Pending**
Address of Project Site and APN (If no address, specify Tract/Parcel Map and Lot Numbers)			**9822 Russell Avenue Garden Grove, CA 92844 APN 098-081-19**

This Preliminary Water Quality Management Plan (P-WQMP) has been prepared for Melia Homes, Inc. by CA Engineering, Inc. The P-WQMP is intended to comply with the requirements of the County of Orange NPDES Stormwater Program requiring the preparation of the plan, and the California Environmental Quality Act (CEQA) to assess the impacts of the project and propose the necessary mitigation for the project as part of the entitlement review process.

The undersigned, while it owns the subject property, will be responsible for the implementation of the final 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 Final WQMP. An appropriate number of approved and signed copies of the Final WQMP shall be available on the subject site in perpetuity.

Owner:	**Melia Homes, Inc.**
Name / Title	B.J. Delzer / President
Company	Melia Homes, Inc.
Address	9860 Irvine Center Drive, Irvine, California 92618
Email	bj@melia-homes.com
Telephone #	949-759-4367

I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.

Owner Signature		Date	

Preparer (Engineer): Fred Cornwell, P.E.		**QSD Certificate # 20652**	
Title	Principal	PE Registration #	45591
Company	CA Engineering, Inc.		
Address	4101 Birch Street, Suite 140, Newport Beach, CA 92660		
Email	fcornwell@ca-eng.net		
Telephone #	949-724-9480 (x2012)		

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	1-13-2026
Place Stamp Here	REGISTERED PROFESSIONAL ENGINEER FRED CORNWELL NO. 45591 CIVIL STATE OF CALIFORNIA		

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Appendices

Exhibits and Attachments Included in Section VI:

- **Vicinity Map**
- **BMP Exhibit (Site Plan)**
- **Oldcastle FloGard +PLUS Catch Basin Insert Filter Specifications and Inspection and Maintenance Guide**
- **GeoStorage Underground Stormwater Detention System Brochure**
- **BMP Fact Sheet—INF-7: Underground Infiltration**
- **BMP Fact Sheet—INF-1: Infiltration Basin (Included for Sizing Standards Regarding Underground Infiltration Only)**
- **State Water Resources Control Board's Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021)**

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

Project Infomation			
Permit/Application No. (If applicable)	**PUD-020-2026**	Grading or Building Permit No. (If applicable)	**Pending**
Address of Project Site (or Tract Map and Lot Number if no address) and APN	**9822 Russell Avenue, Garden Grove, CA 92844** **APN 098-081-19**		
Water Quality Conditions of Approval or Issuance			
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim.)	**No Conditions of Approval for the Project have been issued yet.**		
Conceptual P-WQMP			
Was a Conceptual Water Quality Management Plan previously approved for this project?	**No. This document is the Preliminary WQMP for the Project.**		
Watershed-Based Plan Conditions			
Applicable Watershed	**Anaheim Bay-Huntington Harbor Watershed**		
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	**There are no approved WIHMPs for the Anaheim Bay-Huntington Harbor Watershed, and no TMDLS have been established for the water bodies to which the project will discharge.**		

Section II Project Description

II.1 Project Description

Description of Proposed Project	
Development Category (From Model P-WQMP, Table 7.11-2; or -3):	**Significant Redevelopment Project.** Development Category No. 8 from Table 7.II-2 of the Model WQMP defines the following as a priority project for the North Orange County Permit Area: "All significant redevelopment projects, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety. If the redevelopment results in the addition or replacement of less than 50 percent of the impervious area on-site and the existing development was not subject to WQMP requirement, the numeric sizing criteria discussed in Section 7.II-2.0 only applies to the addition or replacement area. If the addition or replacement accounts for 50 percent or more of the impervious area, the Project WQMP requirements apply to the entire development." **The project site is approximately 1.8 acres, and is located in a predominantly residential development area with a proposed residential use. The northwest portion of the site is currently occupied by buildings housing a church and a preschool, and there is a small storage shed located near the southwest corner of the site. The remainder of the site is covered in asphalt drive aisles and parking areas, concrete hardscape, and landscaping. The proposed work will include demolition of all existing improvements at the site and the construction of 26 townhomes and related improvements. As described in greater detail below, the proposed project will add and/or replace 5,000 or more square feet of impervious surface on an already developed site, and the work will result in the addition or replacement of more than 50% of the impervious area on the entire site. Accordingly, the proposed development is a Priority Project, and the numeric sizing criteria applies to the entire project area.**

<table>
<tr><td>Land Use</td><td colspan="4">Attached Residential Development</td></tr>
<tr><td>Project Area (ft^2): 78,537</td><td colspan="2">Number of Dwelling Units: 26</td><td colspan="2">SIC Code: N/A</td></tr>
<tr><td rowspan="2">Project Area</td><td colspan="2">Pervious</td><td colspan="2">Impervious</td></tr>
<tr><td>Area
(acres or sq ft)</td><td>Percentage</td><td>Area
(acres or sq ft)</td><td>Percentage</td></tr>
<tr><td>Pre-Project Conditions</td><td>10,385 sq. ft.</td><td>13.2%</td><td>68,152 sq. ft.</td><td>86.8%</td></tr>
<tr><td>Post-Project Conditions</td><td>16,278 sq. ft.</td><td>20.7%</td><td>62,259 sq. ft.</td><td>79.3%</td></tr>
<tr><td>Drainage Patterns/Connections</td><td colspan="4">The project site is rectangular in shape and has a relatively flat topography that generally slopes southwesterly with elevations ranging from about 74 to 72 feet above mean sea level (msl). Surface drainage sheet flows to either Russell Avenue or Kerry Street and is conveyed westerly and southerly until entering the storm drain system. The project area currently has no water quality or drainage mitigation devices installed on-site.

The drainage for the proposed project generally follows the existing flow characteristics. The site has been divided into three drainage areas, identified as Areas 1-3. Surface drainage from each area will be collected in catch basins with proprietary insert filters for pretreatment and then directed to that drainage area's underground infiltration BMP facility. The insert filters also will act as the project's trash treatment control devices.

The project is proposing to use GeoStorage Infiltration System units, which are shallow proprietary infiltration chambers. The infiltration chambers comply with the design requirements set forth in BMP Fact Sheet INF-7 and are comprised of 3.75 foot deep, open-bottomed, rectangular vaults surrounded by gravel which will collect and then allow the storm water runoff to infiltrate into the native soils. The vaults are covered with concrete roof planks capable of H-20 traffic loading with a manhole opening in one plank to allow access for maintenance. A brochure describing the GeoStorage Infiltration System is included in Section VI of this P-WQMP. Groundwater at the site was encountered at a depth of 14 feet below current grade, and the site will be raised by one foot during grading operations. Therefore, the separation between the bottom of the infiltration chambers and on-site groundwater will be</td></tr>
</table>

11.25 feet, thus achieving the required 10 foot separation.

The catch basin insert filters and underground infiltration BMPs, which will be located as shown on the BMP Exhibit (Site Plan) included in Section VI of this WQMP, will act as the project's LID BMPs.

The infiltration facilities for Areas 1 and 2 are located near the middle of the site, under parking areas. When the storm flows exceed the capacity of the infiltration chamber in Area 1, the excess flows will bubble out of the Area 1 catch basin and be discharged to Russell Avenue via a parkway culvert. When the storm flows exceed the capacity of the infiltration chamber in Area 2, the excess flows will bubble out of the Area 2 catch basin and be discharged to Russell Avenue via the project driveway entrance.

The infiltration facility for Area 3 is located at the southern border of the site, under a parking area. When the storm flows exceed the capacity of the infiltration chamber in Area 3, the excess flows will bubble out of the most westerly Area 3 catch basin and be discharged to Kerry Street via a parkway culvert.

The Amendment to the Water Quality Control Plan for Ocean Waters of California to Control Trash, and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California adopted by the State Water Board, dictate that trash shall not be present in ocean waters or along shorelines, and prohibit the discharge of trash into surface waters of the state (the "Trash Provisions"). Pursuant to the Trash Provisions, all trash treatment control devices shall meet the Full Capture System definition and be certified by the State Water Resources Control Board. In compliance with the Trash Provisions, the proprietary catch basin insert filters that have been proposed for the project are listed on the State Water Resources Control Board's Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021), a copy of which is included in Section VI of this P-WQMP.

Infiltration chambers were chosen as the primary LID BMPs for the project since site soils are amenable to infiltration.

The site's stormwater flows are discharged to either Russell Avenue or Kerry Street and are conveyed westerly and southerly until entering the

	storm drain system via a catch basin on Donegal Drive (near the intersection of Donegal Drive and Trask Avenue). The storm drain discharges to Westminster Channel, which drains to Bolsa Chica Channel, which in turn flows to Anaheim Bay, which outlets to the Pacific Ocean. No Hydrologic Conditions of Concern exist for the project since 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 stream habitat areas will be affected. (See Section II.3 of this WQMP.)
Narrative Project Description: (Use as much space as necessary.)	The proposed project site is approximately 1.8 acres (78,537 square feet), and is located in a predominantly residential development area. The rectangular site is bounded by Russell Avenue to the north (beyond which are residential buildings), Sunnyside Elementary School to the east, Kerry Street to the west (beyond which are residential buildings), and residential buildings and a church to the south. The northwest portion of the site is currently occupied by buildings housing a church and a preschool, and there is a small storage shed located near the southwest corner of the site. The remainder of the site is covered in asphalt drive aisles and parking areas, concrete hardscape, and landscaping. The proposed work will include demolition of all existing improvements at the site and the construction of 26 townhomes, as well as drive aisles, parking areas, walkways, a recreation area, landscaping, and utility improvements. The existing site contains three buildings with a total footprint of approximately 17,908 square feet, and concrete/paved areas of approximately 50,244 square feet, for a total impervious area of 68,152 square feet (86.8% of the project area), and 10,385 square feet of landscaping/pervious area (13.2% of the project area), for a total project site of 78,537 square feet. The proposed development will contain 26 two-story townhomes (ranging from 1,442 to 1,800 square feet), with a total building footprint area of 30,930 square feet. In addition, the proposed development will contain 8,096 square feet of concrete walkways and recreation facilities, and 23,233 square feet of asphalt drive aisles and parking areas, for a total impervious area of 62,259 square feet, or 79.3% of the project area. The balance of the project site will contain 16,278 square feet of landscaping, or 20.7% of the project area, for a total project site of 78,537 square feet. The only community

	"facility" at the proposed development will be a recreation area located at the eastern border of the site, which will consist of concrete areas, landscaping, and benches. The area of this "facility" is included in the square foot concrete and landscaping figures above. In order to comply with the Trash Provisions and prevent the discharge of trash from the project site, the project will also include a walled trash enclosure with a solid roof. The trash enclosure will be located as shown on the BMP Exhibit (Site Plan) included in Section VI of this WQMP. The asphalt drive aisles contained within the proposed development are the only streets, roads, or highway projects planned to be constructed as part of this WQMP. There are no known materials or wastes that are anticipated to be used or produced at the proposed residential development that would be classified as "hazardous." Further, none of the materials to be used at the proposed residential development will be stored outside. The project will not violate any water quality standards because the project will be required to meet the City's NPDES permit discharge requirements.

II.2 Potential Stormwater Pollutants

Urban runoff from a developed site and storm water pollution associated with the runoff has the potential to contribute pollutants to the municipal storm drain system and ultimately to the tributary receiving waters. Pollutants that are commonly associated with urban development include suspended solids/sediment, nutrients, metals, microbial pathogens, oil and grease, toxic organic compounds, and trash and debris. The pollutants of concern for a specific project are based upon the pollutants identified by regulatory agencies as impairing receiving waters, and pollutants that are anticipated or potentially could be generated by the project based on the proposed land uses. Identifying the anticipated/potential pollutants will allow the project WQMP to appropriately assign BMPs to effectively mitigate storm water pollution prior to the runoff discharging off-site.

Table 2.1 of the Technical Guidance Document to Orange County's Model WQMP, dated May 19, 2011, lists the pollutants of concern generated by various land uses and is reprinted below:

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
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 ft²	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

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.

The table below identifies the potential pollutants of concern for the proposed Russell Avenue Townhomes project, as set forth in Table 2.1 of the Technical Guidance Document under "Attached Residential Development" and "Parking Lots":

Pollutants of Concern

Pollutant	Check One for each: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development with uncovered parking areas in Table 2.1 of the TGD to Orange County's Model WQMP, dated May 19, 2011.
Nutrients	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development with uncovered parking areas in Table 2.1 of the TGD to Orange County's Model WQMP, dated May 19, 2011.
Heavy Metals	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development with uncovered parking areas in Table 2.1 of the TGD to Orange County's Model WQMP, dated May 19, 2011.
Pathogens (Bacteria/Virus)	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development with uncovered parking areas in Table 2.1 of the TGD to Orange County's Model WQMP, dated May 19, 2011.

Pesticides	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development with uncovered parking areas in Table 2.1 of the TGD to Orange County's Model WQMP, dated May 19, 2011.
Oil and Grease	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development with uncovered parking areas in Table 2.1 of the TGD to Orange County's Model WQMP, dated May 19, 2011.
Toxic Organic Compounds	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development with uncovered parking areas in Table 2.1 of the TGD to Orange County's Model WQMP, dated May 19, 2011.
Trash and Debris	**E**		Identified as an anticipated and/or potential pollutant for Attached Residential Development with uncovered parking areas in Table 2.1 of the TGD to Orange County's Model WQMP, dated May 19, 2011.

Suspended Solids / Sediment consist of soils or other surficial materials that are eroded and then transported or deposited by wind, water, or gravity. Excessive sedimentation can increase turbidity, clog fish gills, reduce spawning habitat, lower young aquatic organisms survival rates, smother bottom dwelling organisms, and suppress aquatic vegetation growth. Sediments in runoff also transport other pollutants that adhere to them, including trace metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and phosphorus. The largest source of suspended solids/sediment is typically erosion from disturbed soils.

Nutrients include the macro-nutrients nitrogen and phosphorus. They commonly exist in the form of mineral salts dissolved or suspended in water and as particulate organic matter transported by storm water. Excessive discharge of nutrients to water bodies and streams can cause eutrophication, including excessive aquatic algae and plant growth, loss of dissolved oxygen, release of toxins in sediment, and significant swings in hydrogen ion concentration (pH). Primary sources of nutrients in urban runoff are fertilizers, trash and debris, and eroded soils. Urban areas with improperly managed landscapes can be substantial sources.

Heavy Metals include certain metals that can be toxic to aquatic life if concentrations become high enough to stress natural processes. Metals of concern include cadmium, chromium, copper, lead, mercury, and zinc. Lead and chromium have been used as corrosion inhibitors in primer coatings and are also raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. Copper and zinc are typically associated with building materials, including galvanized metal and ornamental copper, and automotive products, including tires and brake pads.

Humans can be impacted from contaminated groundwater resources, and bioaccumulation of metals in fish and shellfish. Environmental concerns regarding the potential for release of metals to the environment have already led to restricted metal usage in certain applications, for example lead additives in gasoline. The primary source of metals in urban storm water is typically commercially available metal products and automobiles.

Pathogens (Bacteria / Viruses) include bacteria and viruses, which are ubiquitous microorganisms that thrive under a range of environmental conditions. Water containing excessive pathogenic bacteria and viruses can create a harmful environment for humans and aquatic life. The source of pathogenic bacteria and viruses is typically the transport of animal or human fecal wastes from the watershed, but pathogenic organisms do occur in the natural environment.

Pesticides include pesticides and herbicides comprised of chemical compounds commonly used to control nuisance growth or prevalence of organisms. Water containing excessive pesticides and herbicides can constitute a hazard to humans and aquatic life. Areas with improperly managed landscapes, including excessive or improper application of pesticides and/or herbicides, can be a substantial source.

Oil and Grease are characterized as high-molecular weight organic compounds. Elevated oil and grease content can decrease the aesthetic value of the water body, as well as the water quality. Introduction of these pollutants to water bodies may occur due to the wide uses and applications of some of these products in municipal, residential, commercial, industrial, and construction areas. Primary sources of oil and grease are petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids.

Toxic Organic Compounds include organic compounds (pesticides, solvents, hydrocarbons) which at toxic concentrations constitute a hazard to humans and aquatic organisms. Storm water coming into contact with organic compounds can transport excessive levels of organics to receiving waters. Dirt, grease, and grime retained in cleaning fluid or rinse water may also adsorb levels of organic compounds that are harmful or hazardous to aquatic life. Sources of organic compounds include landscape maintenance areas, vehicle maintenance areas, waste handling areas, and potentially most other urban areas.

Trash and Debris includes trash, such as paper, plastic, and various waste materials, that can typically be found throughout the urban landscape, and debris which includes waste products of natural origin which are not naturally discharged to water bodies such as landscaping waste, woody debris, etc. The presence of trash and debris may have a significant impact on the recreational value of a water body and upon the health of aquatic habitat.

II.3 Hydrologic Conditions of Concern

☒ No – Show map

☐ Yes – Describe applicable hydrologic conditions of concern below. *Refer to Section 2.2.3 in the TGD.*

In the North Orange County permit area, where the Russell Avenue Townhomes project is located, downstream channels are considered not susceptible to hydromodification, and therefore projects do not have the potential for an HCOC, if "[a]ll downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive stream habitat areas will be affected." (See Section 7.II-2.3.3 of the Model WQMP.)

With respect to the proposed Russell Avenue Townhomes project, the site's stormwater flows are discharged to either Russell Avenue or Kerry Street and are conveyed westerly and southerly until entering the storm drain system via a catch basin on Donegal Drive (near the intersection of Donegal Drive and Trask Avenue). The storm drain discharges to Westminster Channel, which drains to Bolsa Chica Channel, which in turn flows to Anaheim Bay, which outlets to the Pacific Ocean. No Hydrologic Conditions of Concern exist for the project since 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 stream habitat areas will be affected. (See the Susceptibility Analysis Map for the Anaheim Bay-Huntington Harbor Watershed, Figure 2 of Appendix XVI.3 of the Technical Guidance Document, a copy of which is attached to this WQMP as Appendix C.)

II.4 Post Development Drainage Characteristics

The project site is rectangular in shape and has a relatively flat topography that generally slopes southwesterly with elevations ranging from about 74 to 72 feet above mean sea level (msl). Surface drainage sheet flows to either Russell Avenue or Kerry Street and is conveyed westerly and southerly until entering the storm drain system. The project area currently has no water quality or drainage mitigation devices installed on-site.

The drainage for the proposed project generally follows the existing flow characteristics. The site has been divided into three drainage areas, identified as Areas 1-3. Surface drainage from each area will be collected in catch basins with proprietary insert filters for pretreatment and then directed to that drainage area's underground infiltration BMP facility. The insert filters also will act as the project's trash treatment control devices.

The project is proposing to use GeoStorage Infiltration System units, which are shallow proprietary infiltration chambers. The infiltration chambers comply with the design requirements set forth in BMP Fact Sheet INF-7 and are comprised of 3.75 foot deep, open-bottomed, rectangular vaults surrounded by gravel which will collect and then allow the storm water runoff to infiltrate into the native soils. The vaults are covered with concrete roof planks capable of H-20 traffic loading with a manhole opening in one plank to allow access for maintenance. A brochure describing the GeoStorage Infiltration System is included in Section VI of this P-WQMP. Groundwater at the site was encountered at a depth of 14 feet below current grade, and the site will be raised by one foot during grading operations. Therefore, the separation between the bottom of the infiltration chambers and on-site groundwater will be 11.25 feet, thus achieving the required 10 foot separation.

The catch basin insert filters and underground infiltration BMPs, which will be located as shown on the BMP Exhibit (Site Plan) included in Section VI of this WQMP, will act as the project's LID BMPs.

The infiltration facilities for Areas 1 and 2 are located near the middle of the site, under parking areas. When the storm flows exceed the capacity of the infiltration chamber in Area 1, the excess flows will bubble out of the Area 1 catch basin and be discharged to Russell Avenue via a parkway culvert. When the storm flows exceed the capacity of the infiltration chamber in Area 2, the excess flows will bubble out of the Area 2 catch basin and be discharged to Russell Avenue via the project driveway entrance.

The infiltration facility for Area 3 is located at the southern border of the site, under a parking area. When the storm flows exceed the capacity of the infiltration chamber in Area 3, the excess flows will bubble out of the most westerly Area 3 catch basin and be discharged to Kerry Street via a parkway culvert.

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Infiltration chambers were chosen as the primary LID BMPs for the project since site soils are amenable to infiltration.

The site's stormwater flows are discharged to either Russell Avenue or Kerry Street and are conveyed westerly and southerly until entering the storm drain system via a catch basin on Donegal Drive (near the intersection of Donegal Drive and Trask Avenue). The storm drain discharges to Westminster Channel, which drains to Bolsa Chica Channel, which in turn flows to Anaheim Bay, which outlets to the Pacific Ocean. No Hydrologic Conditions of Concern exist for the project since 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 stream habitat areas will be affected. (See Section II.3 of this WQMP.)

II.5 Property Ownership/Management

All portions of the project and site are owned by Melia Homes, Inc. The individual at Melia Homes, Inc. responsible for this project and all related water quality issues is the president of the company, B.J. Delzer. Mr. Delzer's contact information is as follows: 9860 Irvine Center Drive, Irvine, California 92618; phone number (949) 759-4367; bj@melia-homes.com. All maintenance responsibilities, including the implementation and maintenance of BMPs for the Russell Avenue Townhomes project, shall be performed by Melia Homes, Inc. until a homeowners' association is formed, at which time all BMP implementation and maintenance responsibilities shall be transferred to said homeowners' association.

Section III Site Description

III.1 Physical Setting

Name of Planned Community/Planning Area (if applicable)	**Pending**
Location/Address	**9822 Russell Avenue, Garden Grove, CA 92844**
General Plan Land Use Designation	**Attached Residential Development**
Zoning	**R-2 (Proposed)**
Acreage of Project Site	**Approximately 1.8 acres**
Predominant Soil Type	**During the geotechnical investigation of the site, artificial fills were encountered within the upper two feet across the site. The fills were generally composed of damp, fine- to medium-grained, sands with silts. Underlying the fills were alluvial soils consisting of sands with silt, sandy silts, silty sands/sandy silts, and silty sands. The alluvial soils were present across the site to the maximum depth explored of 51.5 feet. (See page 4 of Albus & Associates, Inc.'s Preliminary Geotechnical Investigation Report, Proposed Residential Development, 9822 Russell Avenue, Garden Grove, California, dated July 1, 2025 ("Geotechnical Report"), a copy of which is attached to this P-WQMP as Appendix E.)**

III.2 Site Characteristics

Site Characteristics	
Precipitation Zone	**0.77 inches** **(See Appendix D of this P-WQMP—Rainfall Zone Map for Orange County, Figure XVI-1, TGD)**
Topography	**Flat**
Drainage Patterns/Connections	The project site is rectangular in shape and has a relatively flat topography that generally slopes southwesterly with elevations ranging from about 74 to 72 feet above mean sea level (msl). Surface drainage sheet flows to either Russell Avenue or Kerry Street and is conveyed westerly and southerly until entering the storm drain system. The project area currently has no water quality or drainage mitigation devices installed on-site. The drainage for the proposed project generally follows the existing flow characteristics. The site has been divided into three drainage areas, identified as Areas 1-3. Surface drainage from each area will be collected in catch basins with proprietary insert filters for pretreatment and then directed to that drainage area's underground infiltration BMP facility. The insert filters also will act as the project's trash treatment control devices. The project is proposing to use GeoStorage Infiltration System units, which are shallow proprietary infiltration chambers. The infiltration chambers comply with the design requirements set forth in BMP Fact Sheet INF-7 and are comprised of 3.75 foot deep, open-bottomed, rectangular vaults surrounded by gravel which will collect and then allow the storm water runoff to infiltrate into the native soils. The vaults are covered with concrete roof planks capable of H-20 traffic loading with a manhole opening in one plank to allow access for maintenance. A brochure describing the GeoStorage Infiltration System is included in Section VI of this P-WQMP. Groundwater at the site was encountered at a depth of 14 feet below current grade, and the site will be raised by one foot during grading operations. Therefore, the separation between the bottom of the infiltration

chambers and on-site groundwater will be 11.25 feet, thus achieving the required 10 foot separation.

The catch basin insert filters and underground infiltration BMPs, which will be located as shown on the BMP Exhibit (Site Plan) included in Section VI of this WQMP, will act as the project's LID BMPs.

The infiltration facilities for Areas 1 and 2 are located near the middle of the site, under parking areas. When the storm flows exceed the capacity of the infiltration chamber in Area 1, the excess flows will bubble out of the Area 1 catch basin and be discharged to Russell Avenue via a parkway culvert. When the storm flows exceed the capacity of the infiltration chamber in Area 2, the excess flows will bubble out of the Area 2 catch basin and be discharged to Russell Avenue via the project driveway entrance.

The infiltration facility for Area 3 is located at the southern border of the site, under a parking area. When the storm flows exceed the capacity of the infiltration chamber in Area 3, the excess flows will bubble out of the most westerly Area 3 catch basin and be discharged to Kerry Street via a parkway culvert.

The Amendment to the Water Quality Control Plan for Ocean Waters of California to Control Trash, and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California adopted by the State Water Board, dictate that trash shall not be present in ocean waters or along shorelines, and prohibit the discharge of trash into surface waters of the state (the "Trash Provisions"). Pursuant to the Trash Provisions, all trash treatment control devices shall meet the Full Capture System definition and be certified by the State Water Resources Control Board. In compliance with the Trash Provisions, the proprietary catch basin insert filters that have been proposed for the project are listed on the State Water Resources Control Board's Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021), a copy of which is included in Section VI of this P-WQMP.

Infiltration chambers were chosen as the primary LID BMPs for the project since site soils are amenable to infiltration.

	The site's stormwater flows are discharged to either Russell Avenue or Kerry Street and are conveyed westerly and southerly until entering the storm drain system via a catch basin on Donegal Drive (near the intersection of Donegal Drive and Trask Avenue). The storm drain discharges to Westminster Channel, which drains to Bolsa Chica Channel, which in turn flows to Anaheim Bay, which outlets to the Pacific Ocean. No Hydrologic Conditions of Concern exist for the project since 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 stream habitat areas will be affected. (See Section II.3 of this WQMP.)
Soil Type, Geology, and Infiltration Properties	**During the geotechnical investigation of the site, artificial fills were encountered within the upper two feet across the site. The fills were generally composed of damp, fine- to medium-grained, sands with silts. Underlying the fills were alluvial soils consisting of sands with silt, sandy silts, silty sands/sandy silts, and silty sands. The alluvial soils were present across the site to the maximum depth explored of 51.5 feet. (See page 4 of the Geotechnical Report attached to this P-WQMP as Appendix E.)** **The geotechnical expert determined that infiltration of stormwater at the site is feasible utilizing the proposed shallow infiltration chambers, and that the "measured" infiltration rate is 1.9 in/hr. (See pages 6-7 of Albus & Associates, Inc.'s Preliminary Geotechnical Investigation for Proposed Water Quality Improvements, Proposed Residential Development, 9822 Russell Avenue, Garden Grove, California, dated October 20, 2025 (Infiltration Report), a copy of which is attached to this P-WQMP as Appendix F.**
Hydrogeologic (Groundwater) Conditions	**Groundwater was encountered at a depth of 14 feet at the time of the geotechnical expert's field investigation. (See page 4 of the Geotechnical Report attached to this P-WQMP as Appendix E.)**
Geotechnical Conditions (relevant to infiltration)	**The geotechnical expert determined that infiltration of stormwater at the site is feasible utilizing the proposed shallow infiltration chambers, and that the "measured" infiltration rate is 1.9 in/hr. (See pages 6-7 of the Infiltration Report, a copy of which is attached to this P-WQMP as Appendix F.**

Off-Site Drainage	**There are no off-site flows that drain onto the project site.**
Utility and Infrastructure Information	**The only utilities associated with the proposed development are the water, sewer, area drains, gas and electrical connections. These laterals will supply the necessary utility connections for the proposed development. There are no main lines contained on the site. The proposed infiltration chambers will not interfere with any on-site utilities.**

III.3 Watershed Description

Receiving Waters	**The site's stormwater flows are discharged to either Russell Avenue or Kerry Street and are conveyed westerly and southerly until entering the storm drain system via a catch basin on Donegal Drive (near the intersection of Donegal Drive and Trask Avenue). The storm drain discharges to Westminster Channel, which drains to Bolsa Chica Channel, which in turn flows to Anaheim Bay, which outlets to the Pacific Ocean.**
303(d) Listed Impairments	**Bolsa Chica Channel —Ammonia, Indicator Bacteria** **Anaheim Bay— Nickel, PCBs, Toxicity**
Applicable TMDLs	**No TMDLS have been established for the water bodies to which the project will discharge.**
Pollutants of Concern for the Project	**Suspended-Solids/Sediment, Nutrients, Heavy Metals, Pathogens (Bacteria / Viruses), Pesticides, Oil & Grease, Toxic Organic Compounds, and Trash & Debris**
Environmentally Sensitive and Special Biological Significant Areas	**The proposed project does not directly discharge to, and is not within or adjacent to, an ESA.**

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?	YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	**Not applicable. There is currently no approved WIHMP for the Anaheim Bay-Huntington Harbor Watershed.**	

Project Performance Criteria	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MP-WQMP)	**No HCOC exists.**
List applicable LID performance criteria (Section 7.II-2.4.3 from MP-WQMP)	**Priority Projects must infiltrate, harvest and use, evapotranspire, or biotreat/biofilter the 85th percentile of the 24-hour storm event (Design Capture Volume).**

List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MP-WQMP)	**Capture and treat runoff from the 24-hour, 85th percentile storm event, and drawdown the captured/treated volume in 48 hours following end of event.**
Calculate LID design storm capture volume for Project.	**The project site has been divided into three drainage areas. The Design Capture Volume (DCV) has been calculated for each drainage area to establish that the underground infiltration BMPs meet the project performance criteria for LID BMPs. The detailed calculations used to determine the DCV are set forth in Section IV.3.2 of this WQMP.**

DRAINAGE AREA	SQUARE FOOTAGE / ACREAGE OF DRAINAGE AREA	DCV (CF)
Area 1	**20,945 SF / 0.48 AC**	**1,006**
Area 2	**31,680 SF / 0.73 AC**	**1,510**
Area 3	**25,912 SF / 0.59 AC**	**1,237**
Total	**78,537 SF / 1.80 AC**	**3,753**

IV.2. Site Design and Drainage

The project site is rectangular in shape and has a relatively flat topography that generally slopes southwesterly with elevations ranging from about 74 to 72 feet above mean sea level (msl). Surface drainage sheet flows to either Russell Avenue or Kerry Street and is conveyed westerly and southerly until entering the storm drain system. The project area currently has no water quality or drainage mitigation devices installed on-site.

The drainage for the proposed project generally follows the existing flow characteristics. The site has been divided into three drainage areas, identified as Areas 1-3. Surface drainage from each area will be collected in catch basins with proprietary insert filters for pretreatment and then directed to that drainage area's underground infiltration BMP facility. The insert filters also will act as the project's trash treatment control devices.

The project is proposing to use GeoStorage Infiltration System units, which are shallow proprietary infiltration chambers. The infiltration chambers comply with the design requirements set forth in BMP Fact Sheet INF-7 and are comprised of 3.75 foot deep, open-bottomed, rectangular vaults surrounded by gravel which will collect and then allow the storm water runoff to infiltrate into the native soils. The vaults are covered with concrete roof planks capable of H-20 traffic loading with a manhole opening in one plank to allow access for maintenance. A brochure describing the GeoStorage Infiltration System is included in Section VI of this P-WQMP. Groundwater at the site was encountered at a depth of 14 feet below current grade, and the site will be raised by one foot during grading operations. Therefore, the separation between the bottom of the infiltration chambers and on-site groundwater will be 11.25 feet, thus achieving the required 10 foot separation.

The catch basin insert filters and underground infiltration BMPs, which will be located as shown on the BMP Exhibit (Site Plan) included in Section VI of this WQMP, will act as the project's LID BMPs.

The infiltration facilities for Areas 1 and 2 are located near the middle of the site, under parking areas. When the storm flows exceed the capacity of the infiltration chamber in Area 1, the excess flows will bubble out of the Area 1 catch basin and be discharged to Russell Avenue via a parkway culvert. When the storm flows exceed the capacity of the infiltration chamber in Area 2, the excess flows will bubble out of the Area 2 catch basin and be discharged to Russell Avenue via the project driveway entrance.

The infiltration facility for Area 3 is located at the southern border of the site, under a parking area. When the storm flows exceed the capacity of the infiltration chamber in Area 3, the excess flows will bubble out of the most westerly Area 3 catch basin and be discharged to Kerry Street via a parkway culvert.

The Amendment to the Water Quality Control Plan for Ocean Waters of California to Control Trash, and Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters,

Enclosed Bays, and Estuaries of California adopted by the State Water Board, dictate that trash shall not be present in ocean waters or along shorelines, and prohibit the discharge of trash into surface waters of the state (the "Trash Provisions"). Pursuant to the Trash Provisions, all trash treatment control devices shall meet the Full Capture System definition and be certified by the State Water Resources Control Board. In compliance with the Trash Provisions, the proprietary catch basin insert filters that have been proposed for the project are listed on the State Water Resources Control Board's Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021), a copy of which is included in Section VI of this P-WQMP.

Infiltration chambers were chosen as the primary LID BMPs for the project since site soils are amenable to infiltration.

The site's stormwater flows are discharged to either Russell Avenue or Kerry Street and are conveyed westerly and southerly until entering the storm drain system via a catch basin on Donegal Drive (near the intersection of Donegal Drive and Trask Avenue). The storm drain discharges to Westminster Channel, which drains to Bolsa Chica Channel, which in turn flows to Anaheim Bay, which outlets to the Pacific Ocean. No Hydrologic Conditions of Concern exist for the project since 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 stream habitat areas will be affected. (See Section II.3 of this WQMP.)

IV.3 LID BMP Selection and Project Conformance Analysis

Each sub-section below documents that the proposed design features conform to the applicable project performance criteria via check boxes, tables, calculations, narratives, and/or references to worksheets.

IV.3.1 Hydrologic Source Controls (HSCs)

Name	**Included?**
Localized on-lot infiltration	**No**
Impervious area dispersion (e.g. roof top disconnection)	**No**
Street trees (canopy interception)	**No**
Residential rain barrels (not actively managed)	**No**
Green roofs/Brown roofs	**No**
Blue roofs	**No**
Impervious area reduction (e.g. permeable pavers, site design)	**No**

The proposed INF-7: Underground Infiltration BMPs will retain and infiltrate the entire LID Design Storm Capture Volume. Therefore, Hydrologic Source Controls are not required for the proposed Russell Avenue Townhomes project.

IV.3.2 Infiltration BMPs

Name	**Included?**
Bioretention without underdrains	**No**
Rain gardens	**No**
Porous landscaping	**No**
Infiltration planters	**No**
Retention swales	**No**
Infiltration trenches	**No**
Infiltration basins	**No**
Drywells	**No**
Subsurface infiltration galleries	**Yes**
French drains	**No**
Permeable asphalt	**No**
Permeable concrete	**No**
Permeable concrete pavers	**No**

The underground infiltration BMPs have been sized in compliance with Worksheet B and BMP Fact Sheet INF-1 of the Technical Guidance Document, as set forth below. (The Infiltration Basin Fact Sheet, INF-1, is to be used to size underground infiltration systems with open pore volume per BMP Fact Sheet INF-7.) The calculations demonstrating the storage provided by and the drawdown time of the underground infiltration BMPs are summarized below. These calculations establish that the Design Capture Volume can be met with the INF-7: Underground Infiltration BMPs, thereby satisfying the project performance criteria for LID BMPs. The underground infiltration BMPs will be located as shown on the BMP Exhibit (Site Plan) included in Section VI of this WQMP.

Further, groundwater at the site was encountered at a depth of 14 feet below current grade, and the site will be raised by one foot during grading operations. Therefore, the separation between the bottom of the 3.75 foot deep infiltration chambers and on-site groundwater will be 11.25 feet, thus achieving the required 10 foot separation.

Further, it has been determined that it is feasible to infiltrate the Design Capture Volume at the project site. See Table 2.7 from the Technical Guidance Document at the end of this section.

DRAINAGE AREA 1

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.77	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.00	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.77	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.48	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.796	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.75	
4	Calculate runoff volume, $V_{design}= (C \times d_{remainder} \times A \times 43560 \times (1/12))$	V_{design}=	1,006	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}=	2.0	
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=	0.95	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	48	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	3.80	feet
6	**Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design}/ d_{max}$	A_{min}=	265	sq-ft

**The designed INF-7: Underground Infiltration BMP for Drainage Area 1 measures 350 square feet (10' x 35') (see BMP Exhibit (Site Plan) included in Section VI of this WQMP); therefore, the INF-7: Underground

Infiltration BMP for Drainage Area 1 exceeds the minimum required BMP area of 265 square feet as calculated in the above Worksheet B.

INF-1: Simple Sizing Method for Underground Infiltration Systems With Open Pore Volume (this sizing method is to be used per INF-7):

The sizing steps are as follows:

Step 1: Determine Infiltration Basin DCV

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

See Worksheet B above—the DCV for Drainage Area 1 = 1,006 cu-ft

Step 2: Determine the 48-hour Depth

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

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

Where:

d_{48} = basin 48-hour drawdown depth, ft

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

This is the maximum depth of the basin below the overflow device to achieve drawdown in 48 hours.

K_{DESIGN} = 0.95 in/hr—See Worksheet B above, Step 3a (3)

d_{48} = 0.95 in/hr x 4 = 3.80 ft

Step 3: Calculate the Required Infiltrating Area

The required infiltrating area (i.e. basin area at mid ponding depth) can be calculated using the following equation:

$A = DCV / (d_P)$

Where:

A = required basin infiltrating area, sq-ft (assumed to be the basin area at mid-ponding depth)

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

d_P = ponding depth, ft (should be equal to or less than d_{48})

d_P = 3.75 ft (See BMP Exhibit (Site Plan) included in Section VI of this WQMP)

A = 1,006 cu-ft / 3.75 ft = 268 sq-ft

**** The designed INF-7: Underground Infiltration BMP for Drainage Area 1 measures 350 square feet (10' x 35') (see BMP Exhibit (Site Plan) included in Section VI of this WQMP); therefore, the INF-7:**

Underground Infiltration BMP for Drainage Area 1 exceeds the minimum required BMP area of 268 square feet as calculated pursuant to BMP Fact Sheet INF-1.

DRAINAGE AREA 2

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.77	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.00	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.77	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.73	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.789	
3	Calculate runoff coefficient, $C= (0.75 \times imp) + 0.15$	C=	0.74	
4	Calculate runoff volume, $V_{design}= (C \times d_{remainder} \times A \times 43560 \times (1/12))$	V_{design}=	1,510	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}=	2.0	
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=	0.95	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	48	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	3.80	feet
6	**Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design}/ d_{max}$	A_{min}=	397	sq-ft

****The designed INF-7: Underground Infiltration BMP for Drainage Area 1 measures 610 square feet (10' x 61') (see BMP Exhibit (Site Plan) included in Section VI of this WQMP); therefore, the INF-7: Underground Infiltration BMP for Drainage Area 1 exceeds the minimum required BMP area of 397 square feet as calculated in the above Worksheet B.**

INF-1: Simple Sizing Method for Underground Infiltration Systems With Open Pore Volume (this sizing method is to be used per INF-7):

The sizing steps are as follows:

Step 1: Determine Infiltration Basin DCV

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

See Worksheet B above—the DCV for Drainage Area 1 = 1,510 cu-ft

Step 2: Determine the 48-hour Depth

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

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

Where:

d_{48} = basin 48-hour drawdown depth, ft

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

This is the maximum depth of the basin below the overflow device to achieve drawdown in 48 hours.

K_{DESIGN} = 0.95 in/hr—See Worksheet B above, Step 3a (3)

d_{48} = 0.95 in/hr x 4 = 3.80 ft

Step 3: Calculate the Required Infiltrating Area

The required infiltrating area (i.e. basin area at mid ponding depth) can be calculated using the following equation:

$A = DCV / (d_P)$

Where:

A = required basin infiltrating area, sq-ft (assumed to be the basin area at mid-ponding depth)

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

d_P = ponding depth, ft (should be equal to or less than d_{48})

d_P = 3.75 ft (See BMP Exhibit (Site Plan) included in Section VI of this WQMP)

A = 1,510 cu-ft / 3.75 ft = 403 sq-ft

**** The designed INF-7: Underground Infiltration BMP for Drainage Area 1 measures 610 square feet (10' x 61') (see BMP Exhibit (Site Plan) included in Section VI of this WQMP); therefore, the INF-7: Underground Infiltration BMP for Drainage Area 1 exceeds the minimum required BMP area of 403 square feet as calculated pursuant to BMP Fact Sheet INF-1.**

DRAINAGE AREA 3

Worksheet B: Simple Design Capture Volume Sizing Method

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.77	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0.00	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.77	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.59	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.794	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.75	
4	Calculate runoff volume, $V_{design} = (C \times d_{remainder} \times A \times 43560 \times (1/12))$	V_{design}=	1,237	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}=	2.0	
3	Calculate design infiltration rate, $K_{design} = K_{measured} \times S_{final}$	K_{design}=	0.95	In/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	48	Hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=	3.80	feet
6	**Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design}/ d_{max}$	A_{min}=	326	sq-ft

****The designed INF-7: Underground Infiltration BMP for Drainage Area 1 measures 480 square feet (8' x 60') (see BMP Exhibit (Site Plan) included in Section VI of this WQMP); therefore, the INF-7: Underground Infiltration BMP for Drainage Area 1 exceeds the minimum required BMP area of 326 square feet as calculated in the above Worksheet B.**

INF-1: Simple Sizing Method for Underground Infiltration Systems With Open Pore Volume (this sizing method is to be used per INF-7):

The sizing steps are as follows:

Step 1: Determine Infiltration Basin DCV

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

See Worksheet B above—the DCV for Drainage Area 1 = 1,237 cu-ft

Step 2: Determine the 48-hour Depth

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

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

Where:

d_{48} = basin 48-hour drawdown depth, ft

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

This is the maximum depth of the basin below the overflow device to achieve drawdown in 48 hours.

K_{DESIGN} = 0.95 in/hr—See Worksheet B above, Step 3a (3)

d_{48} = 0.95 in/hr x 4 = 3.80 ft

Step 3: Calculate the Required Infiltrating Area

The required infiltrating area (i.e. basin area at mid ponding depth) can be calculated using the following equation:

$A = DCV / (d_P)$

Where:

A = required basin infiltrating area, sq-ft (assumed to be the basin area at mid-ponding depth)

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

d_P = ponding depth, ft (should be equal to or less than d_{48})

d_P = 3.75 ft (See BMP Exhibit (Site Plan) included in Section VI of this WQMP)

A = 1,237 cu-ft / 3.75 ft = 330 sq-ft

**** The designed INF-7: Underground Infiltration BMP for Drainage Area 1 measures 610 square feet (10' x 61') (see BMP Exhibit (Site Plan) included in Section VI of this WQMP); therefore, the INF-7: Underground Infiltration BMP for Drainage Area 1 exceeds the minimum required BMP area of 330 square feet as calculated pursuant to BMP Fact Sheet INF-1.**

FACTOR OF SAFETY FOR DRAINAGE AREAS 1, 2 & 3

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	2	0.50
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.25
B	Design	Tributary area size	0.25	1	0.25
		Level of pretreatment/ expected sediment loads	0.25	2	0.50
		Redundancy	0.25	2	0.50
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			1.5
Combined Safety Factor, $S_{Total} = S_A \times S_B$ **(1.25 x 1.50 = 1.875, use 2 per TGD)**					2.0
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					1.90
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_{Observed} / S_{Total}$					0.95
Supporting Data					
Briefly describe infiltration test and provide reference to test forms: **See pages 6-7 of the Infiltration Report, a copy of which is attached to this P-WQMP as Appendix F.**					

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

STORAGE AND DRAWDOWN TIME CALCULATIONS FOR INF-7: UNDERGROUND INFILTRATION BMPS

DRAINAGE AREA 1

REQUIRED STORAGE: DCV = 1,006 CF

STORAGE PROVIDED = (10’ x 35’) X 3.75’ = 1,313 CF

STORAGE PROVIDED (1,313 CF) > REQUIRED STORAGE (1,006 CF)

DRAWDOWN CALCULATION

DRAWDOWN TIME = STORAGE / FACILITY AREA X INFILTRATION RATE
1,313 CF / (10’ X 35’) X (0.0792’/HR) = 47.4 HR < 48 HR

DRAINAGE AREA 2

REQUIRED STORAGE: DCV = 1,510 CF

STORAGE PROVIDED = (10’ x 61’) X 3.75’ = 2,288 CF

STORAGE PROVIDED (2,288 CF) > REQUIRED STORAGE (1,510 CF)

DRAWDOWN CALCULATION

DRAWDOWN TIME = STORAGE / FACILITY AREA X INFILTRATION RATE
2,288 CF / (10’ X 61’) X (0.0792’/HR) = 47.4 HR < 48 HR

DRAINAGE AREA 3

REQUIRED STORAGE: DCV = 1,237 CF

STORAGE PROVIDED = (8’ x 60’) X 3.75’ = 1,800 CF

STORAGE PROVIDED (1,800 CF) = REQUIRED STORAGE (1,237 CF)

DRAWDOWN CALCULATION

DRAWDOWN TIME = STORAGE / FACILITY AREA X INFILTRATION RATE
1,800 CF / (8’ X 60’) X (0.0792’/HR) = 47.4 HR < 48 HR

Table 2.7: Infiltration BMP Feasibility Worksheet

<table>
<tr><th></th><th><i>Infeasibility Criteria</i></th><th><i>Yes</i></th><th><i>No</i></th></tr>
<tr><td>1</td><td>Would Infiltration BMPs pose significant risk for groundwater related concerns? Refer to Appendix VIII (Worksheet I) for guidance on groundwater-related Infiltration feasibility criteria.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The groundwater level for the site is 14 feet in depth and the site will be raised by a foot during grading operations. Therefore, a chamber system set at a depth of 3.75 feet will maintain the minimum required clearance of 10 feet from groundwater. (See pages 6-7 of the Infiltration Report, a copy of which is attached to this P-WQMP as Appendix F.

Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>2</td><td>Would Infiltration BMPs pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert):
• The BMP can only be located less than 50 feet away from slopes steeper than 15 percent.
• The BMP can only be located less than eight feet from building foundations or an alternative setback.
• A study prepared by a geotechnical professional or an available watershed study substantiates that storm water infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be mitigated to an acceptable level.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The site is flat and the BMPs are located more than eight feet from the building foundations. See BMP Exhibit (Site Plan) included in Section VI of this WQMP.

Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>3</td><td>Would infiltration of the DCV from drainage area violate downstream water rights?</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc.</td></tr>
</table>

<table>
<tr><th></th><th><i>Partial Infeasibility Criteria</i></th><th><i>Yes</i></th><th><i>No</i></th></tr>
<tr><td>4</td><td>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?</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
During the geotechnical investigation of the site, artificial fills were encountered within the upper two feet across the site. The fills were generally composed of damp, fine- to medium-grained, sands with silts. Underlying the fills were alluvial soils consisting of sands with silt, sandy silts, silty sands/sandy silts, and silty sands. The alluvial soils were present across the site to the maximum depth explored of 51.5 feet. (See page 4 of the Geotechnical Report attached to this P-WQMP as Appendix E.) The geotechnical expert determined that the “measured” infiltration rate at the site is 1.9 in/hr. (See pages 6-7 of the Infiltration Report, a copy of which is attached to this P-WQMP as Appendix F.)
Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>5</td><td>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.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
The measured infiltration rate at the site is 1.9 in/hr. (See pages 6-7 of the Infiltration Report, a copy of which is attached to this P-WQMP as Appendix F.)
Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>6</td><td>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?</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:

Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>7</td><td>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?</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:

Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
</table>

Infiltration Screening Results (check box corresponding to result):			
8	Is there substantial evidence that infiltration from the project would result in a significant increase in I & I to the sanitary sewer that cannot be sufficiently mitigated? (See Appendix XVII) Provide narrative discussion and supporting evidence: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. **The referenced document is not attached to the current version of the TGD.**		**X**
9	**If any answer from row 1-3 is yes**: infiltration of any volume is not feasible within the DMA or equivalent. Provide basis: Summarize findings of infeasibility screening	**N/A**	
10	**If any answer from row 4-7 is yes**, infiltration is permissible but is not presumed to be feasible for the entire DCV. Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply. Provide basis: Summarize findings of infeasibility screening	**N/A**	
11	If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable. **The selected LID BMPs, INF-7 Underground Infiltration BMPs, have been designed to infiltrate the full DCV.**	**X**	

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Name	Included?
All HSCs; *See Section IV.3.1*	**No**
Surface-based infiltration BMPs	**No**
Biotreatment BMPs	**No**
Above-ground cisterns and basins	**No**
Underground detention	**No**

The proposed INF-7: Underground Infiltration BMPs will retain and infiltrate the entire LID Design Storm Capture Volume. Therefore, additional Evapotranspiration and/or Rainwater Harvesting BMPs are not required for the proposed Russell Avenue Townhomes project.

IV.3.4 Biotreatment BMPs

Name	Included?
Bioretention with underdrains	**No**
Stormwater planter boxes with underdrains	**No**
Rain gardens with underdrains	**No**
Constructed wetlands	**No**
Vegetated swales	**No**
Vegetated filter strips	**No**
Proprietary vegetated biotreatment systems	**No**
Wet extended detention basin	**No**
Dry extended detention basins	**No**

The proposed INF-7: Underground Infiltration BMPs will retain and infiltrate the entire LID Design Storm Capture Volume. Therefore, no biotreatment BMPs will be utilized at the proposed Russell Avenue Townhomes project.

IV.3.5 Hydromodification Control BMPs

<table>
<tr><th colspan="2">Hydromodification Control BMPs</th></tr>
<tr><th>BMP Name</th><th>BMP Description</th></tr>
<tr><td colspan="2">The site's stormwater flows are discharged to either Russell Avenue or Kerry Street and are conveyed westerly and southerly until entering the storm drain system via a catch basin on Donegal Drive (near the intersection of Donegal Drive and Trask Avenue). The storm drain discharges to Westminster Channel, which drains to Bolsa Chica Channel, which in turn flows to Anaheim Bay, which outlets to the Pacific Ocean. No Hydrologic Conditions of Concern exist for the project since 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 stream habitat areas will be affected. (See the Susceptibility Analysis Map for the Anaheim Bay-Huntington Harbor Watershed, Figure 2 of Appendix XVI.3 of the Technical Guidance Document, a copy of which is attached to this P-WQMP as Appendix C.)
Since a Hydrologic Condition of Concern does not exist for this project, no hydromodification control BMPs are required.</td></tr>
</table>

IV.3.6 Regional/Sub-Regional LID BMPs

Regional/Sub-Regional LID BMPs
The proposed INF-7: Underground Infiltration BMPs will retain and infiltrate the entire LID Design Storm Capture Volume. Therefore, no Regional/Sub-Regional LID BMPs are required for the proposed Russell Avenue Townhomes project.

IV.3.7 Treatment Control BMPs

<table>
<tr><th colspan="2">Treatment Control BMPs</th></tr>
<tr><th>BMP Name</th><th>BMP Description</th></tr>
<tr><td colspan="2">The proposed INF-7: Underground Infiltration BMPs will retain and infiltrate the entire LID Design Storm Capture Volume.
In addition, the proposed Oldcastle FloGard +PLUS Catch Basin Insert Filters have been certified by the State Water Resources Control Board as a trash treatment control device that meets the Full Capture System definition. (See the State Water Resources Control Board’s Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021), a copy of which is included in Section VI of this P-WQMP.)
No other Treatment Control BMPs will be utilized at the site.</td></tr>
</table>

IV.3.8 Non-Structural Source Control BMPs

Non-Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
N1	Education for Property Owners, Tenants and Occupants	X		
N2	Activity Restrictions	X		
N3	Common Area Landscape Management	X		
N4	BMP Maintenance	X		
N5	Title 22 CCR Compliance (How development will comply)		X	Not applicable. The project site will not require Title 22 CCR compliance since the operation of the project site will not generate hazardous wastes as part of its routine operation.
N6	Local Industrial Permit Compliance		X	BMP not applicable to this project.
N7	Spill Contingency Plan		X	Not applicable. This site does not mandate the stockpiling of cleanup materials; therefore, it does not require a spill contingency plan.
N8	Underground Storage Tank Compliance		X	Not applicable. There are no underground storage tanks proposed for the project site.
N9	Hazardous Materials Disclosure Compliance		X	Not applicable. The project site will not handle or dispose of hazardous materials as part of its routine operations.
N10	Uniform Fire Code Implementation		X	Not applicable. The project site will not handle or dispose of hazardous materials as part of its routine operations.
N11	Common Area Litter Control	X		
N12	Employee Training	X		

N13	Housekeeping of Loading Docks		X	Not applicable. No loading docks are proposed.
N14	Common Area Catch Basin Inspection	X		
N15	Street Sweeping Private Streets and Parking Lots	X		
N16	Retail Gasoline Outlets		X	Not applicable. No retail gasoline outlets are proposed.

N1 Property Owner Education

The Owner will review the environmental awareness educational materials and BMP Fact Sheets included in Appendices A and B of this Project WQMP upon completion of the residential development. Among other things, these materials will inform the Owner of the impacts of dumping oil, paints, solvents or other potentially harmful chemicals into the storm drain; the proper use and management of fertilizers, pesticides and herbicides in landscaping practices; the impacts of littering and improper watering; and proper maintenance practices for the development.

N2 Activity Restrictions

The Owner shall identify surface water quality protection requirements to ensure that surface water quality activities shall be conducted in conformance with the Project WQMP as it relates to the handling and disposal of contaminants and, through the use of employee training manuals or another equally effective method, shall develop corresponding use restrictions. The use restrictions shall include, but not be limited to, the following:

(a) The Owner shall periodically provide to his employees environmental awareness education materials made available by the local municipalities. These materials will describe the use of chemicals (including pesticides and fertilizers) that should be limited to the covered property with no discharge of specified wastes via hosing or other direct discharge to gutter, catch basins, settling basins and storm drains.

(b) The Owner shall require the use of fertilizers and pesticides to be in strict conformance with City and County guidelines.

(c) The Owner shall prohibit the discharge of leaf litter, grass clippings, trash, animal wastes, paint, or masonry wastes to streets or storm drain systems.

(d) The Owner shall prohibit hosing down any paved surface where the result would be the flow of non-storm water into the street or storm drains.

(e) The Owner shall prohibit oil changing or other auto repairs that could discharge pollutants.

(f) The Owner shall prohibit washing of cars.

N3 Common Area Landscape Management

Management programs will be designed and implemented by the Owner to maintain all of the landscaped areas within the project site. These programs will include how to mitigate the potential dangers of fertilizer and pesticide usage, require that fertilizer and pesticide usage shall be consistent with City and County guidelines, discuss utilization of water-efficient landscaping practices, require that maintenance be consistent with the County Water Conservation Resolution or the City equivalent, and detail the proper disposal of landscape wastes.

The Owner shall implement irrigation and landscaping which will utilize moisture sensors, smart timers, rain shut-off valves and the grouping of plants with similar water requirements in order to prevent excess irrigation and its corresponding runoff. The Owner shall also maintain erosion control devices on the property until adequate vegetation coverage has been achieved following establishment of the landscape plantings.

The Owner shall also perform periodic inspection and adjustment of the automatic irrigation system for valve and sprinkler operation and irrigation spray heads for damage as necessary to ensure adequate moisture delivery without allowing overspray or excessive watering that would lead to unnecessary runoff.

N4 BMP Maintenance

The Owner shall be responsible for implementation of each applicable non-structural BMP as well as scheduling inspection and maintenance cleaning of all applicable structural BMP facilities. The Owner, through its landscape or other maintenance contractor, will be responsible for inspection and maintenance activities in landscape areas. Debris and other water pollutants will be controlled, contained and disposed of in a proper manner by the maintenance contractor, and landscaping debris and silt shall be kept out of the infiltration BMP chambers. Refer to Section V.

N11 Common Area Litter Control

The Owner will be responsible to provide or arrange for weekly sweeping and trash pick-up at the site. The Owner may contract with its landscape or other maintenance contractor to perform these duties, as well as to conduct weekly inspections of all trash receptacles to make sure lids are closed and pick-up of any excess trash on the ground has occurred, and to note and investigate any trash disposal violations.

N12 Employee Training

The Owner shall establish an education program for his employees and/or contractors to inform and train personnel engaged in maintenance activities regarding the impact of dumping oil, paints, solvents or other potentially harmful chemicals into the storm drain; the proper use of fertilizers and pesticides in landscaping maintenance practices; and the impacts of littering and improper water disposal.

N14 Common Area Catch Basin Inspection

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

N15 Parking Lot Sweeping

The Owner, through his employees and/or landscaping or other maintenance contractor, shall sweep all parking areas and drive aisles within the project at least every two weeks, or more often if needed. Debris, sediment and trash picked up during sweeping operations will be deposited in the trash receptacles, and landscaping debris and silt shall be kept out of the infiltration BMP chambers.

IV.3.9 Structural Source Control BMPs

Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
S1	Provide storm drain system stenciling and signage	X		
S2	Design and construct outdoor material storage areas to reduce pollution introduction		X	Not applicable. No outdoor material storage areas are proposed.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	X		
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	X		
S5	Protect slopes and channels and provide energy dissipation		X	Not applicable. The site has no slopes or channels.
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)			
S6	Dock areas		X	Not applicable. No loading dock areas are proposed.
S7	Maintenance bays		X	Not applicable. No maintenance bays are proposed.
S8	Vehicle wash areas		X	Not applicable. No vehicle wash areas are proposed.
S9	Outdoor processing areas		X	Not applicable. No outdoor processing areas are proposed.
S10	Equipment wash areas		X	Not applicable. No equipment wash areas are proposed.
S11	Fueling areas		X	Not applicable. No fueling areas are proposed.
S12	Hillside landscaping		X	Not applicable. No hillside landscaping is proposed.
S13	Wash water control for food preparation areas		X	Not applicable. No food preparation areas are proposed.
S14	Community car wash racks		X	Not applicable. No community car wash racks are proposed.

Structural BMPs shall be installed by the Owner through the construction and development of the project. For instance, irrigation systems shall be designed by a licensed landscape architect and installed by a qualified contractor to the specifications and standards of the City of Garden Grove and the County of Orange. Thereafter, these structural source control BMPs shall be maintained by the Owner.

S1 Provide Storm Drain System Stenciling and Signage (CASQA SD-13)

The Owner is responsible for labeling all of the project's storm drain inlets and catch basins with the phrase, "NO DUMPING! DRAINS TO OCEAN," or an equally effective phrase, to alert the public to the destination of pollutants discharged into storm water. This signage is to be included on the project plans. The signage and stenciling shall be maintained for legibility by the Owner.

S3 Design Trash Enclosures to Reduce Pollution Introduction (CASQA SD-32)

One outdoor trash enclosure is proposed for this site. The proposed trash enclosure will be paved with an impervious surface, and has been designed to not allow run-on from adjoining areas and to divert drainage from adjoining roofs and pavements around the trash enclosure area. The trash enclosure shall also provide a solid roof to prevent direct precipitation, and the trash area drain will not connect to the municipal storm drain system. The trash enclosure will be located as shown on the BMP Exhibit (Site Plan) included in Section VI of this WQMP.

In conjunction with maintenance activities, the Owner will be responsible for inspecting the trash enclosure on a weekly basis to ensure that no hazardous materials or other inappropriate materials are being disposed of, and to ensure that trash is not allowed to overflow the provided bins.

S4 Use Efficient Irrigation Systems and Landscape Design (CASQA SD-12)

The Owner shall direct its landscaping architect to design the timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the municipal storm drain system. The following methods to reduce excessive irrigation runoff shall be incorporated where determined applicable and feasible:

1. Employing rain shutoff devices to prevent irrigation after precipitation.

2. Designing irrigation systems to each landscape area's specific water requirements.

3. Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.

4. Implementing a landscape plan consistent with County Water Conservation Resolution or city equivalent, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

5. The timing and application methods of irrigation water shall be designed to minimize the runoff of excess irrigation water into the municipal storm drain system.

6. Employing other comparable, equally effective, methods to reduce irrigation water runoff.

7. 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 other design features, such as:

   (a) Use mulches (such as wood chips or shredded wood products) in planter areas without ground cover to minimize sediment in runoff.

   (b) Install appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant material where possible and/or as recommended by the landscape architect.

   (c) Leave a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible.

   (d) Choose plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth.

The Owner shall be responsible for implementing and maintaining efficient irrigation systems for all landscaping including but not limited to provisions for water sensors, programmable irrigation cycles, and rain shutoff devices. The irrigation systems shall comply with local and statewide ordinances related to irrigation efficiency. The Owner shall also be responsible for the installation and maintenance of all landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff.

IV.4 Alternative Compliance Plan (If Applicable)

The proposed INF-7: Underground Infiltration BMPs will retain and infiltrate the entire LID Design Storm Capture Volume. Therefore, no Alternative Compliance Plan will be utilized at the site.

IV.4.1 Water Quality Credits

<table>
<tr><th colspan="6">Description of Proposed Project</th></tr>
<tr><td colspan="6">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td>☐ Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="3">☐Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.</td><td colspan="2">☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).</td></tr>
<tr><td colspan="2">☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).</td><td colspan="3">☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned</td><td>☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).</td></tr>
<tr><td>☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td colspan="2">☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.</td><td>☐ In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
<tr><td>Calculation of Water Quality Credits (if applicable)</td><td colspan="5">The proposed INF-7: Underground Infiltration BMPs will retain and infiltrate the entire LID Design Storm Capture Volume. Therefore, no Water Quality Credits will be claimed for the Project WQMP.</td></tr>
</table>

IV.4.2 Alternative Compliance Plan Information

The proposed INF-7: Underground Infiltration BMPs will retain and infiltrate the entire LID Design Storm Capture Volume. Therefore, no Alternative Compliance Plan will be utilized at the site.

Section V Inspection/Maintenance Responsibility for BMPs

Melia Homes, Inc. (the owner of the project), shall assume all BMP inspection and maintenance responsibilities for the Russell Avenue Townhomes project located in Garden Grove, California, until a homeowners' association is formed, at which time all BMP implementation and maintenance responsibilities shall be transferred to said homeowners' association.

CONTACT NAME	**B.J. Delzer**
COMPANY	**Melia Homes, Inc.**
ADDRESS	**9860 Irvine Center Drive** **Irvine, California 92618**
PHONE /EMAIL	**(949)759-4367 / bj@melia-homes.com**

A copy of the Operation and Maintenance Plan is attached to this WQMP as Appendix G.

A Master Covenant and Agreement Regarding On-Site BMP Maintenance (with a copy of the Final WQMP Site Plan attached) will be recorded in the County Recorder's Office with respect to the Project Property prior to approval of the Final WQMP.

The Owner also will prepare and record CC&Rs for the project. The CC&Rs will include activity restrictions intended to reduce or eliminate the introduction of pollutants into site runoff, and activities required to maintain and repair the LID BMPs and non-structural and structural source control BMPs implemented at the project.

The design Engineer will be required to perform a final inspection of the project site to confirm that all required design features and structural BMPs have been constructed and installed per plan and were functioning and maintainable at the completion of the project. See the Engineer's Certification Form attached hereto as Appendix M.

Should the maintenance responsibility be transferred at any time during the operational life of the Russell Avenue Townhomes project, a formal notice of transfer shall be submitted to the City of Garden Grove at the time the maintenance responsibility of the property subject to this WQMP is transferred. A Notice of Transfer of Responsibility form is included in Appendix J. The transfer of responsibility shall be incorporated into this WQMP as an amendment.

ANNUAL CERTIFICATION OF BMP MAINTENANCE

The Owner (until the HOA is formed) shall verify BMP implementation and ongoing maintenance through inspection, self- certification, survey, or other equally effective measures. The certification shall verify, 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. The form that will be used to record the implementation, maintenance, and inspection of BMPs is included in Appendix H. A form that may be utilized to prepare the Annual Certificate of Compliance for BMP maintenance to be submitted to the City is included in Appendix I.

The Annual Certificate of Compliance for BMP maintenance is required to be submitted to the City by July 1st of every year.

The Owner (until the HOA is formed) 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

The Owner shall be responsible for long-term funding for BMP maintenance. BMPs shall be maintained throughout the year, and inspection and maintenance activities shall be documented in this WQMP. When the HOA is formed and takes over maintenance of the project common areas, funding for all BMP maintenance, replacement and repair shall be addressed by the HOA fees.

ACCESS EASEMENT FOR CITY / COUNTY INSPECTION

The City of Garden Grove may conduct verifications to ensure that implementation and appropriate maintenance of structural and non-structural BMPs prescribed within this WQMP are taking place at the project site. Access for inspection shall be confirmed and conveyed in the Owner's Certification on the Final Tract Map with an onsite blanket easement across all common areas (exterior of buildings).

The table below identifies the party responsible for performing the inspection and maintenance of each BMP for the Russell Avenue Townhomes project, and details the maintenance and inspection activities to be performed and the frequency with which each shall be performed.

BMP Inspection/Maintenance

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
N1. Education for Property Owners, Tenants and Occupants (Non-Structural Source Control BMP)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	Educational materials shall be reviewed and made available to purchasers of the Russell Avenue Townhomes. Refer to Appendices A and B of the Project WQMP for a list of applicable educational materials and BMP Fact Sheets.	Upon occupancy, and annually thereafter
N2. Activity Restrictions (Non-Structural Source Control BMP)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	The owner shall include appropriate on-site activity restrictions in the CCRs for the project. These will include, but are not limited to, use of pesticides and fertilizers consistent with City and County guidelines, prohibiting washing or hosing of walkways and driveways, and prohibiting the washing of cars on the property.	Continuous

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N3. Common Area Landscape Management (Non-Structural Source Control BMP)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	Maintenance shall be consistent with City requirements, plus fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP Section 5.5). Typical maintenance includes mowing, trimming, replanting, and debris removal.	Weekly
N4. BMP Maintenance (Non-Structural Source Control BMP)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	Owner shall be responsible for implementation of each non- structural BMP and regularly scheduled cleaning of all BMP structural facilities. Records of inspections and BMP maintenance shall be maintained by the owner and shall be available for review upon request.	Continuous

BMP Inspection/Maintenance

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
N11. Common Area Litter Control (Non-Structural Source Control BMP)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	Litter patrol, violation investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities.	Weekly
N12. Employee Training (Non-Structural Source Control BMP)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	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 1st). Refresher courses shall be conducted on an as needed basis.	Upon hire, and annually thereafter

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N14. Common Area Catch Basin Inspection (Non-Structural Source Control BMP)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	Catch basin inlets shall be inspected and, if necessary, cleaned prior to the storm season by October 1st each year and after all major storm events.	Annually and Immediately After Major Storm Events
N15. Street Sweeping Private Streets and Parking Lots (Non-Structural Source Control BMP)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	Parking lots and drive aisles must be swept every two weeks or more often if needed, including prior to the start of the rainy season (October 1st). Sweeping shall be done with a vacuum-type sweeper. Under no circumstances are outdoor areas/lots to be rinsed or washed with water unless said rinse/wash water is collected and disposed of properly (i.e. into the sewer).	Biweekly or More Often if Needed

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
S1. Provide Storm Drain System Stenciling and Signage (Structural Source Control BMP)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	Storm drain stencils shall be inspected for legibility, at a minimum, once prior to the storm season, and no later than October 1st of each year. Those signs determined to be illegible will be re-stenciled as soon as possible.	Annually

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
S3. Design Trash Enclosures to Reduce Pollutant Introduction	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	In conjunction with maintenance activities, all trash enclosures shall be inspected weekly to ensure that no hazardous materials or other inappropriate materials are being disposed of, and to ensure that trash is not allowed to overflow the provided bins.	Weekly
S4. Use Efficient Irrigation Systems & Landscape Design (Structural Source Control BMP)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	Ongoing maintenance must be consistent with the City's adopted water conservation ord., and fertilizer and pesticide usage consistent with the "County Guidelines for Use of Fertilizers and Pesticides." Maintain all common landscape areas utilizing planting materials with similar watering requirements to reduce excess irrigation runoff. Inspect and maintain the efficient irrigation systems installed for the common area landscaping to ensure the proper functioning of all water sensors, programmable irrigation cycles and rain shutoff valves.	Monthly

BMP Inspection/Maintenance

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Infiltration BMP # 1 Underground Infiltration (INF-7)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	Quarterly inspections of the underground infiltration BMPs shall be conducted utilizing the designed manholes. The BMPs shall be cleaned when inspection reveals that accumulated sediment or trash is clogging the system. Accumulated sediment and trash can be evacuated through the manholes.	Quarterly And Immediately After Major Storm Events
Pretreatment BMP #1 Proprietary Catch Basin Insert Filters (Pretreatment for Infiltration)	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**	Twice a year, prior to and after the rainy season, and after major storm events, the catch basin insert filters shall be visually inspected for damage, have all sediment and debris removed, and the filter medium pouches shall be replaced if necessary. The owner may conduct this maintenance itself or may enter into a service contract for the maintenance as detailed in the Oldcastle FloGardPlus Specs/Maintenance Requirements brochure, located in Section VI of the Project WQMP.	Every Six Months (Approximately April 1st and October 1st) and Immediately After Major Storm Events

Section VI BMP Exhibit (Site Plan)

VI.1 BMP Exhibit (Site Plan)

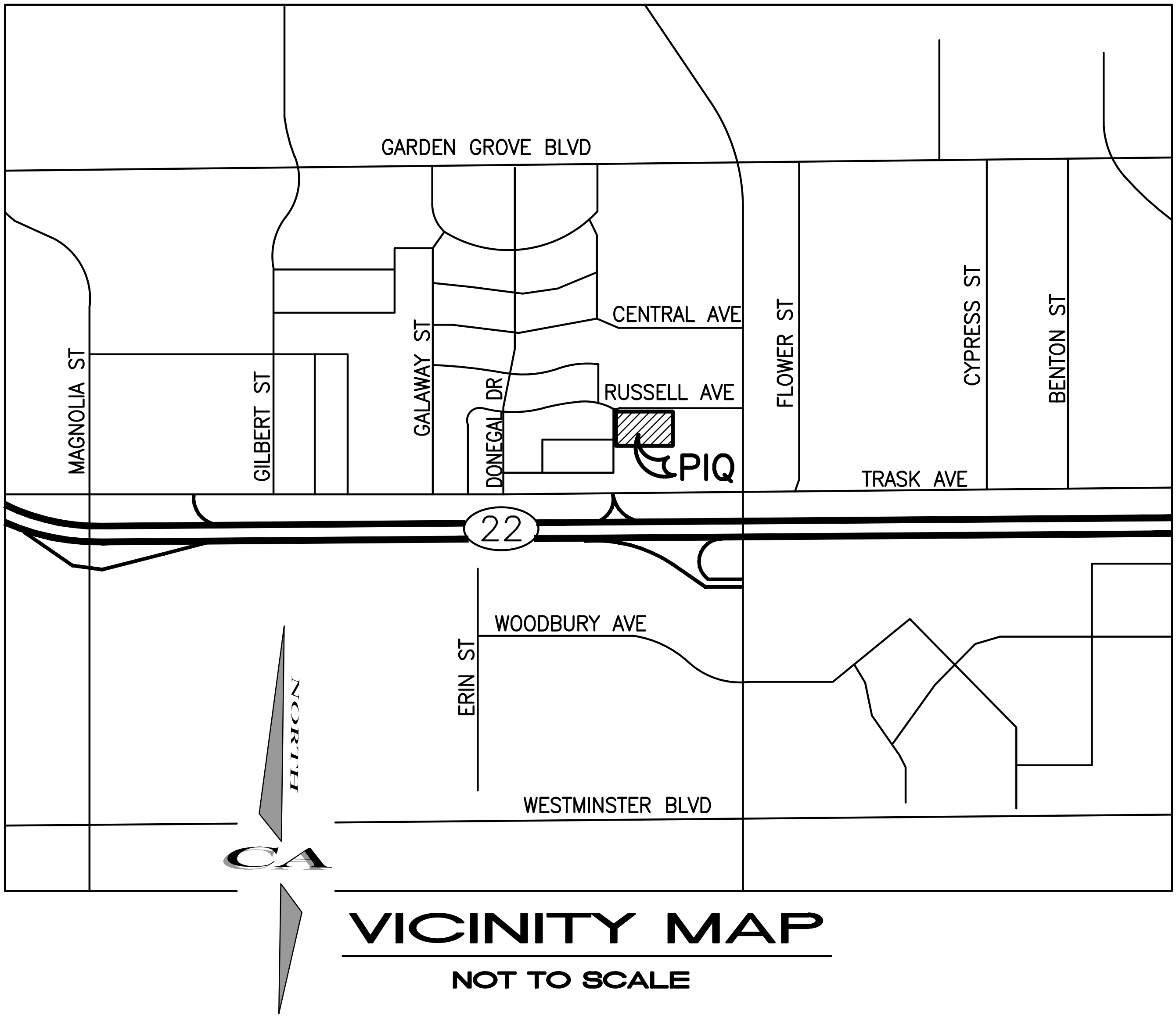
The following documents are included in this section of the WQMP:

- **Vicinity Map**
- **BMP Exhibit (Site Plan)**
- **Oldcastle FloGard +PLUS Catch Basin Insert Filter Specifications and Inspection and Maintenance Guide**
- **GeoStorage Underground Stormwater Detention System Brochure**
- **BMP Fact Sheet—INF-7: Underground Infiltration**
- **BMP Fact Sheet—INF-1: Infiltration Basin (Included for Sizing Standards Regarding Underground Infiltration Only)**
- **State Water Resources Control Board's Certified Full Capture System List of Trash Treatment Control Devices (Updated May 2021)**

VI.2 Submittal and Recordation of Water Quality Management Plan

Following approval of the Final Project-Specific WQMP, the approved WQMP (excluding Appendices) shall be recorded in the Orange County Clerk-Recorder's Office prior to close-out of grading and/or building permit.

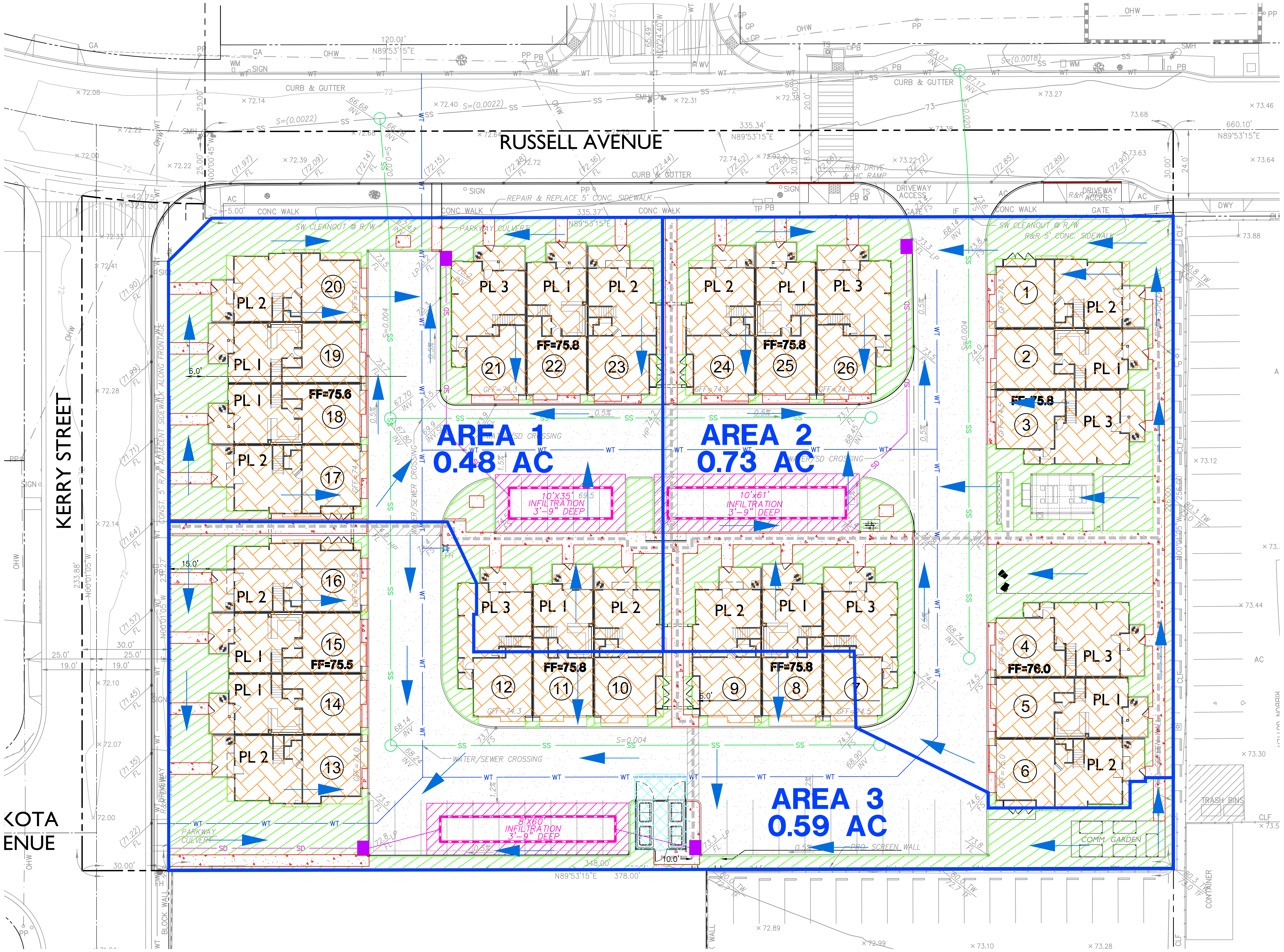
VICINITY MAP



VICINITY MAP

NOT TO SCALE

BMP EXHIBIT (SITE PLAN)



BMP LEGEND

- ▬ DRAINAGE AREAS **AREA 1**
- ← FLOW DIRECTION
- ▨ UNDERGROUND STORM DRAIN INFILTRATION CHAMBER
- 🟩 LANDSCAPE AREA EFFICIENT IRRIGATION / LANDSCAPE AREA RUNOFF–MINIMIZING DESIGN
- ▨ TRASH ENCLOSURE
- ▨ BUILDING
- ▨ CONCRETE HARDSCAPE
- ▨ ASPHALT CONCRETE DRIVE AISLES
- ■ CATCH BASIN INSERT FILTERS
- SD PROPOSED STORM DRAIN
- SS PROPOSED SEWER
- SS EXISTING SEWER
- WT PROPOSED WATER
- WT EXISTING WATER

PROJECT DATA:

TOTAL SITE AREA OF PROPOSED DEVELOPMENT: 1.80 AC (78,537 SF)

BUILDING FOOTPRINT: 30,930 SF
WALKWAYS / CONC. GUTTER / DOCK AREAS: 8,096 SF
DRIVEWAYS / DRIVE AISLES / PARKING AREAS: 23,233 SF

16,278 SF LANDSCAPING PROVIDED
(20.7% PERVIOUS AREA)

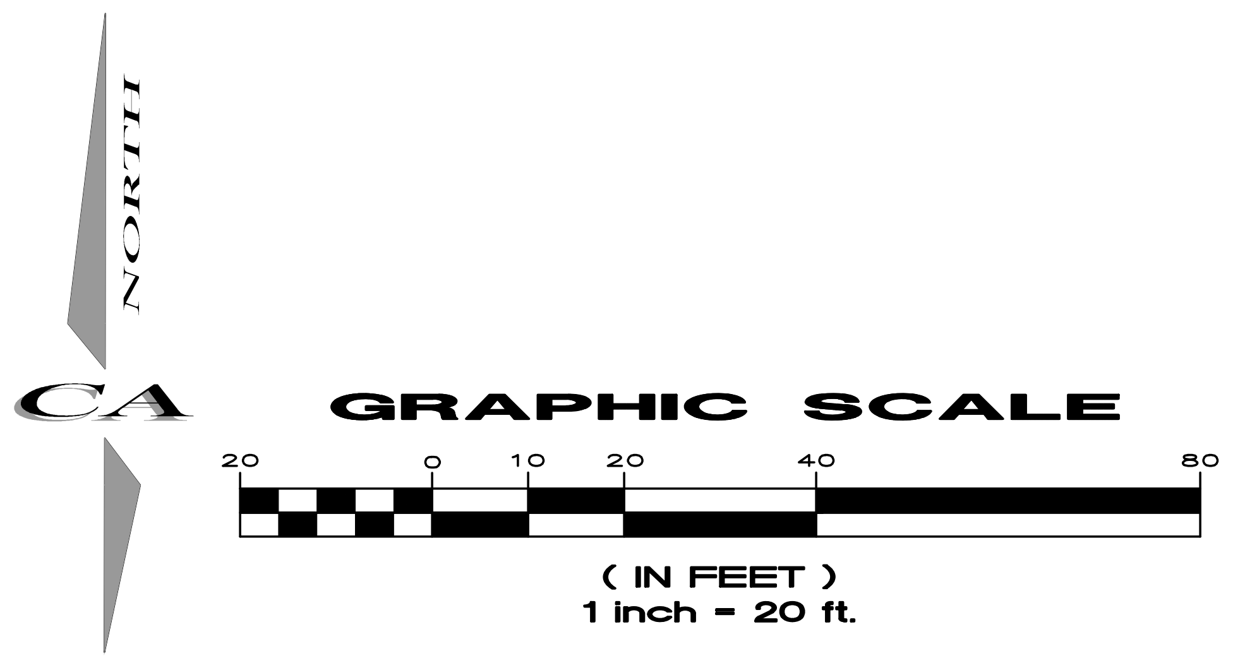
CURRENT USE: COMMERCIAL
PROPOSED USE: RESIDENTIAL

WATERSHED:
ANAHEIM BAY – HUNTINGTON HARBOR

WATER QUALITY CALCULATIONS

FORMULAS
C = 0.75 * IMP % + 0.15
D = DESIGN CAPTURE STORM DEPTH (FIGURE III.1) = 0.77
Dremainder = D - Dhsc = 0.77 - 0 = 0.77
DCV = C * Dremainder * AREA (AC) * 43,560SF/AC * 1/12
A = DCV / Dp
INFILTRATION BASIN VOLUME (cf) = PROVIDED AREA * Dp

WQMP CALCULATIONS	AREA 1	AREA 2	AREA 3	TOTAL
AREA (sf)	20,945	31,680	25,912	**78,537**
% OF TOTAL AREA	26.7%	40.3%	33.0%	**100.0%**
AREA (ac)	0.48	0.73	0.59	**1.80**
LANDSCAPE (sf)	4,264	6,678	5,336	**16,278**
IMPERVIOUS %	79.6%	78.9%	79.4%	**79.3%**
C - RUNOFF COEFFICIENT	0.75	0.74	0.75	**0.74**
D - DESIGN STORM DEPTH	0.77	0.77	0.77	-
D-Remainder	0.77	0.77	0.77	-
DCV - DESIGN CAPTURE VOLUME (cf)	1,006	1,510	1,237	**3,753**
Dp - PONDING DEPTH (ft)	3.75	3.75	3.75	-
A - REQUIRED INFILTRATION BASIN AREA (sf)	268	403	330	-
PROVIDED INFILTRATION BASIN AREA (sf)	350	610	480	-
INFILTRATION BASIN VOLUME (cf)	1,313	2,288	1,800	-



(IN FEET)
1 inch = 20 ft.

PREPARED BY:

CA ENGINEERING, INC.
Planning • Engineering • Surveying
4101 BIRCH ST., STE 140
NEWPORT BEACH, CA 92660
949-724-9480 949-724-9484 FAX

OWNER:

MELIA HOMES INC.
9860 Irvine Center Drive
Irvine, CA 92618
Contact: Mr. Chad Brown
(949) 759-4367

Oct 30 2025

WATER QUALITY MANAGEMENT PLAN
BMP EXIBIT (SITE PLAN)
TR# 19447
9822 RUSSELL AVENUE
Garden Grove, CA 92844

SHEET 1 OF 1

OLDCASTLE FLOGARD +PLUS CATCH BASIN INSERT FILTER SPECIFICATIONS AND INSPECTION AND MAINTENANCE GUIDE

Oldcastle Infrastructure™
A CRH COMPANY

PUT A STOP
to TSS

Removes Pollutants from Runoff Prior to Entering Waterways

Efficient System
Catches pollutants where they are easiest to catch, at the inlet.

Variable Design
Able to be retrofitted or used in new projects.

Treatment Train
Can be incorporated as part of a "Treatment Train".

No Standing Water
Helps to minimize bacteria and odor problems.

Focused Treatment
Removes petroleum hydrocarbons, trash and Total Suspended Solids (TSS).

Maximum Flexibility
Available in a variety of standard sizes to fit round and square inlets.

Economical
Earn a higher return on system investment.

Two-part stainless-steel insert to filter solids and oils/grease.

Easy to install, inspect and maintain, even on small and confined sites.

By the Numbers*:
Filter will remove up to 80% of Total Suspended Solids (TSS), at least 70% of oils and grease, and up to 40% of Total Phosphorus (TP) associated with organic debris as well as Polycyclic Aromatic Hydrocarbons (PAH) from oil leaks and spills.

*Approximate for urban street application.

CATCH BASIN FILTER TEST RESULTS SUMMARY

Testing Agency	% TSS Removal	% Oil & Grease Removal	% PAH Removal
UCLA	80	70 to 80	
U of Auckland Tonking & Taylor, Ltd (for City of Auckland)	78 to 95		
U of Hawaii (for City of Honolulu)	80		20 to 40

PUT A STOP
to TSS

Multi-Purpose Catch Basin Insert Retains Sediment, Debris, Trash and Oils/Grease

FloGard® catch basin insert filters are recommended for areas subject to silt and debris as well as low-to-moderate levels of petroleum hydrocarbons (oils and grease). Examples of such areas include vehicle parking lots, aircraft ramps, truck and bus storage yards, business parks, residential and public streets.

CATCH BASIN FILTER COMPETITIVE FEATURE COMPARISON

Evaluation of Catch Basin Filters (Based on flow-comparable units) (Scale 1-10)	Oldcastle	Other Insert Filter Types**
Flow Rate	10	7
Removal Efficiency*	80%	45%
Capacity - Sludge & Oil	7	7
Service Life	10	3
Installation - Ease of Handling / Installation	8	6
Ease of Inspections & Maintenance	7	7
Value	10	2

*Approximate, based on field sediment removal testing in urban street application **Average

Long-Term Value Comparison (Based on flow-comparable units) (Scale 1-10)	Oldcastle	Other Insert Filter Types**
Unit Value - Initial ($/cfs treated)	10	4
Installation Value ($/cfs treated)	10	7
Absorbent Replacement (annual avg ($/cfs treated)	10	2
Materials Replacement Value (annual avg ($/cfs treated)	10	10
Maintenance Value (annual avg ($/cfs treated)	10	7
Total First Year ROI ($/cfs treated)	10	5
Total Annual Avg Value ($/cfs treated, avg over 20 yrs)*	10	5

Captured debris from FloGard catch basin insert filter in Dana Point, California.

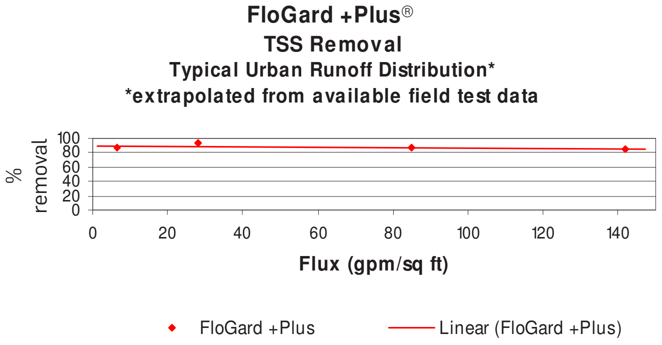
Combination Inlet

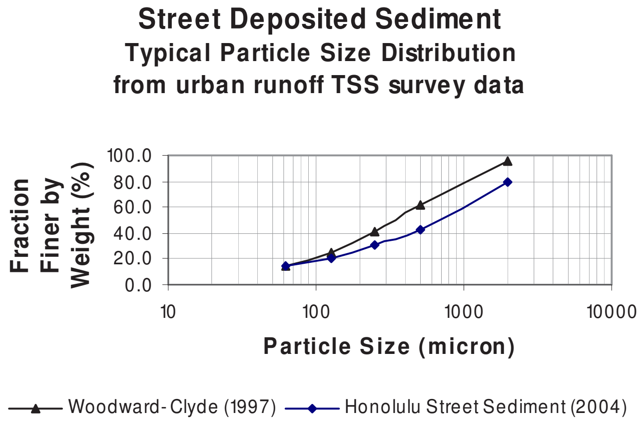
Flat-Grated Inlet

Circular Frame Inlet

FLOGARD +PLUS®

Independent field tests conducted in Hawaii and New Zealand on FloGard +PLUS® Catch Basin Insert Filters to determine removal efficiency of Total Suspended Solids (TSS). Results were extrapolated to a typical street deposited sediment particle size. Removal efficiencies were plotted and reflect effective TSS removal over a typical range of operating flow rates. Results are shown below as a function of unit internal surface area.


FloGard +Plus®
TSS Removal
Typical Urban Runoff Distribution*
***extrapolated from available field test data**


Street Deposited Sediment
Typical Particle Size Distribution
from urban runoff TSS survey data

FloGard +PLUS® Catch Basin Insert Filter is an efficient inlet prefilter designed to remove suspended sediment and floatable trash and hydrocarbons from stormwater runoff in new or retrofit applications. It is ideally suited for removal of primary pollutants from paved surfaces in commercial and residential areas, or may form part of a treatment train. The device features a unique dual-bypass design, durable components, flexible installation options and easy maintenance access.

Units are sized to fit most common styles of drainage inlet grate frames or inlet widths. Rated filtered flow capacities for each model typically exceed the required "first flush" treatment flow rate, and account for reduction in capacity as the unit accumulates suspended pollutants. Rated bypass capacity for each model also typically exceeds the inlet capacity of the catch basin.

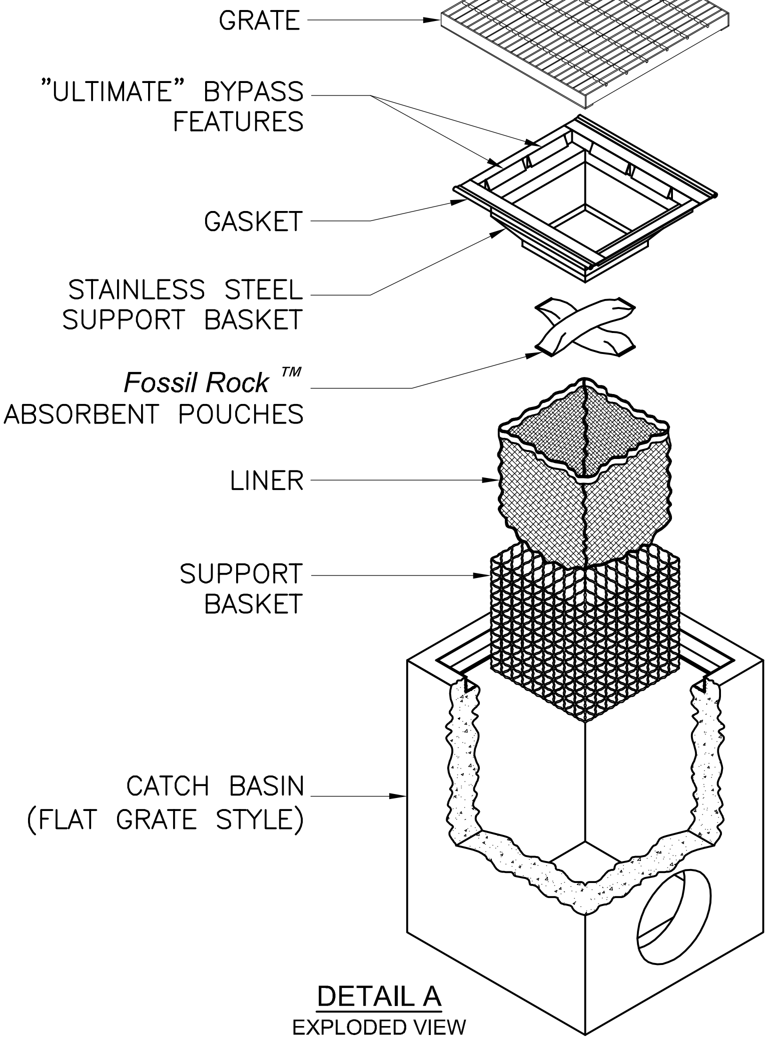
FloGard +PLUS® Test Results Summary

Testing Agency	%TSS Removal	% Oil & Grease Removal
UCLA	80*	70-80
U of Auckland Tonkin & Taylor LTD (City of Auckland)	95** 78-86***	
U of Hawaii (City of Honolulu)	80***	

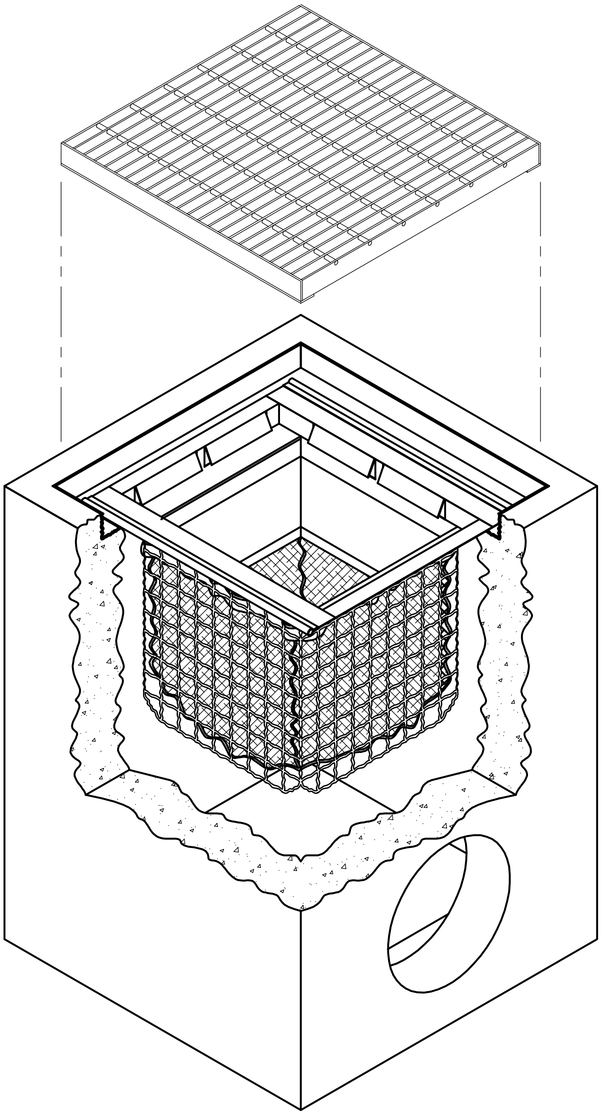
*Sand larger than ~ 575 μm
**Sand distribution ~ 100-1000 μm
***Local street sweep material (distribution consistent with NURP)

See product specifications for standard model details.

FGP-0001



DETAIL A
EXPLODED VIEW



FloGard® FILTER
-INSTALLED INTO CATCH BASIN-

NOTES:

1. Filter insert shall have a high flow bypass feature.

2. Filter support frame shall be constructed from stainless steel Type 304.

3. Filter medium shall be *Fossil Rock* ™, installed and maintained in accordance with manufacturer specifications.

4. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.

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

Inlet
Filtration

FloGard®

Catch Basin Insert Filter

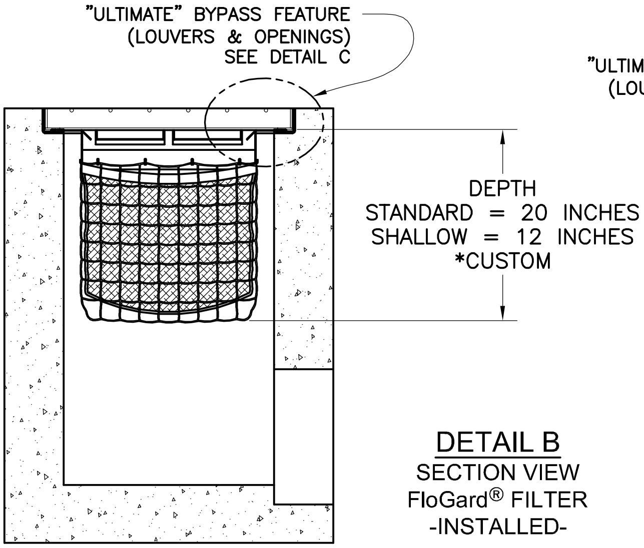
Grated Inlet Style

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

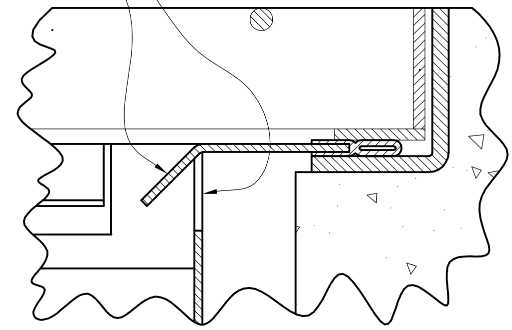
DRAWING NO.	REV	ECO	DATE	
FGP-0001	G	ECO-0142 JPR 7/13/16	JPR 11/3/06	SHEET 1 OF 2

FGP-0001

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



DETAIL B
SECTION VIEW
FloGard® FILTER
-INSTALLED-



DETAIL C
"ULTIMATE"
BYPASS FEATURES

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

SPECIFIER CHART

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

Inlet
Filtration

FloGard®

Catch Basin Insert Filter

Grated Inlet Style

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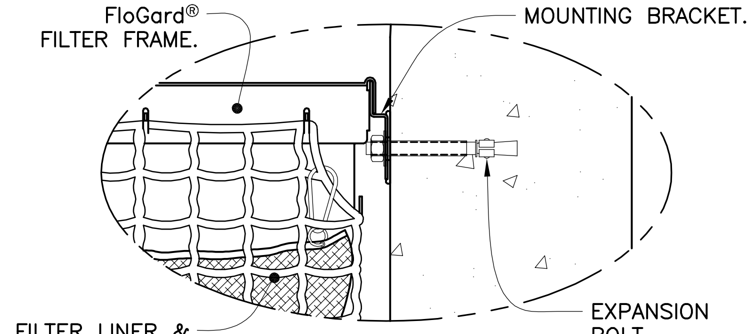
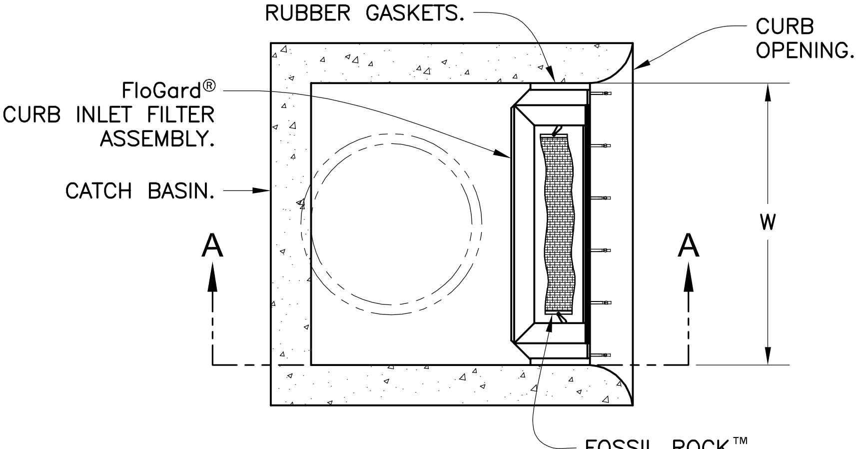
DRAWING NO.	REV	ECO	DATE	
FGP-0001	G	ECO-0142 JPR 7/13/16	JPR 11/3/06	SHEET 2 OF 2

FGP-0002



DETAIL A

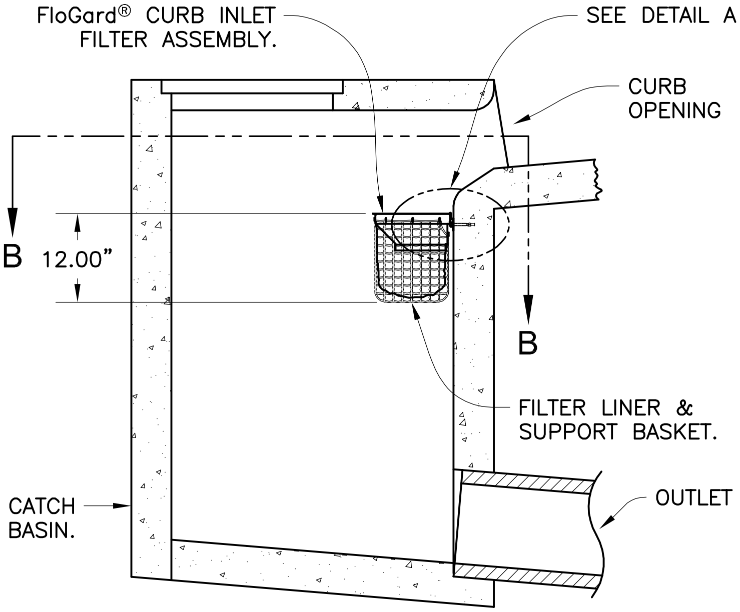
MOUNTING BRACKET & EXPANSION BOLTS
SEE NOTE 2
SCALE: 6X



SECTION B-B

TOP VIEW
SCALE: 1X

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



SECTION A-A

SIDE VIEW
SCALE: 1X

NOTES:

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

Inlet
Filtration

FloGard®

Catch Basin Insert Filter

Curb Inlet Style

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

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

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

Inspection and Maintenance Guide

A division of
Oldcastle Infrastructure

Water

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed FloGard+Plus Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (wash racks, parking garages, etc.): On a recurring basis (no less than three times per year).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing FloGard+Plus catch basin inserts).
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc., shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary, and the pouch tethers re-attached to the liner's D-ring.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium will be replaced with new material. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of storm drain filters, catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined-space trained and certified. Call us at (888) 950-8826 for further information and assistance.

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

OUR MARKETS

BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

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A CRH COMPANY

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800-579-8819

Water
February 2019 v.1

GEOSTORAGE UNDERGROUND STORMWATER DETENTION SYSTEM BROCHURE

GeoStorage

UNDERGROUND STORMWATER DETENTION SYSTEM

Leadership in Energy and Environmental Design (LEED)

GeoStorage contributes to satisfying credit achievements of the U.S. Green Building Council's LEED Green Building Rating System™. For example:

1. Reduces truck traffic to the construction site.
2. Reduces the amount of excavation and potential off-site hauling from the construction site.
3. Provides a reusable water supply with a water tight system.

For more information on LEED's rating system, please visit www.usgbc.org.

GeoStorage Corp.
office 732.741.5015
cell 732.865.3635
tsheridan@geostoragecorp.com
www.geostoragecorp.com

GeoStorage is a registered trademark of GeoStorage Corp.
GeoStorage Systems are patent protected by U.S. patent no. 7,473,055 B2. Other foreign patents also exist.

HydroCAD® Stormwater Modeling System Supported Product

GeoStorage

UNDERGROUND STORMWATER DETENTION SYSTEM

The Next Generation in Stormwater Management Technology

www.geostoragecorp.com

GEOSTORAGE UNDERGROUND STORMWATER MANAGEMENT TECHNOLOGY

Traditional Systems Versus GeoStorage® Systems

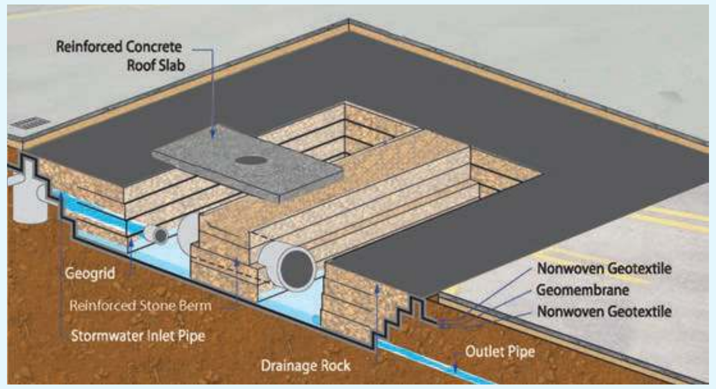
Pipes and pipe arches comprise most traditional underground storm water detention systems. Flexible plastic and metal pipes require a compacted structural backfill above, below and around the pipe resulting in additional costs and a large footprint.

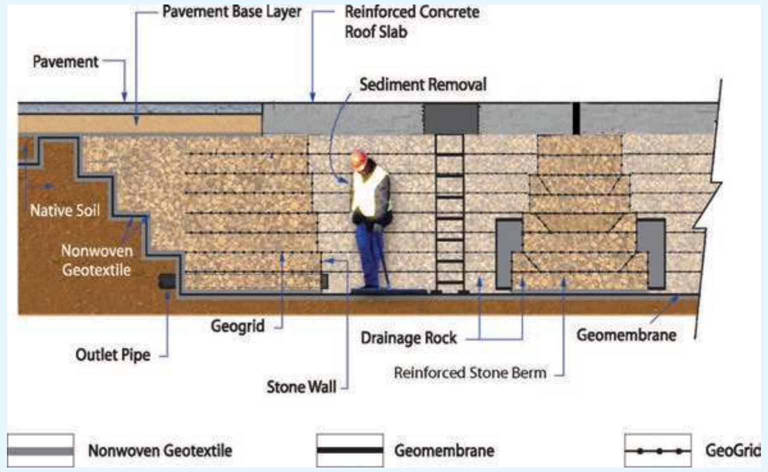
GeoStorage systems utilize AASHTO (American Association of State Highway and Transportation Officials) standards to design a large, deep underground storage chamber. Reinforced walls and piers are constructed with open graded stone to eliminate pore pressures and provide additional storage capacity. The efficiency of GeoStorage reduces costs and the size of the excavation. This patented system also provides a large open chamber that enables easy access for inspection and maintenance.

GeoStorage Redefines Stormwater Management

All land development projects require a stormwater management design. A surface holding pond is the most common stormwater detention system used to capture and control the increase in peak runoff associated with large storm events. GeoStorage is installed beneath parking lots, streets and parks to maximize land usage and lower development costs. The GeoStorage Liner system can be designed for detention or recharge applications.

HOW GEOSTORAGE WORKS





Performance Analysis

GeoStorage not only offers substantial savings when compared to traditional systems, it features inherent properties and benefits that improve overall performance and provide maximum design flexibility.

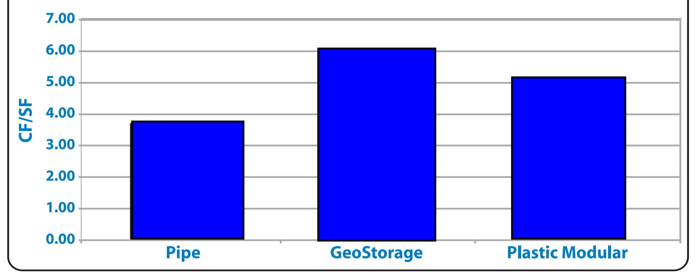
PROJECT ADVANTAGES

✓	COST	Substantial savings over traditional detention and retention systems.
✓	SIZE	Requires smaller footprint than traditional systems as shown below in land efficiency chart.
✓	DURABILITY	Constructed with a reinforced concrete roof, stone and geosynthetic products that have been tested to withstand landfill leachate.
✓	STORMWATER QUALITY	Allows for cost effective inclusion of a sand filter (see below).
✓	MAINTENANCE	Large and open chambers allow for easy access and maintenance.
✓	FLEXIBILTY	Capacity is a function of height and pier placement. These parameters can be adjusted to fit the required depth and footprint.
✓	INSTALLATION RATE	Installed faster than traditional systems.
✓	LOAD CAPACITY	Designed with ASSHTO HS-20 loading. Passenger vehicle or other loading conditions offer significant savings.

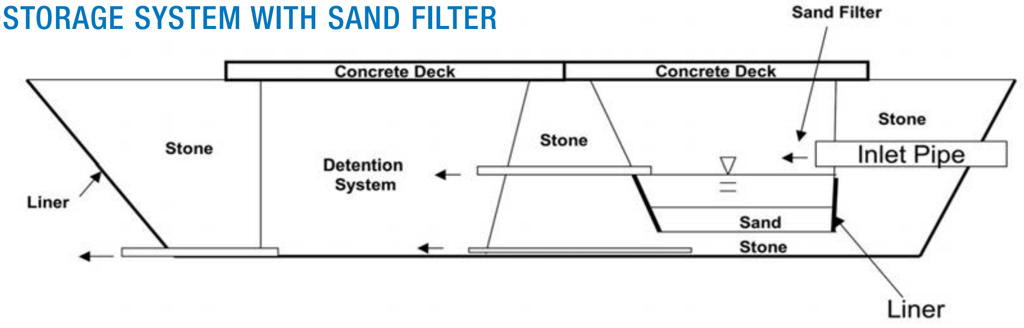
SITE CONDITIONS THAT INCREASE ADVANTAGES

+	Stormwater Treatment Required
+	Cut Sites-Off Site Hauling Required
+	Tight Sites
+	Rock Excavation
+	Low Leakage Requirements
+	Surface Loads <HS-20

LAND EFFICIENCY (100,000 CF)



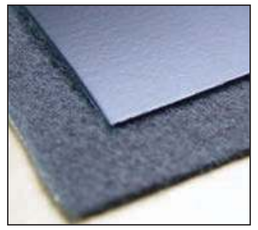
GEOSTORAGE SYSTEM WITH SAND FILTER



APPLICATIONS

GeoStorage can be used in:

- Commercial Property
- Residential Property
- Industrial Development
- Infrastructure
- Airports
- Schools
- Sports Facilities


Liner

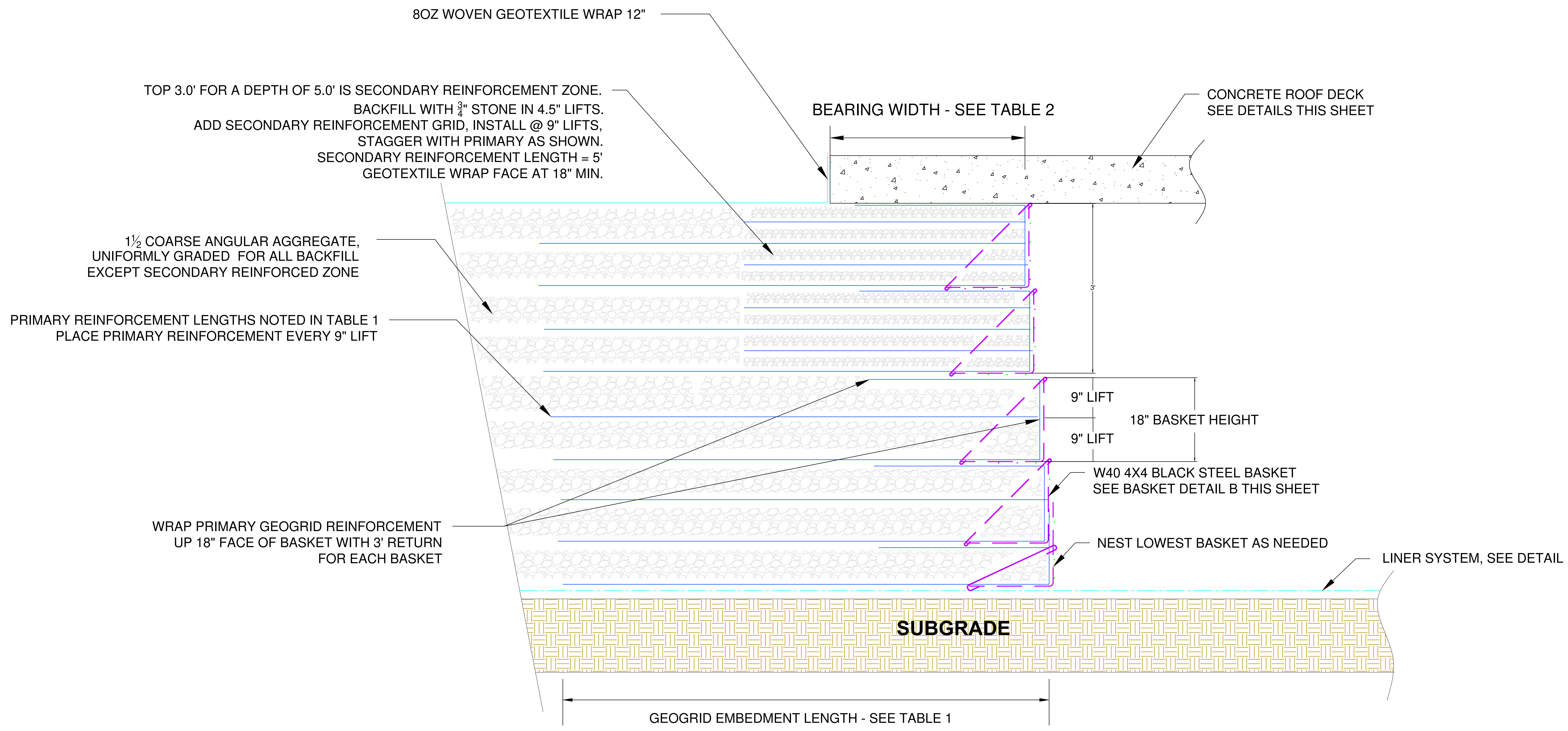

Stonewall


Roof

DETAIL B

TYPICAL LOAD BEARING WALL CONSTRUCTION

NOT TO SCALE



8OZ WOVEN GEOTEXTILE WRAP 12"

TOP 3.0' FOR A DEPTH OF 5.0' IS SECONDARY REINFORCEMENT ZONE.
BACKFILL WITH ¾" STONE IN 4.5" LIFTS.
ADD SECONDARY REINFORCEMENT GRID, INSTALL @ 9" LIFTS,
STAGGER WITH PRIMARY AS SHOWN.
SECONDARY REINFORCEMENT LENGTH = 5'
GEOTEXTILE WRAP FACE AT 18" MIN.

BEARING WIDTH - SEE TABLE 2

CONCRETE ROOF DECK
SEE DETAILS THIS SHEET

1½ COARSE ANGULAR AGGREGATE,
UNIFORMLY GRADED FOR ALL BACKFILL
EXCEPT SECONDARY REINFORCED ZONE

PRIMARY REINFORCEMENT LENGTHS NOTED IN TABLE 1
PLACE PRIMARY REINFORCEMENT EVERY 9" LIFT

W40 4X4 BLACK STEEL BASKET
SEE BASKET DETAIL B THIS SHEET

WRAP PRIMARY GEOGRID REINFORCEMENT
UP 18" FACE OF BASKET WITH 3' RETURN
FOR EACH BASKET

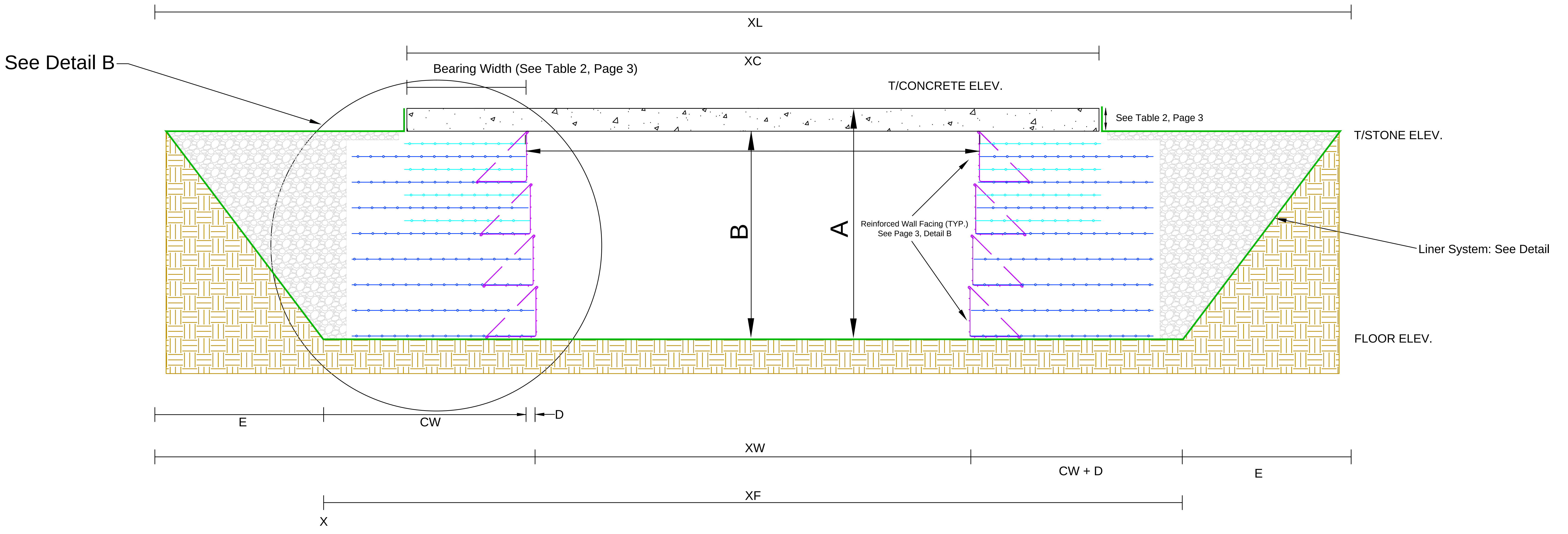
NEST LOWEST BASKET AS NEEDED

LINER SYSTEM, SEE DETAIL

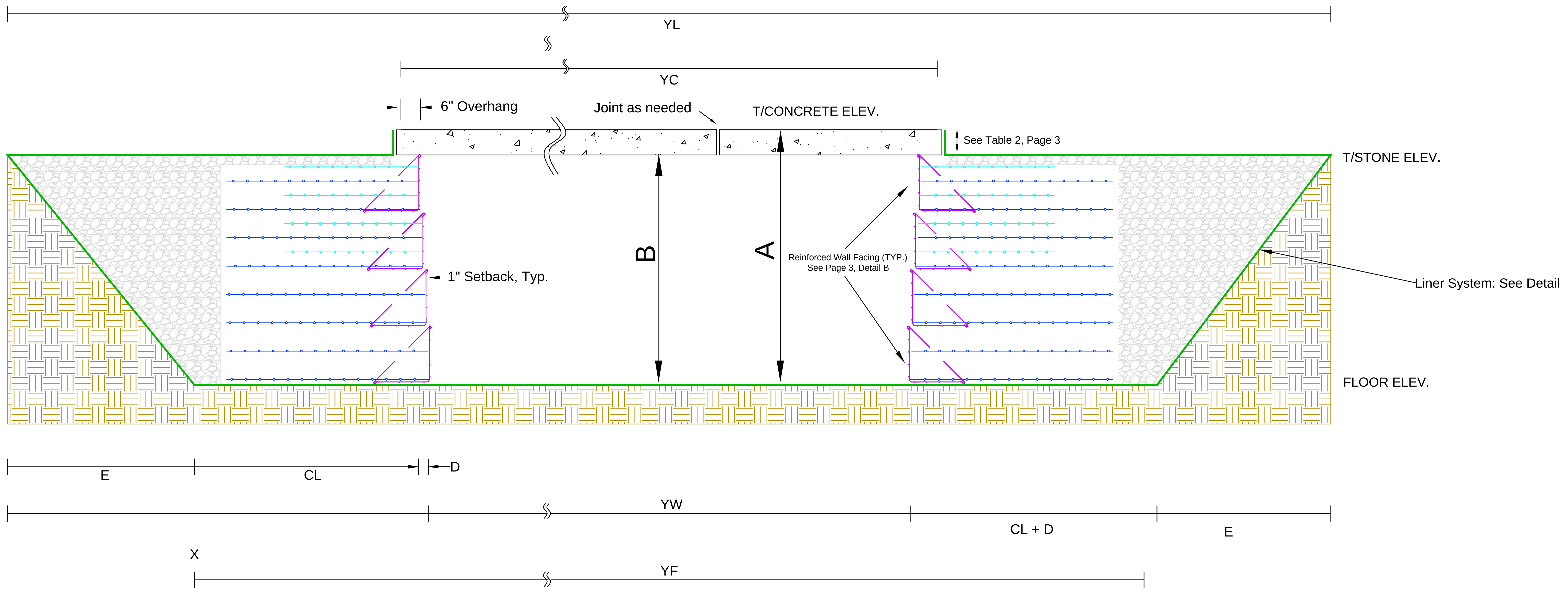
GEOGRID EMBEDMENT LENGTH - SEE TABLE 1

GeoStorage® Elevation View

Section A



Section B



LEGEND

☐ Open Chamber

▨ Stone Backfill

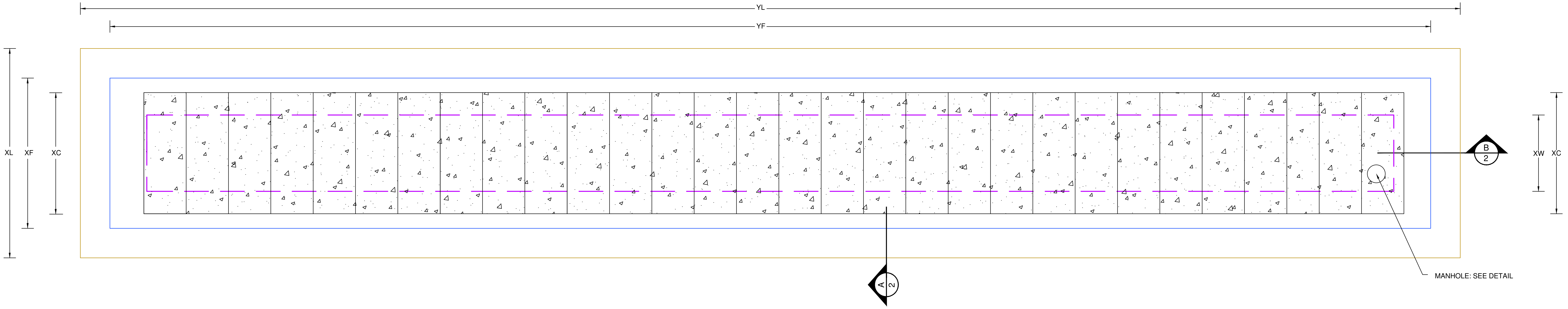
▦ Limits of Excavation

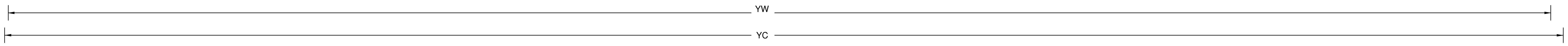
▤ Precast Concrete Roof Deck

▧ Reinforced Walls

GeoStorage® Single Chamber

PLAN VIEW





LEGEND

— - TOE OF LINER SLOPE

— - TOP OF LINER SLOPE

— — — TOE OF STONE WALL/PIER

FEET
— - LIMITS CONCRETE PAD

▨ - CONCRETE PAD

? X - DETAIL OR SECTION DRAWING NUMBER

BMP FACT SHEET—INF-7:
UNDERGROUND INFILTRATION

INF-7: Underground Infiltration

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

Also known as:

- *Infiltration vault*
- *Recharge vault*

Underground Infiltration

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

Feasibility Screening Considerations

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

Opportunity Criteria

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

OC-Specific Design Criteria and Considerations

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

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

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

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

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

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

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

Computing Underground Infiltration Device Size

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

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

Additional References for Design Guidance

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

BMP FACT SHEET—INF-1: INFILTRATION BASIN (INCLUDED FOR SIZING STANDARDS REGARDING UNDERGROUND INFILTRATION ONLY)

XIV.3. Infiltration BMP Fact Sheets (INF)

INF-1: Infiltration Basin Fact Sheet

An infiltration basin consists of an earthen basin constructed in naturally pervious soils (Type A or B soils) with a flat bottom. An energy dissipating inlet must be provided, along with an emergency spillway to control excess flows. An optional relief underdrain may be provided to drain the basin if standing water conditions occur. A forebay settling basin or separate treatment control measure must be provided as pretreatment. An infiltration basin retains the stormwater quality design volume in the basin and allows the retained runoff to percolate into the underlying soils in 72 hours or less. The bottom of an infiltration basin is typically vegetated with dryland grasses or irrigated turf grass; however other types of vegetation are permissible if they can survive periodic inundation and long inter-event dry periods.

Feasibility Screening Considerations

- Infiltration bains shall pass infeasibility screening criteria to be considered for use
- Infiltration basins pose a potential risk of groundwater contamination if underlying soils have very high permeability and low pollutant assimilation capacity; pretreatment should always be provided.
- Evaporation tends to be minor, therefore increases in infiltration compared to natural conditions may result.
- The potential for groundwater mounding should be evaluated if depth to seasonally high groundwater (unmounded) is less than 15 feet.

Also known as:

- *Recharge basins*
- *Infiltration pond*

Infiltration Basin

Source: Pennsylvania Stormwater BMP Manual

Opportunity Criteria

- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Typically need 2-5 percent of drainage area available for infiltration.
- Space available for pretreatment (biotreatment or treatment control BMP as described below).
- 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
- The depth of engineered fill is ≤ 5 feet from the bottom of the facility to native material and infiltration into fill is approved by a geotechnical professional.
- Tributary area land uses include mixed-use and commercial, sngle-family and multi-family, roads and parking lots, and parks and open spaces. Basins can be integrated into parks and open spaces. High pollutant land uses should not be tributary to infiltration BMPs.

OC-Specific Design Criteria and Considerations

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

☐ For facilities with tributary area less than 5 acres, minimum separation to mounded seasonally high groundwater of 5 feet shall be observed.

☐ For facilities with tributary area greater than 5 acres, minimum separation to mounded seasonally high groundwater of 10 feet shall be observed.

☐ Minimum pretreatment (settling forebay or separate BMP) should be provided upstream of the infiltration basin, and water bypassing pretreatment should not be directed to the infiltration basin.

☐ If a settling forebay is used, forebay should have a volume equal to 25% of facility volume and have a minimum length to width ratio of 2:1

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

☐ Side-slopes should be no steeper than 3H:1V.

☐ Design infiltration rate should be determined consistent with guidance contained in **Appendix VII**.

☐ Energy dissipators should be provided at inlet and outlet to prevent erosion.

☐ An overflow device must be provided if basin is on-line.

☐ A minimum freeboard of one foot should be provided above the overflow device (for an on-line basin) or the outlet (for an off-line basin).

☐ Infiltration basin bottom must be as flat as possible.

☐ Basin length to width ratio should be a minimum of 2:1 L:W.

Simple Sizing Method for Infiltration Basins

If the Simple DCV Sizing Method is used to size an infiltration basin, the user calculates the DCV and designs the BMP geometry required to draw down the DCV in 48 hours. The sizing steps are as follows:

Step 1: Determine Infiltration Basin DCV

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

Step 2: Determine the 48-hour Depth

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

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

Where:

d_{48} = basin 48-hour drawdown depth, ft

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

This is the maximum depth of the basin below the overflow device to achieve drawdown in 48 hours.

Step 3: Calculate the Required Infiltrating Area

The required infiltrating area (i.e. basin area at mid ponding depth) can be calculated using the following equation:

$$A = DCV / (d_P)$$

Where:

A = required basin infiltrating area, sq-ft (assumed to be the basin area at mid-ponding depth)

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

d_P = ponding depth, ft (should be equal to or less than d_{48})

Capture Efficiency Method for Infiltration Basins

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

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

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

Where:

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

d_P = ponding depth below overflow device, ft

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

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

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

Step 3: Determine the Basin Infiltrating Area Needed

The required infiltrating area (i.e. basin bottom) can be calculated using the following equation:

$A = DCV/ ((d_P)$

Where:

A = required basin infiltrating area, sq-ft (assumed to be the basin area at mid-ponding depth)

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

d_P = ponding depth, ft

If the area required is greater than the selected basin area, adjust surface area or adjust ponding depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

- Infiltration basins may be preceeded in a treatment train by HSCs in the drainage area, which would reduce the required design volume of the basins.
- Infiltration basins must be preceeded by some form of pretreatment, which may be biotreatment or a treatment control BMP; if an approved biotreatment BMP is used as pretreatment, the overflow from the infiltration basin may be considered “biotreated” for the purposes of meeting the LID requirements.
- The overflow or bypass from an infiltration basin can be routed to a downstream biotreatment BMP and/or a treatment control BMP if additional control is required to achieve LID or treatment control requirements.

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment: http://www.cabmphandbooks.com/Documents/Development/TC-11.pdf
- SMC LID Manual (pp 139): http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 6: http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf
- City of Portland Stormwater Management Manual (Basin, page 2-57) http://www.portlandonline.com/bes/index.cfm?c=47954&a=202883
- San Diego County LID Handbook Appendix 4 (Factsheet 2): http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf

STATE WATER RESOURCES CONTROL BOARD'S CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

(UPDATED MAY 2021)

CALIFORNIA
Water Boards

Gavin Newsom
GOVERNOR

Jared Blumenfeld
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES
(Updated May 2021)

Trash Provisions

In accordance with the Trash Provisions[1], all trash treatment control devices (Devices) installed after December 2, 2015 shall meet the Full Capture System definition[2] and be certified by the State Water Resources Control Board (State Water Board) Executive Director, or designee, prior to installation. The Devices included on this list are either: 1) new Devices certified by the State Water Board, or 2) grandfathered Devices from a list maintained by the San Francisco Regional Water Board prior to the adoption of the Trash Amendments. All new Device installations shall be designed according to the following criteria:

1. Appropriately sized to treat not less than the peak flowrate resulting from a 1-year, 1-hour storm event (design storm) or at least the same peak flows from the corresponding storm drain;
2. Do not bypass trash below the design storm under maximum operational loading conditions; and
3. Trap all particles that are 5 mm or greater up to the design flow[3] or at least the same peak flows from the corresponding storm drain; and do not have a

---

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

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

[3] The region specific one-year, one-hour storm (or design flow) may be obtained from the National Oceanic and Atmospheric Precipitation Estimates. https://www.weather.gov/media/owp/oh/hdsc/docs/Atlas14_Volume6.pdf

diversion structure present upstream such that a portion of the peak flow is not treated to trap all particles 5 mm or greater.

Vector Control Accessibility

According to the California Health and Safety Code[4], Landowners in California are legally responsible to abate (eliminate the source of) a public nuisance arising from their property, including mosquitoes. Mosquito vector control districts have substantial authority to access public and private property, inspect known or suspected sources of mosquitoes, abate mosquito sources, and charge the landowner for work performed and/or charge fees if a landowner is unwilling or unable to address a mosquito source arising from their property.

Depending on the its design, certain Devices may impede the mosquito vector control district's ability to (1) visually inspect the Device and/or storm vault for mosquito breeding, and (2) apply the appropriate chemical treatment. Moreover, some devices may create a habitat for mosquitoes. Prior to installation of any certified Device, the local mosquito vector control district should be contacted to ensure the installation conforms to the District's visual inspection, treatment, and vector breeding minimizing guidelines. The Mosquito Vector Control Association of California Review Team may also be contacted via email at: (Trashtreatment@mvcac.org).

New Device Certification or Fact Sheet Update

To apply for certification of a new Device, or to update a grandfathered Device fact sheet, the Device owner shall submit an application/fact sheet in accordance with the *Trash Treatment Control Device Certification and Fact Sheet Update Requirements.* Upon determining that a Device application is complete and meets the definition of a trash full capture system and is approved by the Mosquito Vector Control Association of California, the Executive Director Designee will place the Device on the State Water Board's *Certified Full Capture System List of Trash Treatment Control Devices*. This list will also identify updates to grandfathered Device fact sheets that satisfy the requirements.

The *Trash Treatment Control Device Certification and Fact Sheet Update Requirements* is found on the Trash Implementation Program webpage (https://www.waterboards.ca.gov/water_issues/programs/stormwater/trash_implementation.html).

Listing of any Device does not constitute an endorsement by the State Water Board. The Executive Director reserves the right to de-certify and remove any Device from this list that does not satisfy the requirements of the Trash Provisions, such as but not limited to when a Device is discontinued or is not approved by Mosquito Vector Control Association of California Review Team.

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[4] Health & Safety Code sections 2001- 4(d); 2002; 2060 (b) and Health & Safety Code sections 2060-2067, 100170, and 100175.

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

To obtain a copy of the applications or fact sheets listed in Table 1 or Table 2 below, or to address questions regarding certification please contact Leo Cosentini at (916) 341-5524 or email address (leo.cosentini@waterboards.ca.gov)

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

TABLE 1 - CATCH BASIN INSERTS AND OTHER DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
AbTech, Industries Internet site (https://www.abtechindustries.com/)	**Ultra Urban Filter Curb Opening and Drop-In**	**Application 25** **05/1/20**	**4/8/20**
Advanced Drainage Systems, Inc. FLEXSTORM Division internet site (http://www.inletfilters.com/)	**FLEXSTORM** **Full Trash Capture Inserts**	**Application 3** **03/15/18**	**None**
Advanced Drainage Systems, Inc. FLEXSTORM Division internet site (http://www.inletfilters.com/)	**FLEXSTORM** **Connector Pipe Screen**	**ADS-1** **Not Updated**	**None**
Bio Clean® Environmental Services, Inc. Internet site (http://www.biocleanenvironmental.com/products/)	**Curb Inlet and Grate Inlet Filters**	**Application 4** **03/15/18**	**None**
Bio Clean® Environmental Services, Inc. Internet site (http://www.biocleanenvironmental.com/products/)	**Modular Connector Pipe Trash Screen**	**BC-3** **Updated 4/30/20**	**3/10/20**
BrightWater™ Internet site (www.wearebrightwater.com/)	**Connector Pipe Screen**	**Application 29** **12/28/20**	**11/19/20**
BrightWater™ Internet site (www.wearebrightwater.com/)	**Curb Inlet Filter**	**Application 26** **6/30/20**	**4/17/20**
CleanWay® Environmental Partners, Inc. Internet site (http://Cleanwayusa.com/)	**CleanWay Curb Inlet Filtration System**	**Application 7** **03/15/18**	**None**

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
CleanWay® Environmental Partners, Inc. Internet site (http://Cleanwayusa.com/)	**CleanWay Drop Inlet**	**Application 8** **03/15/18**	**None**
Coanda Inc. Internet site (http://www.coanda.com/)	**Coanda Trash Screen and Debris Fence**	**COA-1** **No Update**	**None**
Ecology Control Industries Internet site (http://www.ecologycontrol.com/)	**Debris Dam - Catch Basin Insert for Curb Inlet Design**	**ECI-1** **Updated 06/17/20**	**04/29/20**
Enviropod International: A Stormwater360 Group Company Internet site (https://www.enviropod.com/products/enviropod-littatrap-full-capture/)	**Enviropod® LittaTrap™ Full Capture**	**Application 27** **10/15/20**	**07/20/20**
Filtrexx Sustainable Technologies Internet site (https://www.filtrexx.com/en/products/stormexx/)	**StormExx® Clean**	**Application 16** **08/10/18** **Updated 11/25/19**	**12/06/19**
Frog Creek Partners, LLC Internet site (https://frogcreek.partners/)	**Gutter Bin® Channel Filtration System & Mundus Bag® Water Filter**	**Application 22** **06/26/19**	**04/19/19**
Frog Creek Partners, LLC Internet site (https://frogcreek.partners/)	**Gutter Bin® Eco Drop Inlet Filter (DIF & DIF-C) & Mundus Bag® Water Filter**	**Application 24** **02/18/20**	**12/06/19**

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
Frog Creek Partners, LLC Internet site (https://frogcreek.partners/)	**Gutter Bin® Eco Curb Inlet Filter & Mundus Bag® Water Filter**	**Application 23** **02/18/20**	**10/11/19**
G2 Construction, Inc. Internet site (http://www.g2construction.com/products/)	**G2 CPS-Mod™ and Removable CPS-Mod™ Screen**	**Application 18** **06/26/19**	**03/15/19**
G2 Construction, Inc. Internet site (http://www.g2construction.com/products/)	**G2 Grated Inlet Trash Screen**	**Application 19** **06/26/19**	**04/10/19**
Inventive Resources, Inc. Internet site (http://www.IRIproducts.com/)	**Water Decontaminator**	**Application 2** **03/15/18**	**4/20/20**
Oldcastle Infrastructure™ Internet site (https://oldcastleinfrastructure.com/brands/)	**Flo Guard Curb Inlet Basket**	**OI-1** **No Update**	**04/30/21**
Oldcastle Infrastructure™ Internet site (https://oldcastleinfrastructure.com/brands/)	**Flo Guard Grate Inlet Basket**	**OI-2** **No Update**	**04/30/21**
Oldcastle Infrastructure™ Internet site (https://oldcastleinfrastructure.com/brands/)	**Flo Guard Outlet Trash Screen**	**OI-3** **Updated 11/29/19**	**12/06/19**

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
Revel Environmental Manufacturing, Inc. Internet site (http://www.remfilters.com/)	**Triton™ Bioflex Inlet Trash Guard Catchbasin Polyester Fiber Mesh Trash Filter Insert**	**REM-1** **No Update**	**None**
Revel Environmental Manufacturing, Inc. Internet site (http://www.remfilters.com/)	**Triton™ Crescent Pipe Screen**	**Application 12** **07/10/18**	**03/15/19**
Revel Environmental Manufacturing, Inc. Internet site (http://www.remfilters.com/)	**Triton Perf-Full Trash Capture Insert**	**Application 13** **07/10/18**	**03/15/19**
Safe Drain Stormwater Holdings Inc. Internet site (http://www.safedrainusa.com/)	**Storm Vector Guard**	**Application 30** **02/11/21**	**12/17/20**
Stormtek Internet site (https://swimsclean.com/stormtek/) [formerly Advanced Solutions]	**Stormtek ST3 & STEG Catchbasin Connector Pipe**	**AS-1, A1S-2** **No Update**	**None**
United Stormwater, Inc. Internet site (http://www.unitedstormwater.com/)	**Connector Pipe Trash Screen**	**USW-1** **No Update**	**None**

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

TABLE 2 - HIGH FLOW CAPACITY TRASH DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
AquaShield™, Inc. Internet site (http://www.aquashieldinc.com/-aqua-swirl.html)	**Aqua-Swirl® Stormwater Treatment System**	**Application 1** **08/04/17** **Updated 11/06/20**	**12/03/20**
BaySaver Technologies® LLC/Advanced Drainage Systems Inc. Internet site (https://baysaver.com/products/barracuda/)	**Barracuda Hydrodynamic Separator**	**Application 21** **06/26/19**	**03/15/19**
Bio Clean® Environmental Services, Inc. Internet site (http://www.biocleanenvironmental.com/products/)	**Debris Separating Baffle Box**	**Application 6** **03/15/18**	**07/28/20**
Bio Clean® Environmental Services, Inc. Internet site (http://www.biocleanenvironmental.com/products/)	**BioClean DeflectiveScreening Device**	**Application 20** **06/26/19**	**07/28/20**
Bio Clean® Environmental Services, Inc. Internet site (http://www.biocleanenvironmental.com/products/)	**Modular Wetland System®**	**Application 15** **07/10/18**	**03/15/19**
Contech® Construction Products Internet site (http://www.conteches.com/products/stormwater-management/treatment/cds/)	**Continuous Deflective Separator Hydrodynamic Separator**	**CCP-1HF** **No Update**	**None**

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
Jensen® Stormwater Systems Internet site (http://www.jensenengineeredsystems.com/)	**Jensen® Deflective Separators**	**Application 5** **03/15/18**	**12/06/19**
Hydro International® Internet site (https://www.hydro-int.com/)	**Downstream Defender (In-Line and Off-Line Configurations)**	**Application 14** **07/10/18**	**03/16/20**
Hydro International® Internet site (https://www.hydro-int.com/)	**First Defense® High-Capacity Full Trash Capture Device**	**Application 28** **10/30/20**	**08/20/20**
Hydro International® Internet site (https://www.hydro-int.com/)	**Hydro Up-Flo Filter®**	**Application 11** **07/18/18**	**03/16/20**
Hydro International® Internet site (https://www.hydro-Int.com/)	**Hydro DryScreen**	**Application 10** **07/10/18** **Updated 05/05/21**	**04/29/21**
Oldcastle Infrastructure™ Internet site (https://oldcastleinfrastructure.com/brands/)	**FloGard® NetTech**	**OI-11HF** **Updated 12/08/20**	**12/03/20**

CERTIFIED FULL CAPTURE SYSTEM LIST OF TRASH TREATMENT CONTROL DEVICES

Owner / Website	Full Capture System Trash Device Brand Name	Date Application Certified or Fact Sheet Updated	Date Vector Control Accessibility Verified
Oldcastle Infrastructure™ Internet site (https://oldcastleinfrastructure.com/brands/)	**Nutrient Separating Baffle Box®**	**Application 17** **10/12/18** **Updated 07/21/20**	**05/01/20**
Roscoe Moss Company Internet site (https://roscoemoss.com/products/stormwater-gross-solids-removal-device/)	**Storm Flo® Trash Screen – Linear Radial Gross Solids Removal Device**	**RMC-1HF** **No Update**	**None**
StormTrap® Modular Concrete Stormwater Management Internet site (http://stormtrap.com/)	**Inline Netting Trash Trap – Inline Pipe Net with Trash Screen**	**FCT-1HF** **No Update**	**None**
StormTrap® Modular Concrete Stormwater Management Internet site (http://stormtrap.com/)	**End of Pipe Netting Trash Trap –End of Pipe Net with Trash Screen**	**FCT-2HF** **No Update**	**None**
StormTrap® Modular Concrete Stormwater Management Internet site (http://stormtrap.com/)	**SiteSaver®**	**Application 9**	**03/18/21**

Section VII Educational Materials

Education Materials

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

APPENDIX A

EDUCATIONAL MATERIALS

- ....The Ocean Begins at Your Front Door
- ....Tips for the Home Mechanic
- ....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
- ....Sewage Spill
- ....Tips for Home Improvement Projects
- ....Tips for Landscape and Gardening
- ....Tips for Pet Care
- ....Tips for Projects Using Paint

The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Follow these simple steps to help reduce water pollution:

Household Activities

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

Automotive

- Take your vehicle to a commercial car wash. Car washing in the community is not allowed.

  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 - N/A - No Pools

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

Landscape and Gardening

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

Trash

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

Pet Care

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

Common Pollutants

Home Maintenance

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

Lawn and Garden

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

Automobile

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

The Ocean Begins at Your Front Door

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

Did You Know?

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

Where Does It Go?

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

Sources of Non-Point Source Pollution

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

The Effect on the Ocean

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

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

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

For More Information

Orange County Stormwater Program

California Environmental Protection Agency
www.calepa.ca.gov

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

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

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

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

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

Stormwater Best Management Practice Handbook
Visit www.cabmphandbooks.com

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

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

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

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

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

Printed on Recycled Paper

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, not properly disposing of used oil is illegal and can lead to fines. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain.

Help prevent water pollution by taking your used oil and oil filters to a used oil collection center. Most major automotive maintenance centers will accept up to five gallons of used motor oil at no cost. For a list of locations, please visit www.cleanup.org.

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

For information about the proper disposal of household hazardous waste, call the **Household Waste Hotline** at **1-877-89-SPILL (1-877-897-7455)** or visit **www.oclandfills.com.**

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

RECYCLE
USED OIL

emc/rev9/08

Help Prevent Ocean Pollution:

Tips for the Home Mechanic

PROJECT
Pollution
PREVENTION

**The Ocean Begins at
Your Front Door**

Tips for the Home Mechanic

WORK SITE

- Locate the storm drains on or near your property. Do not allow used oil or any materials to flow into these drains.
- Examine your home for sources of pollution.
- Perform automotive projects under cover and in a controlled area to prevent stormwater runoff.
- Sweep or vacuum your automotive workspace regularly
- Use a damp mop to clean work areas. Never hose down surfaces into the street, gutter or storm drain.

- Pour mop water into a sink or toilet. Never dispose of water in a parking lot, street, gutter or storm drain.

PREVENT LEAKS AND SPILLS

- Keep absorbent materials such as rags and/or cat litter in the work area
- Empty drip pans into a labeled, seal container before they are full
- Wipe up any spills or repair leaks as they happen. Don't let them sit.
- Place large pans under any wrecked cars until all fluids are drained.
- Promptly dispose of collected fluids into a hazardous waste drum or deliver them to an oil recycling center. Used oil recycling locations can be found at http://www.ochealthinfo.com/regulatory/usedoil.htm

CLEANING SPILLS

- Clean up spills immediately by using absorbent material such as rags, cat litter or sand. If the material spilled is hazardous, dispose of the rag, litter or sand in the same manner as hazardous waste. If the material spill is non-hazardous, dispose of it in the trash.

- Immediately report spills that have entered the street, gutter or storm drain to the County's 24-Hour Water Pollution Problem Reporting Hotline at 1-877-89-SPILL (1-877-897-7455) or visit www.ocwatersheds.com to fill out an incident report.
- Report emergencies to 911.

VEHICLE FLUID MANAGEMENT

- Vehicle fluids are hazardous waste and must be stored and disposed of in accordance with all local, state and federal laws.
- Designate an area to drain vehicle fluids away from storm drains and sanitary drains.
- When possible, drain vehicle fluids indoors or within covered areas, and only over floors that are constructed of a non-porous material such as concrete. Asphalt and dirt floors absorb spilled or leaked fluids, making the cleanup extremely difficult.

PROJECT Pollution PREVENTION

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

ORANGE COUNTY PublicWorks
Our Community. Our Commitment.
Jess A. Carbajal, Executive Director
Search
Contact The County

OCGOV | Services | Government | Residents | Business | Visitor | Health | Law | Emergency | Info OC | Departments & Agencies

The Ocean Begins at Your Front Door
www.ocwatersheds.com | Report a spill 1.877.89.SPILL

Stormwater 101 | Residents | Kid's Corner | Business | Schools | News/Events | Resources | STORMWATER IQ QUIZ | USED OIL LOCATIONS | CONTACTS

The Public Education section of the Orange County Stormwater Program website is filled with information, interactive games, video and radio public service announcements and issue-specific brochures for you to learn more about water pollution prevention.

Click here to find out about Earth Day events in your community.

It's easy to protect our waterways from pollution. Click here to learn how!

OC WATERSHEDS CLICK HERE FOR MORE INFORMATION | KID'S CORNER Click. Play. Learn. | ESPAÑOL/NGUOI VIET Multi-Cultural Resources Click Here | STAY INFORMED Fill out our form to get news and events | Jump To Our Contact Form

Acceptable Use | Accessibility | Disclaimer | Privacy Policy | Sitemap | FAQs | © 2009 Orange County Public Works

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

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

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

Homeowners Guide for Sustainable Water Use

Low Impact Development, Water Conservation & Pollution Prevention

The Ocean Begins at Your Front Door

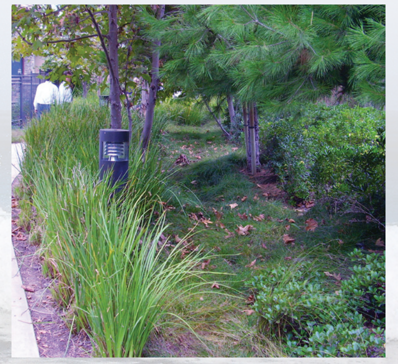
RUNOFF, RAINWATER AND REUSE

Where Does Water Runoff Go?

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

Water Conservation

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

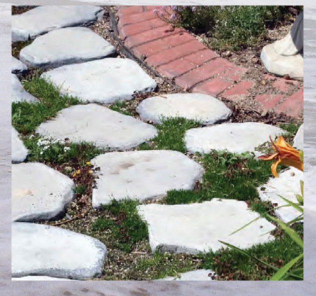


In Orange County, 60-70% of water used by residents and businesses goes to irrigation and other outdoor uses. Reusing rainwater to irrigate our lawn not only reduces the impact of water pollution from runoff, but it also is a great way to conserve our precious water resources and replenish our groundwater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

What is Low Impact Development (LID)?

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

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



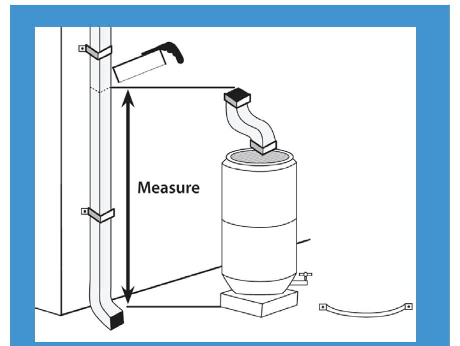
Permeable pavement allows water runoff to infiltrate through the soil and prevents most pollutants from reaching the storm drain system.

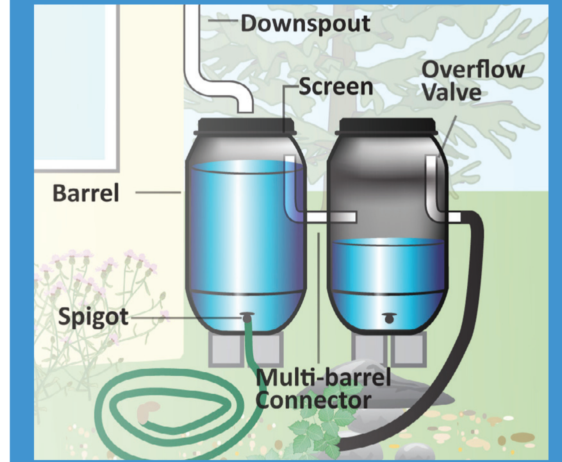
OPTIONS FOR RAINWATER HARVESTING AND REUSE

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

Downspout Disconnection/Redirection

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





Rain Barrels

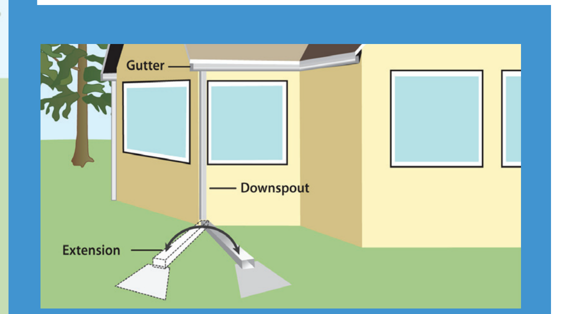
Rain barrels capture rainwater flow from roofs for reuse in landscape irrigation. Capacity of rain barrels needed for your home will depend on the amount of roof area and rainfall received. When purchasing your rain barrel, make sure it includes a screen, a spigot to siphon water for use, an overflow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

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

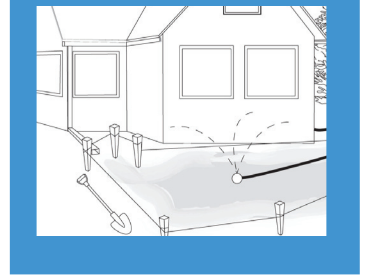
Rain Gardens

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

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



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



OTHER WATER CONSERVATION AND POLLUTION PREVENTION TECHNIQUES

Native Vegetation and Maintenance

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

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

Weed Free Yards

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

Soil Amendments

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

IRRIGATE EFFICIENTLY

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

Smart Irrigation Controllers

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

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

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

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

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

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.

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

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

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

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

For emergencies, dial 911.

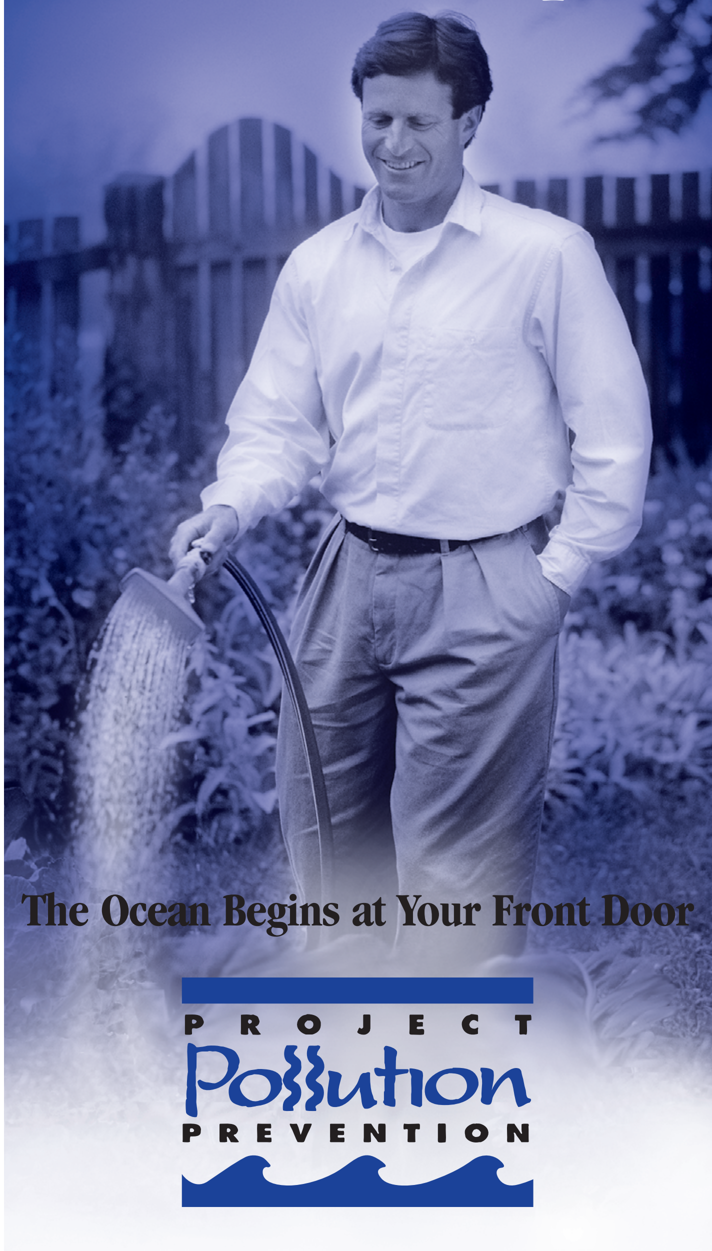
The tips contained in this brochure provide useful information to help prevent water pollution while performing everyday household activities. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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

RECYCLE USED OIL

Help Prevent Ocean Pollution:

Household Tips



The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Pollution Prevention

Household Activities

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

Household Hazardous Wastes include:

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

Gardening Activities

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

Washing and Maintaining Your Car

- Take your car to a commercial car wash. Car washing in the community is not allowed.
- Shake floor mats into a trash can or vacuum to clean.
- Monitor vehicles for leaks and place pans under leaks. Keep your car well maintained to stop and prevent leaks.
- Use cat litter or other absorbents and sweep to remove any materials deposited by vehicles. Contain sweepings and dispose of at a HHWCC.
- Perform automobile repair and maintenance under a covered area and use drip pans or plastic sheeting to keep spills and waste material from reaching storm drains.
- **Never pour oil or antifreeze in the street, gutter or storm drains.** Recycle these substances at a service station, HHWCC, or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.ciwmb.ca.gov/UsedOil.

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

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

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

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

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

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

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

For emergencies, dial 911.

RECYCLE USED OIL

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Help Prevent Ocean Pollution:

Proper Disposal of Household Hazardous Waste

The Ocean Begins at Your Front Door

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ORANGE COUNTY

Pollution Prevention

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

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

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

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

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

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

Common household hazardous wastes

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

Tips for household hazardous waste

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

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

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

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

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

Please do not mix your oil with other substances!

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

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

Recycle
Used Oil

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

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Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center

The Ocean Begins at Your Front Door

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PREVENTION

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

Vonic 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 Orangethorpe 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 Orangethorpe 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 Orangethorpe 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 Orangethorpe 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 Grarden 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

SpeeDee 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)898-2898( )
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.

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Help Prevent Ocean Pollution:

Responsible Pest Control

The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Tips for Pest Control

Key Steps to Follow:

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

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

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

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

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

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

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

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

UC CE
University of California
Cooperative Extension

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

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

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

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

Step 4: **Wear appropriate protective clothing.**

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

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

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

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

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

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

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

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

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

Step 7: **Properly store and dispose of unused pesticides.**

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

Store unused chemicals in a locked cabinet.

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

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

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

PROJECT Pollution PREVENTION

Sewage Spill Regulatory Requirements

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

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

Orange County Stormwater Program

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

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

Orange County Health Care Agency Environmental Health

(714) 433-6419

California Health and Safety Code, Sections 5410-5416

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

Regional Water Quality Control Board

Santa Ana Region	San Diego Region
(951) 782-4130	(858) 467-2952

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

California Office of Emergency Services

(800) 852-7550

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

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

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Sewage Spill

Reference Guide

Your Responsibilities as a Private Property Owner

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

Orange County Sanitation District

Health Care Agency
Environmental Health

PROJECT Pollution PREVENTION
www.ocwatersheds.com

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

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What is a Sewage Spill?

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

Common Causes of Sewage Spills

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

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

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

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

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

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

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

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

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

Overflowing cleanout pipe located on private property

You Could Be Liable

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

What to Look For

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

Look for:

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

Caution

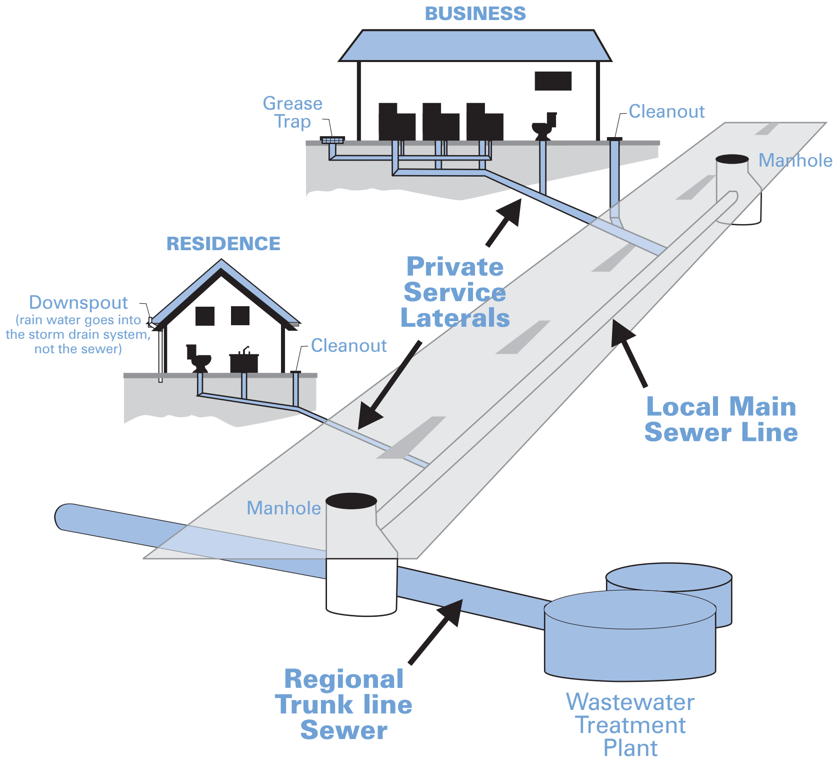
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

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

How a Sewer System Works

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

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



How You Can Prevent Sewage Spills

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

Preventing Grease Blockages

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

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

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

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

Orange County Agency Responsibilites

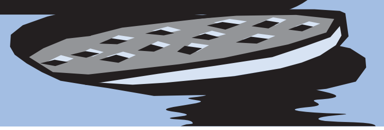
- **City Sewer/Public Works Departments—** Responsible for protecting city property and streets, the local storm drain system, sewage collection system and other public areas.
- **Public Sewer/Sanitation District—** Responsible for collecting, treating and disposing of wastewater.
- **County of Orange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

You Could Be Liable for Not Protecting the Environment

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

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

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



Report Sewage Spills!

City Sewer/Public Works Departments

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

Public Sewer/Water Districts

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

Other Agencies

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

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

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

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

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

For emergencies, dial 911.

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

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Help Prevent Ocean Pollution:

Tips for Home Improvement Projects

The Ocean Begins at Your Front Door

PROJECT
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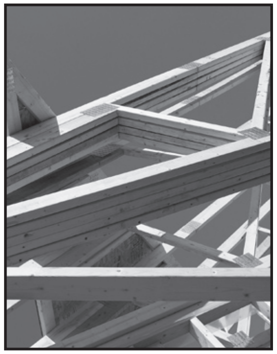
PREVENTION

Tips for Home Improvement Projects

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

General Construction



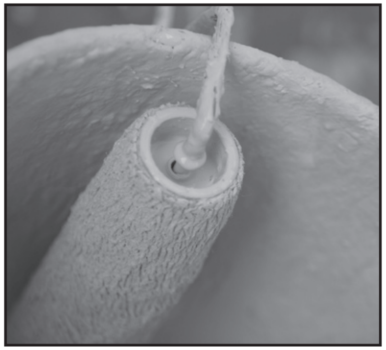
- Schedule projects for dry weather.
- Keep all construction debris away from the street, gutter and storm drain.
- Store materials under cover with temporary roofs or plastic sheets to eliminate or reduce the possibility that rainfall, runoff or wind will carry materials from the project site to the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

Building Materials

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

Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Place the lid on firmly and store the paint can upside-down in a dry location away from the elements.
- Tools such as brushes, buckets and rags should never be washed where excess water can drain into the street, gutter or storm drain. All tools should be rinsed in a sink connected to the sanitary sewer.
- When disposing of paint, never put wet paint in the trash.
- Dispose of water-based paint by removing the lid and letting it dry in the can. Large amounts must be taken to a Household Hazardous Waste Collection Center (HHWCC).
- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.
- For HHWCC locations and hours, call **(714) 834-6752** or visit **www.oclandfills.com**.



Erosion Control

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

Recycle

- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry (bricks, concrete, etc.), carpet, plastic, pipes (plastic, metal and clay), drywall, rocks, dirt and green waste.
- For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**

Spills

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

PROJECT Pollution PREVENTION

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

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

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

UCCE Master Gardener Hotline:
(714) 708-1646

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

For emergencies, dial 911.

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

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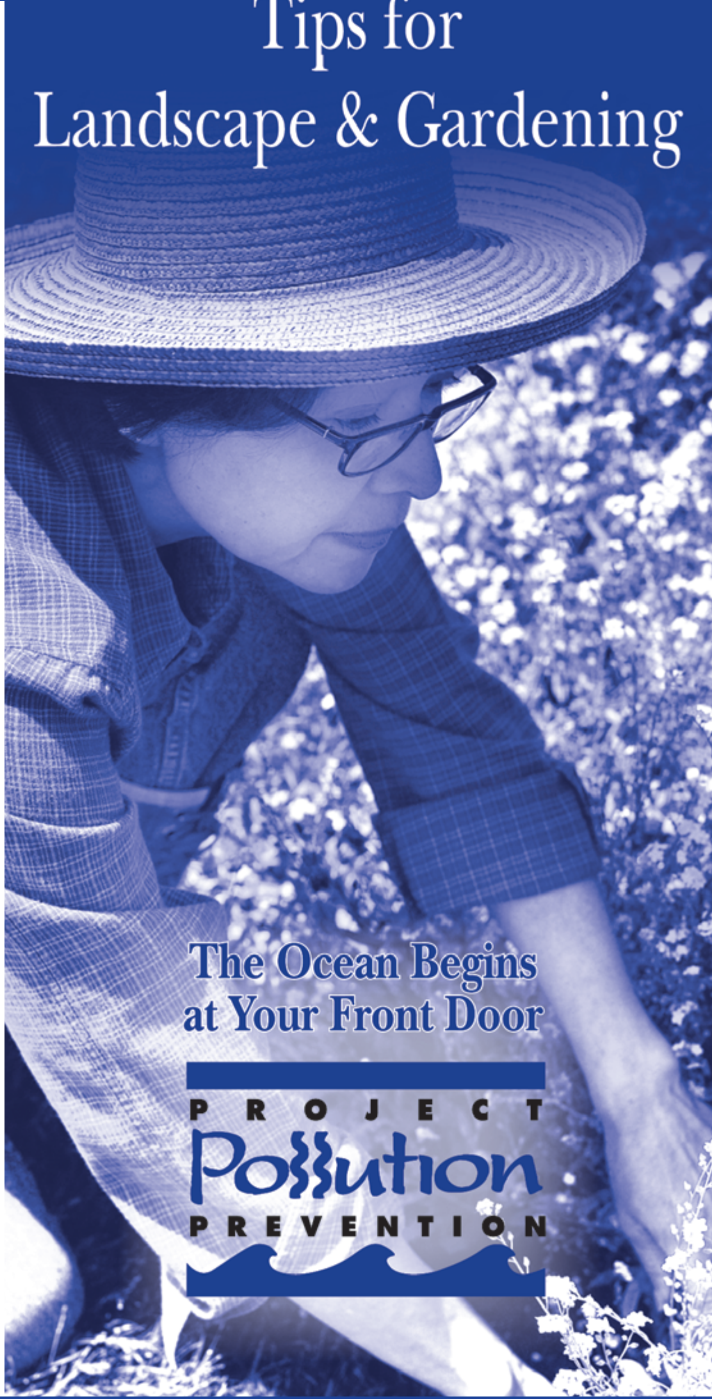
Help Prevent Ocean Pollution:

Tips for Landscape & Gardening



The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Tips for Landscape & Gardening

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

General Landscaping Tips

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

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

Garden & Lawn Maintenance

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

- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.
- Use slow-release fertilizers to minimize leaching, and use organic fertilizers.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.

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

Household Hazardous Waste Collection Centers

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

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

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

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

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

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

For emergencies, dial 911.

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

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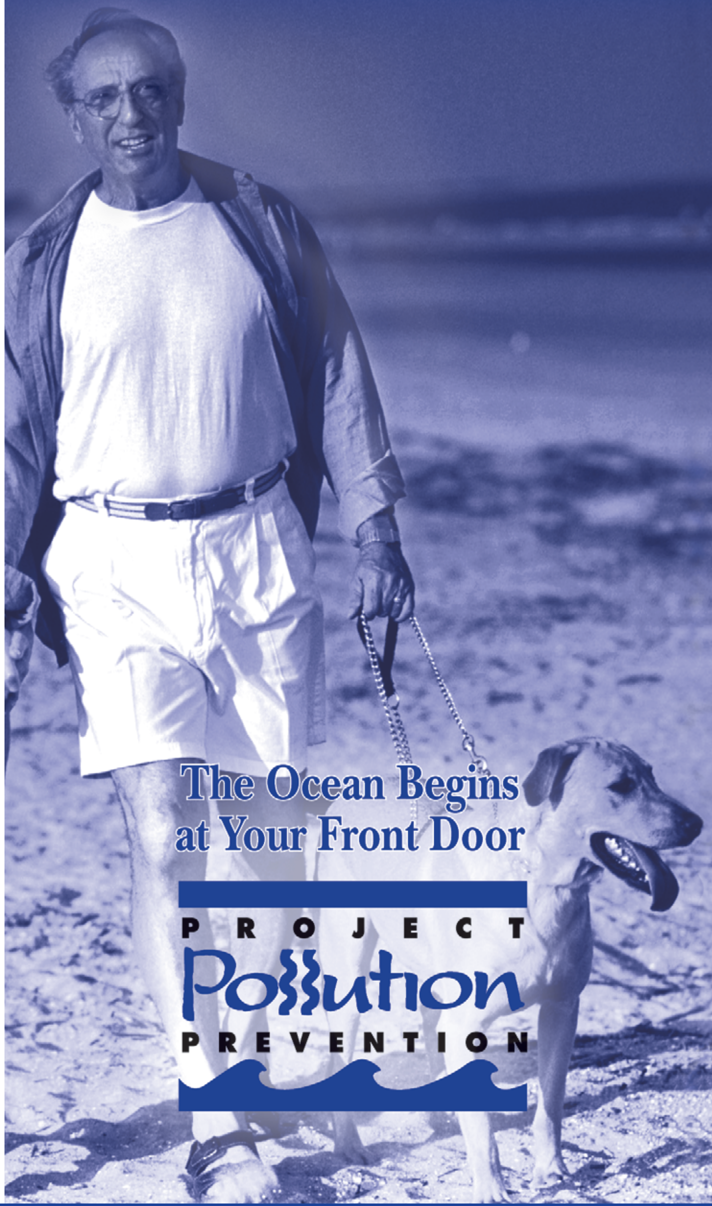
Help Prevent Ocean Pollution:

Tips for Pet Care



The Ocean Begins
at Your Front Door

PROJECT
Pollution
PREVENTION

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.

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Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as painting can lead to water pollution if you're not careful. Paint must be used, stored and disposed of properly to ensure that it does not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

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

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

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

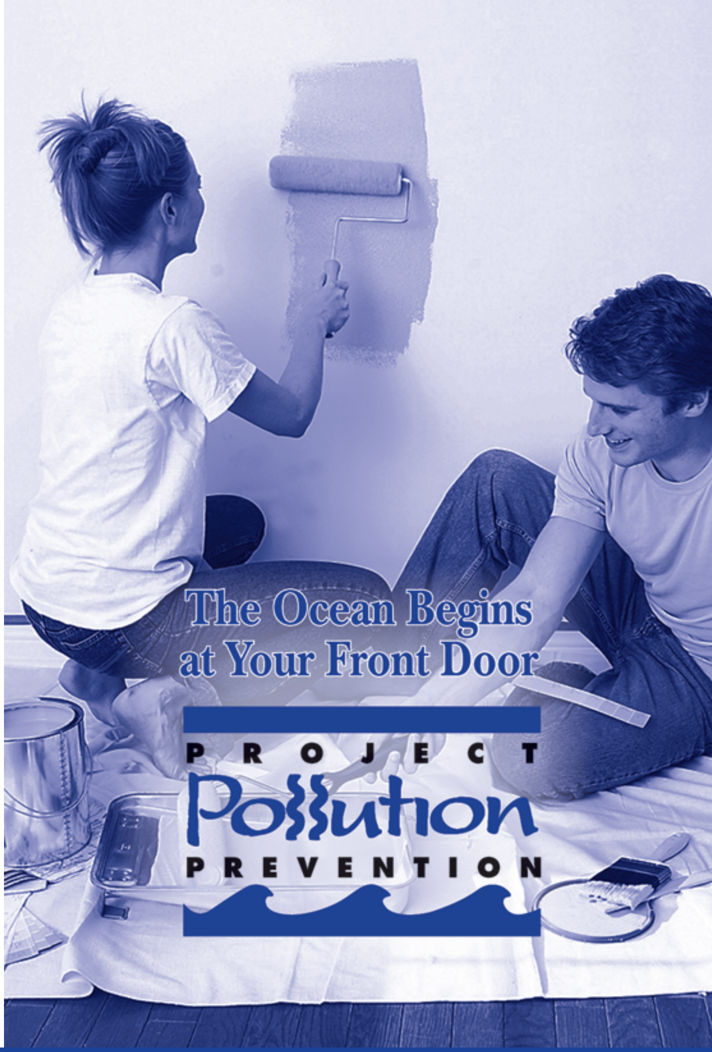
For emergencies, dial 911.

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

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Tips for Projects Using Paint



The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Tips for Projects Using Paint

Paint can cause significant damage to our environment. Whether you hire a contractor or do it yourself, it is important to follow these simple tips when purchasing, using, cleaning, storing and disposing of paint.

Purchasing Paint

- Measure the room or object to be painted, then buy only the amount needed.
- Whenever possible, use water-based paint since it usually does not require hazardous solvents such as paint thinner for cleanup.

Painting

- Use only one brush or roller per color of paint to reduce the amount of water needed for cleaning.
- Place open paint containers or trays on a stable surface and in a position that is unlikely to spill.
- Always use a tarp under the area or object being painted to collect paint drips and contain spills.

Cleaning

- Never clean brushes or rinse paint containers in the street, gutter or storm drain.
- For oil-based products, use as much of the paint on the brushes as possible. Clean brushes with thinner. To reuse thinner, pour it through a fine filter (e.g. nylon, metal gauze or filter paper) to remove solids such as leftover traces of paint.
- For water-based products, use as much of the paint on the brushes as possible, then rinse in the sink.
- Collect all paint chips and dust. Chips and dust from marine paints or paints containing lead, mercury or tributyl tin are hazardous waste. Sweep up and dispose of at a Household Hazardous Waste Collection Center (HHWCC).

Storing Paint

- Store paint in a dry location away from the elements.
- Store leftover water-based paint, oil-based paint and solvents separately in original or clearly marked containers.
- Avoid storing paint cans directly on cement floors. The bottom of the can will rust much faster on cement.
- Place the lid on firmly and store the paint can upside-down to prevent air from entering. This will keep the paint usable longer. Oil-based paint is usable for up to 15 years. Water-based paint remains usable for up to 10 years.

Alternatives to Disposal

- Use excess paint to apply another coat, for touch-ups, or to paint a closet, garage, basement or attic.
- Give extra paint to friends or family. Extra paint can also be donated to a local theatre group, low-income housing program or school.
- Take extra paint to an exchange program such as the **“Stop & Swap”** that allows you to drop off or pick up partially used home care products free of charge. **“Stop & Swap”** programs are available at most HHWCCs.
- For HHWCC locations and hours, call **(714) 834-6752** or visit **www.oclandfills.com**.

Disposing of Paint

- Never put wet paint in the trash.

For water-based paint:

- If possible, brush the leftover paint on cardboard or newspaper. Otherwise, allow the paint to dry in the can with the lid off in a well-ventilated area protected from the elements, children and pets. Stirring the paint every few days will speed up the drying.
- Large quantities of extra paint should be taken to a HHWCC.
- Once dried, paint and painted surfaces may be disposed of in the trash. When setting a dried paint can out for trash collection, leave the lid off so the collector will see that the paint has dried.

For oil-based paint:

- Oil-based paint is a household hazardous waste. All leftover paint should be taken to a HHWCC.

Aerosol paint:

- Dispose of aerosol paint cans at a HHWCC.

Spills

- Never hose down pavement or other impermeable surfaces where paint has spilled.
- Clean up spills immediately by using an absorbent material such as cat litter. Cat litter used to clean water-based paint spills can be disposed of in the trash. When cleaning oil-based paint spills with cat litter, it must be taken to a HHWCC.
- Immediately report spills that have entered the street, gutter or storm drain to the County’s 24-Hour Water Pollution Problem Reporting Hotline at **(714) 567-6363** or visit **www.ocwatersheds.com** to fill out an incident reporting form.

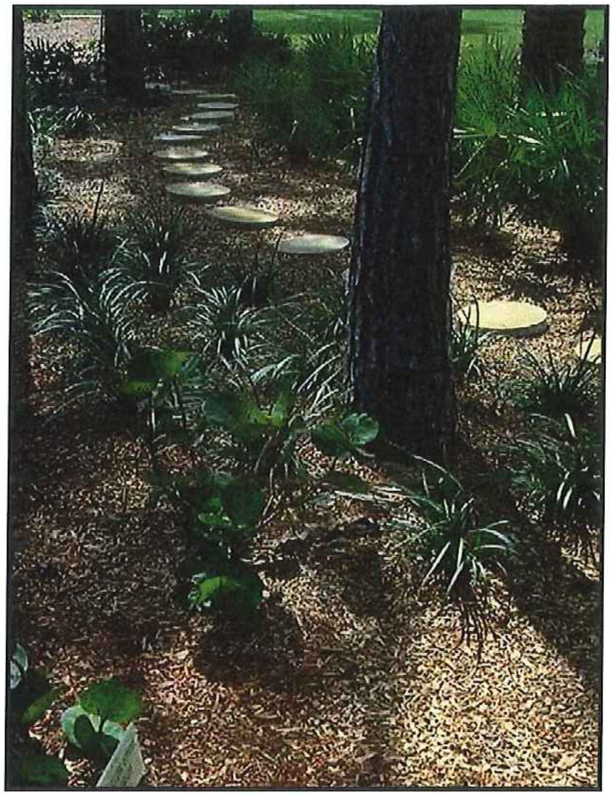
PROJECT
Pollution
PREVENTION

APPENDIX B

POST CONSTRUCTION BMP FACT SHEETS

- ....SD-10 Site Design & Landscape Planning
- ....SD-12 Efficient Irrigation
- ....SD-13 Storm Drain Signage
- ....SD-32 Trash Storage Areas
- ....R-1 Automobile Repair and Maintenance
- ....R-3 Automobile Parking
- ....R-4 Home and Garden Care Activities
- ....R-5 Disposal of Pet Wastes
- ....R-6 Disposal of Green Wastes
- ....R-7 Household Hazardous Waste
- ....R-8 Water Conservation
- ....FP-3 Roads, Streets, and Highways Operation and Maintenance
- ....FP-5 Solid Waste Handling
- ....FP-6 Water and Sewer Utility Operation and Maintenance
- ....DF-1 Drainage Facility Operation and Maintenance

Site Design & Landscape Planning SD-10



Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

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Stormwater
Quality
Association

Designing New Installations

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

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

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

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

Conserve Natural Areas during Landscape Planning

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

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

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

Protection of Slopes and Channels during Landscape Design

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

Redeveloping Existing Installations

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

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

Other Resources

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

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

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

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

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

Efficient Irrigation SD-12

Design Objectives

✓ Maximize Infiltration

✓ Provide Retention

✓ Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

CASQA
California Stormwater Quality Association

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

Redeveloping Existing Installations

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

Other Resources

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

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

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

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

Storm Drain Signage SD-13

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Designing New Installations

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

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

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

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

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

Supplemental Information

Examples

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

Other Resources

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

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

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

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

Trash Storage Areas SD-32

Description

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

Approach

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

Design Objectives

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

Suitable Applications

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

Design Considerations

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

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

Designing New Installations

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

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

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- 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.

R-1
AUTOMOBILE REPAIR AND MAINTENANCE

Automobile repair and maintenance activities have the potential to contribute directly to storm drain systems primarily through spills or the dumping of waste fluids being conveyed to the storm drain. Automotive fluids, such as oils, greases, and solvents, are hydrocarbon based, and may contain metals, chlorinated hydrocarbons, and other toxic compounds. Removal of caked dirt and grime from an automobile increases the sediment load 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 conducting automobile repair and maintenance activities. Remember - The ocean starts at your front door.

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

Required Activities

- Recycle used oil and antifreeze by taking them to service stations and other recycling centers. Never pour oil in storm drains or other areas.

- Do not perform repair and maintenance activities during rain events.

- Immediately clean up and contain any spills. Dispose of all waste and adsorbent materials properly.

- Store hazardous materials and wastes (including, but not limited to, fluids, solvents, parts containing fluids, batteries) indoors, under cover, or in watertight containers.

- Perform automobile maintenance and repairs over impervious surfaces such as concrete, so spills and waste material should be readily cleaned up. Use drip pans, plastic sheeting, etc. to contain spills and waste material.

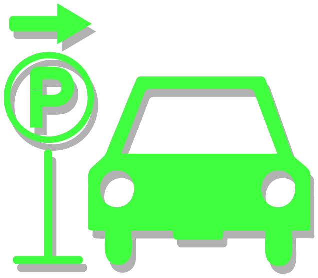
- Dispose of cleaning solvents at the designated hazardous waste center.

RECYCLE
USED OIL

Recommended Activities

- Conduct auto repair activities at a commercial repair facility
- Perform automobile repair and maintenance activities under a covered area.
- Do not buy fluids containing target pollutants (e.g. degreasers containing PERC).
- Monitor parked or stored vehicles and equipment for leaks and place pans under leaks to collect fluids for proper disposal or recycling.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600 Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com



R-3

AUTOMOBILE PARKING

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

Parked automobiles may contribute pollutants to the storm drain because poorly maintained vehicles may leak fluids containing hydrocarbons, metals, and other pollutants. In addition, heavily soiled automobiles may drop clods of dirt onto the parking surface, contributing to the sediment load when runoff is present. During rain events, or wash-down activities, the pollutants may be carried into 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 parking your car. Remember - The ocean starts at your front door.

Required Activities

- If required, vehicles have to be removed from the street during designated street sweeping/cleaning times.
- If the automobile is leaking, place a pan or similar collection device under the automobile, until such time as the leak may be repaired.
- Use dry cleaning methods to remove any materials deposited by vehicles (e.g. adsorbents for fluid leaks, sweeping for soil clod deposits).

Recommended Activities

- Park automobiles over permeable surfaces (e.g. gravel, or porous cement).
- Limit vehicle parking to covered areas.
- Perform routine maintenance to minimize fluid leaks, and maximize fuel efficiency.

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-4
HOME AND GARDEN CARE ACTIVITIES

HOME CARE

Many hazardous materials may be used in and around residences during routine maintenance activities (such as: oils, paints, cleaners, bleaches, pesticides, glues, solvents, and other products). Improper or excessive use of these products can increase the potential for pollutants to be transported to the storm drain by runoff. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting home care activities. Remember - The ocean starts at your front door.

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

Required Activities

- Clean out painting equipment in an area where the waste can be contained and properly disposed of (latex – sewer, oil based – household hazardous waste center).

- Rinse off cement mixers and cement laden tools in a contained washout area. Dispose of dried concrete waste in household trash.

- 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.

- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers. Dispose of them at a household hazardous waste center.

- Household wash waters (e.g. washer machine effluent, mop water, etc.) must be disposed of in the sanitary sewer.

- Pool and spa water may be discharged to the storm drain if residual chlorine is less than 0.1 mg/L, the pH is between 6.5 and 8.5, and the water is free from any unusual coloration. (Call 714-834-6107 to obtain information on a pool drain permit). Pool filter media must be contained and disposed of properly.

Recommended Activities

- Only purchase the types and amounts of materials needed.
- Share unused portions of products with neighbors or community programs (latex paint)

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

GARDEN CARE

Garden activities may contribute pollutants via soil erosion, green waste, fertilizer and pesticide use. Plant and garden care activities such as landscape maintenance, fertilization, and pesticide application have the potential to discharge significant quantities of pollutants to the storm drain system. Nonvegetated surfaces may allow for significant erosion leading to high sediment loads. Other pollutants such as pesticides may adsorb onto the soil particles and be transported off site. Excess fertilizer and pesticide pollutants from over application may be carried to the storm drain by dissolving in irrigation runoff or rainwater. Green wastes may also contain organic matter and may have adsorbed fertilizers and pesticides.

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	x
Other	x

Excessive irrigation is often the most significant factor in home and garden care activities. Pollutants may dissolve in irrigation water and then be transported to the storm drain, or particles and materials coated with fertilizers and pesticides may be suspended in the irrigation flow and carried to the storm drain. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before conducting garden care activities. Remember - The ocean starts at your front door.

Required Activities

- Irrigation systems must be properly adjusted to reflect seasonal water needs.
- Minimize the use of pesticides and fertilizers. Read the labels and follow directions to avoid improper use. Do not apply chemicals if it is windy or about to rain.
- Properly clean up and dispose of spills of gardening chemicals, fertilizes, or soils. If possible, return the spilled material to the container for future use.
- Lawn and garden care products must be stored in closed labeled containers, in covered areas, or off-ground and under protective tarps.
- Household hazardous waste must be properly disposed at a household hazardous waste center.
- Cover nonvegetated surfaces to prevent erosion.

Recommended Activities

- Utilize xeroscaping and use of drought and insect resistant landscaping.
- Cultivate garden often to control weeds
- Use integrated pest management (IPM). Planting pest repelling plants (e.g. Marigolds) or using pest eating insects (e.g. ladybugs) may reduce the need for pesticides.
- Do not leave food (human or pet) outside overnight
- Remove fruit and garden waste

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-5
DISPOSAL OF PET WASTES

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	

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.

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.

- 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 form nearby creeks or storm drains.

R-6
DISPOSAL OF GREEN WASTES

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	

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.

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.

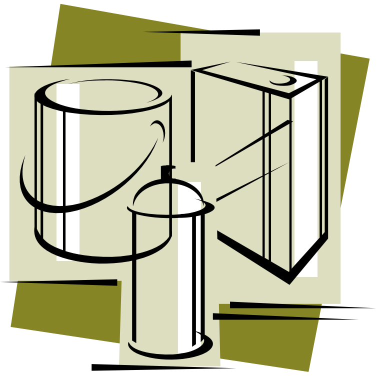
- Utilize native plants and drought tolerant species to reduce the water use and green waste produced.

- 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.

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

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.

RECYCLE USED OIL

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

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

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.

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.

FP-3

ROADS, STREETS, AND HIGHWAYS OPERATION AND MAINTENANCE

Streets, roads, and highways are significant sources of pollutants in storm water discharges, and operation and maintenance (O&M) practices, if not conducted properly, can contribute to the problem. O&M practices may involve one or more of the following activities:

1. **Sweeping & Cleaning**
2. **Street Repair & Maintenance**
3. **Bridge and Structure Maintenance**

Streets, roads, and highways are significant sources of pollutants in storm water discharges, and operation and maintenance (O&M) practices, if not conducted properly, can contribute to the problem. O&M practices may involve one or more of the following activities:

Pollution prevention measures that should be consider and the minimum required and optional model procedures for each performance standard are provided below.

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measure for roads, streets, and highways operation and maintenance include:

- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal)
- Recycle paint and other materials whenever possible.
- Once per year, educate municipal staff on pollution prevention measures.

MODEL PROCEDURES:

1. Sweeping & Cleaning

Sweeping Frequency and Timing

✓ Maintain a consistent sweeping schedule. Provide minimum monthly sweeping of streets.

✓ Perform street cleaning during dry weather if possible.

✓ Avoid wet cleaning or flushing of streets, and utilize dry methods where possible.

✓ If flushing of a street is absolutely necessary, sweep and remove debris before flushing. Do not let wash water enter storm drain inlets. Collect wash water and direct to a dirt or vegetated area, pump into a vacuum truck and dispose of properly.

OPTIONAL:

- Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc.

Equipment Operation and Selection

✓ Maintain cleaning equipment in good working condition and purchase replacement equipment as needed. Old sweepers should be replaced as needed with new technologically advanced sweepers (preferably regenerative air sweepers) that maximize pollutant removal.

✓ Operate sweepers at manufacturer requested optimal speed levels to increase effectiveness.

✓ Clean sweepers at a wash rack that drains to the sanitary sewer. The wash rack area should be covered and bermed and wash water should drain to a clarifier prior to entering the sanitary sewer.

✓ Regularly inspect vehicles and equipment for leaks, and repair immediately.

OPTIONAL:

- If available use vacuum or regenerative air sweepers in the high sediment and trash areas (typically industrial/commercial).

➔ *Note: Permission must be obtained for any discharge of wash water to the sanitary sewer from the local sewering agency.*

Management of Material Removed by Sweeping

✓ Dispose of street sweeping debris and dirt at a landfill.

✓ Do not store swept material along the side of the street or near a storm drain inlet.

✓ If dewatering of saturated materials is necessary it should be conducted in a designated area away from storm drain inlets and the water contained for proper disposal.

✓ If authorized by the local sanitation agency, water may be discharged to the sanitary sewer only after passing through a clarifier. As an alternative, dewatering can be conducted in a containment area in which saturated materials are placed on a tarp and allowed to dry. Dry debris is then disposed of properly.

✓ Keep debris storage to a minimum during the wet season or make sure debris piles are contained (e.g. by berming the area) or covered (e.g. with tarps or permanent covers).

> ➔ *Note: Permission must be obtained for any discharge of wash water to the sanitary sewer from the local sewering agency.*

Maximize Access for Sweepers

✓ Keep accurate operation logs to track program.

✓ Properly maintain and operate equipment; which will increase efficiency.

✓ Sweeping should be conducted as close to the curb line as possible.

OPTIONAL:

- Institute a parking policy to restrict parking in problematic areas during periods of street sweeping.
- Post permanent street sweeping signs in problematic areas; use temporary signs if installation of permanent signs is not possible.
- Develop and distribute flyers notifying residents of street sweeping schedules.

2. Repair and Maintenance

Pavement Marking

✓ Develop paint handling procedures for proper use, storage, and disposal of paints.

✓ Transfer and load paint and hot thermoplastic away from storm drain inlets.

✓ Street or hand sweep thermoplastic grindings. Yellow thermoplastic grindings may require special handling as they may contain lead.

✓ Replace paints containing lead and tributyltin with less toxic alternatives.

✓ Use water based paints. Clean application equipment in a sink that is connected to the sanitary sewer.

✓ Properly store leftover paints if they are to be kept for the next job, or dispose of properly.

✓ See *Spill Control procedure sheet* for guidance on the proper cleanup of paint spills.

Concrete Installation and Repair

✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.

✓ Wash concrete trucks off site or in designated areas on site, such that there is no discharge of concrete wash water into storm drain inlets, open ditches, streets, or other stormwater conveyance structures.

- ✓ Store concrete materials under cover, away from drainage areas.
- ✓ Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- ✓ Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- ✓ When washing poured concrete areas to remove fine particles and expose the aggregate, contain the wash water for proper disposal; do not discharge water to the storm drain system.
- ✓ Do not allow excess concrete to be dumped on-site, except in designated areas.
- ✓ Apply concrete, asphalt, and seal coat during dry weather to allow the material to adequately dry prior to a rain event.
- ✓ When making saw cuts in pavement, use as little water as possible and perform during dry weather. Cover each nearby or appropriate storm drain inlet completely with filter fabric or plastic during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site. Alternatively, a small on-site vacuum may be used to pick up the slurry as this will prohibit slurry from reaching storm drain inlets.

Patching, Resurfacing, and Surface Sealing

- ✓ Pre-heat, transfer or load hot bituminous material away from storm drain inlets.
- ✓ Apply concrete, asphalt, and seal coat during dry weather to allow the material to adequately dry prior to a rain event.
- ✓ Where applicable, cover and seal each nearby or appropriate storm drain inlet (with waterproof material, plastic or mesh) and maintenance holes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from covered man holes and storm drain inlets when the job is complete.
- ✓ Use only as much water as necessary for dust control, to avoid runoff.
- ✓ Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.
- ✓ Prior to a rain event or at the completion of a project, sweep the project area by hand or with a street sweeper.

Equipment Cleaning, Maintenance, and Storage

Also see Equipment Repair & Maintenance procedure sheet.

- ✓ Clean equipment including sprayers, sprayer paint supply lines, patch and paving equipment, and mudjacking equipment at the end of each day. If equipment can be cleaned and materials reapplied at the job site, do so in compliance with the laws and regulations. Clean in a sink or other area (e.g. vehicle wash area) that is connected to the sanitary sewer.

> ➔ *Note: Permission must be obtained for any discharge of wash water to the sanitary sewer from the local sewering agency.*

✓ If refueling or repairing vehicles and equipment must be done on-site, conduct the activity away from storm drain inlets and watercourses.

✓ Place drip pans or absorbent materials under heavy equipment when not in use.

✓ Clean paint brushes and tools covered with water-based paints in sinks connected to sanitary sewers. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.

OPTIONAL:

- Conduct cleaning at a corporation or maintenance yard if possible.
- When practical, perform major equipment repairs at the corporation yard.

> ➔ *In addition to the procedures above, review and apply general procedures outlined for Minor Construction activities when conducting street, road, and highway repair and maintenance activities.*

3. Bridge and Structure Maintenance

Painting and Paint Removal

✓ Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.

✓ Do not transfer or load paint near storm drain inlets or watercourses.

✓ Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint container.

✓ If sand blasting is used to remove paint, cover nearby storm drain inlets prior to starting work.

✓ If the bridge crosses a watercourse, perform work on a maintenance traveler or platform, or use suspended netting or tarps to capture paint, rust, paint removing agents, or other materials, to prevent discharge of materials to surface waters. If sanding, use a sander with a vacuum filter bag.

✓ Recycle paint when possible (e.g. paint may be used for graffiti removal activities). Dispose of paint at an appropriate household hazardous waste facility.

✓ See Spill Control procedure sheet for guidance on the proper cleanup of paint spills.

Graffiti Removal

✓ Avoid graffiti abatement activities during rain events.

✓ Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.

- ✓ Note that care should be taken when disposing of waste since it may need to be disposed of as hazardous waste.
- ✓ When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal above.
- ✓ Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a landscaped or dirt area.
- ✓ If a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound), plug nearby storm drains and collect wash water and dispose of properly.

OPTIONAL:

- Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

Guardrail and Fence Repair

- ✓ When cleaning guardrails or fences follow the appropriate surface cleaning methods (depending on the type of surface) outlined in the *Sidewalk, Plaza, and Fountain Maintenance and Cleaning* procedure sheet.
- ✓ If painting is conducted, follow the *Painting and Paint Removal* procedures above.
- ✓ If graffiti removal is conducted, follow the *Graffiti Removal* procedures above.
- ✓ If construction takes place, see the procedure sheet for *Minor Construction*.
- ✓ Recycle materials whenever possible.

LIMITATIONS:

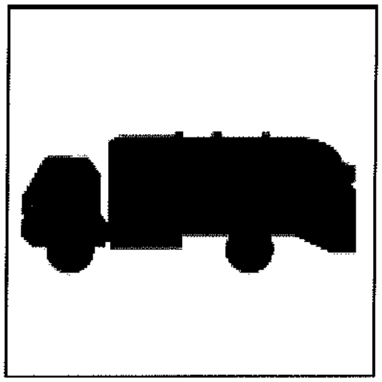
Limitations related to street sweeping may include high equipment costs, the potential inability to restrict parking in urban areas, the need for sweeper operator training, the inability of current sweeper technology to remove oil and grease, and the lack of scientific evidence regarding the expected levels of pollutant removal.

REFERENCES:

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.



FP-5

SOLID WASTE HANDLING

It is important to control litter to eliminate trash and other materials in storm water runoff. Waste reduction is a major component of waste management and should be encouraged through training and public outreach. Management of waste once it is collected may involve reuse, recycling, or proper disposal. Specific solid waste handling activities may include one or more of the following:

1. **Solid Waste Collection**
2. **Waste Reduction and Recycling**
3. **Hazardous Waste Collection**
4. **Litter Control**

Reduce by purchasing only the amount needed.
Reuse products when possible.
Recycle leftover products that are recyclable, and dispose of other wastes safely.

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for solid waste handling include:

- Reuse products when possible.
- Recycle leftover products that are recyclable.
- Once per year, educate municipal staff on pollution prevention measures.

MODEL PROCEDURES:

1. Solid Waste Collection

✓ Implement procedures, where applicable, to collect, transport, and dispose of solid waste at appropriate disposal facilities in accordance with applicable federal, state, and local laws and regulations. Optional disposal options include the reuse and recycling of appropriate materials (see following sections).

✓ Include properly designed trash storage areas.

✓ Regularly inspect solid waste containers for structural damage. Repair or replace damaged containers as necessary.

✓ Secure solid waste containers; containers must be closed tightly when not in use.

✓ Do not fill waste containers with washout water or any other liquid.

✓ Remove all debris from containers prior to cleaning with water. Only clean out containers in a designated area that drains to a washrack that is connected to a sanitary sewer.

Also see Emergency Spill Response procedure sheet.

✓ Minimize spillage/leaking from solid waste containers. For larger solid waste containers (especially compactors) that utilize a hydraulic fluid pump system, regularly inspect and replace faulty pumps or hoses to minimize the potential of releases and spills.

✓ Ensure that only appropriate solid wastes are disposed of. Certain wastes such as hazardous wastes, appliances, fluorescent bulbs, pesticides, etc. may not be disposed of in solid waste containers.

2. Waste Reduction and Recycling

Although many types of waste can be recycled, recycling options for each waste type may be limited. 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 properly.

✓ Provide containers for the collection and storage of recyclable materials.

✓ Do not mix liquid wastes, this can cause chemical reactions or make recycling impossible and complicate disposal.

✓ Recycle used motor oil. Municipalities are required to have a used oil recycling element within their integrated waste management plan.

CalRecycle has a Recycling Hotline, (800) RECYCLE, that provides information and recycling locations for used oil.

3. Hazardous Waste Collection

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

✓ Follow proper storage and disposal measures for hazardous waste materials as identified on packaging or Material Safety Data Sheets.

✓ Emergencies related to hazardous waste should be reported to 911

OPTIONAL:

- Identify and promote use of non-hazardous alternatives.
- Promote household hazardous waste (HHW) reuse and recycling.

4. Litter Control

✓ Enforce anti-litter laws.

✓ Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.

✓ Clean out and cover litter receptacles frequently to prevent overflow.

✓ Increase litter control for events generating substantial quantities of litter.

OPTIONAL:

- Post "No Littering" signs
- Place trash receptacles at transit stops and maintain as necessary.
- Participate in and/or organize additional clean-up programs (e.g., "Coastal Clean Up Day", "Pride Days", "Volunteer Connection Days").

REFERENCES:

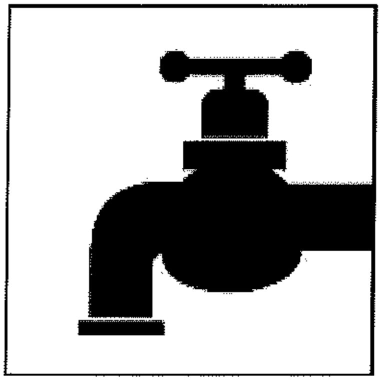
Bay Area Stormwater Management Agencies Association. 1996. *Pollution From Surface Cleaning.*

California Storm Water Best Management Practice Handbooks. Municipal Best Management Practice Handbook. Prepared by Camp Dresser & McKee, Larry Walker Associates, Uribe and Associates, Resources Planning Associates for Stormwater Quality Task Force. March 1993.

Environmental Protection Agency (EPA). *Pollution Prevention and Good Housekeeping for Municipal Operations Storm Water. Pet Waste Collection.* Office of Wastewater Management. Online:

http://www.epa.gov/npdes/menuofbmps/poll_3.htm

Harvard University. 2002. Solid Waste Container Best Management Practices – Fact Sheet On-Line Resources – Environmental Health and Safety.



FP-6

WATER AND SEWER UTILITY OPERATION AND MAINTENANCE

Although the operation and maintenance of public utilities are not considered themselves a chronic source of stormwater pollution, some activities and accidents can result in the discharge of pollutants that can pose a threat to both human health and the quality of receiving waters if they enter the storm drain system. Activities associated with the operation and maintenance of water and sewer utilities to prevent and handle such incidents include the following:

1. **Water Line Maintenance**
2. **Sanitary Sewer Maintenance**
3. **Spill/Leak/Overflow Control, Response, and Containment**

Cities that do not provide maintenance of water and sewer utilities should coordinate with the contracting agency responsible for these activities and ensure that these model procedures are followed.

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for water and sewer utility operation and maintenance include:

- Inspect potential non-storm water discharge flow paths and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).
- Once per year, educate municipal staff on pollution prevention measures.

MODEL PROCEDURES:

1. Water Line Maintenance

Procedures can be employed to reduce pollutants from discharges associated with water utility operation and maintenance activities. Planned discharges may include fire hydrant testing, flushing water supply mains after new construction, flushing lines due to complaints of taste and odor, dewatering mains for maintenance work. Unplanned discharges from treated, recycled water, raw water, and groundwater systems operation and maintenance activities can occur from water main breaks, sheared fire hydrants, equipment malfunction, and operator error.

Planned Discharges

✓ For planned discharges use one of the following options:

- Reuse water for dust suppression, irrigation, or construction compaction
- Discharge to the sanitary sewer system with approval
- Discharge to the storm drain system or to a creek using applicable pollution control measures listed below (this option is ONLY applicable to uncontaminated pumped ground water, water line flushing, fire hydrant testing and flushing, discharges from potable water sources other than water main breaks) and may require a permit from the Regional Water Quality Control Board.

✓ If water is discharged to a storm drain inlet (catch basin), control measures must be put in place to control potential pollutants (i.e. sediment, chlorine, etc.). Examples of some storm drain inlet protection options include:

- Silt fence – appropriate where the inlet drains a relatively flat area.
- Gravel and wire mesh sediment filter – Appropriate where concentrated flows are expected.
- Wooden weir and fabric – use at curb inlets where a compact installation is desired.

✓ Prior to discharge, inspect discharge flow path and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).

✓ Select appropriate pollution control measure(s) considering the receiving system (i.e. curb inlet, drop inlet, culvert, creek, etc.) and ensure that the control device(s) fit properly.

✓ General design considerations for inlet protection devices include the following:

  - The device should be constructed such that cleaning and disposal of trapped sediment is made easy, while minimizing interference with discharge activities.
  - Devices should be constructed so that any standing water resulting from the discharge will not cause excessive inconvenience or flooding/damage to adjacent land or structures.

✓ The effectiveness of control devices must be monitored during the discharge period and any necessary repairs or modifications made as needed.

OPTIONAL:

- Sediment removal may be enhanced by placing filter fabric, gravel bags, etc. at storm drain inlets.

Unplanned Discharges

✓ Stop the discharge as quickly as possible by turning off water source.

✓ Inspect flow path of the discharged water:

  - Control erosion along the flow path.
  - Identify areas that may produce significant sediment or gullies, use sandbags to redirect the flow.
  - Identify erodible areas which may need to be repaired or protected during subsequent repairs or corrective actions

✓ If repairs or corrective action will cause additional discharges of water, select the appropriate procedures for erosion control, chlorine residual, turbidity, and chemical additives. Prevent potential pollutants from entering the flow path and ensure that no additional discharged water enters storm drain inlets.

2. Sanitary Sewer Maintenance

Applicable to municipalities who own and operated a sewage collection system. Facilities that are covered under this program include sanitary sewer pipes and pump stations owned and operated by the Permittee. The owner of the sanitary sewer facilities is the entity responsible for carrying out this prevention and response program.

Sewer System Cleaning

✓ Sewer lines should be cleaned on a regular basis to remove grease, grit, and other debris that may lead to sewer backups.

✓ Establish routine maintenance program. Cleaning should be conducted at an established minimum frequency and more frequently for problem areas such as restaurants that are identified

✓ Cleaning activities may require removal of tree roots and other identified obstructions.

Preventative and Corrective Maintenance

✓ During routine maintenance and inspection note the condition of sanitary sewer structures and identify areas that need repair or maintenance. Items to note may include the following:

- cracked/deteriorating pipes
- leaking joints/seals at manhole
- frequent line plugs
- line generally flows at or near capacity
- suspected infiltration or exfiltration

✓ Document suggestions and requests for repair and report the information to the appropriate manager or supervisor.

✓ Prioritize repairs based on the nature and severity of the problem. Immediate clearing of blockage or repair is required where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, sewer line blockages). These repairs may be temporary until scheduled or capital improvements can be completed.

✓ Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure.

3. Spill/Leak/Overflow Control, Response, and Containment

Control

Also see Drainage System procedures sheet

✓ Refer to countywide *Illicit Discharge Detection and Elimination Program.* Components of this program include:

- Investigation/inspection and follow-up
- Elimination of illicit discharges and connections
- Enforcement of ordinances
- Respond to sewage spills

- Facilitate public reporting of illicit discharges and connections. A citizen's hotline for reporting observed overflow conditions should be established to supplement the field screening efforts being conducted by the Principal Permittee.

Response and Containment

- ✓ Establish lead department/agency responsible for spill response and containment. Provide coordination within departments.
- ✓ When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system to the maximum extent practicable by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.).
- ✓ If a spill reaches the storm drain notify County of Orange Health Care Agency through Control One at (714) 628-7208.
- ✓ Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system.
- ✓ Record required information at the spill site.
- ✓ Perform field tests as necessary to determine the source of the spill.
- ✓ Develop additional notification procedures regarding spill reporting as needed.

LIMITATIONS:

Private property access rights needed to perform testing along storm drain right-of-ways. Requirements of municipal ordinance authority for suspected source verification testing necessary for guaranteed rights of entry.

REFERENCES:

California Storm Water Best Management Practice Handbooks. Municipal Best Management Practice Handbook. Prepared by Camp Dresser & McKee, Larry Walker Associates, Uribe and Associates, Resources Planning Associates for Stormwater Quality Task Force. March 1993.

Los Angeles County Stormwater Quality. Public Agency Activities Model Program. On-line: http://ladpw.org/wmd/npdes/public_TC.cfm

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

Santa Clara Valley Urban Runoff Pollution Prevention Program. Water Utility Pollution Prevention Plan.

DF-1
DRAINAGE FACILITY OPERATION AND MAINTENANCE

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

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

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

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

Program/Facility Being Inspected: ______________________________

Date: ____________________ Inspector Name: ______________________________

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

MAINTENANCE PROCEDURES:

1. Inspection and Cleaning of Drainage Facilities

Unsatisfactory **OK**

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General Guidelines

T 1A. Annually inspect and clean drainage structures as needed.

T 1B. Maintain appropriate records of cleaning and inspections.

T 1C. Properly dispose of removed materials at a landfill or recycling facility.

T 1D. Conduct intermittent supplemental visual inspections during the wet season to determine if there are problem inlets where sediment/trash or other pollutants accumulate, and provide for additional cleanouts as appropriate.

T 1E. Prevent or clean up any discharges that may occur during the course of maintenance and cleaning procedures.

T 1F. Verify that appropriate employees or subcontractors are trained in proper conductance of maintenance activities, including record keeping and disposal.

T 1G. Annually inspect and clean v-ditches as needed, prior to the wet season. On shrub-covered slopes, vegetative debris may be placed on the downhill side of the ditch. Trash should be bagged and disposed at a landfill.

Unsatisfactory

OK

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General Guidelines (cont.)

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

Storm Drain Flushing

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

Waste Management

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

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

2. Controlling Illicit Connections and Discharges

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

3. Controlling Illegal Dumping

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

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

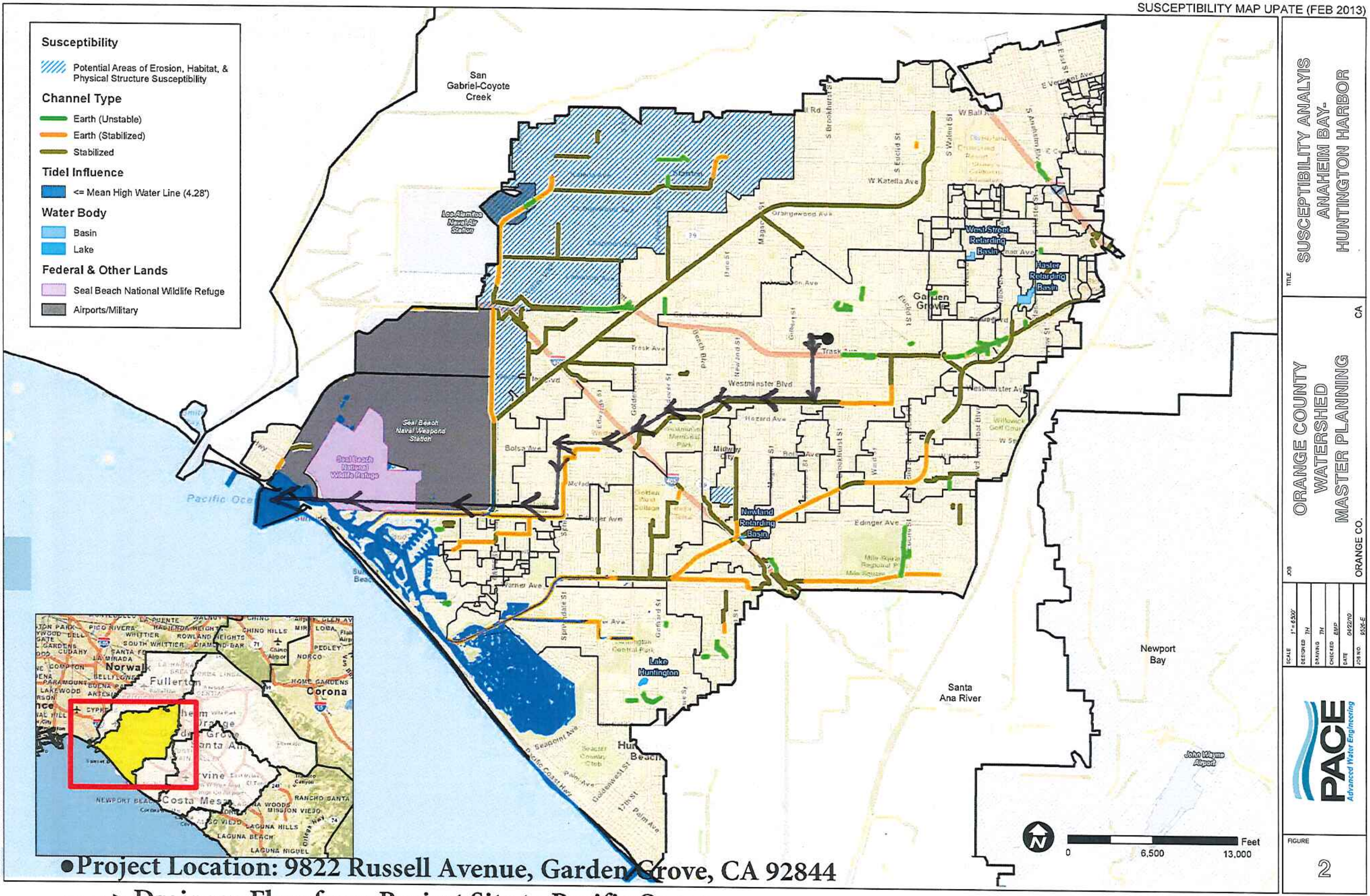
LIMITATIONS:

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

APPENDIX C

SUSCEPTIBILITY ANALYSIS MAP FOR
ANAHEIM BAY-HUNTINGTON HARBOR WATERSHED

SUSCEPTIBILITY MAP UPATE (FEB 2013)



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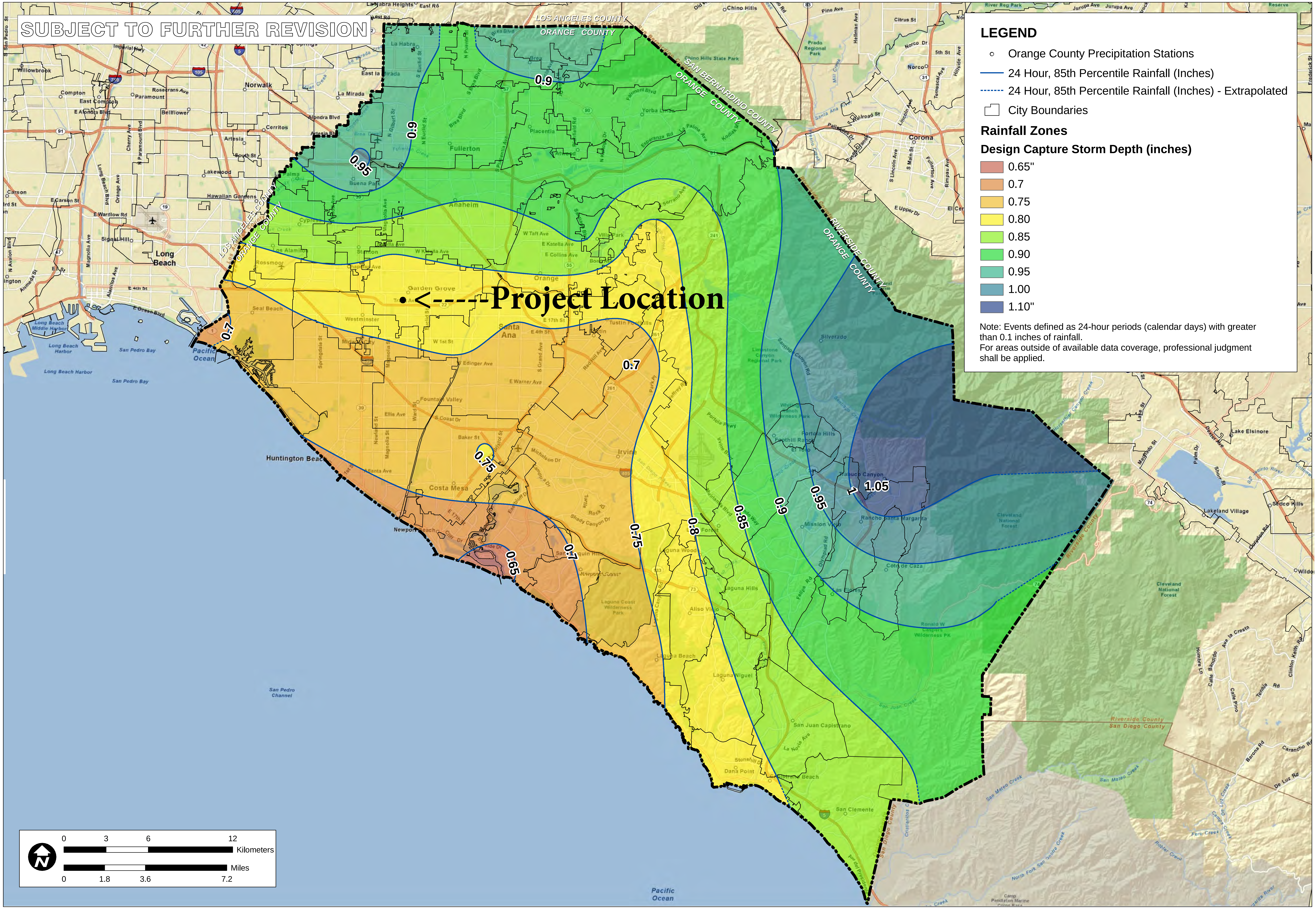
●Project Location: 9822 Russell Avenue, Garden Grove, CA 92844

-----> Drainage Flow from Project Site to Pacific Ocean

APPENDIX D

RAINFALL ZONE MAP FOR ORANGE COUNTY



RAINFALL ZONES

ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT

ORANGE CO. CA

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

PACE Advanced Water Engineering

FIGURE XVI-1

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●Project Location: 9822 Russell Avenue, Garden Grove, CA 92844

APPENDIX E

ALBUS & ASSOCIATES, INC.’S PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT, PROPOSED RESIDENTIAL DEVELOPMENT, 9822 RUSSELL AVENUE, GARDEN GROVE, CALIFORNIA, DATED JULY 1, 2025

July 1, 2025
J.N.: 3341.00

Mr. Chad Brown
Melia Homes
8951 Research Drive
Irvine, California 92618

Subject: **Preliminary Geotechnical Investigation Report, Proposed Residential Development, 9822 Russell Avenue, Garden Grove, California**

Dear Mr. Brown,

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

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

Sincerely,

ALBUS & ASSOCIATES, INC.

David E. Albus
Principal Engineer

REPORT

FIGURES AND PLATES

APPENDICES

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

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

- Review of published geologic and seismic data for the site and surrounding area
- Exploratory drilling and soil sampling
- Laboratory testing of select soil samples
- Engineering analyses of data obtained from our review, exploration, and laboratory testing
- Evaluate site seismicity, liquefaction potential, and settlement potential
- Preparation of this report

1.2 SITE LOCATION AND DESCRIPTION

The property is located at 9822 Russell Avenue within the city of Garden Grove. The site is rectangularly shaped and bordered by Kerry Street to the west, Russel Avenue to the north, residential properties to the south, and Sunnyside Elementary School to the east. The location of the site and its relationship to the surrounding areas are shown on Figure 1, Site Location Map.

The site is currently occupied by a church located within the northwest corner of the site. Additional structures are also present within the northwest portion of the site and appear to be associated with a child day care center. The remainder of the site is covered in asphalt with driveways and parking bays associated with the onsite improvements. Chain link fencing is present along the east and a portion of the south. A masonry block wall is also present along the south property line.

The site is relatively flat with elevations ranging from 70 to 72 feet above Mean Sea Level (based on Google Earth). Drainage is generally directed as sheet flow to either Russell Avenue or to Kerry Street. Site vegetation consists of bushes and moderate sized trees.

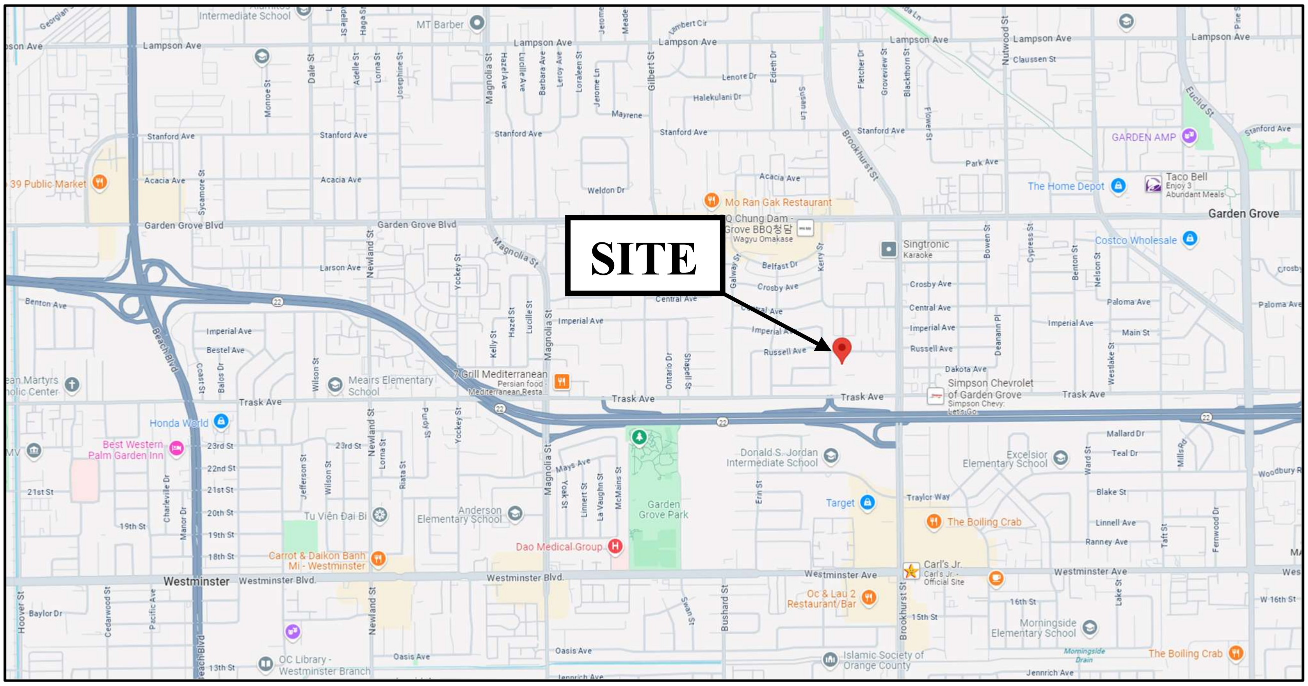

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FIGURE 1-SITE LOCATION MAP

Proposed Residential Development
9822 Russell Avenue, Garden Grove, California

NOT TO SCALE

1.3 PROPOSED DEVELOPMENT

Review of the conceptual site plan provided suggests the site will be constructed with (26) twenty-six 2-story townhomes at grade within six buildings. Associated interior driveways, parking, underground utilities, and decorative hardscape and landscape areas are also anticipated.

No grading or structural plans were available in preparing this report. However, we anticipate minor cuts and filling of the site will be required to achieve future surface configuration, and we expect future foundation loads will be relatively light.

2.0 INVESTIGATION

2.1 RESEARCH

We have reviewed referenced geologic publications, maps, and historical aerial photos of the vicinity. Data from these sources were utilized for the development of some of our findings and conclusions presented in this report.

A cursory review of the geologic map of Orange County by Morton (1981) in the vicinity of the site suggests the site is underlain by alluvium and colluvium (Qac).

Historical imagery suggests that the site was undeveloped as far back as 1953. By 1963, the site appears to have been developed into its current configuration. The site appears to be relatively unchanged since the date of this proposal.

2.2 SUBSURFACE EXPLORATION

Subsurface exploration for this investigation was completed on June 10, 2025. Three (3) exploratory borings were drilled to depths of approximately 11.5 to 51.5 feet below existing ground surface utilizing a truck-mounted, hollow-stem-auger drill rig. A representative of ***Albus & Associates, Inc.*** logged the exploratory excavation. Visual and tactile identifications were made of the materials encountered, and their descriptions are presented on the Exploration Log in Appendix A.

The CPT soundings were advanced using a 30-ton CPT truck, utilizing an external subcontactor. As the cone is advanced through the soil, direct measurements are obtained and recorded for tip resistance, side resistance and porewater measurements. The relationship between the tip resistance and the side resistance allows for the determination of the general soil type. Following the completion of the CPT soundings, logs are generated that provide a relatively continuous profile of the tip resistance, side resistance, and pore water measurements. Copies of the CPT logs are provided in Appendix A.

Bulk, relatively undisturbed, and Standard Penetration Test (SPT) samples were obtained at selected depths 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 using a standard SPT soil sampler. During each sampling interval, the samplers were 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 and testing. The borings were backfilled with soil cuttings in a non-compacted state, and asphalt was patched upon completion of drilling.

The approximate locations of the exploratory excavations completed by this firm are shown on the enclosed Geotechnical Map, Plate 1.

2.3 LABORATORY TESTING

Selected samples of representative earth materials from the borings were returned to our laboratory for testing. Tests consisted of USCS classification, in-situ moisture content and dry density, maximum dry density and optimum moisture content, expansion potential, soluble sulfate content, Atterberg limits, consolidation, direct shear, percent passing No. 200 sieve, sieve analysis, 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 SUBSURFACE CONDITIONS

3.1 SUBSOIL CONDITIONS

Artificial fills (Af) were encountered within the upper 2 feet across the site within the areas of our exploration. The fills were predominately sands with silts, damp, and fine- to medium-grained. Site exploration was limited to areas within the existing asphalt due to the existing buildings onsite. We anticipate deeper, localized fills below and surrounding the existing buildings which would have resulted from previous grading activities.

Alluvium (Qal) was encountered below the fills for the maximum depth explored of 51.5 feet. The alluvium consisted of sands with silt, sandy silts, silty sands / sandy silts, and silty sands.

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

3.2 GROUNDWATER

Groundwater was encountered during this firm’s subsurface exploration at a depth of 14 feet. The CDMG Special Report 03 suggests that historic high groundwater for the subject site is approximately 13-14 feet.

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 based on the 2008 National Seismic Hazards Maps.

TABLE 3.1
SUMMARY OF FAULTS

Name	Distance (miles)	Slip Rate (mm/yr.)	Preferred Dip (degrees)	Slip Sense	Rupture Top (km)	Fault Length (km)
San Joaquin hills	5.22	0.5	23	thrust	2	27
Newport-Inglewood, alt 1	6.46	1	88	strike slip	0	65
Newport Inglewood Connected alt 1	6.46	1.3	89	strike slip	0	208
Newport Inglewood Connected alt 2	6.49	1.3	90	strike slip	0	208
Puente Hills (Coyote Hills)	7.25	0.7	26	thrust	2.8	17

4.0 ANALYSES

4.1 SEISMICITY AND SEISMIC DESIGN PARAMETERS

The 2022 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.

The site is underlain by soil strata that are susceptible to liquefaction. As such, per item 1 in Section 20.3.1, the project site should be designated Site Class F. However, because the proposed developments are anticipated to have fundamental periods of less than 0.5 seconds, per the same (referenced item) the site is exempted from Site Class F designation. Instead, site class can be designated per Section 20.3. Using weighted average SPT blow count N > 15 (across the upper 100 ft of the soil profile) in Table 20.3-1, Site Class D is assigned. (or: Using weighted average SPT blow count N < 15 (across the upper 100 ft of the soil profile) in Table 20.3-1, Site Class E is assigned.). We used the OSHPD seismic hazard tool 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 the computer program OpenSHA (Field et al., 2013), which implements Method 1 as described on Section 21.2.1.1. Fault Models 3.1 and 3.2 from the Third Uniform California Earthquake Rupture Forecast (UCERF3) were used as the earthquake rupture forecast models for the PSHA. In addition to known fault sources, background seismicity was also included in the PSHA. The ground motion Prediction Equations (GMPEs) selected for use in this analysis are those developed for the Pacific Earthquake Engineering Research Center (PEER) Next

Generation Attenuation (NGA) West 2 project. Four GMPEs - Abrahamson et al. (2014), Boore et al. (2014), Campbell and Bozorgnia (2014), and Chiou and Youngs (2014) were used to perform the analysis.

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 NGA-West2 GMPE Worksheet. For this, 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 (Fa and Fv, respectively) were determined per Section 21.3 in conjunction 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 OSHPD seismic hazard tool. According to Section 21.5.3 of ASCE 7, either mapped or site-specific PGAm may be used for soil related analysis. For this investigation, a mapped PGAm of 0.67 was incorporated into the analysis.

4.2 STATIC SETTLEMENT

Analyses were performed for the potential settlement of the underlying soils encountered during our investigation. The site is predominately granular in nature. As such, analyses of settlement were based on the elastic method using estimated moduli correlated from N_{60} blow counts, as well as consideration from consolidation testing. Two analyses were performed to evaluate settlement of the structures. The first model was based on a conventional shallow strip footing 1.2 feet wide and a wall load of 3,000 plf. The second model was based on a conventional square footing with 3 feet width and a column load of 27 kips. Both models yielded a total settlement of less than 0.5 inches.

4.3 LIQUEFACTION

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

- A source of ground shaking, such as an earthquake, capable of generating soil mass distortions.
- A relatively loose silty and/or sandy soil.

- A relative shallow groundwater table (within approximately 50 feet below ground surface) or completely saturated soil conditions that will allow positive pore pressure generation.

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

The liquefaction analyses were based on field and laboratory testing data results from CPT-1 and CPT-2. The liquefaction analyses were performed utilizing the CLiq software by GeoLogismiki which incorporates the methods by NCEER (1998) and Robertson (2009) for the CPT data.

Historic high groundwater was assumed at a depth of 13 feet below the existing ground surface based on our discussion in Section 3.2. Fine-grained soils that do not have a Plasticity Index (PI) less than 12 and field moisture contents greater than 85% of liquid limit (LL) or soils with corrected blow counts greater than 30 per foot were assumed to be not susceptible to liquefaction. Based on our analysis, some layers of granular soils below a depth of 13 feet have factors of safety below 1.3 are prone to liquefaction during the design earthquake event. The results of our liquefaction analyses are presented in Appendix C.

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 also our opinion that the proposed development will not adversely impact the stability of adjoining properties if grading and construction is performed in accordance with the recommendations presented in this report. Key issues that could have significant 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 known active faults are known to project through the subject site, nor do the sites lie within the boundaries of an “Earthquake Fault Zone” as defined by the State of California in the Alquist-Priolo Earthquake Fault Zoning Act. The closest known active fault is the San Joaquin hills fault, located approximately 5.22 miles away. Therefore, the potential for ground rupture due to an earthquake beneath the sites is considered low.

5.2.2 Ground Shaking

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

5.2.3 Liquefaction

Based on our analyses, liquefaction may occur below the site during periods of strong ground motion. Our analyses indicate liquefaction could lead to a total seismic settlement (saturated and dry) of the ground surface of up to approximately 5.5 inches due to seismic consolidation during liquefaction. Given this condition, differential settlement due to seismic settlement would likely be on the order of half of the total seismic settlement or approximately 2.75 inches over 30 feet or approximately 0.01L.

Based on the State of California Special Publication 117A, hazards from liquefaction should be mitigated to the extent required to reduce seismic risk to “acceptable levels”. The acceptable level of risk means, “that level that provides reasonable protection of the public safety” [California Code of Regulations Title 14, Section 3721 (a)]. The use of well-reinforced foundations, such as post-tensioned slabs, grade beams with structural slabs, or mat foundations, have been proven to adequately provide basal support for similar structures during comparable liquefaction events. Further, ASCE 7-16, Section 12.13.9.2 allows for use of properly designed foundations for mitigation of seismic settlement. Since the estimated differential settlement is less than 0.015L, structural mitigation is permitted. Specific recommendations for mitigation of differential seismic settlement are provided in Section 6.3.

5.3 STATIC SETTLEMENT

Provided the existing near surface soils are removed and recompacted, 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 residential structures. Specific recommendations for ground preparation are provided in Section 6.1.4.

5.4 EXCAVATION AND MATERIAL CHARACTERISTICS

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 of deleterious debris and oversized rocks (greater than 4 inches in greatest dimension). If encountered, portions of concrete debris and asphalt can likely be reduced in size (4” minus) and incorporated within fill soils during earthwork operations.

Temporary construction slopes will be required to complete removal of unsuitable soils and for construction of underground utilities. Site materials are typically coarse-grained and may be prone to caving. Such excavations will require laybacks where they are surcharged or where they exceed 4 feet in height. Specific recommendations are provided in Section 6.1.5.

Most of the near-surface soils are below optimum moisture content. As such, the addition of water to these materials will be required during placement and compaction as engineered fills.

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 the existing upper 4 feet of earth materials will shrink up to approximately 8 to 13 percent. The subsidence of removal bottoms is estimated to be on the order of 0.15 feet. The estimates of shrinkage and/or bulkage are intended as an aid for project engineers in determining earthwork quantities. However, these estimates should be used with some caution since they are not absolute values. Contingencies should be made for balancing earthwork quantities based on actual swelling and bulkage that occurs during the grading process.

5.6 SOIL EXPANSION

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

6.0 RECOMMENDATIONS

6.1 EARTHWORK

6.1.1 General Earthwork and Grading Specifications

All earthwork and grading should be performed in accordance with applicable requirements of Cal/OSHA, applicable specifications of the Grading Codes of the City of Garden Grove, California in addition to the recommendations presented herein.

6.1.2 Pre-Grade Meeting and Geotechnical Observation

Prior to commencement of grading, we recommend a meeting be held between the developer, City Inspector, grading contractor, civil engineer, and geotechnical consultant to discuss the proposed grading and construction logistics. We also recommend that a geotechnical consultant be retained to provide soil engineering and engineering geologic services during site grading and foundation construction. 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 that appear 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

All existing site improvements, oversized materials, vegetation and other deleterious materials should be removed from the areas to be developed. Existing underground improvements such as utility lines, septic tanks, seepage pits, etc. are also anticipated at the site. If encountered during site development, these improvements should also be completely removed from the site and seepage pits should be properly abandoned in accordance with the requirements established by the governing agencies as well as recommendations made in the field by the project geotechnical consultant.

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 6.1.6. 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 6.1.6.

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.

Concrete debris generated by site demolition can be reduced to no more than 4 inches in maximum dimension and uniformly incorporated with fill soils during earthwork operations.

6.1.4 Ground Preparation

Within the building pad areas and retaining walls, the existing artificial fills are considered unsuitable for supporting proposed structures and site improvements. Therefore, the upper 2 feet of the existing earth materials should be removed and replaced as engineered compacted fills. In addition to general removal of unsuitable soils, the existing soils should be over-excavated to a minimum depth of 1 foot below the bottom of footings for residential structures and one foot below retaining walls.

Existing soil within roadways and parking areas should be removed to at least 12 inches below the proposed pavement subgrade and replaced with engineered compacted fill.

Removals should extend laterally beyond the limits of the proposed buildings, a distance equal to the depth of removal (i.e. 1:1 projection) but not less than 5 feet. Existing soils below proposed pavement should be removed laterally to at least the edge of the pavement. 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.

All removal excavations should be evaluated by the geotechnical consultant during grading to confirm the exposed conditions are as anticipated and to provide supplemental recommendations if required.

The grading contractor should take appropriate measures when excavating adjacent any existing improvements to remain in-place to avoid disturbing or compromising support of existing structures.

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

6.1.5 Temporary Excavations

Temporary construction slopes and trench excavations may be cut vertically up to a height of 4 feet provided that no surcharging of the excavations is present. Temporary excavations greater than 4 feet in height but no more than 10 feet should be laid back to a 1:1 (H:V) or flatter or shored to mitigate the potential for instability. Where temporary excavations expose friable granular soils, the excavation should be laid back to a gradient of 1.5:1 (H:V).

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.

The grading contractor should take appropriate measures when excavating adjacent existing improvements to avoid disturbing or compromising support of existing structures.

6.1.6 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 at least 100 percent of 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.

6.1.7 Import Materials

If import materials are required to achieve the proposed finish grades, the import soils should have an Expansion Index (EI) less than 21 (ASTM D 4829) and negligible soluble sulfate content. Import sources should be indicated to the geotechnical consultant at least 3 days prior to hauling the materials to the site so that appropriate testing and evaluation of the fill materials can be performed in advance.

6.2 SITE SPECIFIC SEISMIC DESIGN PARAMETERS

6.2.1 Mapped Seismic Design Parameters

For design of the project in accordance with Chapter 16 of the 2022 CBC, the mapped seismic parameters may be taken as presented in the tables below.

TABLE 6.1
2022 CBC Mapped Seismic Design Parameters

Parameter	Value
Site Class	D
Mapped MCE_R Spectral Response Acceleration, short periods, S_S	1.374
Mapped MCE_R Spectral Response Acceleration, at 1-second period, S_1	0.488
Site Coefficient, F_a	1.0
Site Coefficient, F_v *	1.712
Adjusted MCE_R Spectral Response Acceleration, short periods, S_{MS}	1.374
Adjusted MCE_R Spectral Response Acceleration, at 1-second period, S_{M1} *	1.253
Design Spectral Response Acceleration, short periods, S_{DS}	0.916
Design Spectral Response Acceleration, at 1-second period, S_{D1} *	0.835
Long-Period Transition Period, T_L (sec.)	8
Seismic Design Category for Risk Categories I-IV	II

MCE_R = Risk-Targeted Maximum Considered Earthquake

*According to Section 11.4.8 in ASCE 7-16 and supplement 3, "a ground motion hazard analysis shall be performed in accordance with Section 21.2 for the following structures on Site Class D site with S_1 greater than or equal to 0.2." However, "A ground motion hazard analysis is not required for structures where the value of the parameter S_{M1} determined by Eq. (11.4-2) is increased by 50% for all applications of S_{M1} in the Standard. The resulting value of the parameter S_{D1} determined by Eq. (11.4-4) shall be used for all applications of S_{D1} in this Standard." Should this exception not be met, the site-specific seismic design parameters provided in the next section should be used.

6.2.2 Site-Specific Seismic Design Parameters

In addition to the Code Spectra parameters presented in Table 6.1, we have performed a site-specific ground motion hazard analysis in accordance with Chapter 21 of ASCE 7-16 to obtain site-specific seismic design acceleration parameters, the risk-targeted maximum considered earthquake response spectrum, and the design earthquake response spectrum. The site-specific seismic design parameters are presented below.

TABLE 6.2
2022 CBC Site-Specific Seismic Design Parameters

Parameter	Value
Site Class	D
Site Coefficient, F_a	1.0
Site Coefficient, F_v	2.5
Adjusted MCE Spectral Response Acceleration, short periods, S_{MS}	1.683
Adjusted MCE Spectral Response Acceleration, at 1-second period, S_{M1}	1.488
Design Spectral Response Acceleration, short periods, S_{DS}	1.122
Design Spectral Response Acceleration, at 1-second period, S_{D1}	0.992

MCE = Maximum Considered Earthquake

6.3 FOUNDATION DESIGN

6.3.1 General

The following design parameters are provided to assist the project structural engineer to design foundation systems to support the proposed structures at the site. Recommendations for design of other foundation systems will be provided upon request. These design parameters are based on typical site materials encountered during subsurface exploration and are provided for preliminary design and estimating purposes. Depending on actual materials encountered during site grading and actual foundation loads, the design parameters presented herein may require modification.

The site is subject to the adverse effects of liquefaction. The site may be subject to seismic settlement that will require additional mitigation through design considerations in the foundation and slab on grade systems. We assume the foundation system will consist of either shallow foundations that are tied together with grade beams or a post-tension slab system. Therefore, the provision of ASCE 7-16, Section 12.13.9.2 should be incorporated into the design in addition to other recommendations provided below. Where the requirements of ASCE 7-16 are greater, the provisions of ASCE 7-16 should govern.

6.3.2 Soil Expansion

The recommendations presented herein are based on soils with a **Very Low** expansion potential (EI < 21). 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.

6.3.3 Settlement

Under normal static conditions, the foundation system should be designed to tolerate a total settlement of 1 inch and a differential settlement of ½-inch over 30 feet. The foundations should also be designed for total and differential seismic settlement of 5.5 inches and 2.75 inches over 30 feet, respectively. Requirements for conventional shallow footings should incorporate the requirements of Section 12.13.9 of ASCE 7-16. The PTI design parameters presented in Section 6.3.7 incorporate the estimated seismic settlements.

6.3.4 Allowable Bearing Value

Provided site grading is performed as recommended herein, a bearing value of 2,000 pounds per square foot (psf) may be used for continuous beams or isolated pad footings. The bearing value is based on beams having a minimum width of 12 inches and founded at a minimum of 12 inches below the lowest adjacent grade. The above value may be increased by 250 psf and 1000 psf for each additional foot in width and depth, respectively, up to a maximum value of 3,000 psf. Recommended allowable bearing values include both dead and live loads and may be increased by one-third for wind and seismic forces.

6.3.5 Lateral Resistance

Provided site grading is performed in accordance with the recommendations provided by the project geotechnical consultant, a passive earth pressure of 330 pounds per square foot per foot of depth up to a maximum value of 1,000 pounds per square foot may be used to determine lateral bearing for beams. This value may be increased by one-third when designing for wind and seismic forces. A coefficient of friction of 0.37 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. Where lateral removals cannot be performed beyond the foundation, the passive resistance values should be decreased by 25% such as for design of property line walls.

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

6.3.6 Shallow Footings and Slabs on Grade

Exterior and interior building footings should be founded at a minimum depth of 12 inches and 12 inches, respectively, below the lowest adjacent grade. All continuous footings should be reinforced with a minimum of two No. 4 bars, one top and one bottom. The structural engineer may require different reinforcement and should dictate if greater than the recommendations provided herein.

Interior isolated pad footings should be a minimum of 24 inches square and founded at minimum depths of 12 inches below the lowest adjacent final grade. Exterior isolated pad footings intended for support of patio covers or similar construction should be a minimum of 24 inches square and founded at a minimum depth of 12 inches below the lowest adjacent final grade. Isolated footings should be tied to nearby continuous footings in both directions with grade beams in accordance with the requirements of ASCE 7-16, Section 12.13.9.

Interior concrete slabs constructed on grade should be a minimum 4 inches thick and should be reinforced with a minimum of No. 3 bars spaced 30 inches on center, each way. Care should be taken to ensure the placement of reinforcement at mid-slab height. The structural engineer may recommend a greater slab thickness and reinforcement based on proposed use and loading conditions and such recommendations should govern if greater than the recommendations presented herein. Reinforcement and stiffening beams should be provided as required by ASCE 7-16, Section 12.13.9 for effects of liquefaction settlement.

Concrete floor slabs in areas to receive carpet, tile, or other moisture sensitive coverings should be underlain with a minimum of 10-mil moisture vapor retarder conforming to ASTM E 1745-11, Class A. The membrane should be properly lapped, sealed, and underlain with at least 2 inches of sand having a SE no less than 30. One inch of this sand may be placed over the membrane to aid in the curing of the concrete. This vapor retarder 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.

Special consideration should be given to slabs in areas to receive ceramic tile or other rigid, crack-sensitive floor coverings. Design and construction of such areas should mitigate hairline cracking as recommended by the structural engineer.

6.3.7 Post-Tensioned Slab on Grade

Due to potential seismic settlement, the proposed structures may be supported by a post-tension slab. Perimeter edge beams for the post-tensioned slabs should have a minimum effective width of 12 inches and be founded at a minimum depth of 12 inches below the lowest adjacent final ground surface. Interior beams may be founded at a minimum depth of 12 inches below the tops of the finish floor slabs. Where a post-tensioned mat is utilized, the exterior edge of the mat should be embedded at least 8 inches below the lowest adjacent grade. The thickness of the floor slab/mat should be determined by the project structural engineer; however, we recommend a minimum slab thickness of 5.0 inches.

Design of the mat may be based on a modulus of subgrade reaction (Kv1) of 125 pounds per cubic inch (pci). The modulus is based on an effective loading area of 1 foot by 1 foot. The modulus may be adjusted for other effective loading areas using the equation provided below.

$K_b(pci) = Kv1\left\{\frac{b+1}{2b}\right\}^2$; where “b” is the effective width of loading (minimum dimension) in feet.

Concrete floor slabs in areas to receive carpet, tile, or other moisture sensitive coverings should be underlain with a minimum of 10-mil moisture vapor retarder conforming to ASTM E 1745, Class A. The membrane should be properly lapped, sealed, and underlain within a layer of sand at least 2 inches thick. One inch of sand may be placed over the membrane to aid in the curing of the concrete. The sand should have a SE no less than 30. This vapor retarder 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. If a post tension mat is used and is at least 8 inches in thickness, sand below the slab may be omitted.

Prior to placing concrete, subgrade soils below slab-on-grade/mat areas should be thoroughly moistened to provide moisture contents at least 120 percent of the optimum moisture content to a depth of 12 inches.

Based on the guidelines provided in the “Design of Post-Tensioned Slabs-on-Ground” 3rd Edition by Post-Tensioning Institute, the em and ym values are summarized in Table 6.3. These values already consider differential settlement from liquefiable soils.

TABLE 6.3
PTI Design Parameters

Parameter	Value
Edge Lift Moisture Variation Distance, e_m	5.1 feet
Edge Lift, y_m	1.66 inches
Center Lift Moisture Variation Distance, e_m	9.0 feet
Center Lift, y_m	1.10 inches

6.3.8 Foundation Observations

Foundation 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 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.

6.4 RETAINING AND SCREENING WALLS

6.4.1 General

The following preliminary design and construction recommendations are provided for general retaining and screen walls. Final wall designs specific to site development should be provided to the project geotechnical consultant 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.

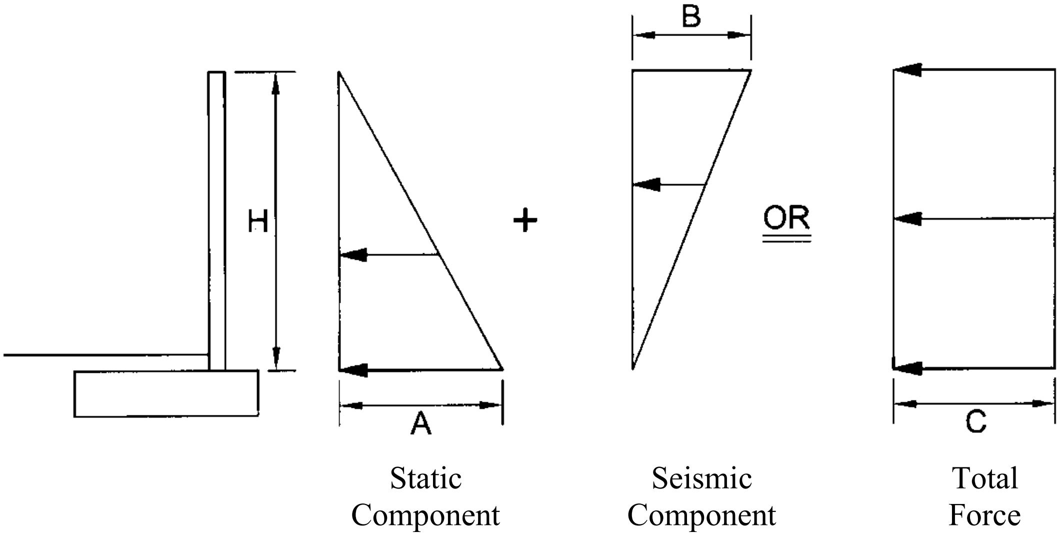
6.4.2 Allowable Bearing Value and Lateral Resistance

Design of retaining and screen walls may utilize the bearing and lateral resistance values provided in Section 6.3.4 and 6.3.5. The passive earth pressure for walls along property lines, where lateral removals are likely restricted, should be reduced by 25%.

6.4.3 Earth Pressures

Static and seismic earth pressures for level and 2:1 (H:V) backfill conditions are provided in Table 6.4. Seismic earth pressures provided herein are based on the method provided by Seed & Whitman (1970) using a peak ground acceleration (PGA) of 0.39 g for 10% probability of exceedance in 50 years. As indicated in Section 1807.2.2of the 2022 CBC, retaining walls supporting 6 feet of backfill or less are not required to be designed for seismic earth pressures. The values provided in the following table do not consider hydrostatic pressure. Retaining walls should also be designed to support adjacent surcharge loads imposed by other nearby footings or traffic loads in addition to the earth pressure.

TABLE 6.4
SEISMIC EARTH PRESSURES
Pressure Diagram



Earth Pressure Values
Walls Up to 10 Feet in Height

Value	Backfill Condition	
	Level	2H:1V Slope
A	33H	54H
B	12H	12H
C	22H	33H

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.

6.4.4 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 pipes 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 the wall that will be in contact with soil and should lap over and onto the top of the 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 smoothly 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.

6.4.5 Footing Reinforcement

All continuous footings should be reinforced with a minimum of four No. 4 bars, two top and two bottom. The structural engineer may require different reinforcement and should dictate if greater than the recommendations provided herein. Where recommended removals are limited due to space restrictions, greater reinforcement may be warranted. Such specific recommendations should be provided by our firm during grading as-built conditions observed in the field.

6.4.6 Wall Jointing

All free-standing, exterior site walls should be provided with cold joints through the masonry block section at horizontal spacing generally not exceeding 40 feet. The joints should not extend through the footing. Retaining walls that are integral to the building should be provided joints based on recommendations by the structural engineer.

6.4.7 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.

6.4.8 Wall Backfill

Onsite soils may be used for backfill behind retaining walls. The project geotechnical consultant should approve the backfill used for retaining walls. Wall backfill should be thoroughly moistened to provide moisture contents slightly over 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 to the wall to avoid damage to the wall.

6.5 EXTERIOR FLATWORK

Concrete sidewalks, patios, and similar flatwork should be a nominal 4 inches thick and provided with saw cuts or expansion joints at spacing no greater than 10 feet in each direction. 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 thoroughly moistened to a moisture content of at least 100 percent of optimum 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.

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 0.5% away from building foundations and masonry walls.

6.6 CONCRETE MIX DESIGN AND CORROSION

Laboratory testing of existing near-surface soils for soluble sulfate content indicates soluble sulfate concentration less than 0.15%. We recommend following the procedures provided in ACI 318, Section 4.3, Table 4.3.1 for **negligible** sulfate exposure. Upon completion of rough grading, an evaluation of as-graded conditions and further laboratory testing should be completed for the site to confirm or modify the recommendations provided in this section.

Laboratory testing of onsite soil indicates a minimum resistivity of 4,700 ohm-cm, chloride content of 25 ppm, and a pH of 8.3. Based on laboratory test results, site soils are **Moderately Corrosive** to metals. Structures fabricated from metals should have appropriate corrosion protection if they are in direct contact with site soils. Under such conditions, a corrosion specialist should provide specific recommendations.

6.7 POST GRADING CONSIDERATIONS

6.7.1 Site Drainage and Irrigation

Positive drainage devices, such as sloping concrete flatwork, graded swales or area drains, should be provided around the new construction to collect and direct all surface water to suitable discharge areas. In general, the site should be graded to conform to the requirements of Section 1804.4 of the 2022 California Building Code. However, the slope of the ground surface may be reduced to a maximum of 2% based on soils and environmental conditions of the site. No rain or excess water should be directed toward or 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.

6.7.2 Utility Trenches

Trench excavations should be constructed in accordance with the recommendations contained in Section 6.1.5 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. Trench backfill should be brought to moisture content slightly over optimum, 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. The project geotechnical consultant should perform density testing, along with probing, to test compaction. Jetting should not be completed without prior approval from the project geotechnical consultant.

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.

6.8 PRELIMINARY PAVEMENT DESIGN

6.8.1 Preliminary Structural Sections

Based on the soil conditions present at the site and estimated traffic indices, preliminary pavement sections are provided in Table 6.5 below. A preliminary "R-value" of 25 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. It should be noted that the preliminary paving sections provided below are considered suitable for support of a 94,000 pound fire apparatus.

TABLE 6.5
PRELIMINARY PAVEMENT STRUCTURAL SECTIONS FOR RESIDENTIAL DEVELOPMENT

Location	Traffic Index	AC (inches)	Paver Thickness (mm)	Portland Cement Concrete (inches)	AB (inches)
Driveway	5.0	3.0 4.0	--	--	7.0 4.0
		--	80	--	8.0
		--	--	6.0	--
Parking Stalls	--	3.0	--	---	4.0

6.8.1 Subgrade Preparation

Prior to placement of pavement elements, subgrade soils should be moisture-conditioned to at least 110 percent of the optimum moisture content then compacted to at least 90 percent of the laboratory determined maximum dry density. Areas observed to pump or yield under vehicle traffic should be removed and replaced with firm and unyielding compacted soil or aggregate base materials.

6.8.2 Aggregate Base

Aggregate base should be moisture conditioned to slightly over the optimum moisture content, placed in lifts no greater than 6 inches in thickness, then compacted to at least 95 percent of the laboratory standard (ASTM D 1557). Aggregate base materials should be Class 2 Aggregate Base conforming to Section 26-1 of the latest edition of the Caltrans Standard Specifications, Crushed Aggregate Base conforming to Section 200-2.2 of the latest edition of the Standard Specifications for Public Works Construction (Greenbook) or Crushed Miscellaneous Base conforming to Section 200-2.4 of the Greenbook.

6.8.3 Asphaltic Concrete

Paving asphalt should be PG 64-10. Asphaltic concrete materials should conform to Section 203-6 of the Greenbook and construction should conform to Section 302 of the Greenbook. Where traffic will traverse over cold joints in asphaltic concrete such as against concrete ribbon gutters and concrete paver sections, the asphaltic concrete section should be thickened by 1 additional inch from the values indicated in the above Table 6.5 within 2 feet of cold joints.

6.8.4 Concrete Pavers

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 6.6.

TABLE 6.6
Gradation for Sand Bedding

Sieve Size	Percent Passing
⅜”	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

Construction of edge restraints should also follow manufacturer’s specifications. As a minimum, restraints should be provided along the perimeter of concrete pavers and where there is a change in the paving materials. The proposed concrete bands should extend to the bottom of the base course underlying the concrete pavers. Portland cement concrete used to construct concrete bands should conform to Section 201 of the Greenbook and should have a minimum compressive strength of 2,500 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 ¼ of the slab thickness. Expansion/cold joints may be used in lieu of score joints. However, cold joints should be provided with dowels or keyways are recommended by PCA.

6.8.5 Portland Cement Concrete (PCC)

Portland cement concrete used to construct concrete paving should conform to Section 201 of the Greenbook and should have a minimum compressive strength of 3,000 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 ¼ 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 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.

Trash pickup areas should be provided with a concrete slab where the bins will be picked up and extend at least 3 feet past the front wheel landing areas. The slab should be at least 8 inches thick and be reinforced with No. 4 bars spaced at 24 inches on centers, both ways. The slabs should be provided transverse and longitudinal joints spacing as specified above. Dowels or a keyway should be provided at all cold joints.

6.9 PLAN REVIEW AND CONSTRUCTION SERVICES

We recommend ***Albus & Associates, Inc.*** be engaged to review any future development plans, including revisions to the grading plans, foundation plans and proposed structural loads, 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 described herein and in other literature are believed representative of the total project area, and the conclusions contained in this report are presented on that basis. However, soil materials can vary in characteristics between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein. As such, observation and testing by a geotechnical consultant prior to and during the grading and construction phases of the project are essential to confirming the basis of this report.

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

This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and time period. The contents of this report are professional opinions and as such, are not to be considered 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 **Melia Homes** to assist the project consultants in determining the feasibility of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

Respectfully submitted,

ALBUS & ASSOCIATES, INC

Daniel Albus
Project Engineer

Reviewed by:

Hai D. Nguyen
Associate Engineer
RCE 82460

REGISTERED PROFESSIONAL ENGINEER
HAI D. NGUYEN
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CIVIL
STATE OF CALIFORNIA

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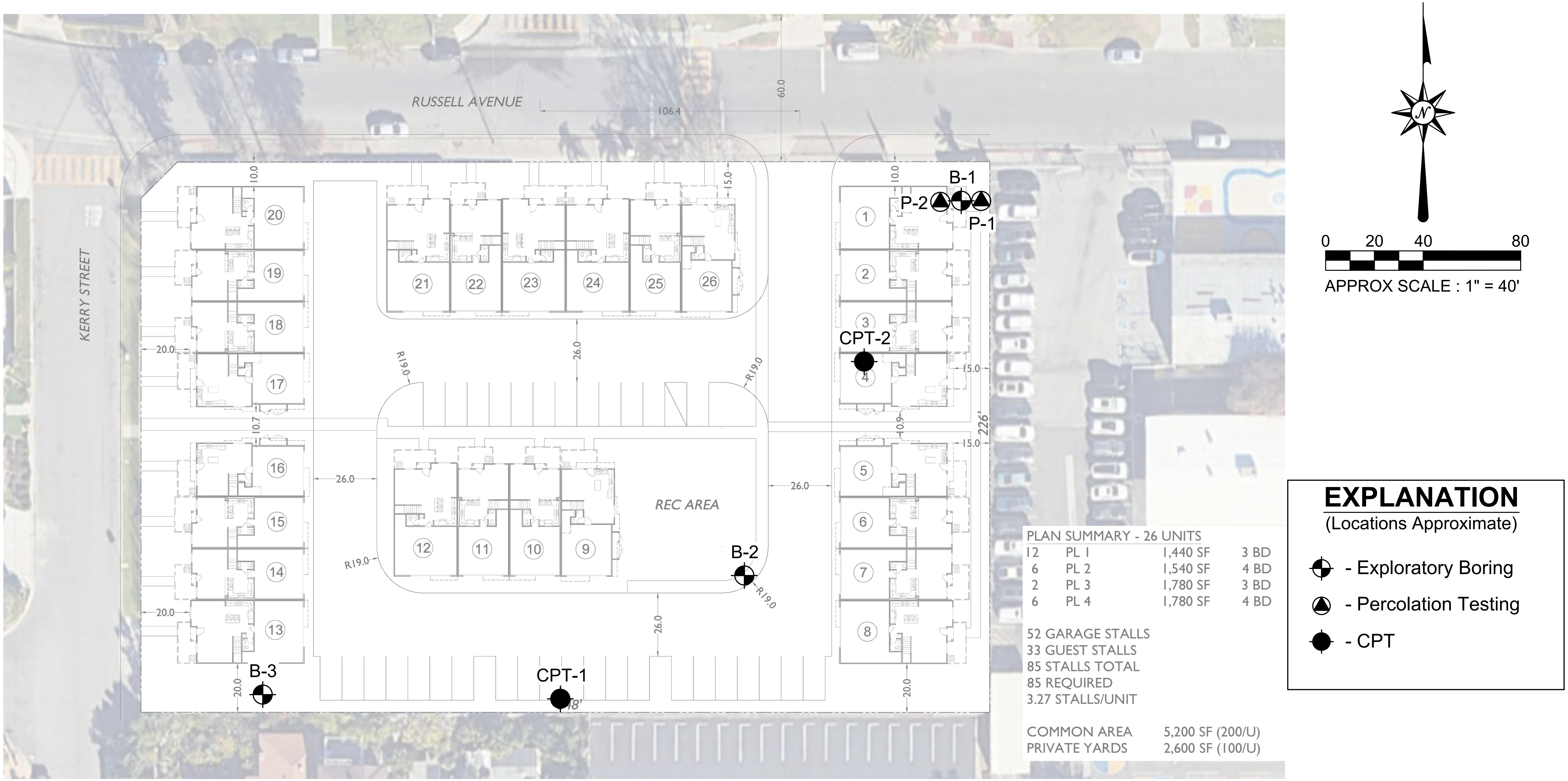


PLAN SUMMARY - 26 UNITS

12	PL 1	1,440 SF	3 BD
6	PL 2	1,540 SF	4 BD
2	PL 3	1,780 SF	3 BD
6	PL 4	1,780 SF	4 BD

52 GARAGE STALLS
33 GUEST STALLS
85 STALLS TOTAL
85 REQUIRED
3.27 STALLS/UNIT

COMMON AREA	5,200 SF (200/U)
PRIVATE YARDS	2,600 SF (100/U)

EXPLANATION
(Locations Approximate)

- ⊕ - Exploratory Boring
- ▲ - Percolation Testing
- ● - CPT

Base Provided By Summa Architecture

ALBUS & ASSOCIATES

GEOTECHNICAL MAP

Job No.: 3341.00 | Date: 06/18/2025 | Plate: 1

APPENDIX A

EXPLORATION LOGS

Field Identification Sheet

- Light gray
- Gray
- Dark gray
- Gray Brown
- Light brown
- Brown
- Dark Brown
- Olive brown
- Olive
- Yellow
- Yellowish brown
- Yellowish red
- Red
- Reddish Brown
- Tan

Description Order:

Description, Color, Moisture, Density, Grain Size, Additional Description

Description	%	Example
	0-5	Sand
trace	5-15	Sand trace Silt
with	15-30	Sand with Silt
	30+	Silty Sand

<u>More Examples</u>

Sand with Silt trace Clay
Sand trace Silt and Clay
Sand with Silt and Clay
Gravelly Sand with Silt trace Clay
Silty Clay with Sand trace Gravel

Moisture

Dry	absence of water
Damp	below optimum
Moist	near optimum
Very Moist	above optimum
Wet	free water visible

Density (Navfac)

Coarse grained soils	SPT	CA
Very Loose	0-3	0-5
Loose	3-8	5-13
Medium Dense	8-14	13-22
Dense	14-25	22-40
Very Dense	25>	40>

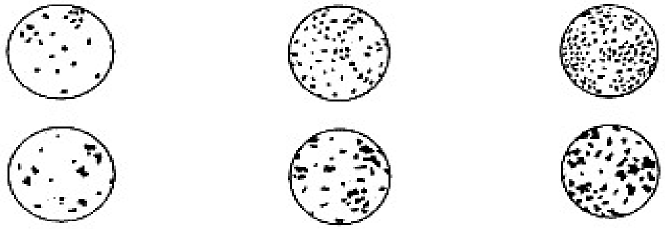
Fine grained soils		
Very Soft	2<	0-3
Soft	2-4	3-6
Medium Stiff	4-8	6-13
Stiff	8-15	13-24
Very Stiff	15-30	24-48
Hard	30>	48>

Grain Size

Description		Sieve Size	Approx. Size
Boulders		>12"	Larger than basketball
Cobbles		3-12"	Fist to basketball
Gravel	coarse	3/4-3"	Thumb to Fist
	fine	#4-3/4"	Pea to Thumb
Sand	coarse	#10-4	Rock Salt to Pea
	medium	#40-10	Sugar to Rock Salt
	fine	#200-40	Flour to Sugar
Fines		Pass #200	Smaller than Flour

Additional Description (ie. roots, pinhole pores, debris, etc.)

Trace 5%   Moderate 15%   Abundant 30%



EXPLORATION LOG

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

				Samples			Laboratory Tests		
Depth (feet)	Lith-ology	Material Description	Water	Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		EXPLANATION							
		Solid lines separate geologic units and/or material types.							
5		Dashed lines indicate unknown depth of geologic unit change or material type change.							
		Solid black rectangle in Core column represents California Split Spoon sampler (2.5in ID, 3in OD).			■				
		Double triangle in core column represents SPT sampler.			⧗				
10		**Vertical Lines** in core column represents Shelby sampler.			▥				
		Solid black rectangle in Bulk column respresents large bag sample.				■			
15		**Other Laboratory Tests:** 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)							
20		200 = Percent Passing #200 Sieve Consol = Consolidation SE = Sand Equivalent Rval = R-Value ATT = Atterberg Limits							

EXPLORATION LOG B-1

JOB NO. 3341.00	**CLIENT/PROJECT** Melia Homes	**DAY** Tuesday	**DATE** 2025-06-10
LOCATION 9822 Russell Avenue, Garden Grove	**LATITUDE** 33.76847	**LONGITUDE** -117.95723	**ELEVATION** 70.9
LOGGED BY klopez	**DRILLER** 2R Drilling	**DRILL METHOD** Hollow-Stem Auger	**DRIVING WEIGHT** 140 lbs / 30 in

DEPTH	LITHO	DESCRIPTION	H2O	COR	BAG	BLOW COUNT	MC (%)	DD (pcf)	LAB
		Asphalt							max ei so4 sa ph resist ch
1		**Artificial Fill (Af)** Sand with Silt (SP-SM): tan, damp, medium grained							
2				■		20	3	96	
3		**Alluvium (Qal)** Sand (SP): tan, damp, medium dense, fine to medium grained							
4				■		20	2.4	97.7	
5									
6		Sand trace Silt (SP): gray brown, very moist, loose, fine to medium grained		■		6	7.6	93.1	200
7									
8									
9									
10		Sandy Silt (ML): gray brown, very moist, very loose, fine to medium grained		■		5			
11									
12									
13									
14			▼						
15		@ 15 ft, wet, loose		⧗		3			200
16									
17									
18									
19									
20		Silty Sand / Sandy Silt (SM / ML): gray, wet, medium dense / very stiff, fine grained		⧗		14			200
21									
22									
23									
24									
25		Silty Sand (SM): gray, wet, loose, fine grained		⧗		6	25.5		att
26									
27									
28									
29									

EXPLORATION LOG B-1

JOB NO.	CLIENT/PROJECT	DAY	DATE
3341.00	Melia Homes	Tuesday	2025-06-10

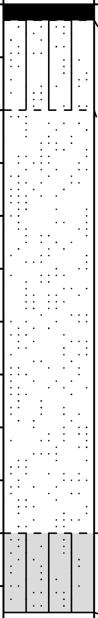
LOCATION	LATITUDE	LONGITUDE	ELEVATION
9822 Russell Avenue, Garden Grove	33.76847	-117.95723	70.9

LOGGED BY	DRILLER	DRILL METHOD	DRIVING WEIGHT
klopez	2R Drilling	Hollow-Stem Auger	140 lbs / 30 in

DEPTH	LITHO	DESCRIPTION	H2O	COR	BAG	BLOW COUNT	MC (%)	DD (pcf)	LAB
		Silty Sand / Sandy Silt (SM / ML): gray, wet, loose / stiff, fine grained		▼		6			
31				▲					
32									
33									
34									
35		@ 35 ft, medium dense		▼		9			200
36				▲					
37									
38									
39									
40				▼		8			
41				▲					
42									
43									
44									
45		Silty Sand with Clay (SM-SC): gray, wet, medium dense, fine grained		▼		11	27.8		att
46				▲					
47									
48									
49									
50				▼		8	34.3		
51				▲					
52		Total Depth 51.5 feet Groundwater at 14 feet							
53									
54									
55									
56									
57									
58									
59									

EXPLORATION LOG B-2

JOB NO. 3341.00
CLIENT/PROJECT Melia Homes
DAY Tuesday
DATE 2025-06-10
LOCATION 9822 Russell Avenue, Garden Grove
LATITUDE 33.76805
LONGITUDE -117.95752
ELEVATION 70.7
LOGGED BY klopez
DRILLER 2R Drilling
DRILL METHOD Hollow-Stem Auger
DRIVING WEIGHT 140 lbs / 30 in



DEPTH	LITHO	DESCRIPTION	H2O	COR	BAG	BLOW COUNT	MC (%)	DD (pcf)	LAB
		Asphalt							
1		**Artificial Fill (Af)**							
2		Sand with Silt (SP-SM): light brown, damp, fine to medium grained		▨		19	6.8	99.9	
3		**Alluvium (Qal)**		▨					
4		Sand (SP): light brown, damp, medium dense, fine to medium grained		▨		12	8.8	96.9	consol
5				▨					
6		@ 4 ft, gray brown, moist, loose		▨		6	12.4	89.8	
7				▨					
8									
9									
10		Sandy Silt trace Clay (ML): gray brown, very moist to wet, very loose, fine grained		▨		4	31.6	89.1	sa hydro
11				▨					
12		Total Depth 11.5 feet No Groundwater							
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									

ALBUS & ASSOCIATES

EXPLORATION LOG B-3

JOB NO.	CLIENT/PROJECT	DAY	DATE
3341.00	Melia Homes	Tuesday	2025-06-10

LOCATION	LATITUDE	LONGITUDE	ELEVATION
9822 Russell Avenue, Garden Grove	33.76792	-117.95817	71.3

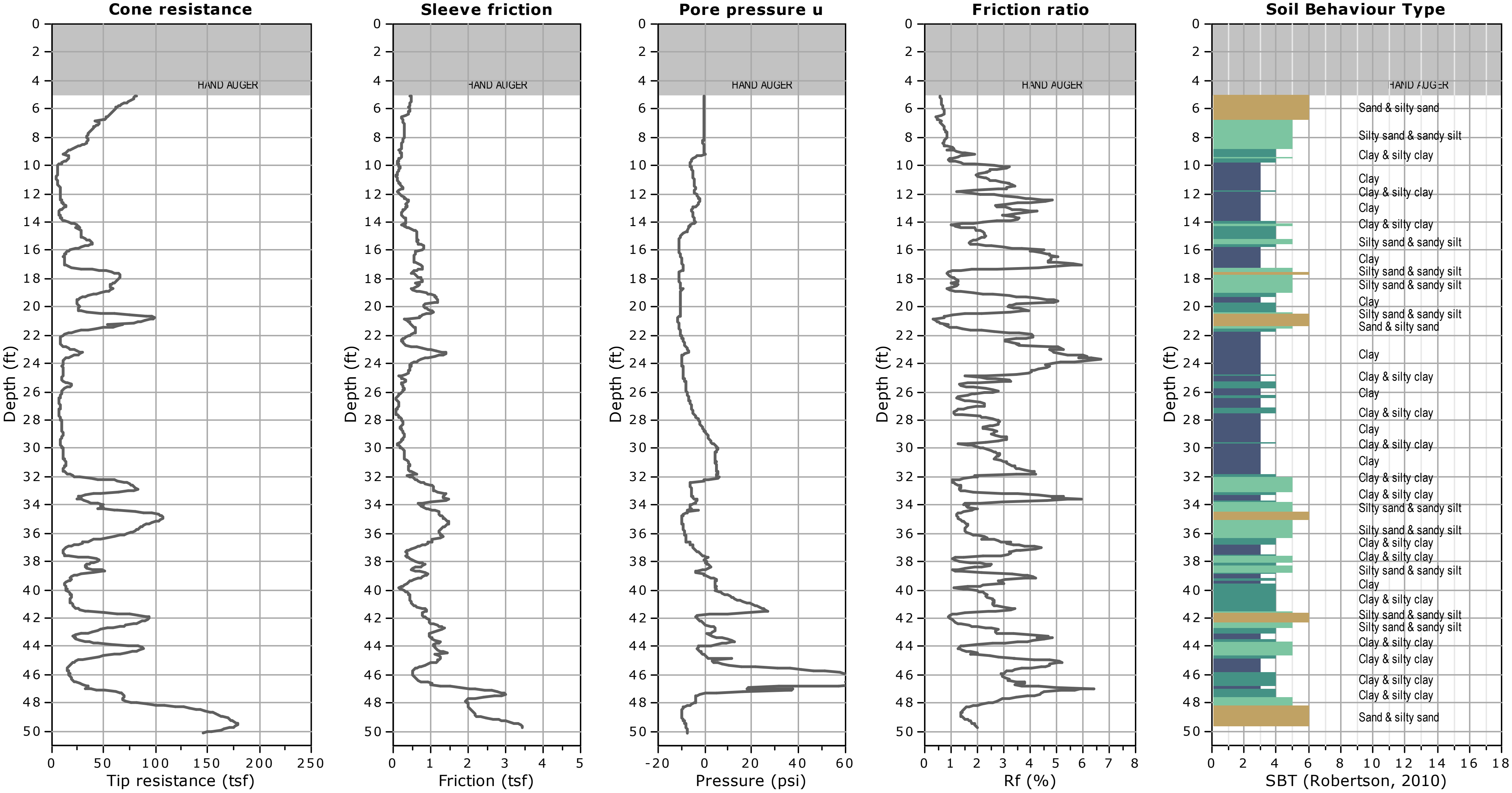
LOGGED BY	DRILLER	DRILL METHOD	DRIVING WEIGHT
klopez	2R Drilling	Hollow-Stem Auger	140 lbs / 30 in

DEPTH	LITHO	DESCRIPTION	H2O	COR	BAG	BLOW COUNT	MC (%)	DD (pcf)	LAB
		Asphalt							
1		**Artificial Fill (Af)**							
2		Sand with Silt (SP-SM): light brown, moist, fine to medium grained		▨		13	4.7	100.4	
3		**Alluvium (Qal)** Sand (SP): brown, damp to moist, loose, fine to medium grained		▨					
4				▨		16	8.4	100.2	
5		@ 4 ft, medium dense		▨					
6		@ 6 ft, loose		▨		12	12.4	87.4	
7									
8									
9									
10		Sandy Silt with Clay (ML): gray brown, moist, soft, fine grained		▨		4	28.5	93.2	
11		Total Depth 11.5 feet No Groundwater		▨					
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									

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

Project: **Albus & Associates**
Location: **9822 Russell Avenue, Garden Grove, CA**

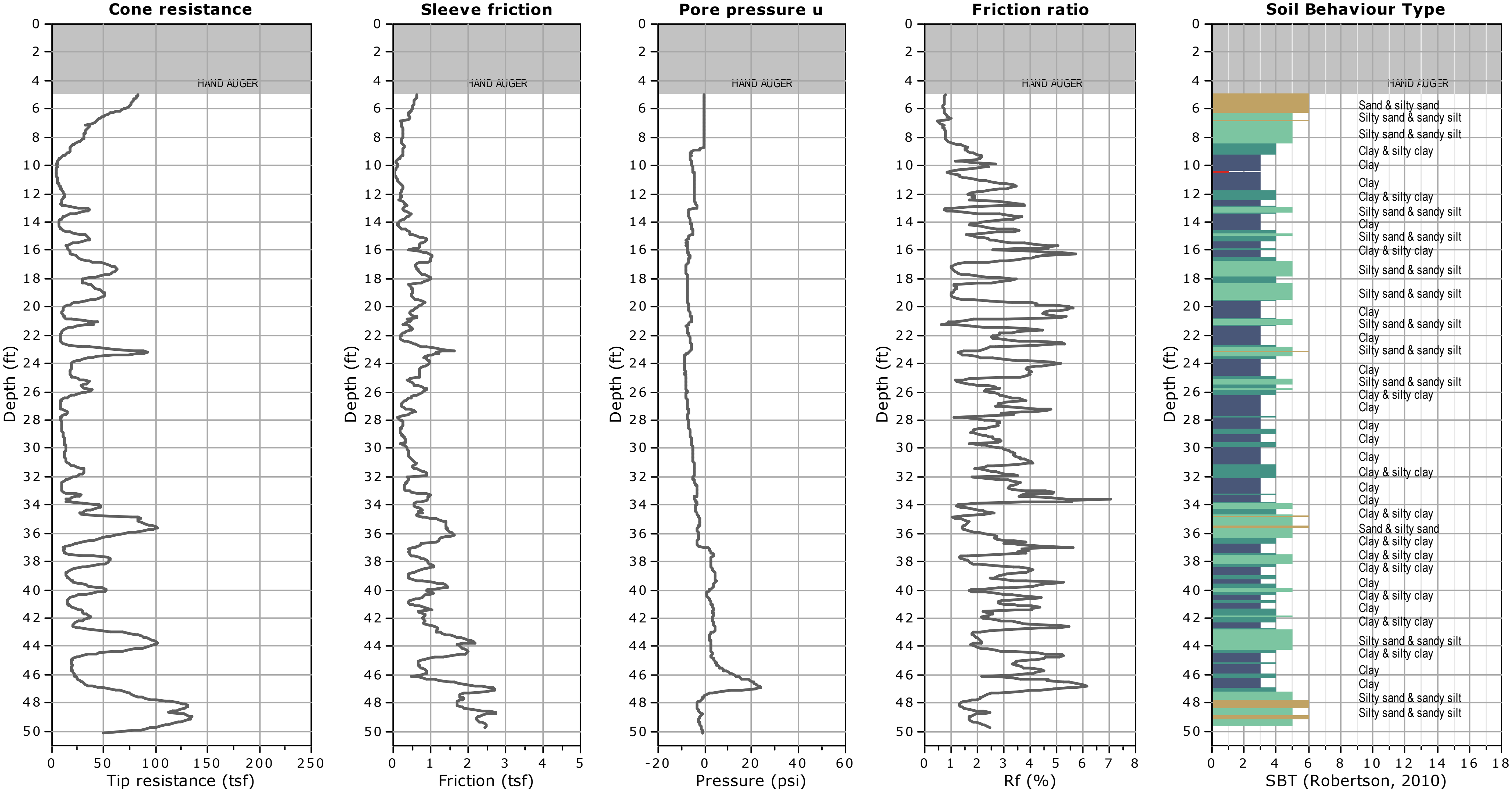
CPT-1
Total depth: 50.07 ft, Date: 6/10/2025



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

Project: **Albus & Associates**
Location: **9822 Russell Avenue, Garden Grove, CA**

CPT-2
Total depth: 50.07 ft, Date: 6/10/2025



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.

Maximum Dry Density and Optimum Moisture Content

Maximum dry density and optimum moisture content of onsite soils were determined for one selected sample in general accordance with Method A of ASTM D1557. Pertinent test values are given on Table B-1.

Expansion Potential

Expansion index testing was performed on a selected sample. The test was performed in accordance with ASTM D4829. The test result is presented on Table B-1.

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-1.

Atterberg Limits

Atterberg Limits (Liquid Limit, Plastic Limit, and Plasticity Index) were performed in accordance with Test Method ASTM D-4318. Pertinent test values are presented within Table B-1.

Particle-Size Analyses and Hydrometer

Particle-size analyses were performed on selected samples in accordance with ASTM D 422. The results are presented graphically on the attached Plates B-1 and B-2.

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. Results of the tests are graphically presented on Plate B-3.

Direct Shear

The Coulomb shear strength parameters, angle of internal friction and cohesion, were determined for a bulk sample obtained from one 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-4.

Percent Passing the No. 200 Sieve

The percentage 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 D1140. Test results are presented on Table B-1.

Corrosion

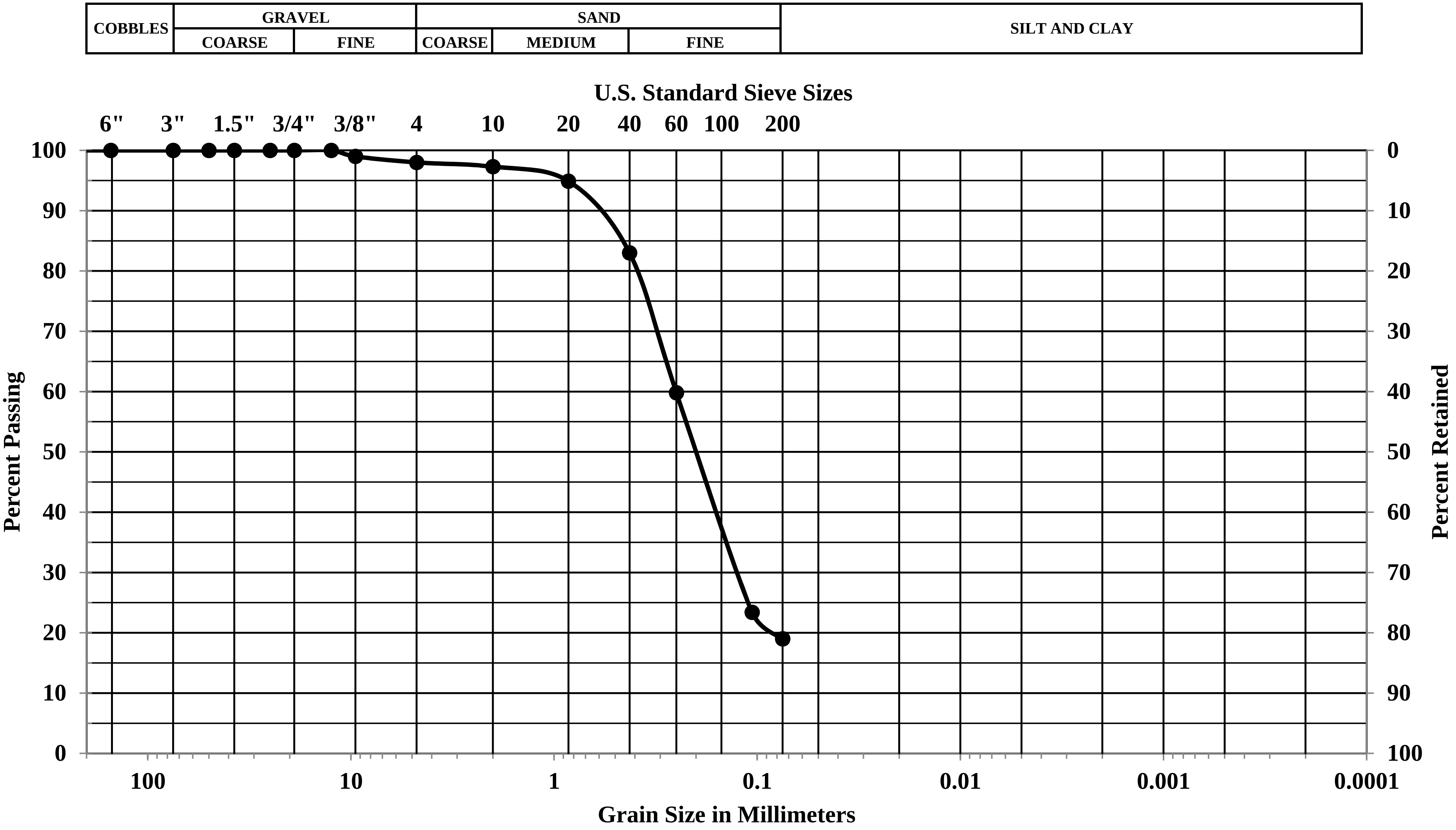
Select samples were tested for minimum resistivity, chloride, and pH in accordance with California Test Method 643. Results of these tests are provided in Table B-1.

TABLE B-1
SUMMARY OF LABORATORY TEST RESULTS

Boring No.	Sample Depth (ft.)	Soil Description	Test Results	
B-1	0-5	Sand with Silt (SP-M)	Maximum Dry Density (pcf): Optimum Moisture Content (%): Expansion Index: Expansion Potential: Soluble Sulfate Content (%): Sulfate Exposure: pH: Chloride (ppm): Minimum Resistivity (ohm-cm):	121 10 0 Very Low 0.015 Negligible 8.3 25 4700
B-1	6	Sand trace Silt (SP)	Passing No. 200 Sieve (%):	2.6
B-1	15	Sandy Silt (ML)	Passing No. 200 Sieve (%):	59.1
B-1	20	Silty Sand / Sandy Silt (SM/ML)	Passing No. 200 Sieve (%):	51
B-1	25	Silty Sand (SM)	Liquid Limit: Plastic Index:	29 5
B-1	35	Silty Sand / Sandy Silt (SM/ML)	Passing No. 200 Sieve (%):	45.5
B-1	45	Silty Sand with Clay (SM-SC)	Liquid Limit: Plastic Index:	36 12

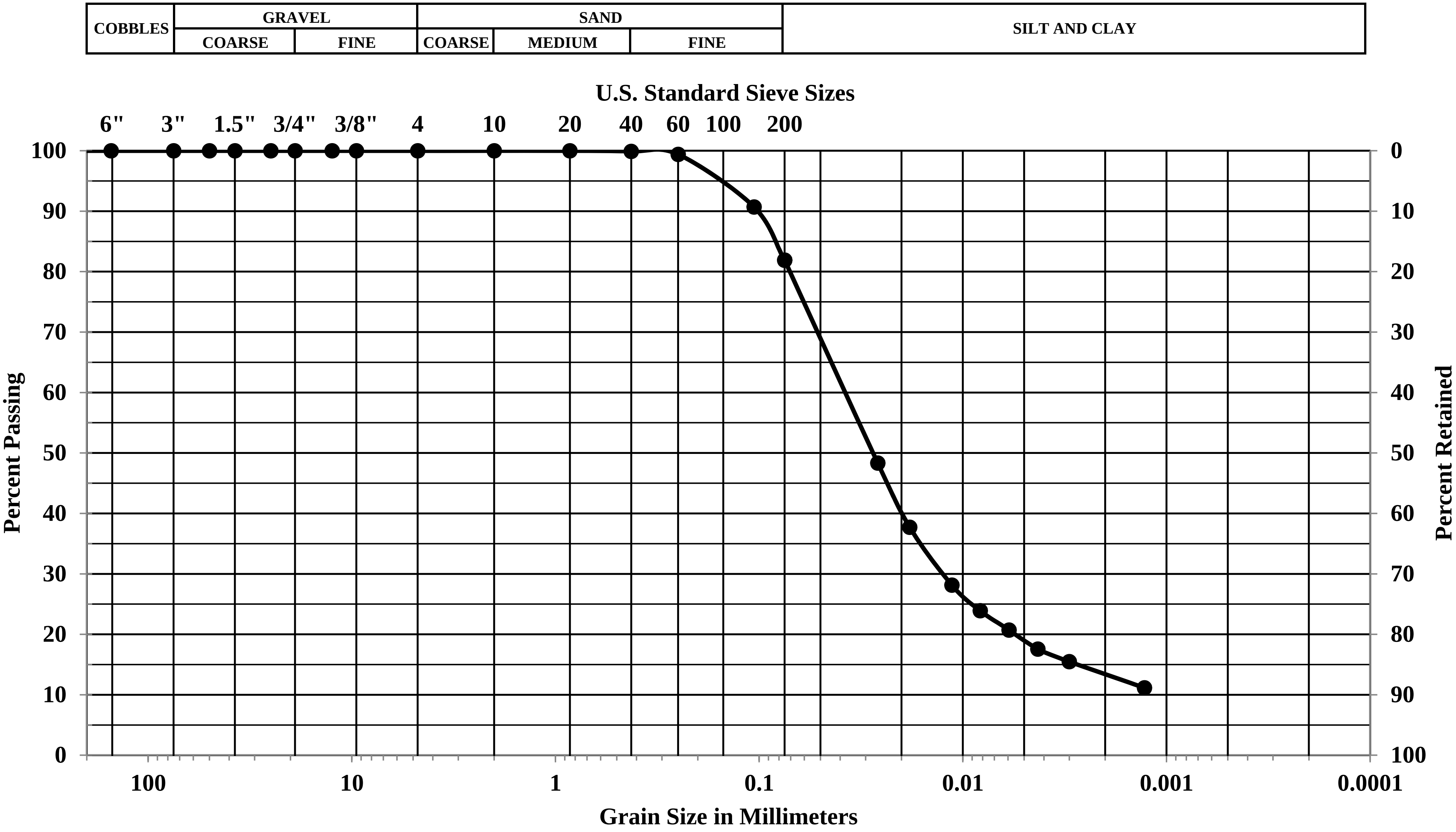
Note: Additional laboratory test results are provided on the boring logs provided in Appendix A.

GRAIN SIZE DISTRIBUTION



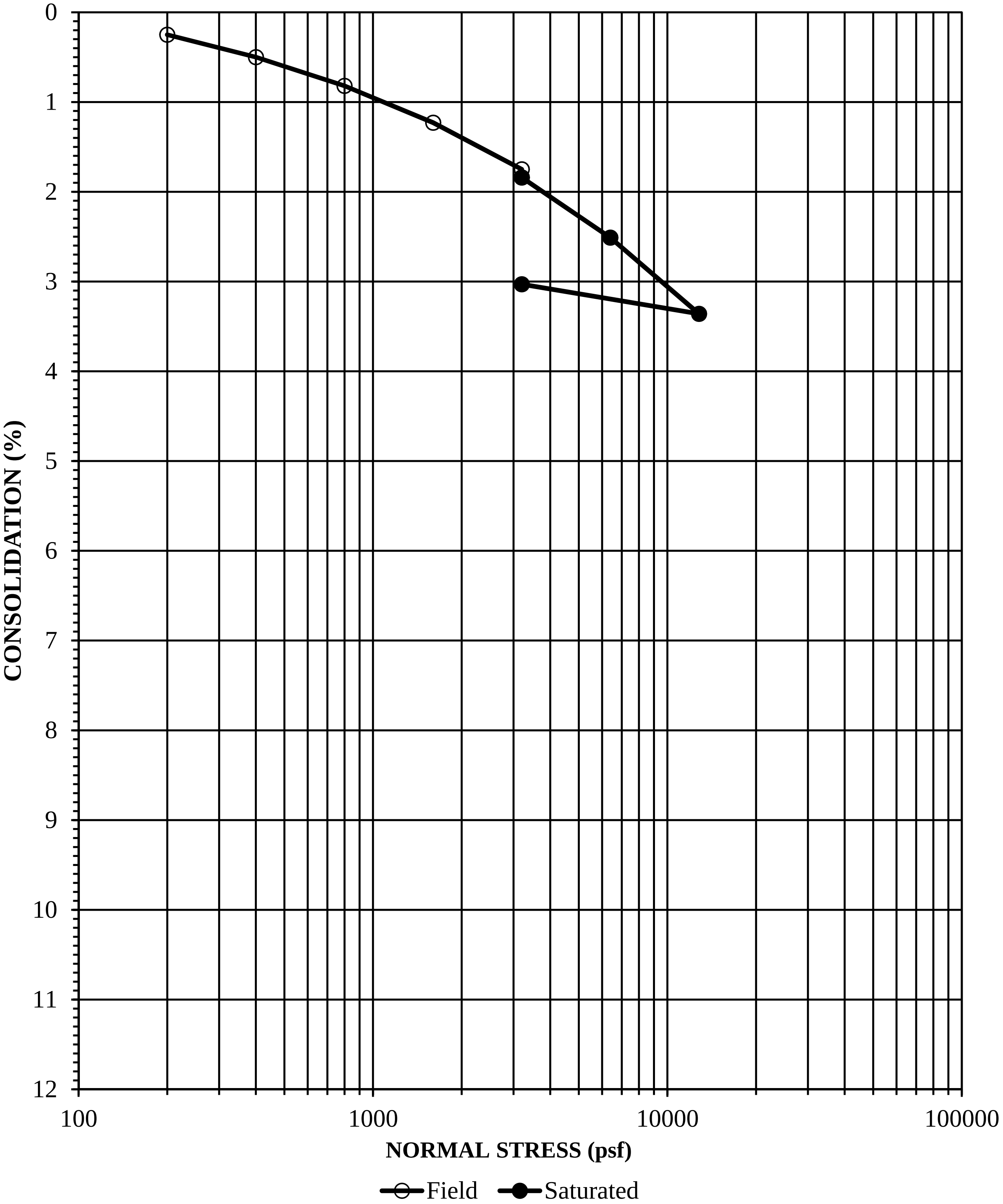
Job Number	**Location**	**Depth**	**Description**
3341.00	B-1	0-5	Sand with Silt (SP-SM)

GRAIN SIZE DISTRIBUTION



Job Number	Location	Depth	Description
3341.00	B-2	10	Silt trace Sand and Clay (ML)

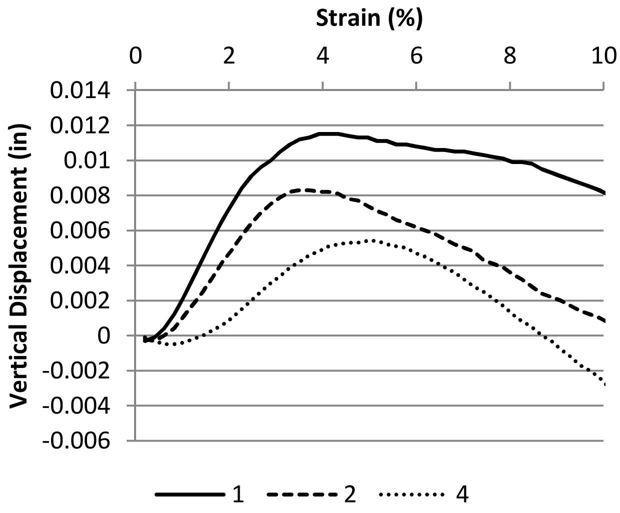
CONSOLIDATION

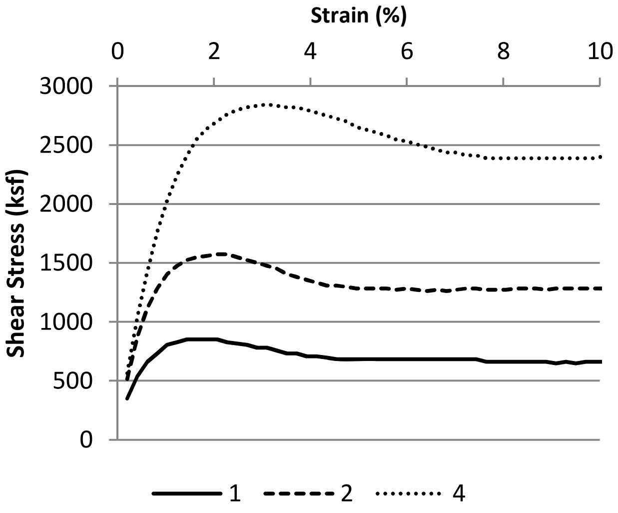


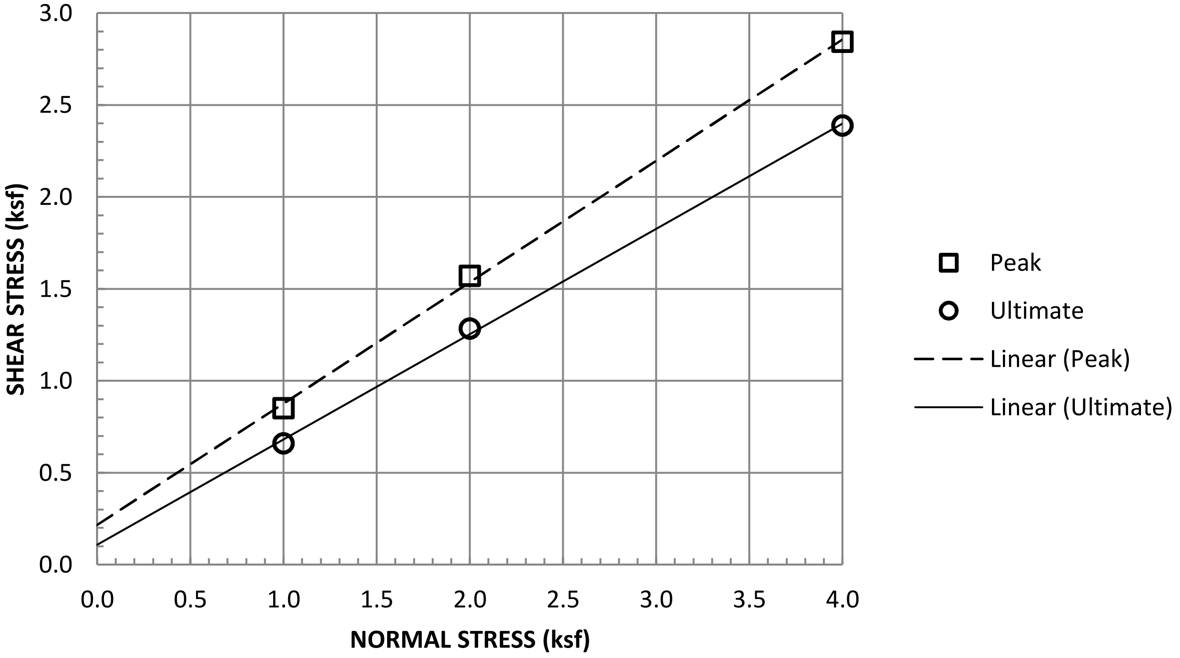
Job Number	Location	Depth	Description
3341.00	B-2	4	Silty Sand (SM)

Initial Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Concent (%)
96.0	10.4	17

DIRECT SHEAR







Sample Type:	Remolded to 90% of 121 pcf, Saturated		
Normal Stress (ksf)	1	2	4
Peak Shear Stress (ksf)	0.852	1.572	2.844
Peak Displacement (in)	0.012	0.008	0.005
Ultimate Shear Stress (ksf)	0.66	1.284	2.388
Ultimate Displacement (in)	0.25	0.25	0.25
Initial Dry Density (pcf)	108.7	108.7	108.7
Initial Moisture Content (%)	10	10	10
Final Moisture Content (%)	15.2	15.1	14.3
Strain Rate (in/min)	0.01		

Job Number	Location	Depth	Description
3341.00	B-1	0-5	Sand with Silt (SP-SM)

APPENDIX C

LIQUEFACTION ANALYSIS

TABLE OF CONTENTS

Kehoe Testing and Engineering
Albus & Associates, Inc.
1011 N. Armando St., Anaheim, CA
www.albusgeo.net

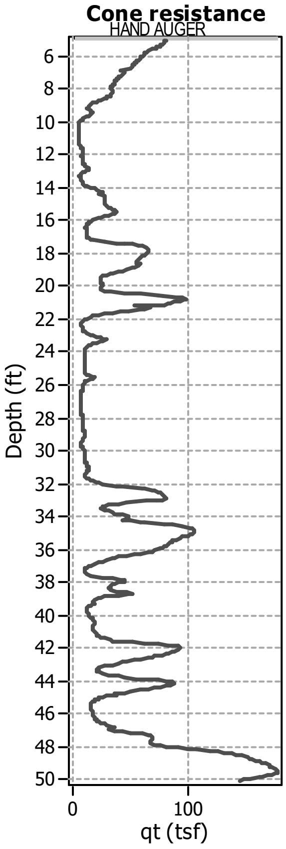
LIQUEFACTION ANALYSIS REPORT

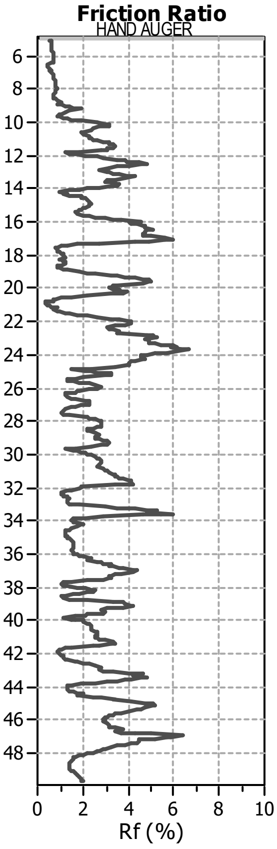
Project title : 3341.00 Melia Homes -- Garden Grove **Location : 9822 Russell Avenue, Garden Grove, CA**

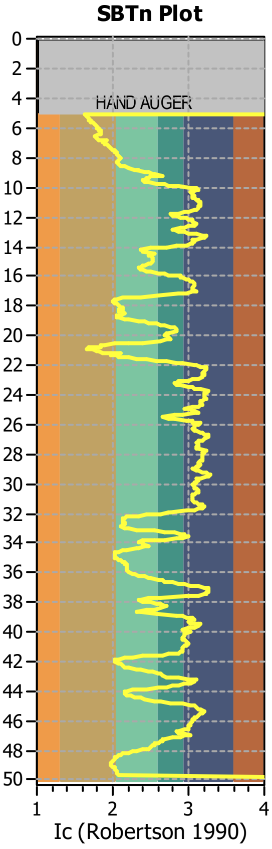
CPT file : CPT-1

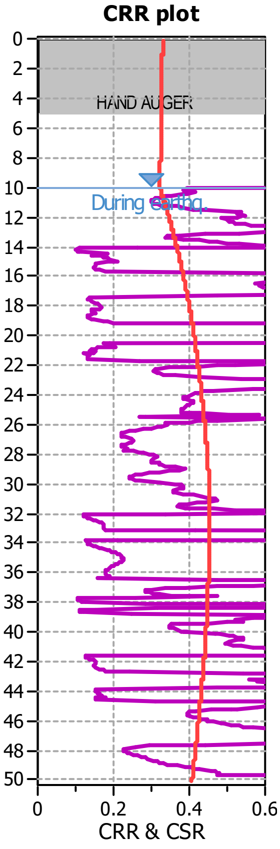
Input parameters and analysis data

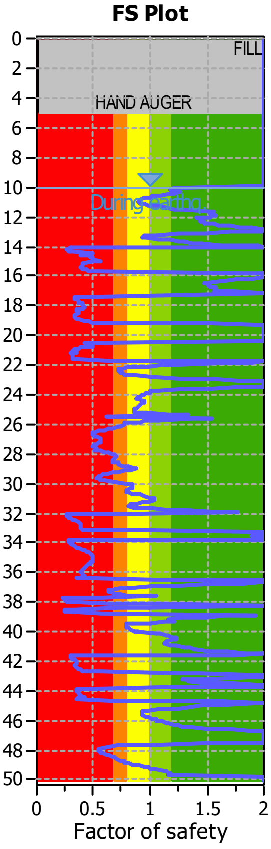
Analysis method:	Robertson (2009)	G.W.T. (in-situ):	14.00 ft	Use fill:	Yes	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	13.00 ft	Fill height:	3.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	120.00 lb/ft^3	Limit depth:	N/A
Earthquake magnitude M_w:	6.74	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.67	Unit weight calculation:	Based on SBT	K_σ applied:	No		

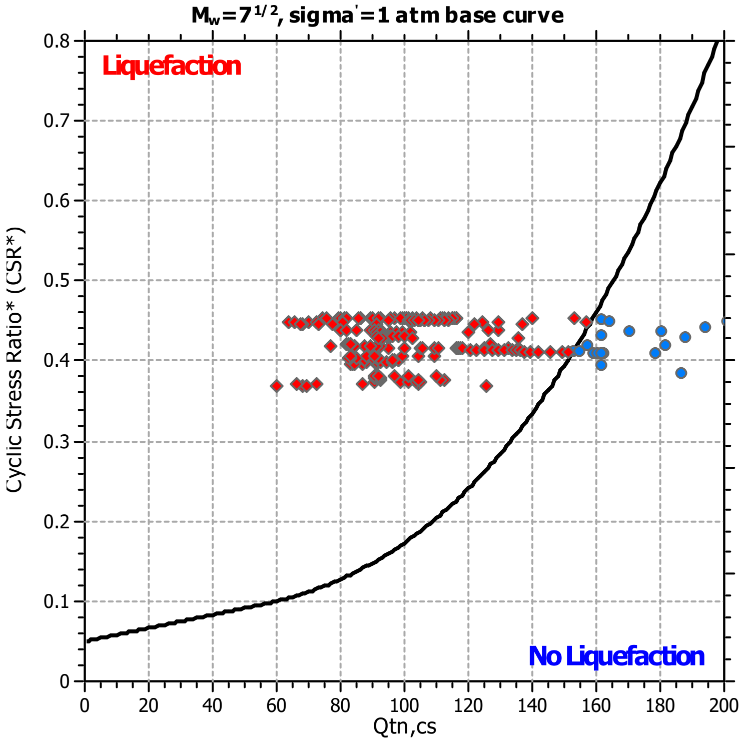

Cone resistance

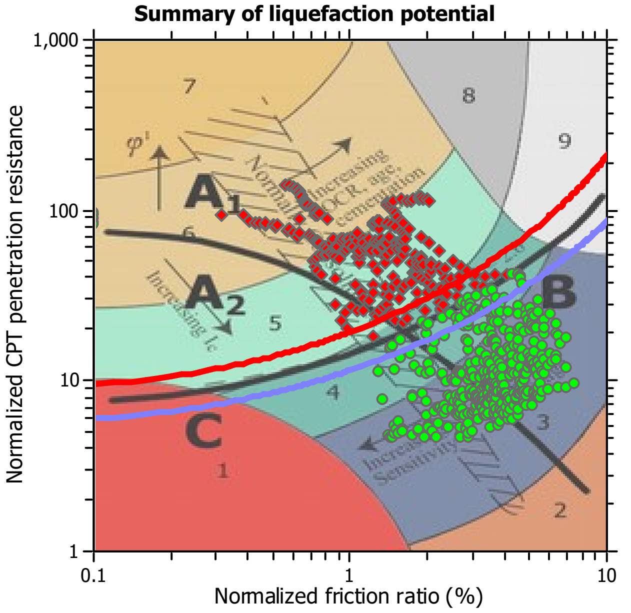

Friction Ratio


SBTn Plot


CRR plot

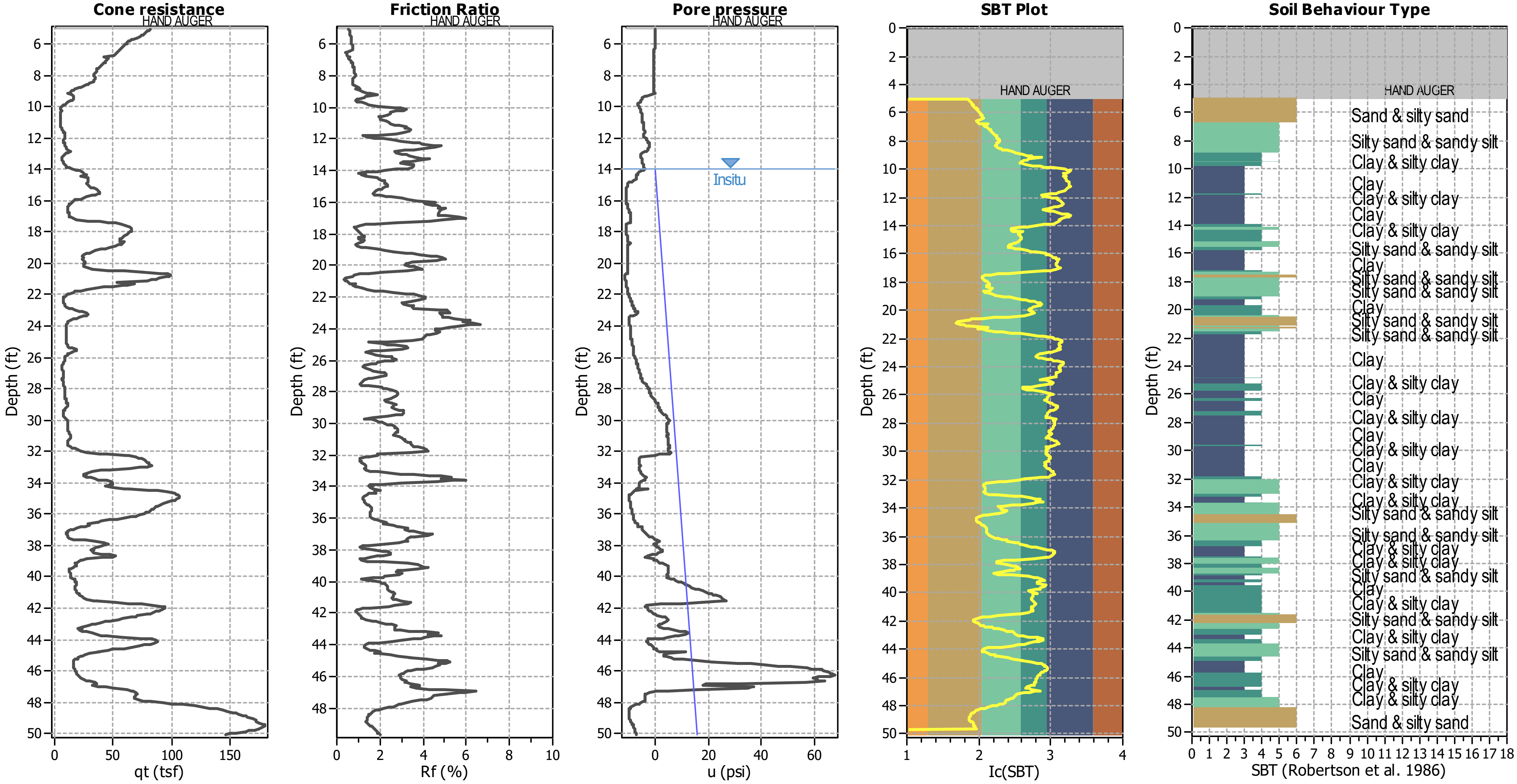

FS Plot


$M_w=7^{1/2}$, sigma'=1 atm base curve


Summary of liquefaction potential

Zone A$_1$: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A$_2$: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



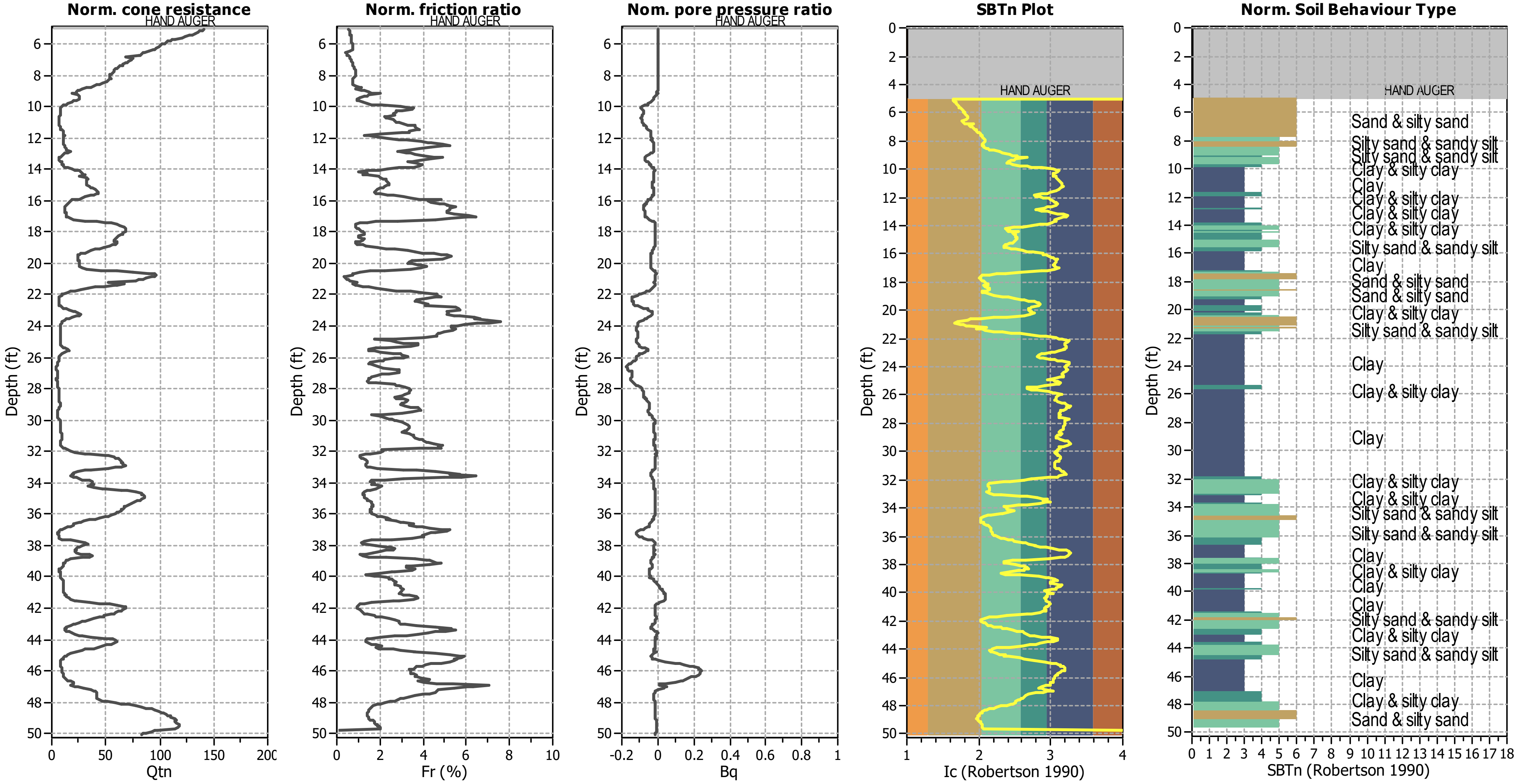
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	13.00 ft	Fill weight:	120.00 lb/ft³
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.74	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.67	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	14.00 ft	Fill height:	3.00 ft	Limit depth:	N/A

SBT legend

🟥	1. Sensitive fine grained	🟩	4. Clayey silt to silty	🟧	7. Gravely sand to sand
🟫	2. Organic material	🟩	5. Silty sand to sandy silt	⬛	8. Very stiff sand to
🟦	3. Clay to silty clay	🟨	6. Clean sand to silty sand	⬜	9. Very stiff fine grained

CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method: Robertson (2009)
Fines correction method: Robertson (2009)
Points to test: Based on Ic value
Earthquake magnitude M_w: 6.74
Peak ground acceleration: 0.67
Depth to water table (insitu): 14.00 ft

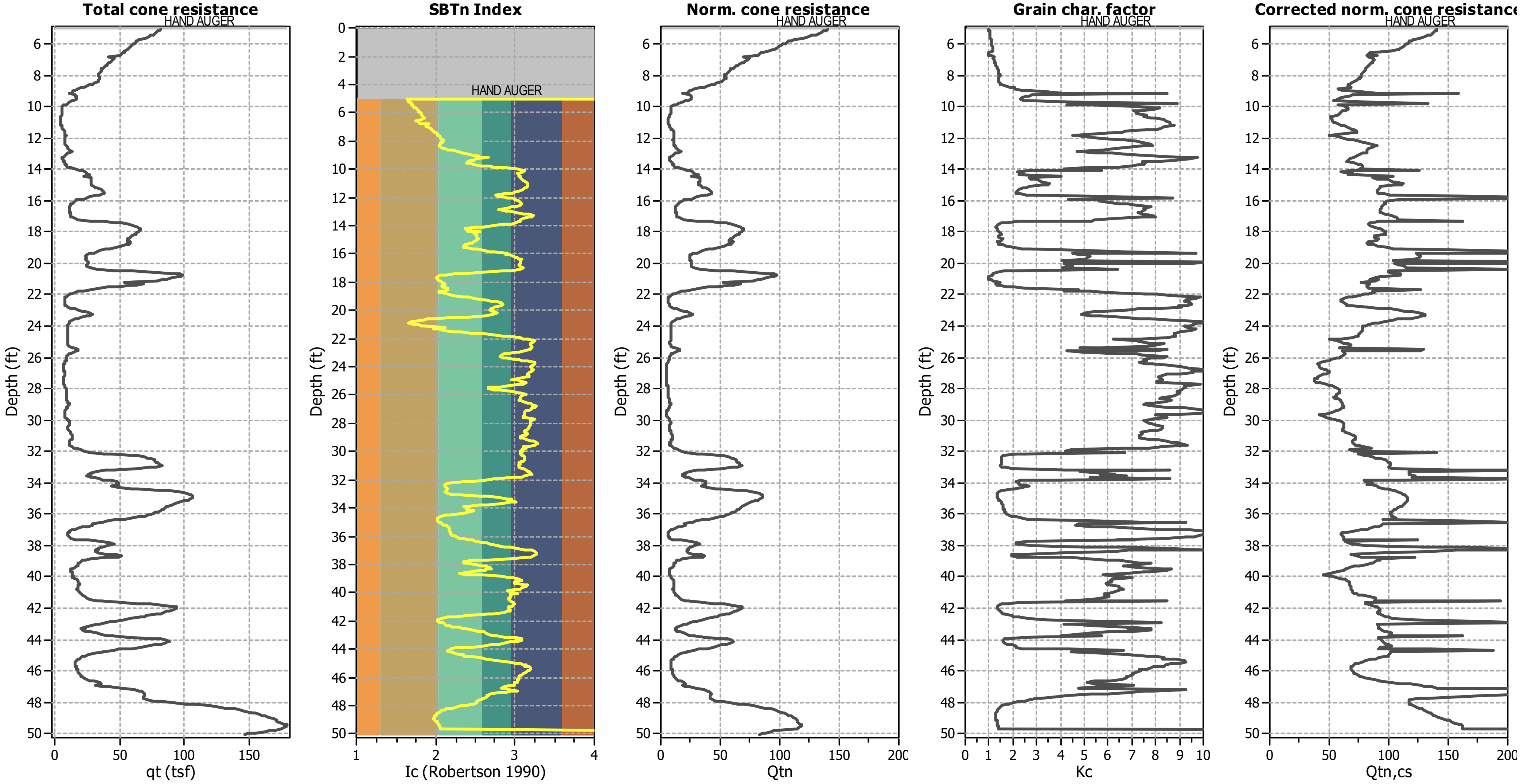
Depth to water table (erthq.): 13.00 ft
Average results interval: 1
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: Yes
Fill height: 3.00 ft

Fill weight: 120.00 lb/ft³
Transition detect. applied: No
K_σ applied: No
Clay like behavior applied: All soils
Limit depth applied: No
Limit depth: N/A

SBTn legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty
- 🟩 5. Silty sand to sandy silt
- 🟫 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to
- ⬜ 9. Very stiff fine grained

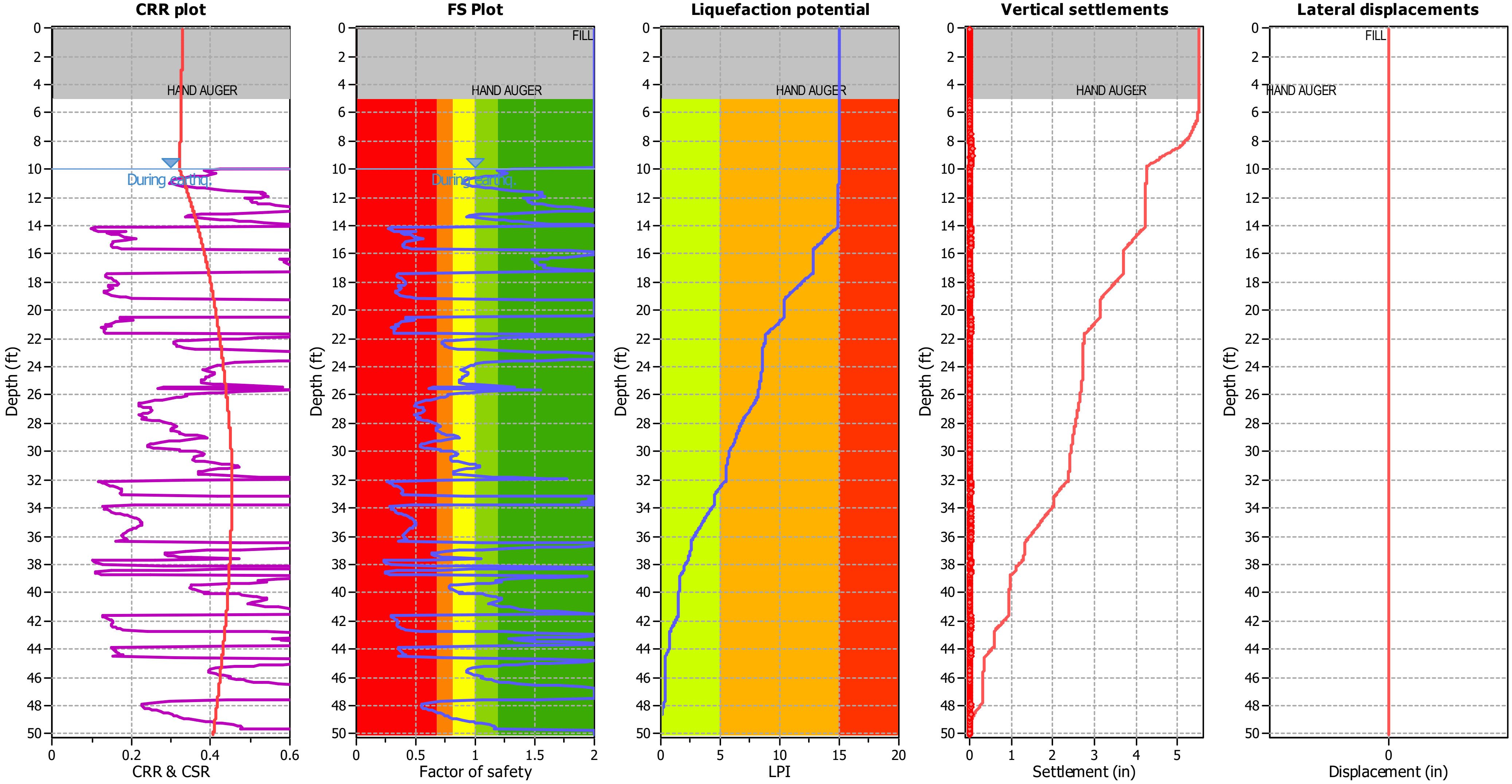
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	13.00 ft	Fill weight:	120.00 lb/ft³
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.74	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.67	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	14.00 ft	Fill height:	3.00 ft	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	13.00 ft	Fill weight:	120.00 lb/ft^3
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.74	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.67	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	14.00 ft	Fill height:	3.00 ft	Limit depth:	N/A

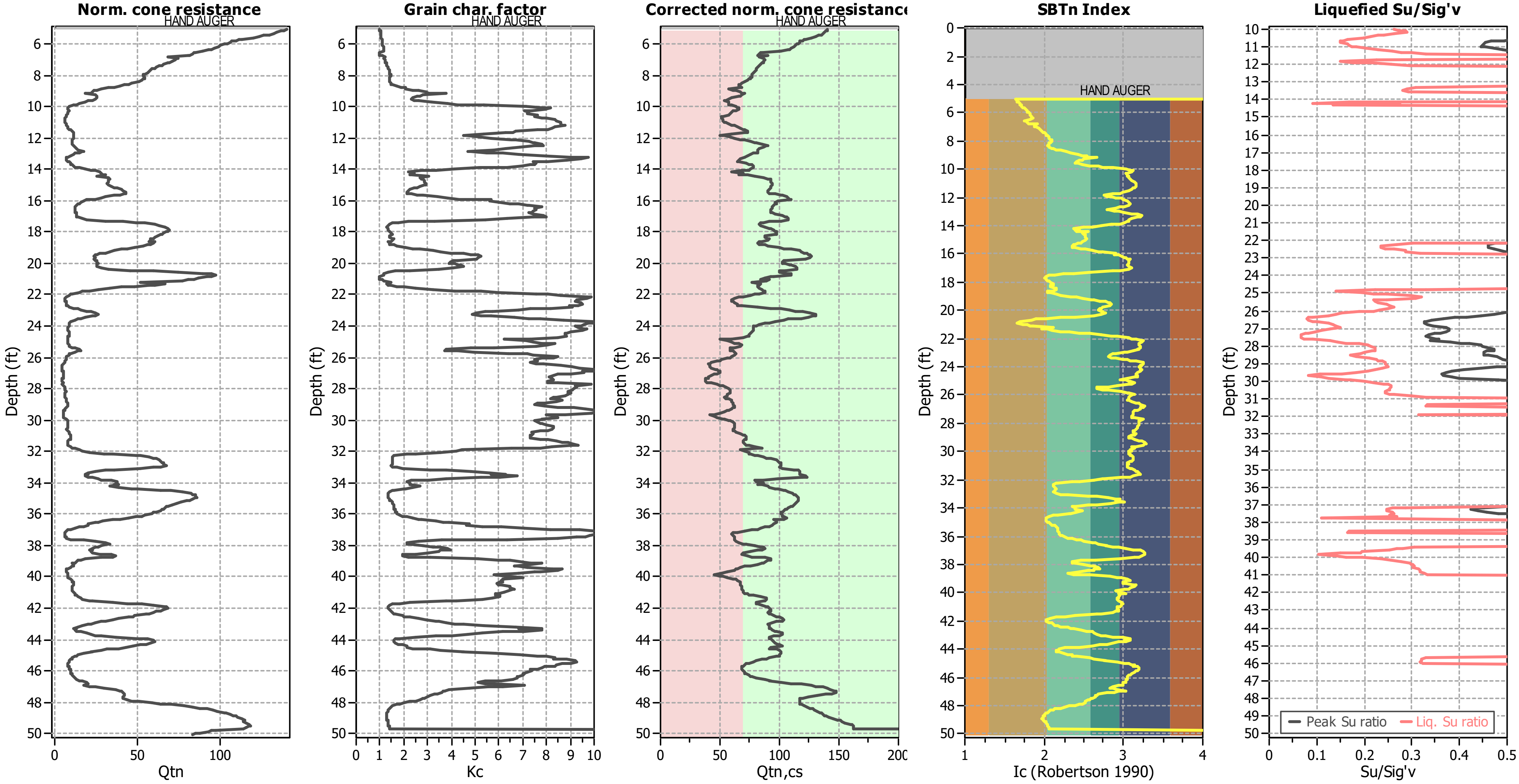
F.S. color scheme

🟥 Almost certain it will liquefy
🟧 Very likely to liquefy
🟨 Liquefaction and no liq. are equally likely
🟩 Unlike to liquefy
🟩 Almost certain it will not liquefy

LPI color scheme

🟥 Very high risk
🟧 High risk
🟩 Low risk

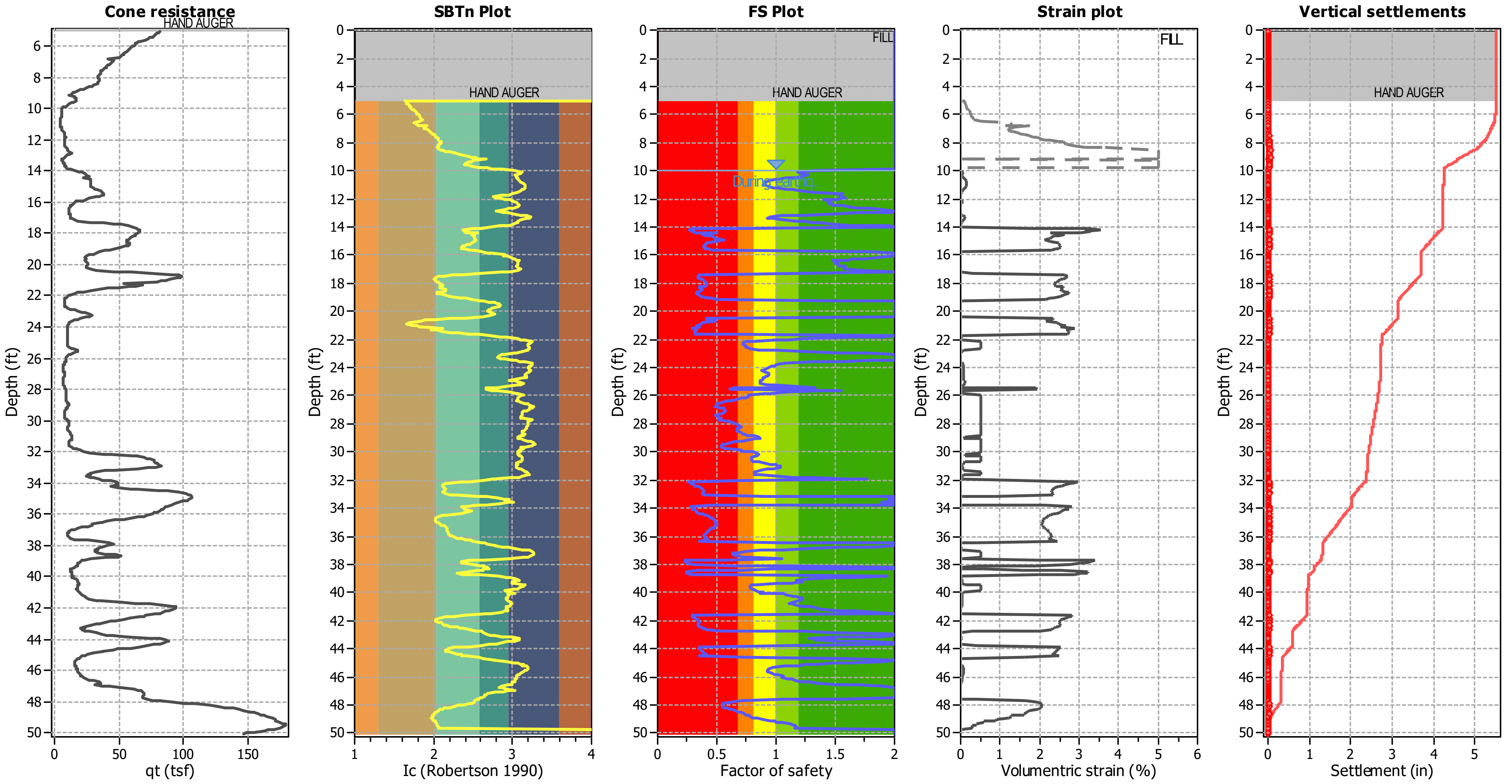
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	13.00 ft	Fill weight:	120.00 lb/ft^3
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.74	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.67	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	14.00 ft	Fill height:	3.00 ft	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

Kehoe Testing and Engineering
Albus & Associates, Inc.
1011 N. Armando St., Anaheim, CA
www.albusgeo.net

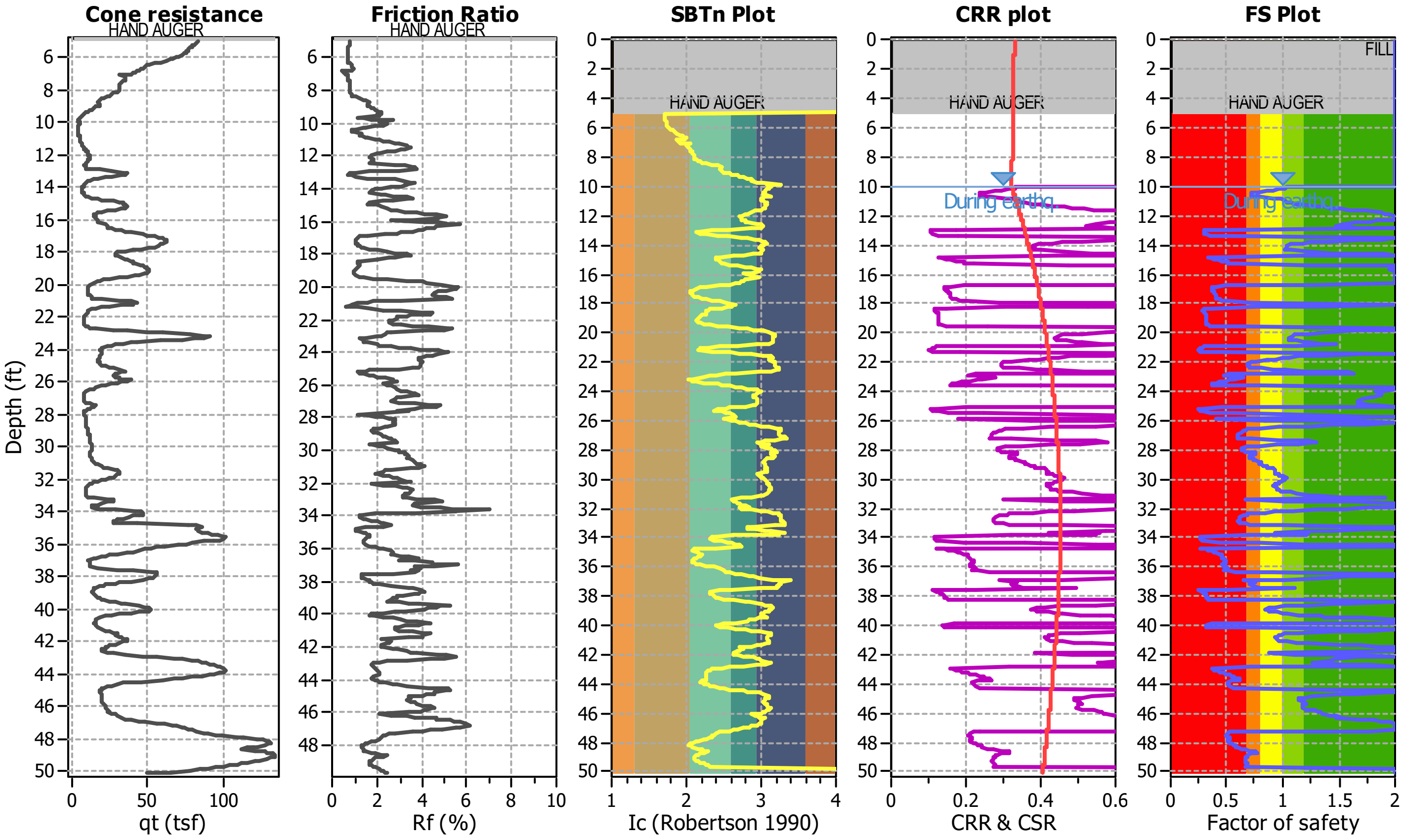
LIQUEFACTION ANALYSIS REPORT

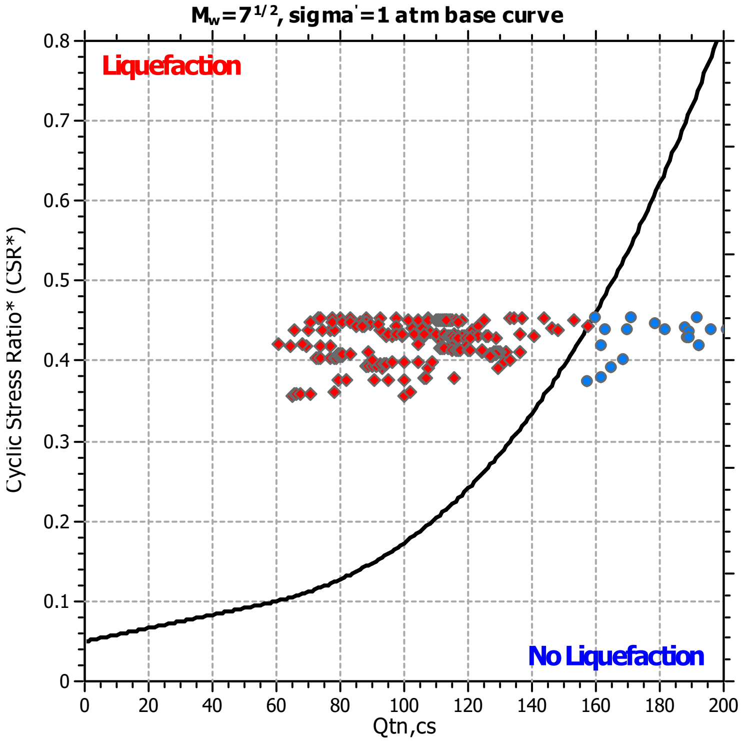
Project title : 3341.00 Melia Homes -- Garden Grove **Location : 9822 Russell Avenue, Garden Grove, CA**

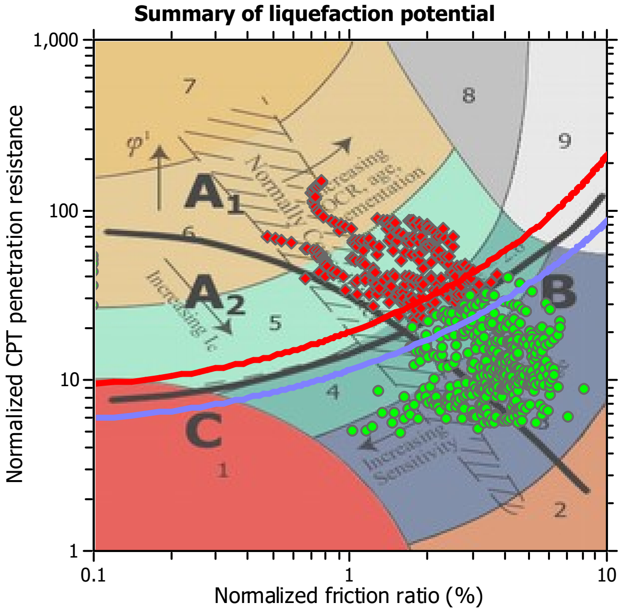
CPT file : CPT-2

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	14.00 ft	Use fill:	Yes	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	13.00 ft	Fill height:	3.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	120.00 lb/ft³	Limit depth:	N/A
Earthquake magnitude M_w:	6.74	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.67	Unit weight calculation:	Based on SBT	K_σ applied:	No		

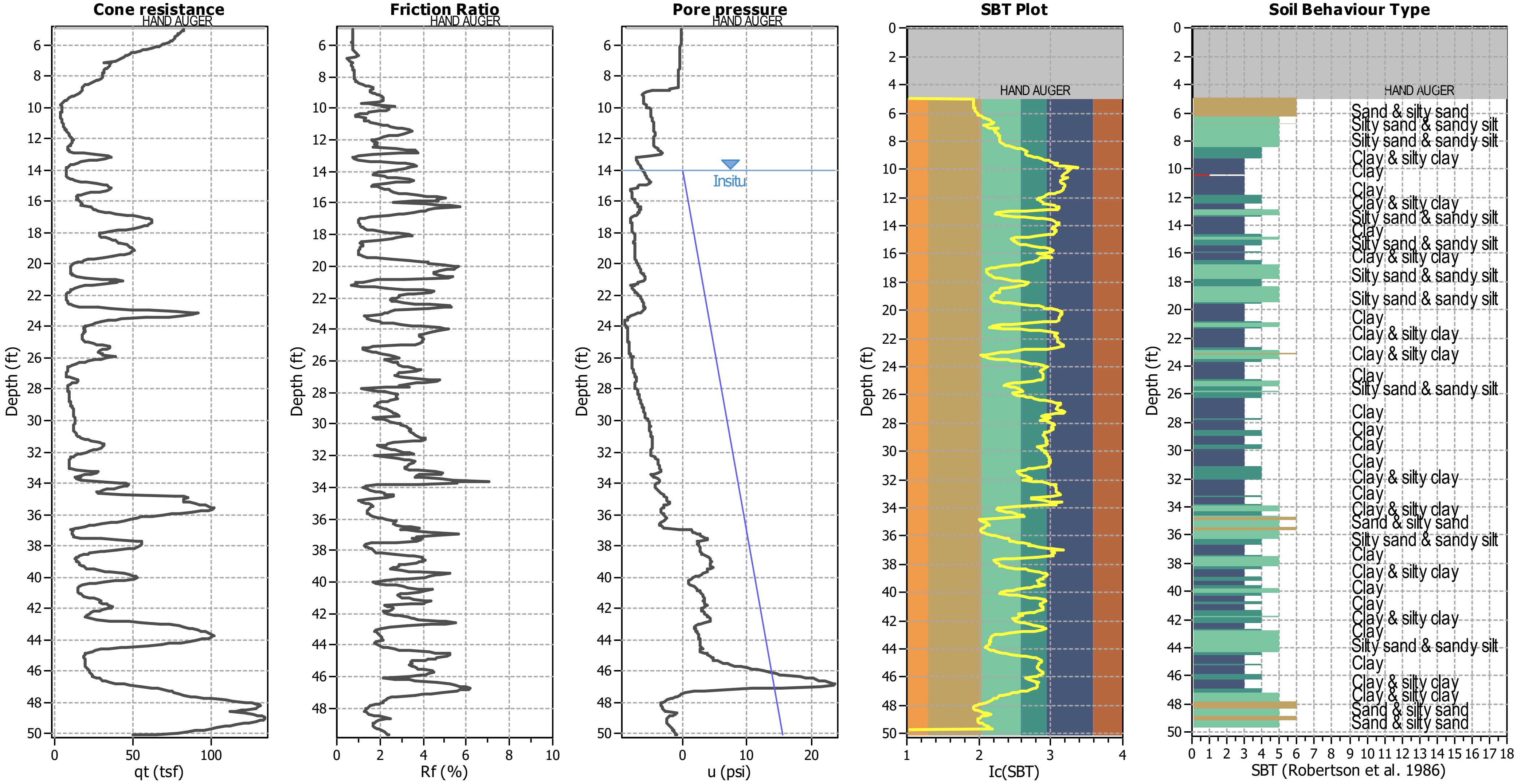






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



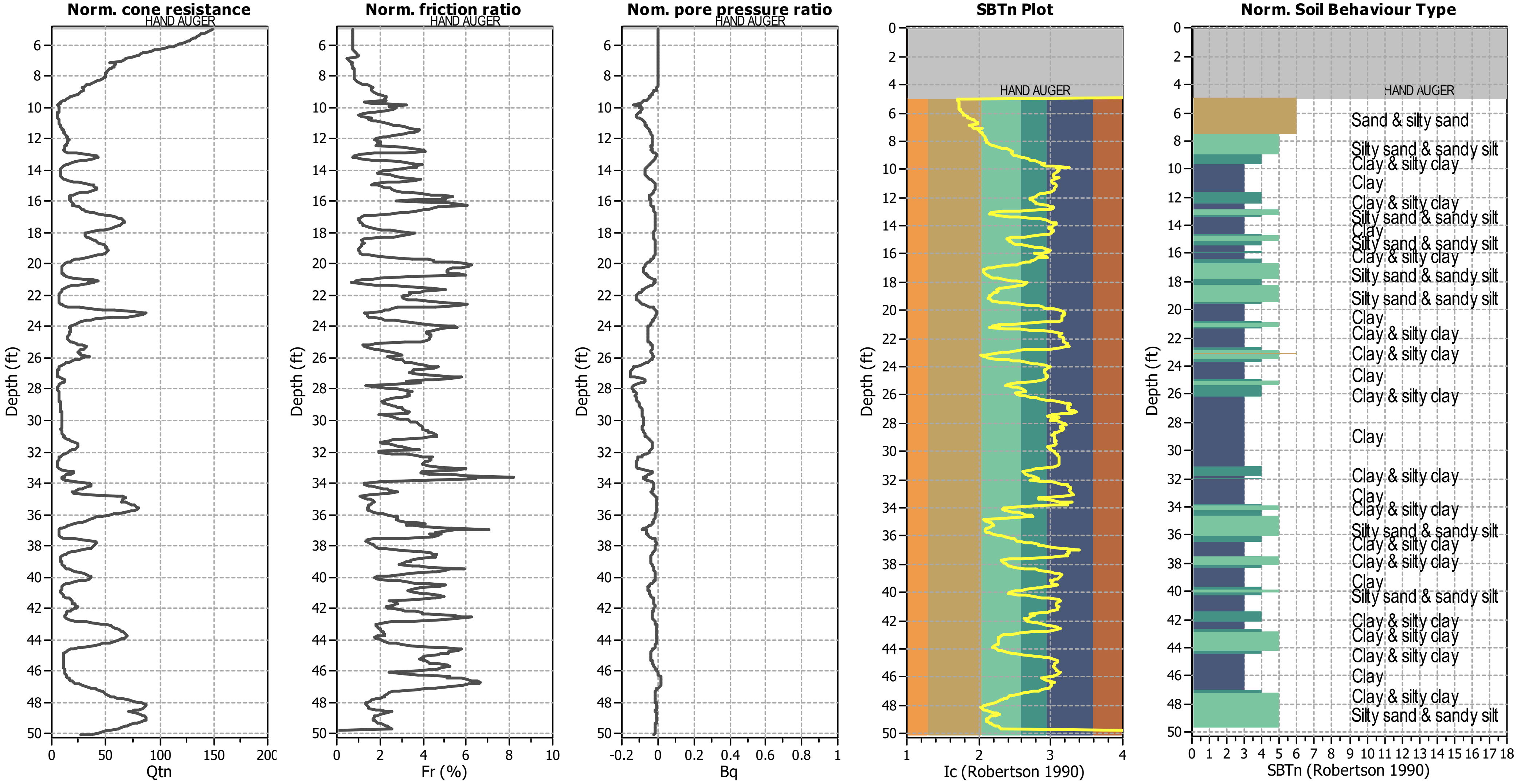
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	13.00 ft	Fill weight:	120.00 lb/ft³
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.74	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.67	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	14.00 ft	Fill height:	3.00 ft	Limit depth:	N/A

SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟫 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	13.00 ft	Fill weight:	120.00 lb/ft^3
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.74	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.67	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	14.00 ft	Fill height:	3.00 ft	Limit depth:	N/A

SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
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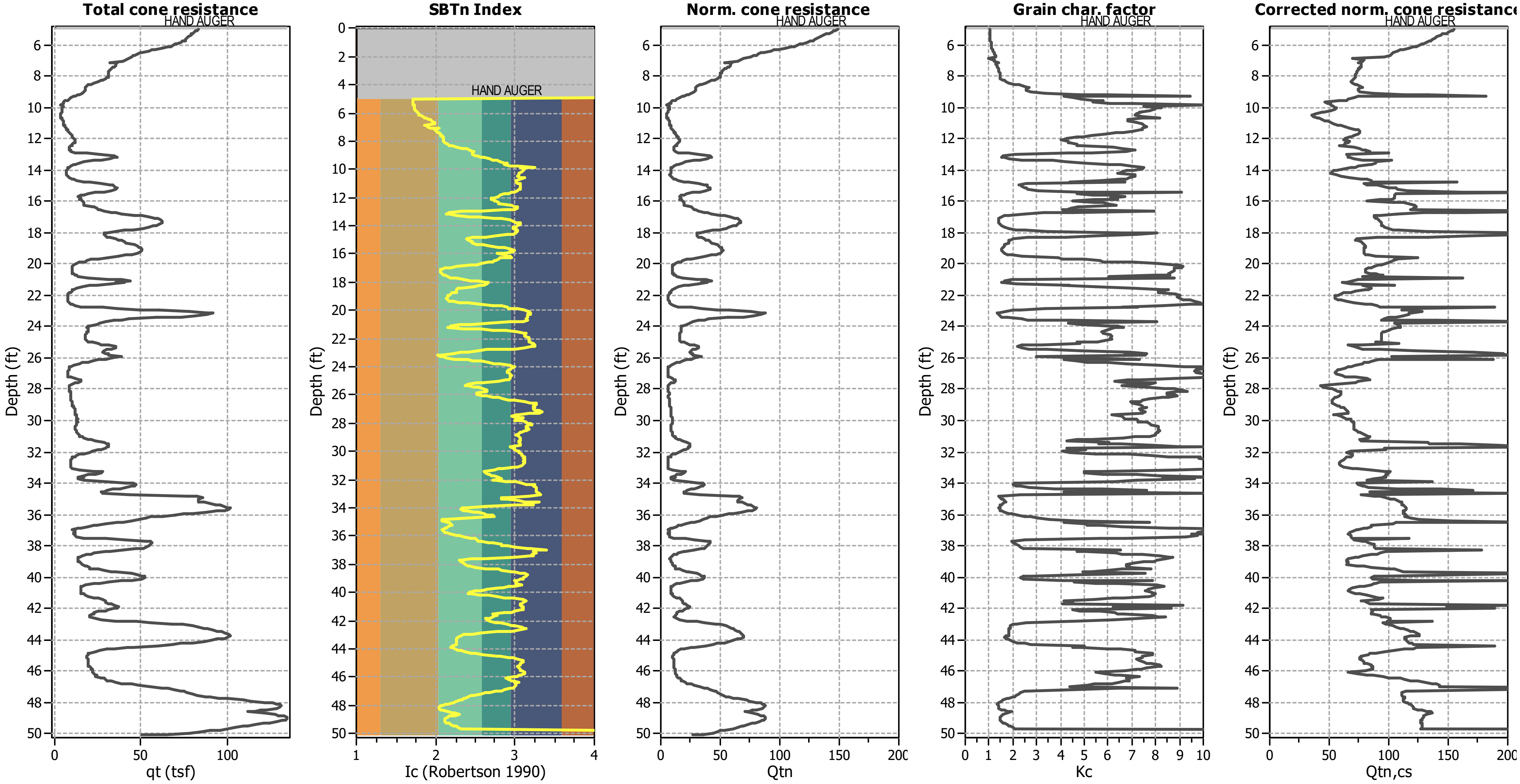
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

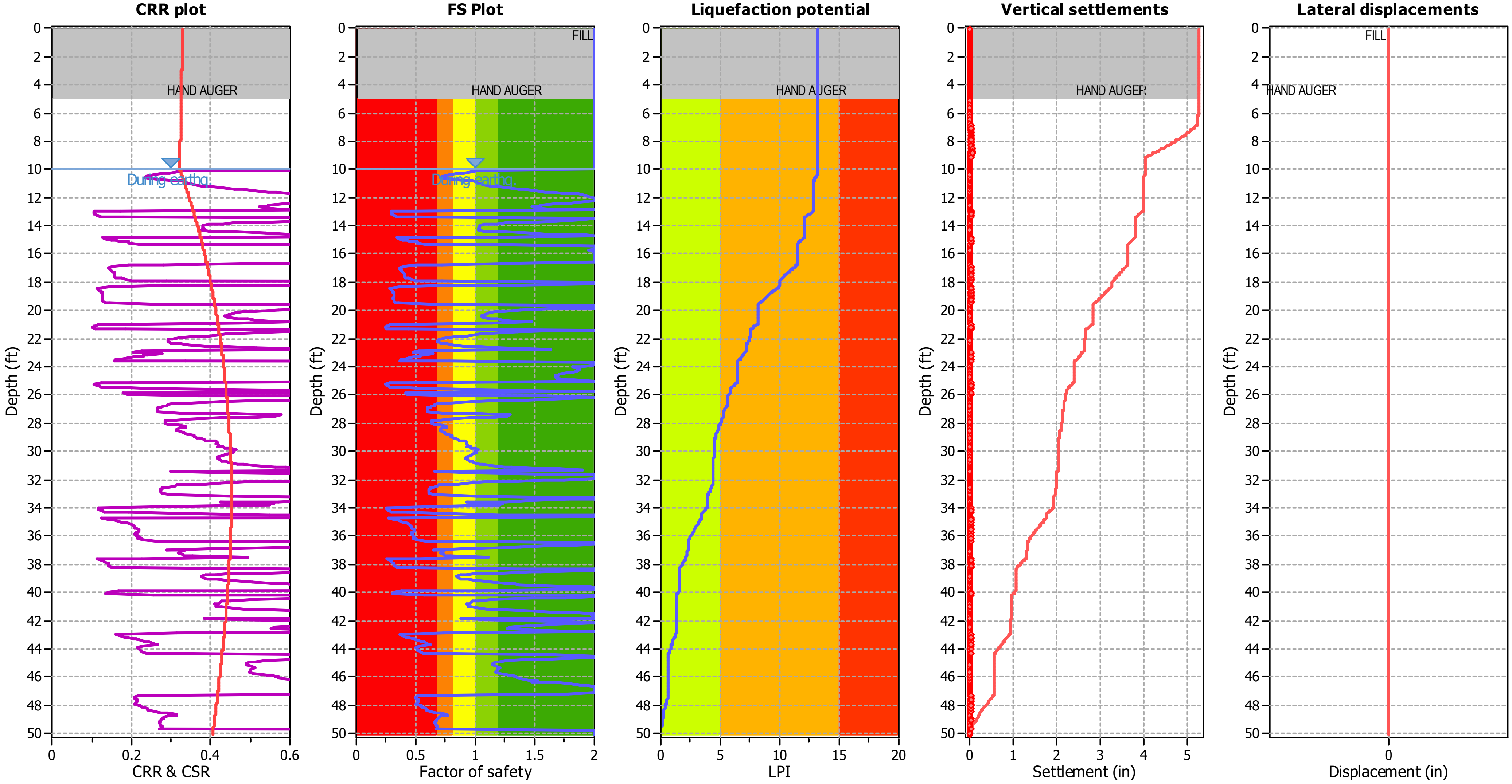
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	13.00 ft	Fill weight:	120.00 lb/ft^3
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.74	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.67	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	14.00 ft	Fill height:	3.00 ft	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	13.00 ft	Fill weight:	120.00 lb/ft³
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.74	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.67	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	14.00 ft	Fill height:	3.00 ft	Limit depth:	N/A

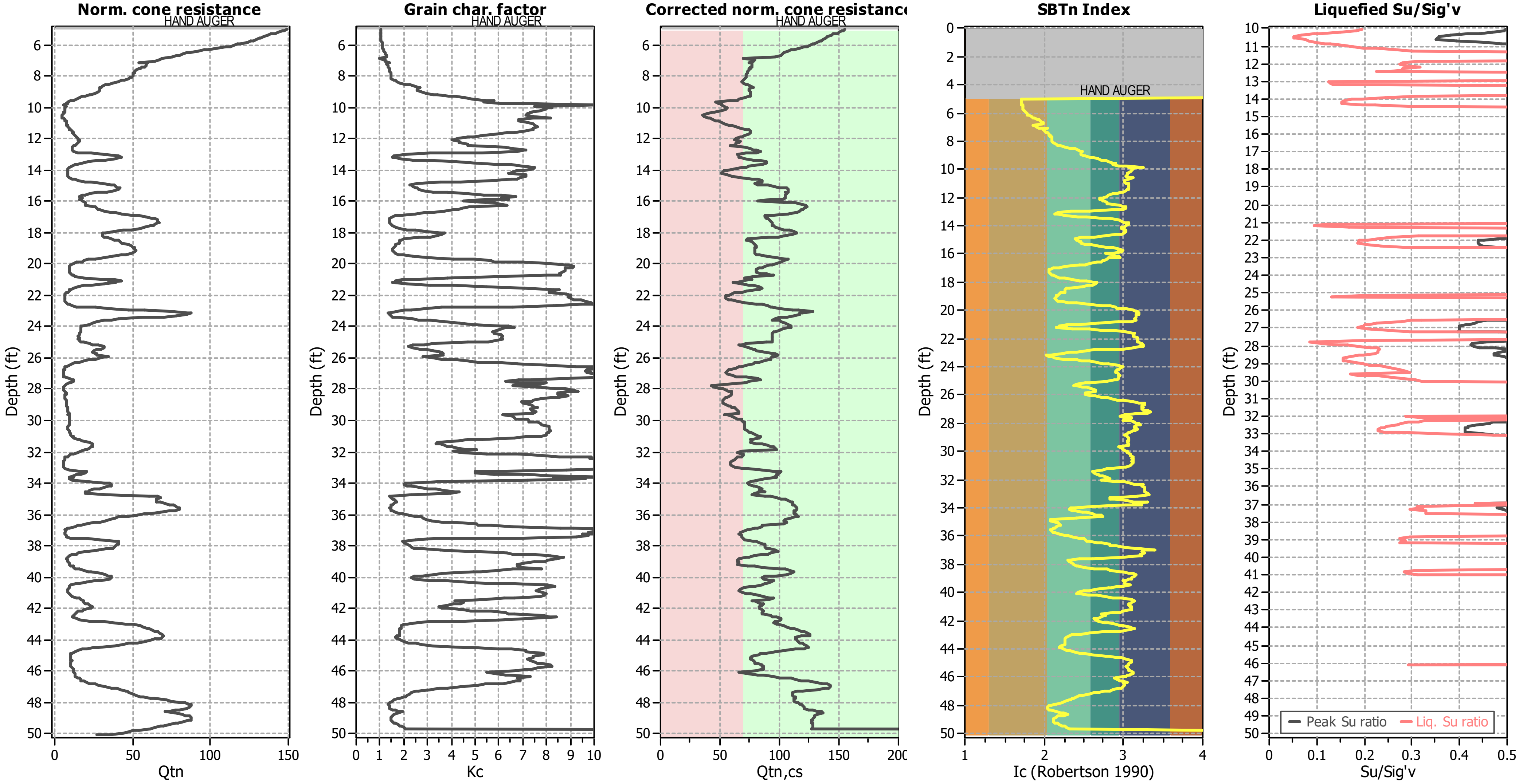
F.S. color scheme

🟥 Almost certain it will liquefy
🟧 Very likely to liquefy
🟨 Liquefaction and no liq. are equally likely
🟩 Unlike to liquefy
🟩 Almost certain it will not liquefy

LPI color scheme

🟥 Very high risk
🟧 High risk
🟩 Low risk

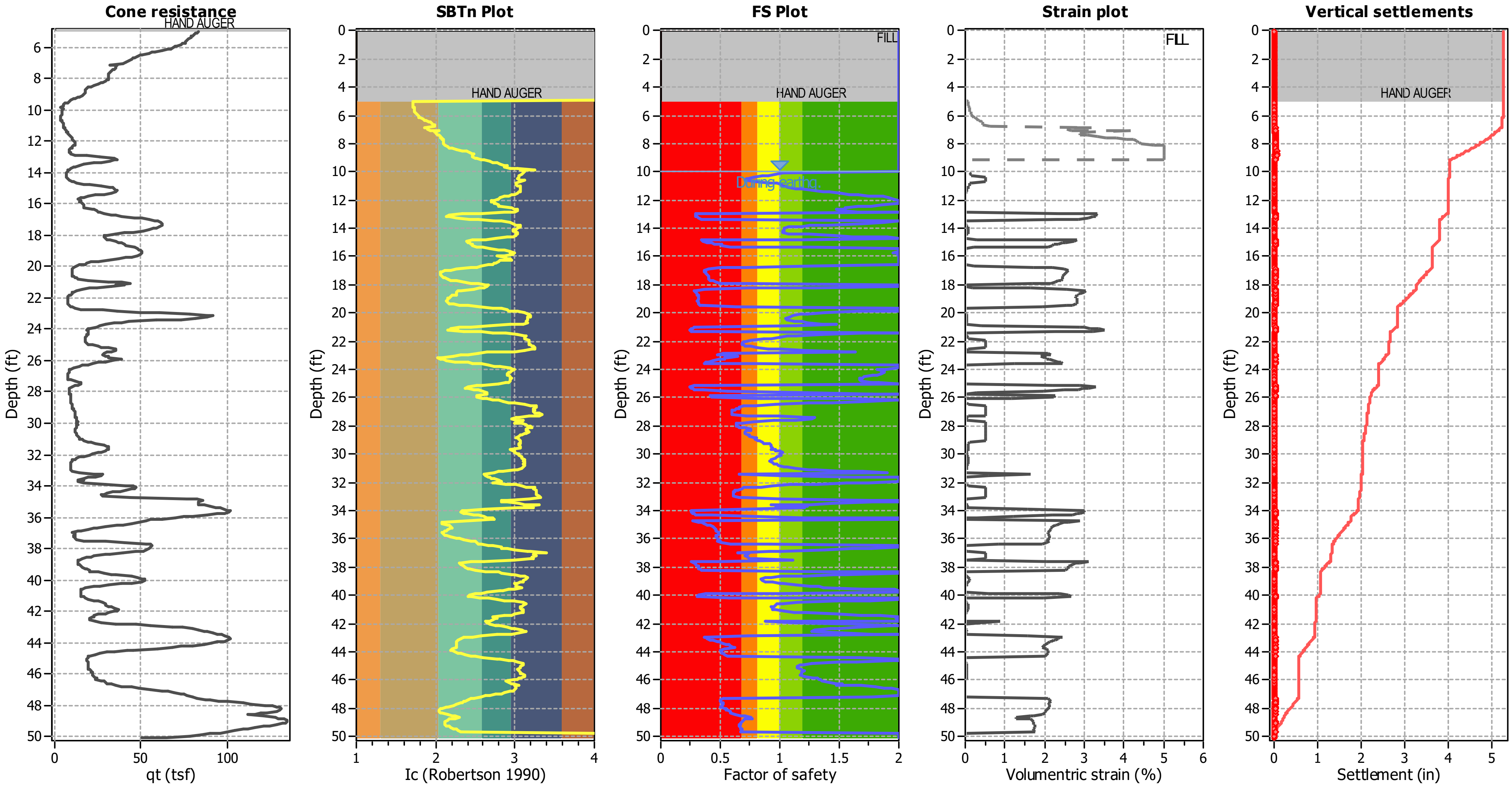
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	13.00 ft	Fill weight:	120.00 lb/ft³
Fines correction method:	Robertson (2009)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.74	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.67	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	14.00 ft	Fill height:	3.00 ft	Limit depth:	N/A

Estimation of post-earthquake settlements



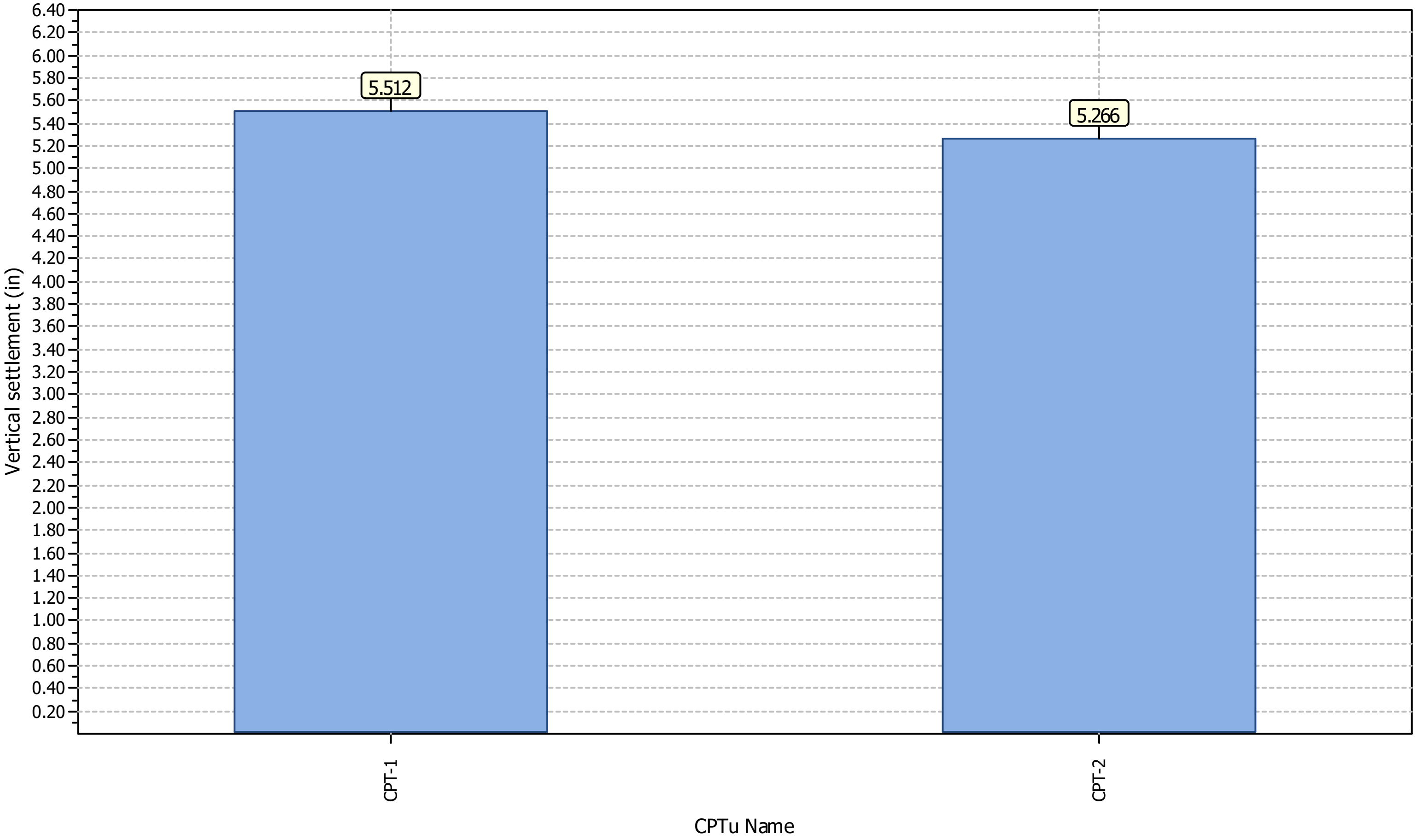
Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

Project title : 3341.00 Melia Homes -- Garden Grove

Location : 9822 Russell Avenue, Garden Grove, CA

Overall vertical settlements report



APPENDIX F

ALBUS & ASSOCIATES, INC.'S PRELIMINARY GEOTECHNICAL INVESTIGATION FOR PROPOSED WATER QUALITY IMPROVEMENTS, PROPOSED RESIDENTIAL DEVELOPMENT, 9822 RUSSELL AVENUE, GARDEN GROVE, CALIFORNIA, DATED OCTOBER 20, 2025

ALBUS & ASSOCIATES

October 20, 2025
J.N.: 3341.00

Mr. Chad Brown
Melia Homes
8951 Research Drive
Irvine, California 92618

Subject: **Preliminary Geotechnical Investigation for Proposed Water Quality Improvements, Proposed Residential Development, 9822 Russell Avenue, Garden Grove, California**

Dear Mr. Wister,

Albus & 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

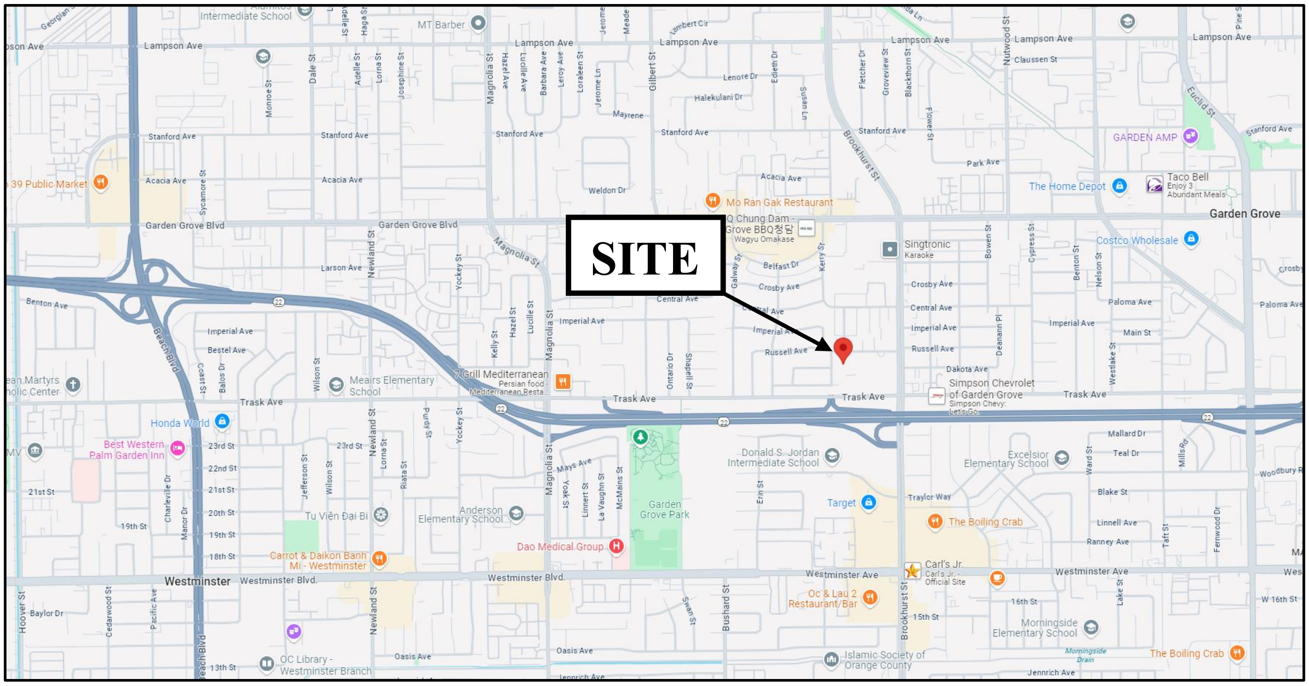
SITE DESCRIPTION AND PROPOSED DEVELOPMENT

Site Location and Description

The property is located at 9822 Russell Avenue within the city of Garden Grove. The site is rectangularly shaped and bordered by Kerry Street to the west, Russel Avenue to the north, residential properties to the south, and Sunnyside Elementary School to the east. The location of the site and its relationship to the surrounding areas are shown on Figure 1, Site Location Map.

The site is currently occupied by a church located within the northwest corner of the site. Additional structures are also present within the northwest portion of the site and appear to be associated with a child day care center. The remainder of the site is covered in asphalt with driveways and parking bays associated with the onsite improvements. Chain link fencing is present along the east and a portion of the south. A masonry block wall is also present along the south property line.

The site is relatively flat with elevations ranging from 70 to 72 feet above Mean Sea Level (based on Google Earth). Drainage is generally directed as sheet flow to either Russell Avenue or to Kerry Street. Site vegetation consists of bushes and moderate sized trees.



© 2025 Google

FIGURE 1-SITE LOCATION MAP

Proposed Residential Development
9822 Russell Avenue, Garden Grove, California

NOT TO SCALE

Proposed Development

Review of the conceptual site plan provided suggests the site will be constructed with (26) twenty-six 2-story townhomes at grade within six buildings. Associated interior driveways, parking, underground utilities, and decorative hardscape and landscape areas are also anticipated.

No grading or structural plans were available in preparing this report. However, we anticipate minor cuts and filling of the site will be required to achieve future surface configuration, and we expect future foundation loads will be relatively light.

SUMMARY OF FIELD AND LABORATORY WORK

Subsurface Investigation

Subsurface exploration for this investigation was conducted on June 10, 2025, and consisted of drilling three (3) soil borings to depths ranging from approximately 11.5 to 51.5 feet below the existing ground surface (bgs) and advancing two (2) Cone Penetration Testing (CPT) soundings to a depth of approximately 50 feet bgs each. The borings were drilled using a truck-mounted, continuous flight, hollow-stem-auger drill rig. A representative of Albus & 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 CPT soundings were advanced using a 30-ton CPT truck. As the cone is advanced through the soil, direct measurements are obtained and recorded for tip resistance, side resistance and porewater measurements. The relationship between the tip resistance and the side resistance allows a determination of the general soil type. Following completion of the CPT soundings, a log is generated that provides a continuous profile of the tip resistance, side resistance and porewater measurements. Shear wave velocity was measured within one of the CPTs using a seismic cone. Copies of the CPT logs are provided in Appendix A.

The approximate locations of our borings and CPTs are shown on the enclosed Geotechnical Map, Plate 1.

Bulk, relatively undisturbed and Standard Penetration Test (SPT) sample was obtained at selected depths within the exploratory borings for subsequent laboratory testing. A California split-spoon soil sampler with a 3-inch O.D., 2.5-inch I.D., lined with brass rings, was used to gather soil samples. 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. Sample was placed in sealed containers or plastic bags and transported to our laboratory for analysis. The borings were backfilled with auger cuttings upon completion of sampling.

Two additional borings, P-1 and P-2, were drilled near boring B-1 for percolation testing. Upon completion of drilling, well materials were installed within P-1 and P-2 for subsequent percolation testing. Construction details for P-1 and P-2 consisted of 5 feet and 4.9 feet of well materials. Both wells utilized perforated 3-inch-diameter pipe and pipe covered with filter sock. Upon completion of testing, all well materials were removed from the borings and then backfilled with soil cuttings.

Percolation Testing

Percolation testing was performed on June 10, 2025, 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, 200 washes, 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

Artificial fills (Af) were encountered within the upper 2 feet across the site within the areas of our exploration. The fills were predominately sands with silts, damp, and fine- to medium-grained. Site exploration was limited to areas within the existing asphalt due to the existing buildings onsite. We anticipate deeper, localized fills below and surrounding the existing buildings which would have resulted from previous grading activities.

Alluvium (Qal) was encountered below the fills for the maximum depth explored of 51.5 feet. The alluvium consisted of sands with silt, sandy silts, silty sands / sandy silts, and silty sands.

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

Groundwater

Groundwater was encountered during this firm’s subsurface exploration at a depth of 14 feet. The CDMG Special Report 03 suggests that historic high groundwater for the subject site is approximately 13-14 feet.

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

Test Well	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	5	2.85	2.15	1.36	5.04
P-2	4.9	2.8	2.1	1.56	5.86

Design of Chamber

The ***infiltration rate*** in a BMP 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 BMP, and presence of ground water are factors that make determining the effective infiltration rate of a device 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 being tested, 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. Generally, solution of Darcy's equation would require solving a differential equation. Where the BMP is a shallow basin with homogenous soil conditions and no groundwater within the influence of infiltration, the hydraulic gradient is approximately 1 and therefore, the infiltration rate would simply be equal to the permeability rate. However, where these conditions are not met such as the presence of variable permeability characteristics with depth, shallow groundwater, or the BMP has significant water head conditions, the hydraulic gradient could be more or less than 1 and a more complex approach is required to determine the effective infiltration rate. At the site, the upper 10 feet of cleaner sands are underlain by a soil with a significantly lower permeability. Groundwater is also present as a depth that will lessen the downward flow. The presence of these conditions will require additional consideration to estimate the effective infiltration rate of the chambers. Due to these complications, the infiltration characteristics of the proposed chamber were modeled using a computer program.

Infiltration in a chamber 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 permeability properties can be modeled with either Fredlund et al (1994), Green and Corey (1971), Van Genuchten (1980), or Saxton et al. (1986). Only saturated permeabilities were used in our analyses.

A Seep/W model was setup as a 2D planer layout and with the bottom of the chamber at a depth of 4 feet below ground surface and a width of 10 feet. The model consisted of two zones of material to represent the general soil profile. The saturated permeability of material 1 was modeled to represent the coarse-grained materials encountered in the upper 10 feet and was based on the results of our field percolation testing. The saturated permeability of material 2 was estimated from gradation testing of the materials. The permeability values are summarized in Table 2.

TABLE 2
Summary of Permeability Values

Depth (ft)	Material No.	Material Type	Sat. Perm., Ks (in/hr)
0-10	1	SP	5.0
>10	2	ML	0.35

Water in the chamber was assumed to be at a depth of 4 feet below the ground surface (bottom of chamber) so a fix-head boundary was set with a total head elevation of 96 feet along the bottom edge of the chamber (ground surface was set to an elevation of 100 feet). Groundwater was assumed to be present at a depth of 14 feet. Therefore, a fix-head boundary was set with a total head of 86 feet along the sides and bottom of the model.

A steady state analysis was performed to estimate the outflow that the chamber well can accommodate. Using a chamber as described above, we obtain a static total flow of 0.00044 ft^3/sec per foot of chamber. The "measured" infiltration rate is obtained by dividing the flow rate by the width of the chamber. Therefore, the measured infiltration rate is 0.00044cfs * 3,600 sec/hr. * 12 in/ft / 10 ft = 1.9 in/hr. A plot depicting the resulting pressure head contours and flow vectors for the model is provided on Plate C-5.

CONCLUSIONS AND RECOMMENDATIONS

Results of our work indicate a storm water disposal system consisting of shallow chambers is feasible at the site. The use of a chamber system 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 presented in our referenced geotechnical report, the site is within a liquefaction hazard zone. However, infiltration is not anticipated to cause mounding of groundwater due to the relatively high permeability of the site soils. As discussed above, the groundwater level for the site is 14 feet in depth. Therefore, a chamber system set at a depth of 4 feet will maintain a minimum required clearance of 10 feet from groundwater.

The “design” infiltration rate should be obtained by applying a factor of safety to the effective “measured” infiltration rate of 1.9 in./hr. Table 2 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. The measured infiltration rate is based on chambers that are no more than 10 feet in width. If the chambers are more than 10 feet in width, this office should be contacted to evaluate the potential for a reduction in the measured infiltration rate.

TABLE 2
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	2	0.5
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, S_A = Σp			1.25

Excavation for the chambers should avoid causing compaction of the bottom soils. A representative of this firm should observe the exposed soils prior to placement of gravel or chambers to confirm the appropriate soils are exposed.

A filter fabric such as Mirafi 140N should be provided between the surrounding soils and gravel on the sides and top of the gravel section. The gravel should be placed in lifts no more than 24 inches thick and vibrated to consolidate the materials.

Soils in the upper 4 feet are expected to be friable in nature. As such, open excavations for the chambers should be laid back at a 1.5 to 1 (H:V). Excavation for construction of the chamber system should be in accordance with OSHA requirements. The installation of the system 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 **Melia Homes** 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 & ASSOCIATES, INC.

David E. Albus
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
DAVID E. ALBUS
No. 2455
GEOTECHNICAL
STATE OF CALIFORNIA

Enclosures: Plate 1- Geotechnical Map
Appendix A - Exploratory Logs
Appendix B – Laboratory Testing
Appendix C - Percolation Testing and Analyses

REFERENCES

Publications & Reports

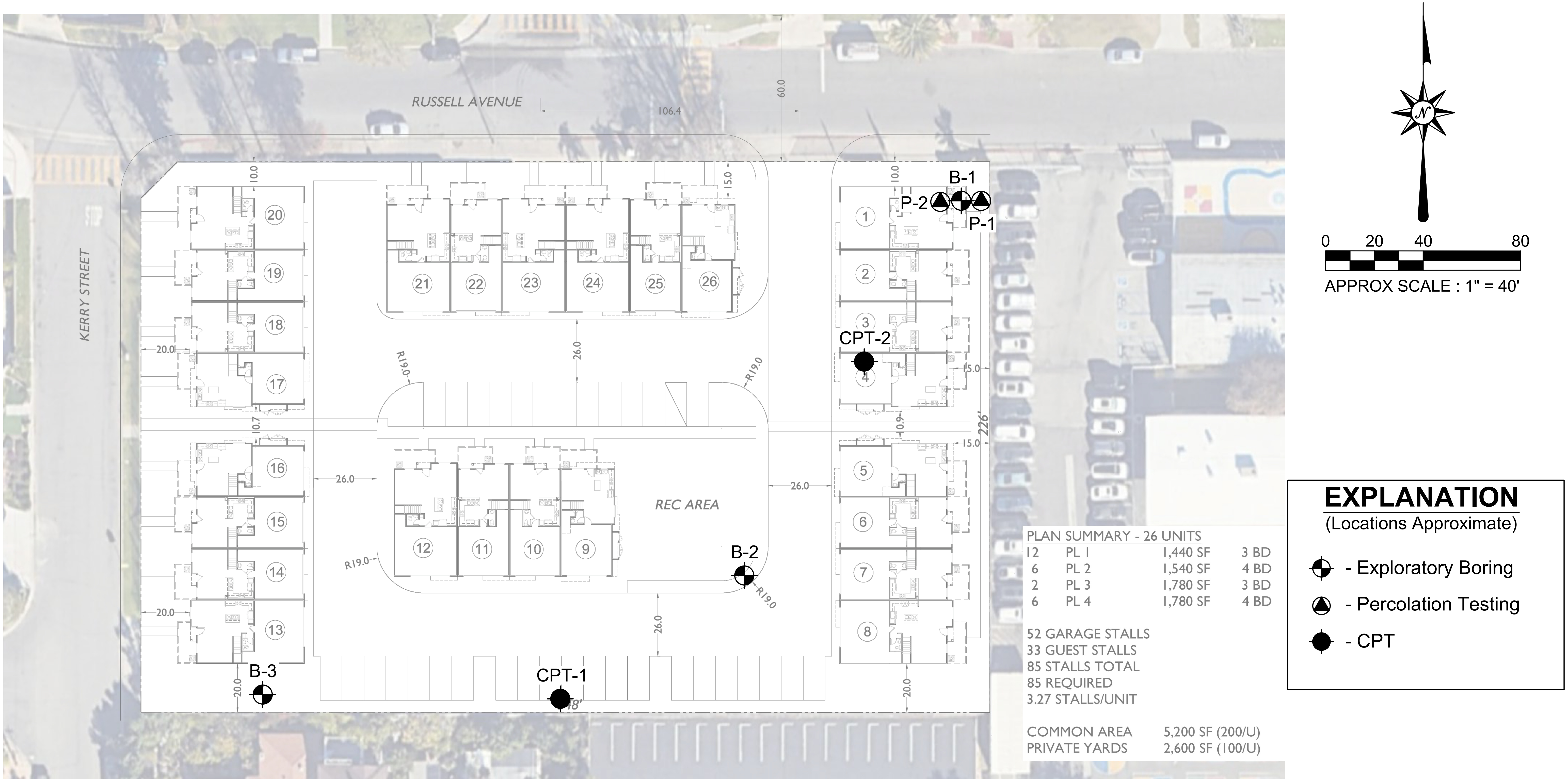
Albus & Associates, Inc., (2025), *Preliminary Geotechnical Investigation Report, Proposed Residential Development, 9822 Russell Avenue, Garden Grove, California*, dated July 1, 2025, J.N. 3341.00

California Department of Conservation, Division of Mines and Geology (1997), "*Seismic Hazard Zone Report for the Anaheim and Newport Beach 7.5-Minute Quadrangle, Orange Counties, California*", Seismic Hazard Report 003, 1997.

United States Department of The Interior, Bureau of Reclamation (1989), *Procedure for Performing Field Permeability Testing by the Well Permeameter Method*, (USBR 7300-89).

Plans

CA Engineering, Inc., *Water Quality Management Plan, BMP Exibit (Site Plan), Tr# 19447, 9822 Russell Avenue, Garden Grove, CA 92844*, dated October 8, 2025.



PLAN SUMMARY - 26 UNITS

12	PL 1	1,440 SF	3 BD
6	PL 2	1,540 SF	4 BD
2	PL 3	1,780 SF	3 BD
6	PL 4	1,780 SF	4 BD

52 GARAGE STALLS
33 GUEST STALLS
85 STALLS TOTAL
85 REQUIRED
3.27 STALLS/UNIT

COMMON AREA	5,200 SF (200/U)
PRIVATE YARDS	2,600 SF (100/U)

EXPLANATION

(Locations Approximate)

- ⊕ - Exploratory Boring
- ▲ - Percolation Testing
- ● - CPT

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Base Provided By Summa Architecture

ALBUS & ASSOCIATES

GEOTECHNICAL MAP

Job No.: 3341.00 | Date: 10/20/2025 | Plate: 1

APPENDIX A

EXPLORATORY LOGS

Field Identification Sheet

- Light gray
- Gray
- Dark gray
- Gray Brown
- Light brown
- Brown
- Dark Brown
- Olive brown
- Olive
- Yellow
- Yellowish brown
- Yellowish red
- Red
- Reddish Brown
- Tan

Description Order:

Description, Color, Moisture, Density, Grain Size, Additional Description

Description	%	Example
	0-5	Sand
trace	5-15	Sand trace Silt
with	15-30	Sand with Silt
	30+	Silty Sand

More Examples

Sand with Silt trace Clay
Sand trace Silt and Clay
Sand with Silt and Clay
Gravelly Sand with Silt trace Clay
Silty Clay with Sand trace Gravel

Moisture

Dry	absence of water
Damp	below optimum
Moist	near optimum
Very Moist	above optimum
Wet	free water visible

Density (Navfac)

Coarse grained soils	SPT	CA
Very Loose	0-3	0-5
Loose	3-8	5-13
Medium Dense	8-14	13-22
Dense	14-25	22-40
Very Dense	25>	40>

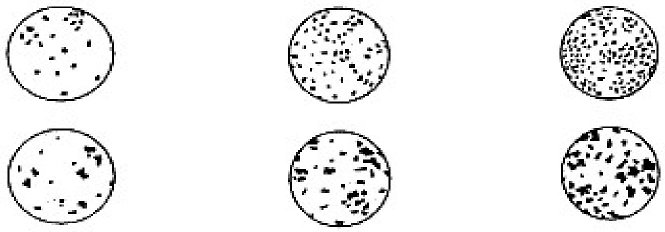
Fine grained soils		
Very Soft	2<	0-3
Soft	2-4	3-6
Medium Stiff	4-8	6-13
Stiff	8-15	13-24
Very Stiff	15-30	24-48
Hard	30>	48>

Grain Size

Description		Sieve Size	Approx. Size
Boulders		>12"	Larger than basketball
Cobbles		3-12"	Fist to basketball
Gravel	coarse	3/4-3"	Thumb to Fist
	fine	#4-3/4"	Pea to Thumb
Sand	coarse	#10-4	Rock Salt to Pea
	medium	#40-10	Sugar to Rock Salt
	fine	#200-40	Flour to Sugar
Fines		Pass #200	Smaller than Flour

Additional Description (ie. roots, pinhole pores, debris, etc.)

Trace 5% Moderate 15% Abundant 30%



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
		EXPLANATION							
		Solid lines separate geologic units and/or material types.							
5		Dashed lines indicate unknown depth of geologic unit change or material type change.							
		Solid black rectangle in Core column represents California Split Spoon sampler (2.5in ID, 3in OD).			■				
		Double triangle in core column represents SPT sampler.			⧗				
10		**Vertical Lines** in core column represents Shelby sampler.			▥				
		Solid black rectangle in Bulk column respresents large bag sample.				■			
		<u>**Other Laboratory Tests:**</u>							
15		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)							
20		200 = Percent Passing #200 Sieve							
		Consol = Consolidation							
		SE = Sand Equivalent							
		Rval = R-Value							
		ATT = Atterberg Limits							

Albus & Associates, Inc.

Plate A-1

EXPLORATION LOG B-1

JOB NO. 3341.00
CLIENT/PROJECT Melia Homes
DAY Tuesday
DATE 2025-06-10
LOCATION 9822 Russell Avenue, Garden Grove
LATITUDE 33.76847
LONGITUDE -117.95723
ELEVATION 70.9
LOGGED BY klopez
DRILLER 2R Drilling
DRILL METHOD Hollow-Stem Auger
DRIVING WEIGHT 140 lbs / 30 in

DEPTH	LITHO	DESCRIPTION	H2O	COR	BAG	BLOW COUNT	MC (%)	DD (pcf)	LAB
		Asphalt							max ei so4 sa ph resist ch
1		**Artificial Fill (Af)**							
2		Sand with Silt (SP-SM): tan, damp, medium grained		■		20	3	96	
3		**Alluvium (Qal)** Sand (SP): tan, damp, medium dense, fine to medium grained							
4				■		20	2.4	97.7	
5									
6		Sand trace Silt (SP): gray brown, very moist, loose, fine to medium grained		■		6	7.6	93.1	200
7									
8									
9									
10		Sandy Silt (ML): gray brown, very moist, very loose, fine to medium grained		■		5			
11									
12									
13									
14			▼						
15		@ 15 ft, wet, loose		⧗		3			200
16									
17									
18									
19									
20		Silty Sand / Sandy Silt (SM / ML): gray, wet, medium dense / very stiff, fine grained		⧗		14			200
21									
22									
23									
24									
25		Silty Sand (SM): gray, wet, loose, fine grained		⧗		6	25.5		att
26									
27									
28									
29									

EXPLORATION LOG B-1

JOB NO. 3341.00	**CLIENT/PROJECT** Melia Homes	**DAY** Tuesday	**DATE** 2025-06-10
LOCATION 9822 Russell Avenue, Garden Grove	**LATITUDE** 33.76847	**LONGITUDE** -117.95723	**ELEVATION** 70.9
LOGGED BY klopez	**DRILLER** 2R Drilling	**DRILL METHOD** Hollow-Stem Auger	**DRIVING WEIGHT** 140 lbs / 30 in

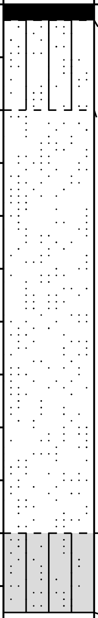
DEPTH	LITHO	DESCRIPTION	H2O	COR	BAG	BLOW COUNT	MC (%)	DD (pcf)	LAB
		Silty Sand / Sandy Silt (SM / ML): gray, wet, loose / stiff, fine grained		⧗		6			
31									
32									
33									
34									
35		@ 35 ft, medium dense		⧗		9			200
36									
37									
38									
39									
40				⧗		8			
41									
42									
43									
44									
45		Silty Sand with Clay (SM-SC): gray, wet, medium dense, fine grained		⧗		11	27.8		att
46									
47									
48									
49									
50				⧗		8	34.3		
51									
52		Total Depth 51.5 feet Groundwater at 14 feet							
53									
54									
55									
56									
57									
58									
59									

EXPLORATION LOG B-2

JOB NO.	CLIENT/PROJECT	DAY	DATE
3341.00	Melia Homes	Tuesday	2025-06-10

LOCATION	LATITUDE	LONGITUDE	ELEVATION
9822 Russell Avenue, Garden Grove	33.76805	-117.95752	70.7

LOGGED BY	DRILLER	DRILL METHOD	DRIVING WEIGHT
klopez	2R Drilling	Hollow-Stem Auger	140 lbs / 30 in



DEPTH	LITHO	DESCRIPTION	H2O	COR	BAG	BLOW COUNT	MC (%)	DD (pcf)	LAB
		Asphalt							
1									
2		**Artificial Fill (Af)** Sand with Silt (SP-SM): light brown, damp, fine to medium grained		▨		19	6.8	99.9	
3				▨					
4		**Alluvium (Qal)** Sand (SP): light brown, damp, medium dense, fine to medium grained		▨		12	8.8	96.9	consol
5				▨					
6		@ 4 ft, gray brown, moist, loose		▨		6	12.4	89.8	
7				▨					
8									
9									
10		Sandy Silt trace Clay (ML): gray brown, very moist to wet, very loose, fine grained		▨		4	31.6	89.1	sa hydro
11				▨					
12		Total Depth 11.5 feet No Groundwater							
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									

EXPLORATION LOG B-3

JOB NO.	CLIENT/PROJECT	DAY	DATE
3341.00	Melia Homes	Tuesday	2025-06-10

LOCATION	LATITUDE	LONGITUDE	ELEVATION
9822 Russell Avenue, Garden Grove	33.76792	-117.95817	71.3

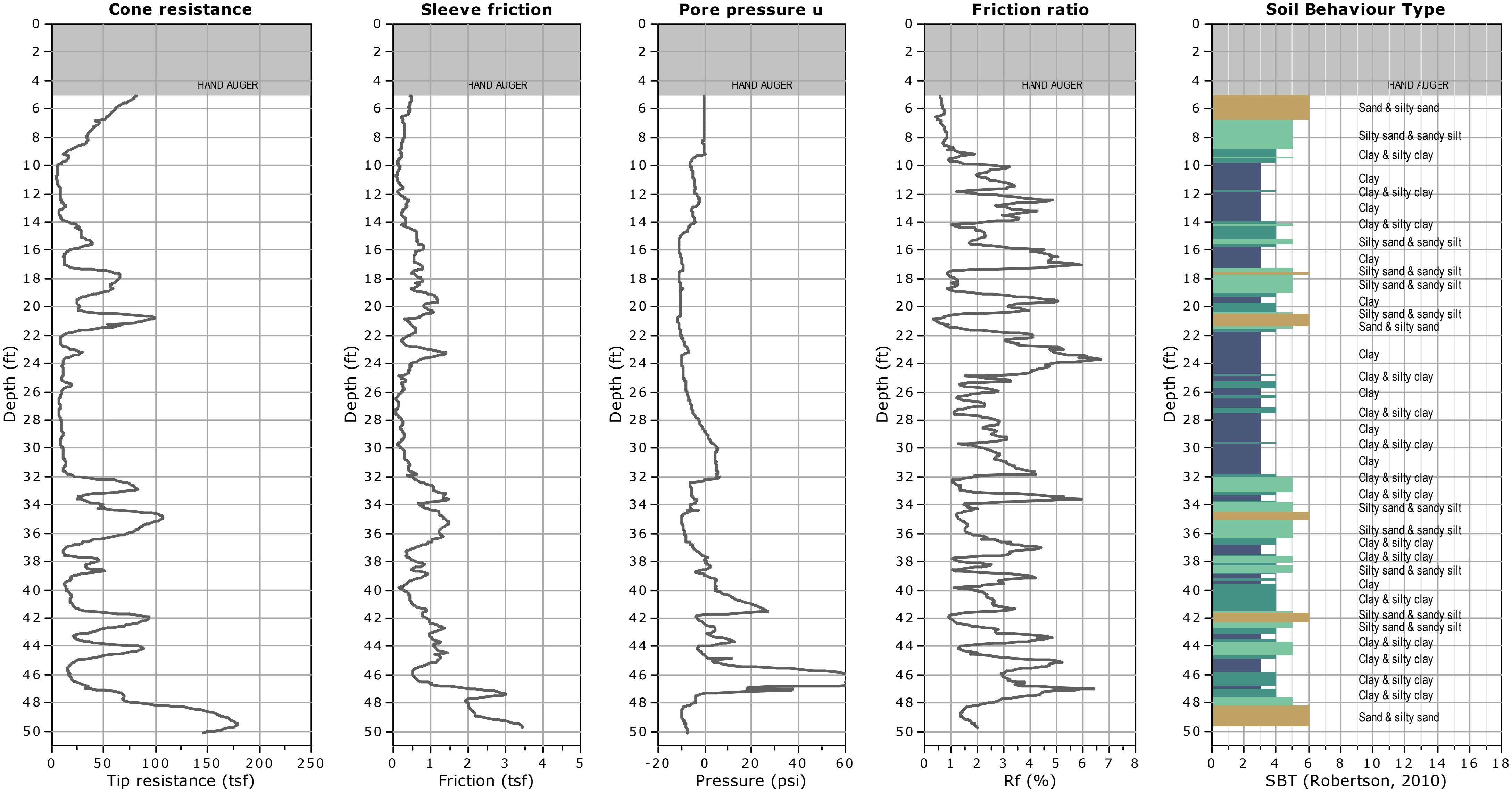
LOGGED BY	DRILLER	DRILL METHOD	DRIVING WEIGHT
klopez	2R Drilling	Hollow-Stem Auger	140 lbs / 30 in

DEPTH	LITHO	DESCRIPTION	H2O	COR	BAG	BLOW COUNT	MC (%)	DD (pcf)	LAB
		Asphalt							
1		**Artificial Fill (Af)**							
2		Sand with Silt (SP-SM): light brown, moist, fine to medium grained		▨		13	4.7	100.4	
3									
4		**Alluvium (Qal)** Sand (SP): brown, damp to moist, loose, fine to medium grained		▨		16	8.4	100.2	
5									
6		@ 4 ft, medium dense		▨		12	12.4	87.4	
7		@ 6 ft, loose							
8									
9									
10		Sandy Silt with Clay (ML): gray brown, moist, soft, fine grained		▨		4	28.5	93.2	
11									
12		Total Depth 11.5 feet No Groundwater							
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									

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

Project: **Albus & Associates**
Location: **9822 Russell Avenue, Garden Grove, CA**

CPT-1
Total depth: 50.07 ft, Date: 6/10/2025



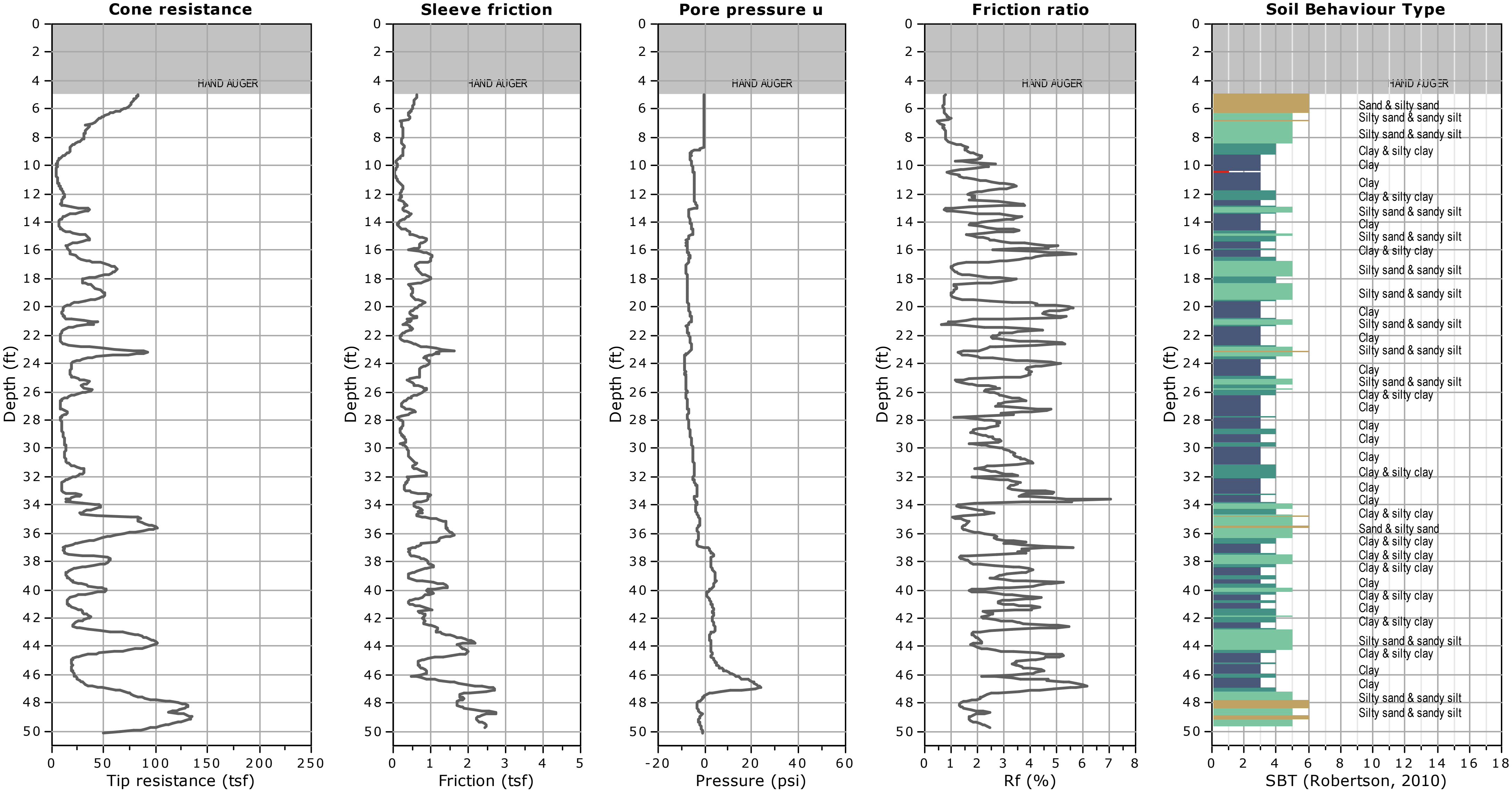
Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Albus & Associates**

Location: **9822 Russell Avenue, Garden Grove, CA**

CPT-2

Total depth: 50.07 ft, Date: 6/10/2025



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 D 2487). The samples were re-examined in the laboratory and classifications reviewed and then revised where appropriate. The assigned group symbols are presented on the Exploration Logs provided in Appendix A.

In Situ Moisture and Density

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

Particle-Size Analyses

Particle-size analyses were performed on selected samples in accordance with ASTM D 422. The results are presented graphically on the attached Plate B-1.

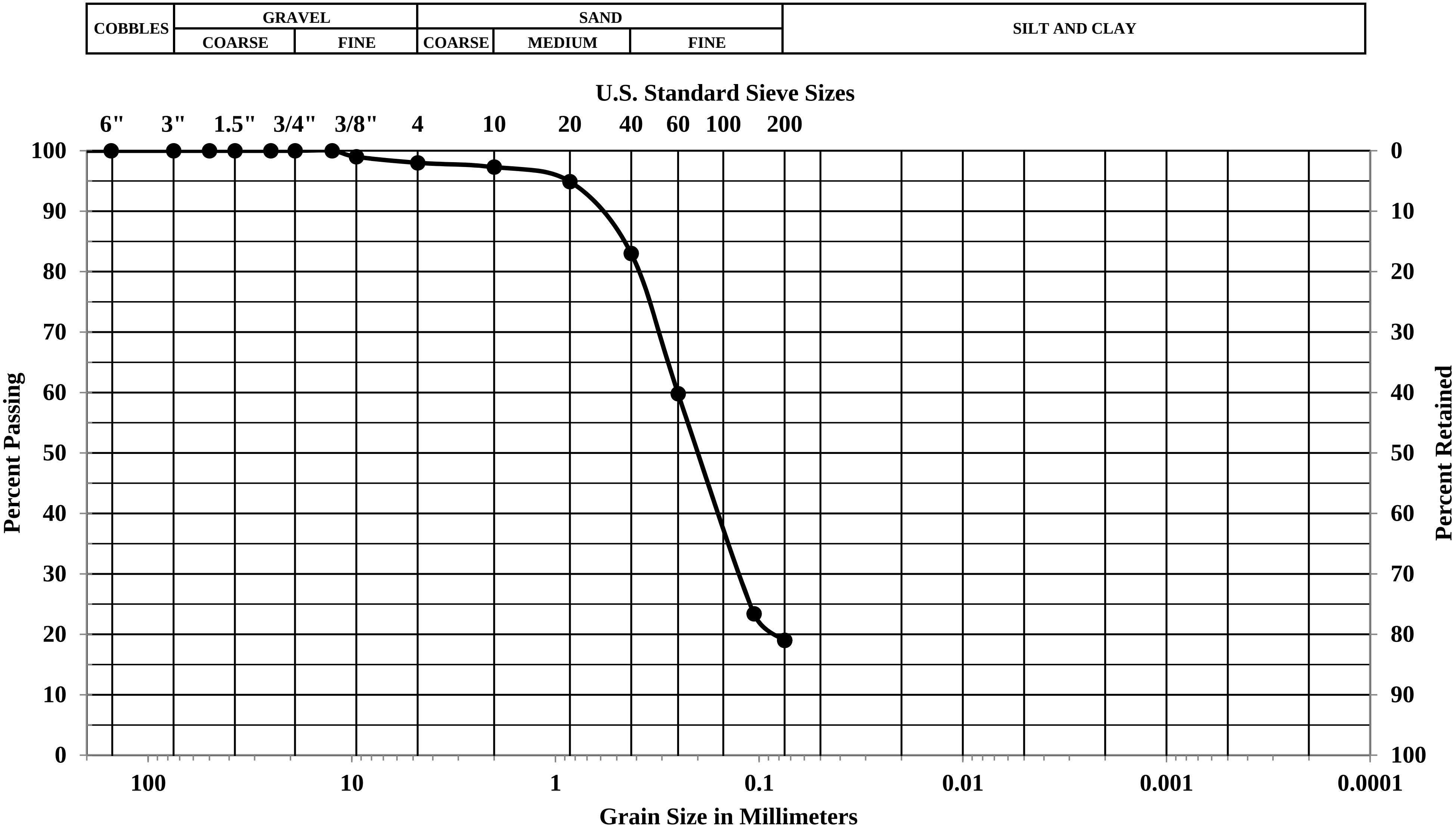
Percent Passing the No. 200 Sieve

The percentage 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 D1140. Test results are presented on Table B.

TABLE B
SUMMARY OF LABORATORY TEST RESULTS

Boring No.	Sample Depth (ft)	Soil Description	Test Results	
B-1	35	Silty Sand	Passing -200 (%):	45.5
B-2	6	Sand trace Silt (SP)	Passing -200 (%):	12.6
B-2	15	Sandy Silt	Passing -200 (%):	59.1
B-2	20	Sandy Silt	Passing -200 (%):	51

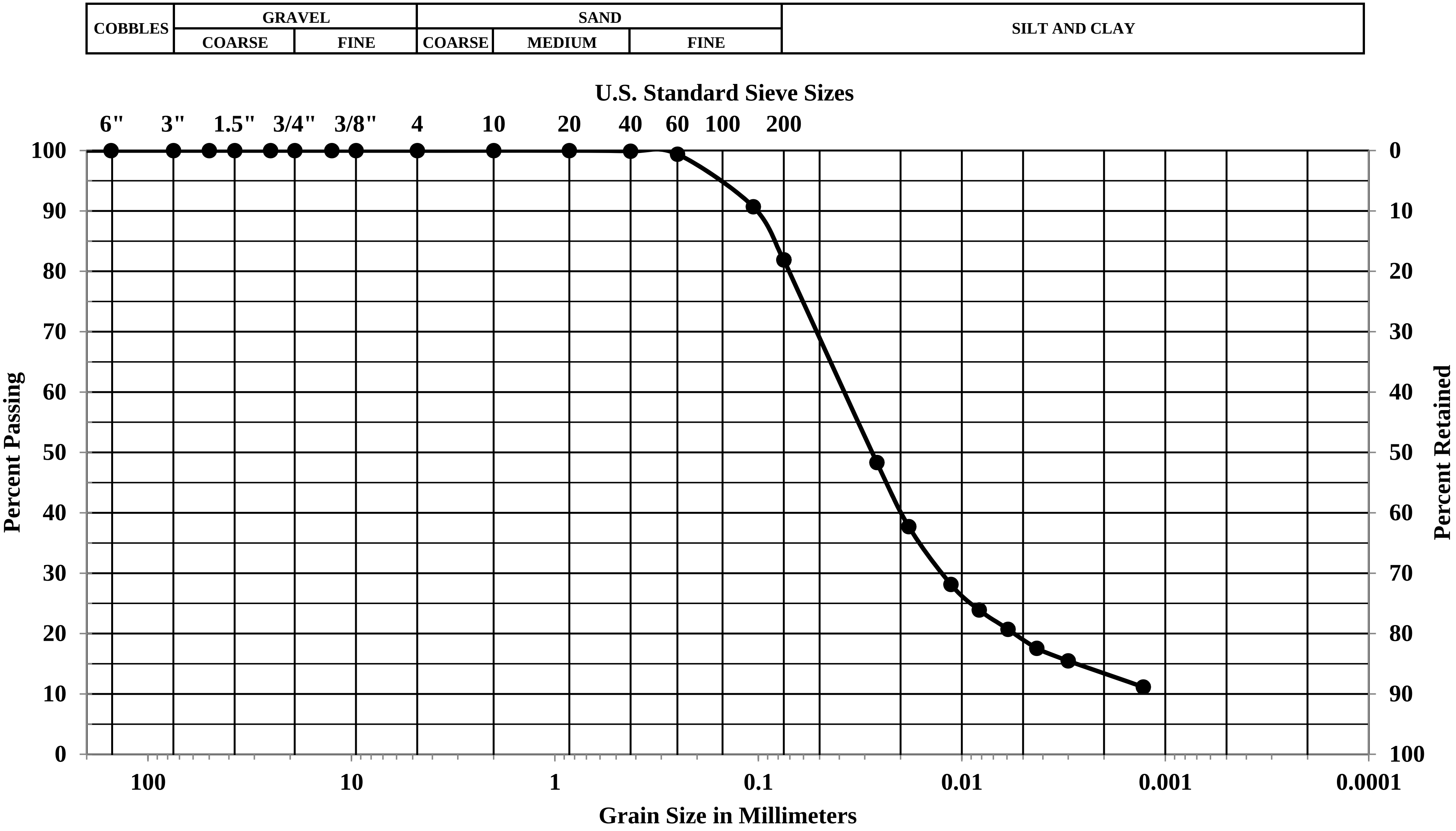
GRAIN SIZE DISTRIBUTION



Job Number	Location	Depth	Description
3341.00	B-1	0-5	Sand with Silt (SP-SM)

Albus & Associates, Inc.

GRAIN SIZE DISTRIBUTION



Job Number	Location	Depth	Description
3341.00	B-2	10	Silt trace Sand and Clay (ML)

APPENDIX C

PERCOLATION TESTING AND ANALYSES

Field Percolation Testing - Constant Head

Client: Melia Homes

Job. No.: 3341.00

Date Tested: 6/10/2025

Test by: ddalbus

Location: P-1

Top of Casing to Bottom of Well (ft): 5

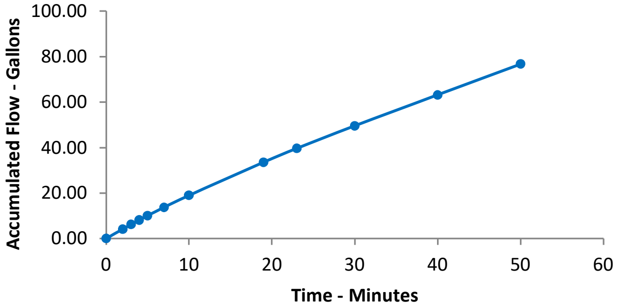
Elev. of Ground Surface (ft):

Diam. of Test Hole (in): 8

Diam. of Casing (in): 3

Ht. to Top of Casing (ft): 0.25

Water Tempurature (C°):



Constant Head

Elapsed Time (minutes)	Time	Depth to H2O (ft)	Flow Rate (gal./min.)	Total H_2O used (gal)
0	12:00	2.95	2.12	0.00
2	12:02	2.9	2.00	4.12
3	12:03	2.9	1.96	6.18
4	12:04	2.85	1.86	8.16
5	12:05	2.8	1.82	10.07
7	12:07	2.8	1.68	13.75
10	12:10	2.80	1.56	19.00
19	12:19	2.80	1.48	33.58
23	12:23	2.85	1.36	39.66
30	12:30	2.85	1.36	49.60
40	12:40	2.85	1.36	63.20
50	12:50	2.85	1.36	76.80

Field Percolation Testing - Constant Head

Client: Melia Homes

Job. No.: 3341.00

Date Tested: 6/10/2025

Test by: ddalbus

Location: P-2

Top of Casing to Bottom of Well (ft): 4.9

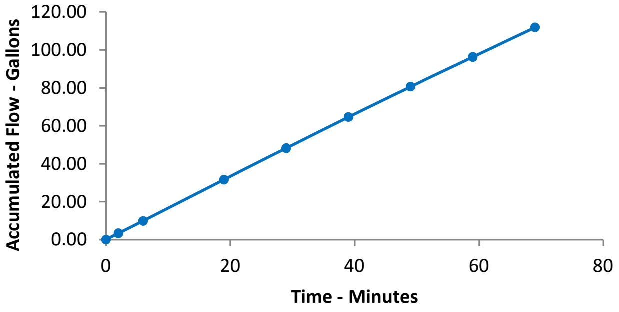
Elev. of Ground Surface (ft):

Diam. of Test Hole (in): 8

Diam. of Casing (in): 3

Ht. to Top of Casing (ft): 0.2

Water Tempurature (C°):



Constant Head

Elapsed Time (minutes)	Time	Depth to H2O (ft)	Flow Rate (gal./min.)	Total H_2O used (gal)
0	12:56	2.75	1.66	0.00
2	12:58	2.85	1.66	3.32
6	13:02	2.9	1.68	9.96
19	13:15	2.80	1.64	31.67
29	13:25	2.80	1.64	48.27
39	13:35	2.80	1.56	64.67
49	13:45	2.80	1.56	80.67
59	13:55	2.80	1.56	96.27
69	14:05	2.80	1.56	111.87

INFILTRATION WELL DESIGN

Constant Head
USBR 7300-89 Method
J.N.: 3341.00
Client: Melia Homes
Well No.: 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):	2	
Ground Surface to Bottom of Well (**h_1**):	4.75	feet
Depth to Water (**h_2**):	2.6	feet
Height of Water in the Well (h_1-h_2=**h**):	2.15	feet
Radius of Well (**r**):	4.0	Inches
Minimum Volume Required:	223.2	Gal.
Discharge Rate of Water Into Well for Steady-State Condition (**q**):	1.36	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**):	9.4	
Factor of Safety:	1	
Coefficient of Permeability @ 20° C (**k_{20}**):	7.00E-03	ft/min.
Design k_{20}:	5.04	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**, **Condtion 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 puposes 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.: 3341.00
Client: Melia Homes
Well No.: P-2

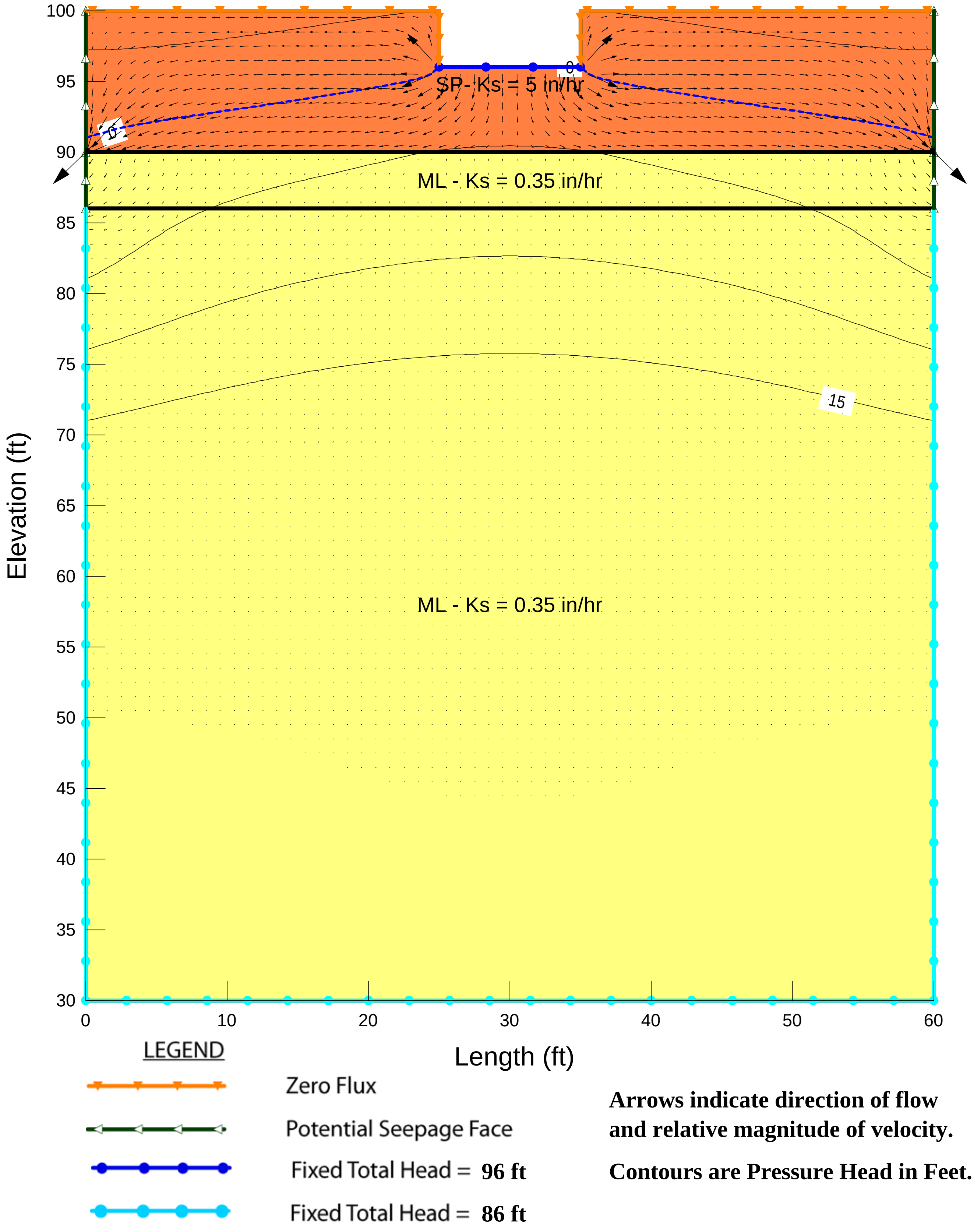
Low Water Table	Condition 1	
High Water Table & Water Below Bottom of Well	Condition 2	
High water Table with Water Above the Well Bottom	Condition 3	
		Units:
Enter Condition (1, 2 or 3):	2	
Ground Surface to Bottom of Well (**h_1**):	4.7	feet
Depth to Water (**h_2**):	2.6	feet
Height of Water in the Well (h_1-h_2=**h**):	2.1	feet
Radius of Well (**r**):	4.0	Inches
Minimum Volume Required:	212.7	Gal.
Discharge Rate of Water Into Well for Steady-State Condition (**q**):	1.56	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**):	9.4	
Factor of Safety:	1	
Coefficient of Permeability @ 20° C (**k_{20}**):	8.14E-03	ft/min.
Design k_{20}:	5.86	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**, **Condtion 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 puposes 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



Arrows indicate direction of flow and relative magnitude of velocity.

Contours are Pressure Head in Feet.

APPENDIX G

OPERATION AND MAINTENANCE (O&M) PLAN

Operation and Maintenance (O&M) Plan

Water Quality Management Plan
for

RUSSELL AVENUE TOWNHOMES
(TTM 19447)

9822 Russell Avenue
Garden Grove, CA 92844

Appendix G, Operation and Maintenance Plan
Note: OWNER = Melia Homes, Inc.

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			
Y	**N1. Education for Property Owners, Tenants and Occupants** For developments with POA and residential projects of more than fifty (50) dwelling units, project conditions of approval will require that the POA periodically provide environmental awareness education materials, made available by the municipalities, to all of its members. Among other things, these materials will describe the use of chemicals (including household type) that should be limited to the property, with no discharge of wastes via hosing or other direct discharge to gutters, catch basins and storm drains. Educational materials available from the County of Orange can be downloaded here: **http://www.ocwatersheds.com/PublicEd/resources/default.aspx** (TGD Section 6.2)	Educational materials shall be provided upon owner occupancy. Refer to Section VII for a list of educational materials to be distributed to residential tenants. **Frequency: Upon owner occupancy, and annually thereafter**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**
Y	**N2. Activity Restrictions** If a POA is formed, conditions, covenants and restrictions (CCRs) must be prepared by the developer for the purpose of surface water quality protection. An example would be not allowing car washing outside of established community car wash areas in multi-unit complexes. Alternatively, use restrictions may be developed by a building operator through lease terms, etc. These restrictions must be included in the Project WQMP. (TGD Section 6.2)	The owner, through CCRs or another equally effective method, shall develop use restrictions. These will include, but are not limited to, use of pesticides and fertilizers consistent with City and County guidelines, prohibiting washing or hosing of walkways and driveways, and prohibiting the washing of cars on the property. **Frequency: Continuous**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**

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
Y	**N3. Common Area Landscape Management** Identify on-going landscape maintenance requirements that are consistent with those in the County Water Conservation Resolution (or city equivalent) that include fertilizer and/or pesticide usage consistent with Management Guidelines for Use of Fertilizers (DAMP Section 5.5). Statements regarding the specific applicable guidelines must be included in the Project WQMP. (TGD Section 6.2.)	Maintenance shall be consistent with City requirements, plus fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP Section 5.5). Typical maintenance includes mowing, trimming, replanting, and debris removal. **Frequency: Weekly**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**
Y	**N4. BMP Maintenance** The Project WQMP shall identify responsibility for implementation of each non-structural BMP and scheduled cleaning and/or maintenance of all structural BMP facilities.	Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the owner and shall be available for review upon request. **Frequency: Continuous**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**

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
N	**N5. Title 22 CCR Compliance**		
N	**N6. Local Water Quality Permit Compliance**		
N	**N7. Spill Contingency Plan**		
N	**N8. Underground Storage Tank Compliance**		
N	**N9. Hazardous Materials Disclosure Compliance**		
N	**N10. Uniform Fire Code Implementation**		
Y	**N11. Common Area Litter Control** For industrial/commercial developments and for developments with POAs, the owner/POA should be required to implement trash management and litter control procedures in the common areas aimed at reducing pollution of drainage water. The owner/POA may contract with their landscape maintenance firms to provide this service during regularly scheduled maintenance, which should consist of litter patrol, emptying of trash receptacles in common areas, and noting trash disposal violations by tenants/homeowners or businesses and reporting the violations to the owner/POA for investigation.	Litter patrol, violation investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities. **Frequency: Weekly**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**

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
Y	**N12. Employee Training** Education program (see N1) as it would apply to future employees of individual businesses. Developer either prepares manual(s) for initial purchasers of business site or for development that is constructed for an unspecified use makes commitment on behalf of POA or future business owner to prepare. An example would be training on the proper storage and use of fertilizers and pesticides, or training on the implementation of hazardous spill contingency plans.	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 1st). Refresher courses shall be conducted on an as needed basis. **Frequency: Annually**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**
N	**N13. Housekeeping of Loading Docks**		
Y	**N14. Common Area Catch Basin Inspection** For industrial/commercial developments and for developments with privately maintained drainage systems, the owner is required to have at least 80 percent of drainage facilities inspected, cleaned and maintained on an annual basis with 100 percent of the facilities included in a two-year period. Cleaning should take place in the late summer/early fall prior to the start of the rainy season. Drainage facilities include catch basins (storm drain inlets) detention basins, retention basins, sediment basins, open drainage channels and lift stations. Records should be kept to document the annual maintenance.	Catch basin inlets shall be inspected and, if necessary, cleaned prior to the storm season by October 1st each year and after all major storm events. **Frequency: Annually and Immediately After Major Storm Events**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**

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
Y	**N15. Street Sweeping Private Streets and Parking Lots** Streets and parking lots are required to be swept prior to the storm season, in late summer or early fall, prior to the start of the rainy season or equivalent as required by the governing jurisdiction.	Parking lots and drive aisles must be swept every two weeks or more often if needed, including prior to the start of the rainy season (October 1st). **Frequency: Biweekly or More Often if Needed**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Structural Source Control BMPs			
Y	**S1. Provide Storm Drain System Stenciling and Signage** Storm drain stencils are highly visible source control messages, typically placed directly adjacent to storm drain inlets. The stencils contain a brief statement that prohibits the dumping of improper materials into the municipal storm drain system. Graphical icons, either illustrating anti-dumping symbols or images of receiving water fauna, are effective supplements to the anti-dumping message. Stencils and signs alert the public to the destination of pollutants discharged into stormwater. The following requirements should be included in the project design and shown on the project plans: 1. Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language (such as: “NO DUMPING-DRAINS TO OCEAN”) and/or graphical icons to discourage illegal dumping. 2. Post signs and prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area. 3. Maintain legibility of stencils and signs. See CASQA Stormwater Handbook BMP Fact Sheet SD-13 for additional information.	Storm drain stencils shall be inspected for legibility, at a minimum, once prior to the storm season, and no later than October 1st of each year. Those signs determined to be illegible will be re-stenciled as soon as possible. **Frequency: Annually**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners’ association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners’ association.**
N	**S2. Design Outdoor Hazardous Material Storage Areas to Reduce Pollutant Introduction**		

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**
Y	**S3. Design Trash Enclosures to Reduce Pollutant Introduction** Trash storage areas will be designed to reduce pollutant introduction. All trash container areas will meet the following requirements: - Paved with an impervious surface, designed to not allow run-on from adjoining areas, designed to divert drainage from adjoining roofs and pavements around the area, screened or walled to prevent off-site transport of trash; and - Provide solid roof or awning to prevent exposure to direct precipitation. - No trash area drains will be connected to the MS4.	**Frequency: Continuous**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**

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
Y	**S4. Use Efficient Irrigation Systems & Landscape Design** Projects shall design the timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the municipal storm drain system. (Limited exclusion: detached residential homes.) The following methods to reduce excessive irrigation runoff shall be considered, and incorporated on common areas of development and other areas where determined applicable and feasible by the Permittee: 1. Employing rain shutoff devices to prevent irrigation after precipitation. 2. Designing irrigation systems to each landscape area's specific water requirements 3. Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines. 4. Implementing landscape plan consistent with County Water Conservation Resolution or city equivalent, which may include provision of water sensors, programmable irrigation times (for short cycles), etc. 5. The timing and application methods of irrigation water shall be designed to minimize the runoff of excess irrigation water into the municipal storm drain system. 6. Employing other comparable, equally effective, methods to reduce irrigation water runoff. 7. 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 other design features, such as:	Maintain all common landscape areas utilizing planting materials with similar watering requirements to reduce excess irrigation runoff. Inspect and maintain the efficient irrigation systems installed for the common area landscaping to ensure the proper functioning of all water sensors, programmable irrigation cycles and rain shutoff valves. **Frequency: Monthly**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**

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
Y	**S4. Use Efficient Irrigation Systems & Landscape Design (Continued)** • Use mulches (such as wood chips or shredded wood products) in planter areas without ground cover to minimize sediment in runoff. • Install appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant material where possible and/or as recommended by the landscape architect. • Leave a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible. • Choose plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth. Irrigation practices shall comply with local and statewide ordinances related to irrigation efficiency.	•	

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
N	**S5. Protect Slopes and Channels**		
N	**S6. Loading Dock Areas**		
N	**S7. Maintenance Bays and Docks**		
N	**S8. Vehicle Wash Areas**		
N	**S9. Outdoor Processing Areas**		
N	**S10. Equipment Wash Areas**		
N	**S11. Fueling Areas**		
N	**S12. Hillside Landscaping**		

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
N	**S13. Wash Water Controls for Food Preparation Areas**		
N	**S14. Community Car Wash Racks**		

BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Low Impact Development BMPs		
Infiltration BMP # 1 Underground Infiltration Chambers (INF-7) Quarterly inspections of the underground infiltration BMPs shall be conducted utilizing the designed manholes/inspection ports. The BMPs shall be cleaned when inspection reveals that accumulated sediment or trash is clogging the system. Accumulated sediment and trash can be evacuated through the manholes.	**Frequency: Quarterly And Immediately After Major Storm Events**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**
Pretreatment BMP #1 Proprietary Catch Basin Insert Filters (Pretreatment for Infiltration) **(Oldcastle FloGard +Plus Catch Basin Insert Filter or Approved Equivalent)** Twice a year, prior to and after the rainy season, and after major storm events, the catch basin insert filters shall be visually inspected for damage, have all sediment and debris removed, and the filter medium pouches shall be replaced if necessary. The Applicant may conduct this maintenance itself, or may enter into a service contract for the maintenance of the insert filters as detailed in the Kristar FloGard +Plus Specifications /Maintenance Requirements brochure, a copy of which is attached hereto.	**Frequency: Every Six Months (Approximately April 1st and October 1st) and Immediately After Major Storm Events**	**Melia Homes, Inc. (the owner of the project) shall be responsible for all BMP operation and maintenance for the Project until a homeowners' association is formed, at which time all BMP operation and maintenance responsibilities shall be transferred to the homeowners' association.**

Required Permits

No permits are required for the implementation, operation, and maintenance of the BMPs described in this plan.

Recordkeeping

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

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

Inspection and Maintenance Guide

A division of
Oldcastle Infrastructure

Water

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation’s water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed FloGard+Plus Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (wash racks, parking garages, etc.): On a recurring basis (no less than three times per year).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing FloGard+Plus catch basin inserts).
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc., shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary, and the pouch tethers re-attached to the liner’s D-ring.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium will be replaced with new material. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of storm drain filters, catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined-space trained and certified. Call us at (888) 950-8826 for further information and assistance.

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

OUR MARKETS

BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

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Oldcastle Infrastructure™
A CRH COMPANY

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Water

February 2019 v.1

APPENDIX H

RECORD OF BMP IMPLEMENTATION, MAINTENANCE AND INSPECTION

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

APPENDIX I

ANNUAL CERTIFICATE OF COMPLIANCE

(BMP MAINTENANCE)

ANNUAL CERTIFICATE OF COMPLIANCE
(BMP INSPECTION & MAINTENANCE)

Project: Russell Avenue Townhomes (TR 19447) **Year:** ___________________
9822 Russell Avenue
Garden Grove, CA 92844

CERTIFICATION: I certify that the above-named project has complied with the inspection and maintenance frequencies specified for the onsite Best Management Practices (BMPs) detailed in the Operation and Maintenance Plan and the Water Quality Management Plan for the project. The project includes the following routine source control BMPs (marked with an "X"):

X	N1. Education for Property Owners, Tenants and Occupants	**X**	S1. Provide storm drain system stenciling and signage
X	N2. Activity Restrictions		S2. Design and construct outdoor material storage areas to reduce pollution introduction
X	N3. Common Area Landscape Management	**X**	S3. Design and construct trash and waste storage areas to reduce pollution introduction
X	N4. BMP Maintenance	**X**	S4. Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control
	N5. Title 22 CCR Compliance (How development will comply)		S5. Protect slopes and channels and provide energy dissipation Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)
	N6. Local Industrial Permit Compliance		
	N7. Spill Contingency Plan		S6. Dock areas
	N8. Underground Storage Tank Compliance		S7. Maintenance bays
	N9. Hazardous Materials Disclosure Compliance		S8. Vehicle wash areas
	N10. Uniform Fire Code Implementation		S9. Outdoor processing areas
X	N11. Common Area Litter Control		S10. Equipment wash areas
X	N12. Employee Training		S11. Fueling areas
	N13. Housekeeping of Loading Docks		S12. Hillside landscaping
X	N14. Common Area Catch Basin Inspection		S13. Wash water control for food preparation areas
X	N15. Street Sweeping Private Streets and Parking Lots		S14. Community car wash racks
	N16. Retail Gasoline Outlets		

Owner has also upheld the recommended inspection and maintenance schedule for the project's LID BMPs listed below:

Underground Infiltration Chambers
Oldcastle FloGard +PLUS Catch Basin Insert Filters

This facility is in compliance with the requirements of the City of Garden Grove, the Regional Water Quality Control Board and the National Pollution Discharge Elimination System.
Copies of site inspection and maintenance reports are on file at the main Facility offices.

Facility Owner / Director____

Printed Name:_______________________________ Date:__________________________

I hereby certify that this document and any attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Facility Owner / Director____

Printed Name:_______________________________ Date:__________________________

APPENDIX J

NOTICE OF TRANSFER OF RESPONSIBILITY FOR WQMP

NOTICE OF TRANSFER OF RESPONSIBILITY

WATER QUALITY MANAGEMENT PLAN

Russell Avenue Townhomes (TR 19447)

9822 Russell Avenue
Garden Grove, CA 92844

Submission of this Notice of Transfer of Responsibility constitutes notice to the City of Garden Grove 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 its 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 subject to 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 hereby certify that ____is 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:	Date:

B. New Owner

I hereby certify that ____is 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 been informed 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 K

PRELIMINARY HYDROLOGY REPORT FOR TTM 19447, DATED OCTOBER 28, 2025

CA ENGINEERING, INC.

Planning • Engineering • Surveying

PRELIMINARY HYDROLOGY REPORT

FOR

T.T.M. 19447

9822 Russell Avenue

City of Garden Grove, CA

Date: October 28th, 2025

FRED CORNWELL
NO. 45591

PLANS PREPARED UNDER THE SUPERVISION OF:

10/28/25

Fred Cornwell, P.E. - R.C.E 45591 Date

Table of Contents

1.0 INTRODUCTION

The purpose of this report is to present the hydrology analysis and drainage calculations for a proposed residential development located at 9822 Russell Avenue, in the City of Garden Grove, California. The site proposes to construct 26 townhomes and related improvements on approximately 1.80 acres. This report will determine the existing and proposed storm water runoff rates from the project site and determine the impact on the existing surrounding drainage facilities,

2.0 EXISTING DRAINAGE CONDITIONS

The project site is located in the City of Garden Grove, California, and is comprised of approximately 1.80 acres (78,537 square feet), and is located in a predominantly residential development area. The rectangular site is bounded by Russell Avenue to the north (beyond which are residential buildings), Sunnyside Elementary School to the east, Kerry Street to the west (beyond which are residential buildings), and residential buildings and a church to the south.

The northwest portion of the site is currently occupied by buildings housing a church and a preschool, and there is a small storage shed located near the southwest corner of the site. The remainder of the site is covered in asphalt drive aisles and parking areas, concrete hardscape, and landscaping.

The project site is rectangular in shape and has a relatively flat topography that generally slopes southwesterly with elevations ranging from about 74 to 72 feet above mean sea level (msl). Surface drainage sheet flows to either Russell Avenue or Kerry Street and is conveyed westerly and southerly until entering the storm drain system downstream via a catch basin on Donegal Drive near the Trask Avenue intersection. The project area currently has no water quality or drainage mitigation devices installed on-site.

3.0 PROPOSED DRAINAGE CONDITIONS

The drainage for the proposed project generally follows the existing flow characteristics. The site has been divided into four drainage areas, identified as Areas 1-4. Storm flows from each area will be collected via curb & gutters in the drive aisles and drain to one of four curb-opening catch basins. Drainage in the non-drive aisle areas will be captured via proposed area drains. All of the captured drainage will be directed to one of three underground infiltration BMP facilities that will be sized to treat the Design Capture Volume (DCV) as defined in the Technical Guidance Document for the WQMP.

During larger storm events, as with existing conditions, drainage for the proposed project will outlet onto either Russell Avenue or Kerry Street. In Area 1, the excess flows will bubble out of the Area 1 catch basin and be discharged to Russell Avenue via a parkway culvert. In Area 2, the excess flows will bubble out of the Area 2 catch basin and be discharged to Russell Avenue via the project driveway entrance. Overflow drainage for Areas 3 and 4 will bubble out of the Area 3 catch basin and be discharged to Kerry Street via a parkway culvert.

4.0 METHODOLOGY

The hydrology calculations for the study were completed using AES software based on the Orange County Hydrology Manual methodology. The Rational Method was used to determine the peak discharges for the pre-and post-developed conditions and can be found in Appendix “A” (existing) & Appendix “B” (proposed).

These peak flow rates for the 2, 10 and 100 year storm events will be compared in the results section of this report found below. The hydrologic sub areas and flow paths that produce these rates are shown on the Existing (Exhibit A) & Proposed (Exhibit B) hydrology maps.

5.0 HYDRAULICS

Note, the hydraulic calculations including the catch basin and pipe sizing will be analyzed in the Final Hydrology Report.

6.0 WATER QUALITY

The BMP facilities will be sized to capture and treat the Design Capture Volume (DCV) per the Technical Guidance Document as published by the County of Orange. The underground infiltration BMP facilities will be sized to store a total of 5,760 cubic feet of stormwater, which is in excess of the total DCV of 3,736 cubic feet.

Since there are no hydraulic conditions of concern (HCOC's), the flow will not have to be detained. When a larger storm event occurs that increases the runoff to a point where the underground infiltration BMP facilities are full, the excess flows be discharged to Russell Avenue or Kerry Street via parkway culverts or the driveway entrance.

7.0 FLOOD PLAIN DESIGNATION

The site falls within a Zone "X" designation under the FEMA Map 06059C0138J, dated December 3, 2009. Zone X (Shaded Orange Area) represents areas determined 0.2% annual chance flood hazard, area of 1% annual chance flood with average depth less than one foot or with drainage areas less than one square mile.

8.0 RESULTS

The results of the Existing and Proposed conditions for the existing site outlet location as shown on the hydrology maps are as follows:

	Existing Condition			Proposed Condition					Increase/ (Decrease)	%
	A1	∑A2/A3	TOTAL	A1	A2	A3	A4	TOTAL	-	-
Area	0.54 AC	1.26 AC	**1.80 AC**	0.48 AC	0.73 AC	0.42 AC	0.17 AC	**1.80 AC**	-	-
2 Year Storm	0.94 CFS	1.66 CFS	**2.60 CFS**	0.83 CFS	1.13 CFS	0.73 CFS	0.31 CFS	**3.00 CFS**	0.40 CFS	15.4%
10 Year Storm	1.69 CFS	3.01 CFS	**4.70 CFS**	1.51 CFS	2.05 CFS	1.33 CFS	0.56 CFS	**5.45 CFS**	0.75 CFS	16.0%
100 Year Storm	2.58 CFS	4.63 CFS	**7.21 CFS**	2.31 CFS	3.15 CFS	2.05 CFS	0.85 CFS	**8.36 CFS**	1.15 CFS	16.0%

Under proposed conditions, flows for the 2 year storm is increased by 15.4%, flows for the 10 year storm is increased 16.0%, and flows for the 100 year storm is increase by 16.0% when compared to existing conditions.

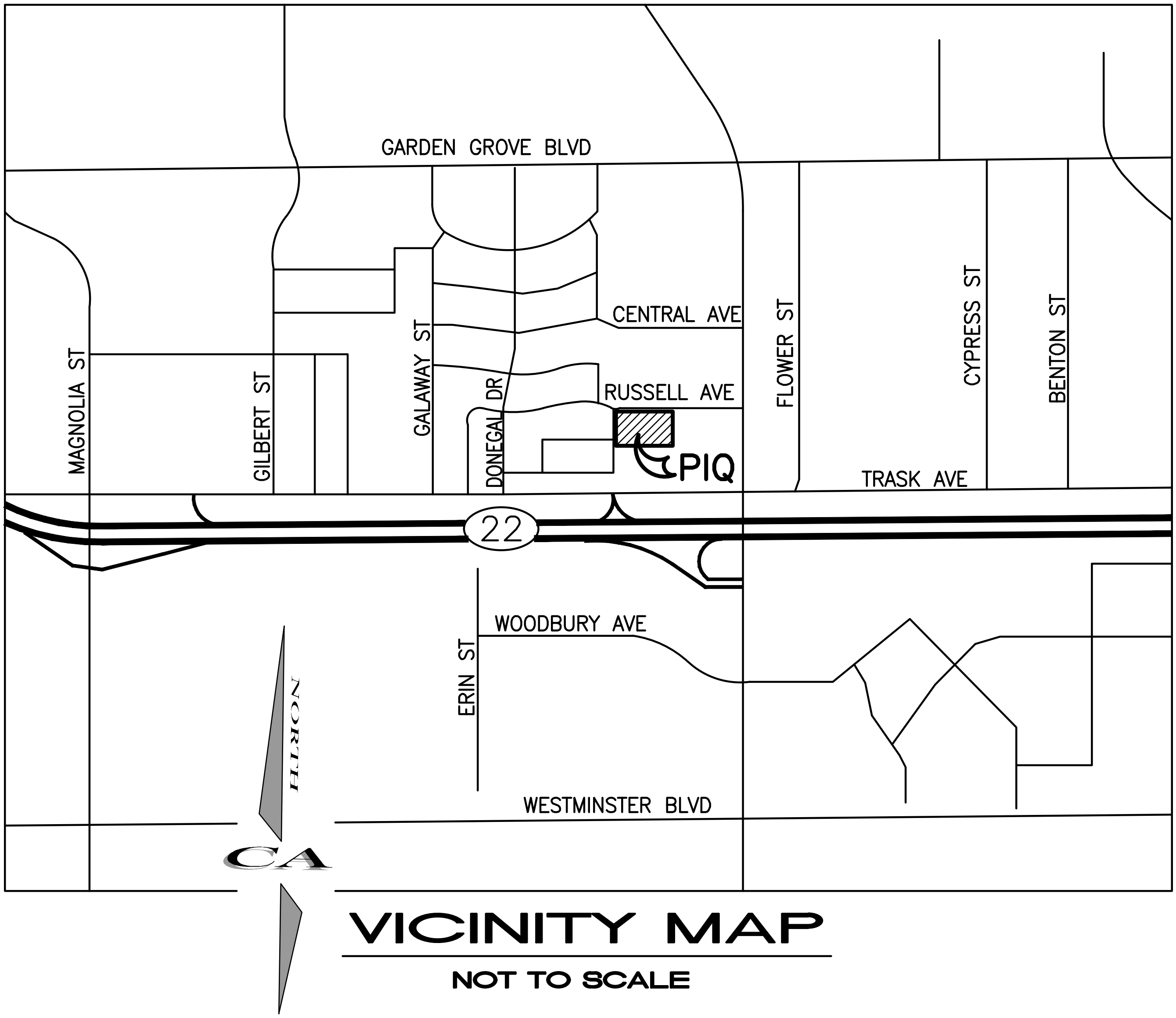
9.0 CONCLUSION

To meet water quality requirements, the DCV will be captured onsite with four curb inlet catch basins and treated in underground infiltration BMP facilities. During larger storm events, as with existing conditions, drainage for the proposed project will outlet onto Russell Avenue & Kerry Street.

During a 100 year storm event, existing flows (7.21 CFS) will be increase by 1.15 CFS under proposed conditions (8.36 CFS). For the 10 year storm event, existing flows (4.70 CFS) will be increased by 0.75 CFS under proposed conditions (5.45 CFS). For the 2 year storm event, existing flows (2.60 CFS) will be increased by 0.40 CFS under proposed conditions (3.00 CFS).

Since proposed flows are slightly increased from the existing flows, the proposed project site will have no significant impact on the existing surrounding drainage facilitates.

10.0 VICINITY MAP



VICINITY MAP

NOT TO SCALE

11.0 SOIL MAP

Hydrologic Soil Group—Orange County and Part of Riverside County, California

MAP LEGEND

Area of Interest (AOI)

- ▭ Area of Interest (AOI)

Soils

Soil Rating Polygons

- ■ A
- ■ A/D
- ■ B
- ■ B/D
- ■ C
- ■ C/D
- ■ D
- □ Not rated or not available

Soil Rating Lines

- 〰 A
- 〰 A/D
- 〰 B
- 〰 B/D
- 〰 C
- 〰 C/D
- 〰 D
- 〰 Not rated or not available

Soil Rating Points

- ■ A
- ■ A/D
- ■ B
- ■ B/D
- ■ C
- ■ C/D
- ■ D
- □ Not rated or not available

Water Features

- 〰 Streams and Canals

Transportation

- ┼┼┼ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

Background

- ■ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

> Warning: Soil Map may not be valid at this scale.
>
> Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 19, Sep 8, 2025

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 1, 2024—Jul 1, 2024

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
163	Metz loamy sand	B	4.8	100.0%
Totals for Area of Interest			**4.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDICES

APPENDIX A: EXISTING RATIONAL METHOD, 2, 10, & 100 YEAR STORM FREQUENCY OUTPUT FILES.

```
____________________________________________________________________________
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
 * EXISTING CONDITION                                                       *
 * 2 YR STORM                                                               *
 *                                                                          *
 **************************************************************************

  FILE NAME: 491-22EX.DAT
  TIME/DATE OF STUDY: 13:24 10/27/2025
============================================================================
  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 = 0.85
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   173.00
  ELEVATION DATA: UPSTREAM(FEET) =     73.40  DOWNSTREAM(FEET) =     72.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.455
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.955
  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        0.54      0.30     0.100    36    6.45
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.94
  TOTAL AREA(ACRES) =      0.54   PEAK FLOW RATE(CFS) =      0.94

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     74.00  DOWNSTREAM(FEET) =     72.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.981
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.617
  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        0.91      0.30     0.100    36    8.98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.30
  TOTAL AREA(ACRES) =      0.91   PEAK FLOW RATE(CFS) =      1.30

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     72.80
  DOWNSTREAM NODE ELEVATION(FEET) =     71.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   149.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) = 0.050   MANNING'S N = .0140
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   0.50
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.491
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        0.35      0.30     0.100    36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.82
  AVERAGE FLOW DEPTH(FEET) =   0.15   FLOOD WIDTH(FEET) =   14.53
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.36   Tc(MIN.) =   10.34
  SUBAREA AREA(ACRES) =    0.35       SUBAREA RUNOFF(CFS) =    0.46
  EFFECTIVE AREA(ACRES) =    1.26     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =       1.66

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.15   FLOOD WIDTH(FEET) =   15.47
  FLOW VELOCITY(FEET/SEC.) =   1.82   DEPTH*VELOCITY(FT*FT/SEC) =   0.28
```

```
  LONGEST FLOWPATH FROM NODE      3.00 TO NODE      5.00 =     449.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.3  TC(MIN.) =     10.34
  EFFECTIVE AREA(ACRES) =      1.26  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       1.66
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:

 ************************** DESCRIPTION OF STUDY **************************
* EXISTING CONDITION                                                       *
* 10 YR STORM                                                              *
*                                                                          *
 **************************************************************************

  FILE NAME: 491-22EX.DAT
  TIME/DATE OF STUDY: 13:28 10/27/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =    6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.  (FT)      (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   173.00
  ELEVATION DATA: UPSTREAM(FEET) =     73.40  DOWNSTREAM(FEET) =     72.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.455
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.507
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 B        0.54      0.30     0.100    56    6.45
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.69
  TOTAL AREA(ACRES) =      0.54   PEAK FLOW RATE(CFS) =      1.69
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     74.00  DOWNSTREAM(FEET) =     72.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.981
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.902
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 B        0.91      0.30     0.100    56    8.98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.35
  TOTAL AREA(ACRES) =      0.91   PEAK FLOW RATE(CFS) =      2.35

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     72.80
  DOWNSTREAM NODE ELEVATION(FEET) =     71.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   149.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0140
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   0.50
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.685
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        0.35      0.30     0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.77
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.90
  AVERAGE FLOW DEPTH(FEET) =   0.18   FLOOD WIDTH(FEET) =   21.41
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.31   Tc(MIN.) =   10.29
  SUBAREA AREA(ACRES) =    0.35       SUBAREA RUNOFF(CFS) =    0.84
  EFFECTIVE AREA(ACRES) =    1.26     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =       3.01

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOOD WIDTH(FEET) =   22.34
  FLOW VELOCITY(FEET/SEC.) =   1.93   DEPTH*VELOCITY(FT*FT/SEC) =   0.36
  LONGEST FLOWPATH FROM NODE      3.00 TO NODE      5.00 =     449.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.3  TC(MIN.) =     10.29
  EFFECTIVE AREA(ACRES) =      1.26  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       3.01
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
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                          Analysis prepared by:

 ************************* DESCRIPTION OF STUDY *************************
* EXISTING CONDITION                                                       *
* 100 YR STORM                                                             *
*                                                                          *
 **************************************************************************

  FILE NAME: 491-22EX.DAT
  TIME/DATE OF STUDY: 13:28 10/27/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   173.00
  ELEVATION DATA: UPSTREAM(FEET) =     73.40  DOWNSTREAM(FEET) =     72.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.455
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.345
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 B        0.54      0.30     0.100    76    6.45
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.58
  TOTAL AREA(ACRES) =      0.54   PEAK FLOW RATE(CFS) =      2.58
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =     74.00  DOWNSTREAM(FEET) =     72.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.981
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.423
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 B        0.91      0.30     0.100    76    8.98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.60
  TOTAL AREA(ACRES) =      0.91   PEAK FLOW RATE(CFS) =      3.60

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     72.80
  DOWNSTREAM NODE ELEVATION(FEET) =     71.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   149.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0140
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   0.50
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.110
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        0.35      0.30     0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.24
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.02
  AVERAGE FLOW DEPTH(FEET) =   0.21   FLOOD WIDTH(FEET) =   26.72
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.23   Tc(MIN.) =   10.21
  SUBAREA AREA(ACRES) =    0.35       SUBAREA RUNOFF(CFS) =    1.29
  EFFECTIVE AREA(ACRES) =    1.26     AREA-AVERAGED Fm(INCH/HR) =   0.03
  AREA-AVERAGED Fp(INCH/HR) =   0.30  AREA-AVERAGED Ap =   0.10
  TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =       4.63

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOOD WIDTH(FEET) =   27.97
  FLOW VELOCITY(FEET/SEC.) =   2.04   DEPTH*VELOCITY(FT*FT/SEC) =   0.44
  LONGEST FLOWPATH FROM NODE      3.00 TO NODE      5.00 =     449.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.3  TC(MIN.) =     10.21
  EFFECTIVE AREA(ACRES) =      1.26  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       4.63
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX B: PROPOSED RATIONAL METHOD, 2, 10 & 100 YEAR STORM FREQUENCY OUTPUT FILES.

```
____________________________________________________________________________
 ****************************************************************************
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                            Analysis prepared by:







  ************************** DESCRIPTION OF STUDY **************************
 * PROPOSED CONDITION                                                       *
 * 2 YR STORM                                                               *
 *                                                                          *
  **************************************************************************

   FILE NAME: 491-22PR.DAT
   TIME/DATE OF STUDY: 16:44 10/27/2025
 ============================================================================
   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 = 0.85
   *DATA BANK RAINFALL USED*
   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
 NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
 ===  =====  =========  =================  ======  ===== ====== ===== =======
   1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ****************************************************************************
   FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
 ----------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ============================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   186.00
   ELEVATION DATA: UPSTREAM(FEET) =     75.50  DOWNSTREAM(FEET) =     73.20

   Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
```

```
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.308
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.981
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.48      0.30     0.200    36    6.31
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.83
  TOTAL AREA(ACRES) =      0.48   PEAK FLOW RATE(CFS) =      0.83

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   253.00
  ELEVATION DATA: UPSTREAM(FEET) =     75.50  DOWNSTREAM(FEET) =     73.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.655
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.773
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.73      0.30     0.200    36    7.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.13
  TOTAL AREA(ACRES) =      0.73   PEAK FLOW RATE(CFS) =      1.13

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   178.00
  ELEVATION DATA: UPSTREAM(FEET) =     75.00  DOWNSTREAM(FEET) =     72.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.199
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.001
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.42      0.30     0.200    36    6.20
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.73
  TOTAL AREA(ACRES) =      0.42   PEAK FLOW RATE(CFS) =      0.73

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   162.00
```

```
  ELEVATION DATA: UPSTREAM(FEET) =     75.40  DOWNSTREAM(FEET) =     73.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.913
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.056
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.17      0.30     0.200    36    5.91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.17   PEAK FLOW RATE(CFS) =      0.31
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.2  TC(MIN.) =      5.91
  EFFECTIVE AREA(ACRES) =      0.17  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       0.31
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
____________________________________________________________________________
****************************************************************************
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                           Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
 * PROPOSED CONDITION                                                       *
 * 10 YR STORM                                                              *
 *                                                                          *
 **************************************************************************

  FILE NAME: 491-22PR.DAT
  TIME/DATE OF STUDY: 16:50 10/27/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN- / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   186.00
  ELEVATION DATA: UPSTREAM(FEET) =     75.50  DOWNSTREAM(FEET) =     73.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.308
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.553
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.48      0.30     0.200    56    6.31
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.51
  TOTAL AREA(ACRES) =      0.48   PEAK FLOW RATE(CFS) =      1.51

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   253.00
  ELEVATION DATA: UPSTREAM(FEET) =     75.50  DOWNSTREAM(FEET) =     73.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.655
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.180
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.73      0.30     0.200    56    7.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.05
  TOTAL AREA(ACRES) =      0.73   PEAK FLOW RATE(CFS) =      2.05

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   178.00
  ELEVATION DATA: UPSTREAM(FEET) =     75.00  DOWNSTREAM(FEET) =     72.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.199
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.589
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.42      0.30     0.200    56    6.20
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.33
  TOTAL AREA(ACRES) =      0.42   PEAK FLOW RATE(CFS) =      1.33

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   162.00
  ELEVATION DATA: UPSTREAM(FEET) =     75.40  DOWNSTREAM(FEET) =     73.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.913
  *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  3.688
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.17      0.30     0.200    56    5.91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.56
  TOTAL AREA(ACRES) =      0.17   PEAK FLOW RATE(CFS) =      0.56
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.2  TC(MIN.) =      5.91
  EFFECTIVE AREA(ACRES) =      0.17  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       0.56
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

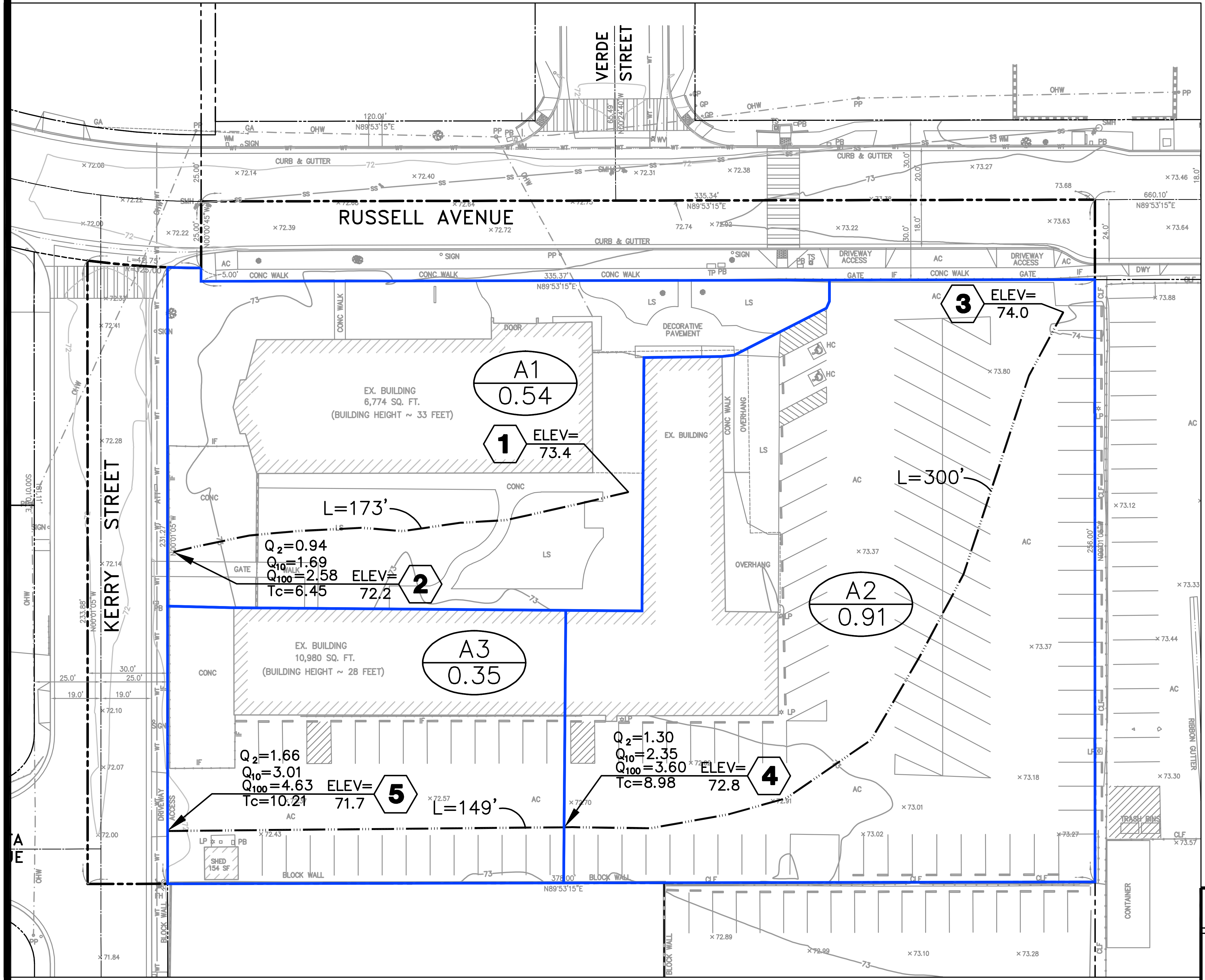
```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
             Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                           Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
 * PROPOSED CONDITION                                                     *
 * 100 YR STORM                                                           *
 *                                                                        *
 **************************************************************************

  FILE NAME: 491-22PR.DAT
  TIME/DATE OF STUDY: 16:51 10/27/2025
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   186.00
  ELEVATION DATA: UPSTREAM(FEET) =     75.50  DOWNSTREAM(FEET) =     73.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.308
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.416
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

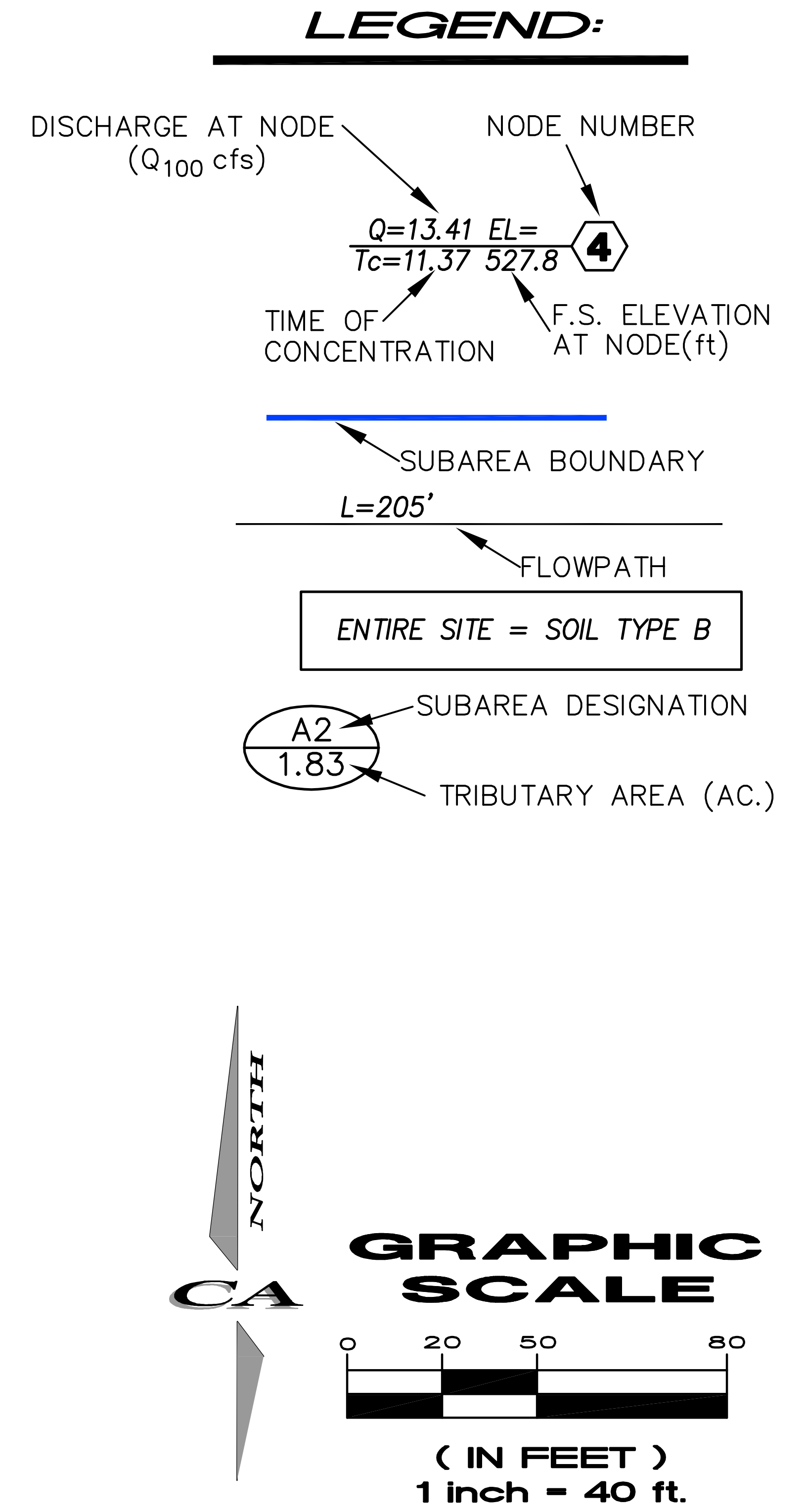
```
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.48      0.30     0.200    76    6.31
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.31
  TOTAL AREA(ACRES) =      0.48   PEAK FLOW RATE(CFS) =      2.31

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   253.00
  ELEVATION DATA: UPSTREAM(FEET) =     75.50  DOWNSTREAM(FEET) =     73.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.655
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.847
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.73      0.30     0.200    76    7.65
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      3.15
  TOTAL AREA(ACRES) =      0.73   PEAK FLOW RATE(CFS) =      3.15

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   178.00
  ELEVATION DATA: UPSTREAM(FEET) =     75.00  DOWNSTREAM(FEET) =     72.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.199
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.470
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.42      0.30     0.200    76    6.20
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.05
  TOTAL AREA(ACRES) =      0.42   PEAK FLOW RATE(CFS) =      2.05

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   162.00
  ELEVATION DATA: UPSTREAM(FEET) =     75.40  DOWNSTREAM(FEET) =     73.30

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.913
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.620
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       B        0.17      0.30     0.200    76    5.91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.85
  TOTAL AREA(ACRES) =      0.17   PEAK FLOW RATE(CFS) =      0.85
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.2  TC(MIN.) =      5.91
  EFFECTIVE AREA(ACRES) =      0.17  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       0.85
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

EXHIBITS

EXHIBIT A: EXISTING CONDITION HYDROLOGY MAP





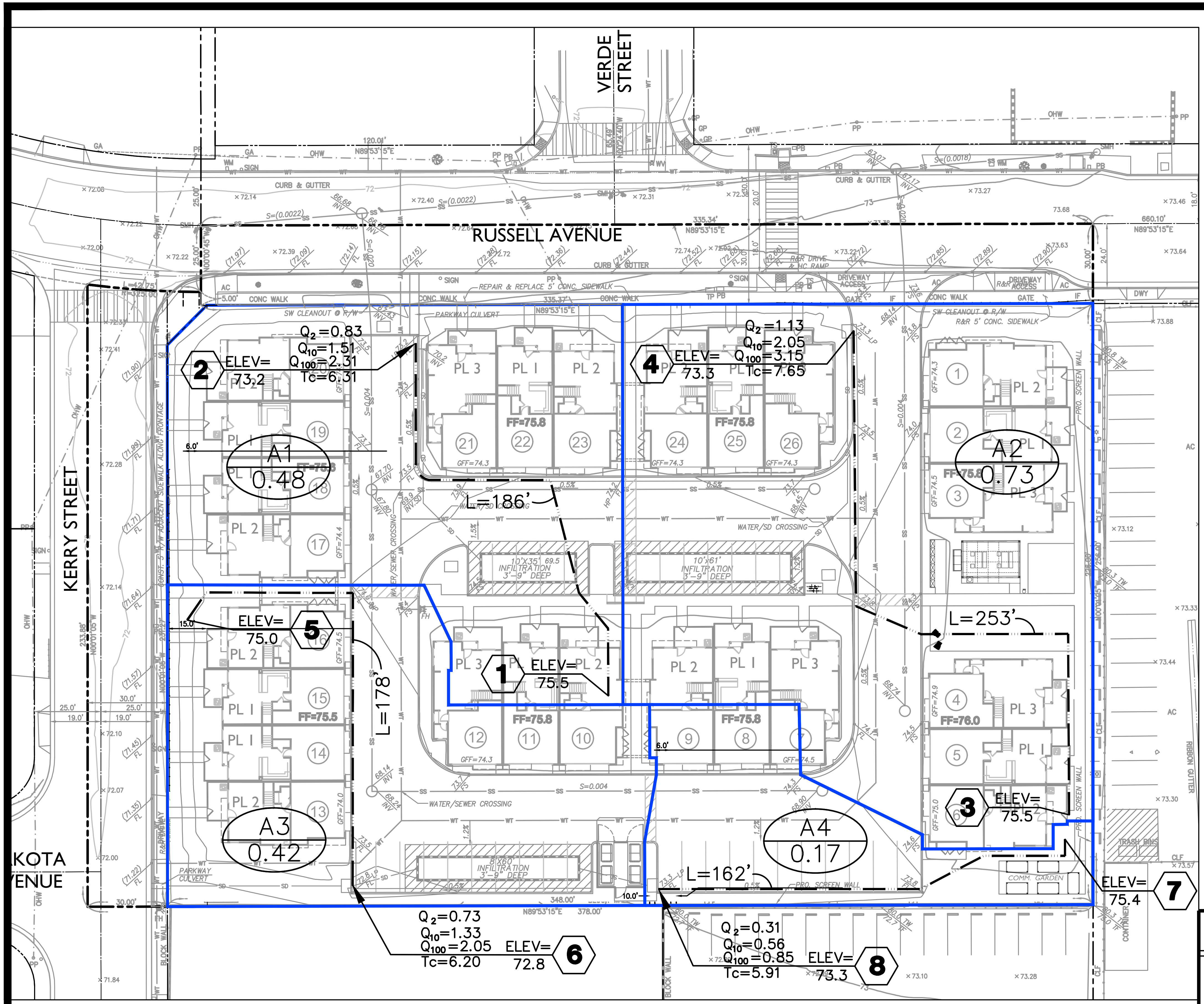
CITY OF GARDEN GROVE

HYDROLOGY MAP
(EXISTING CONDITION)

9822 RUSSELL AVENUE
GARDEN GROVE, CA 92844

S:\491-22 Garden Grove russell\HYDRO\491-22 HYDRO EX.dwg Last Modified: 27 Oct 2025 - 11:04am
Plotted on: 28 Oct 2025 - 2:40pm by cward

EXHIBIT B: PROPOSED CONDITION HYDROLOGY MAP



LEGEND:

DISCHARGE AT NODE (Q_{100} cfs)

NODE NUMBER

Q=13.41 EL= Tc=11.37 527.8 4

TIME OF CONCENTRATION

F.S. ELEVATION AT NODE(ft)

SUBAREA BOUNDARY

L=205'

FLOWPATH

ENTIRE SITE = SOIL TYPE B

A2 1.83

SUBAREA DESIGNATION

TRIBUTARY AREA (AC.)

NORTH

CA

GRAPHIC SCALE

0 20 40 80

(IN FEET)
1 inch = 40 ft.

CITY OF GARDEN GROVE

HYDROLOGY MAP
(PROPOSED CONDITION)
9822 RUSSELL AVENUE
GARDEN GROVE, CA 92844

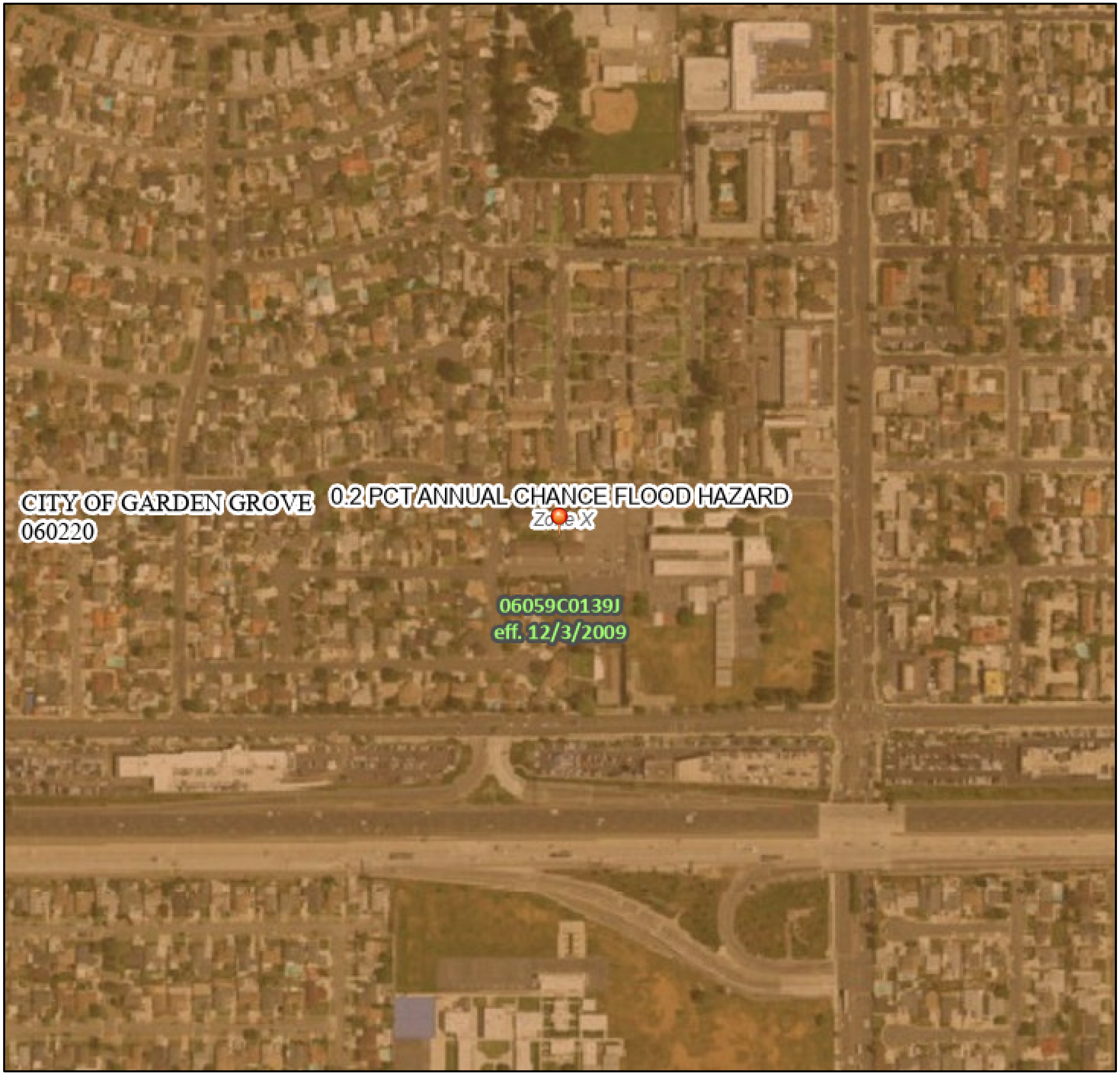
S:\491-22 Garden Grove russell\HYDRO\491-22 HYDRO PRO.dwg Last Modified: 28 Oct 2025 - 5:12pm
Plotted on: 03 Nov 2025 - 6:00pm by cward

EXHIBIT C: FIRM MAP

National Flood Hazard Layer FIRMette

FEMA

117°57'47"W 33°46'20"N



117°57'9"W 33°45'51"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	🟦	Without Base Flood Elevation (BFE) *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
	▨	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	🟧	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	▨	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	▨	Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
	▨	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
	▭	Effective LOMRs
	■	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	— — —	Channel, Culvert, or Storm Sewer
	IIIIIII	Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8 — — —	Coastal Transect
	~~ 513 ~~~	Base Flood Elevation Line (BFE)
	—	Limit of Study
	—	Jurisdiction Boundary
	--- ---	Coastal Transect Baseline
	- —	Profile Baseline
	—	Hydrographic Feature
MAP PANELS	☐	Digital Data Available
	☐	No Digital Data Available
	☒	Unmapped

N

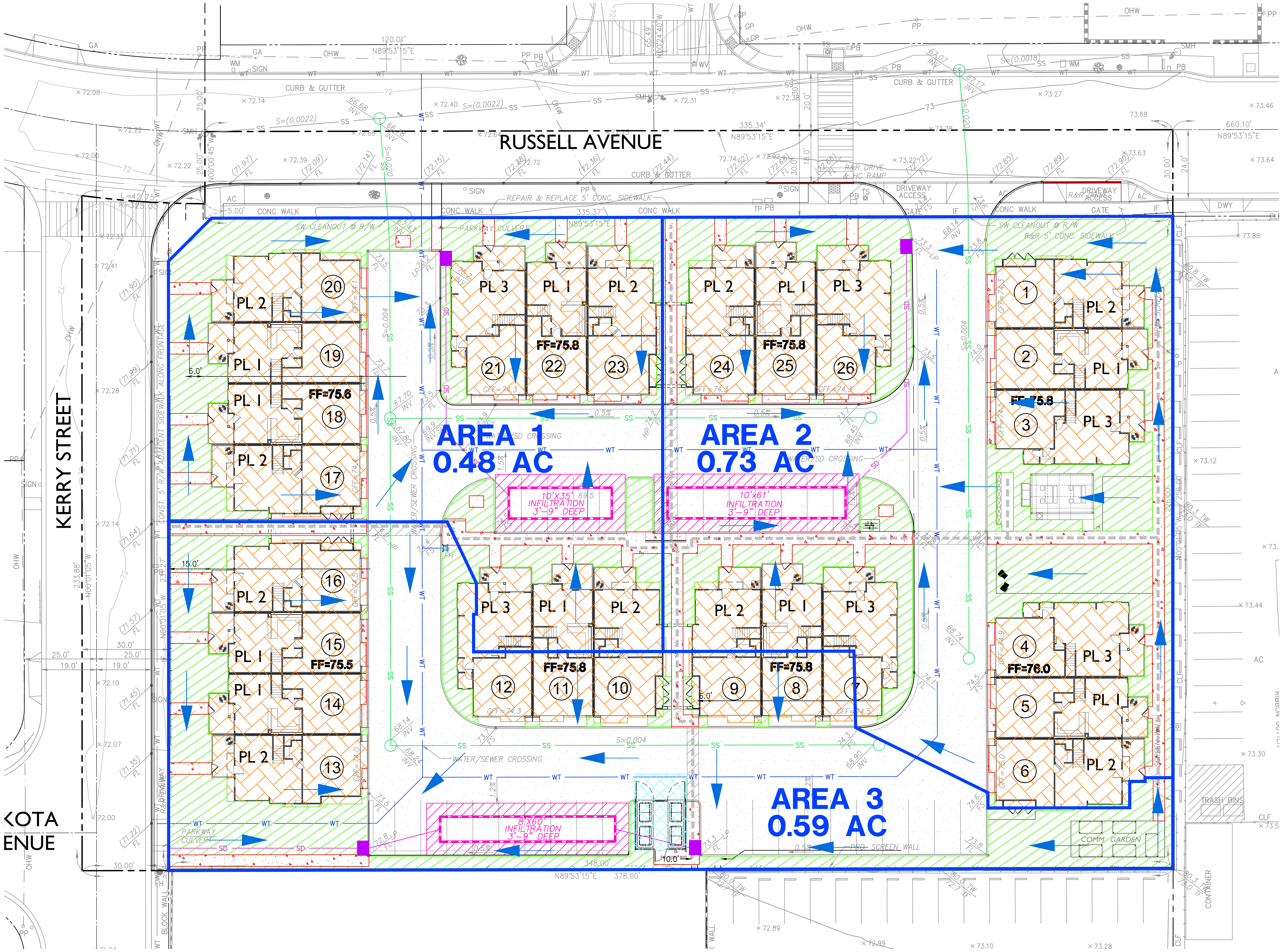
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

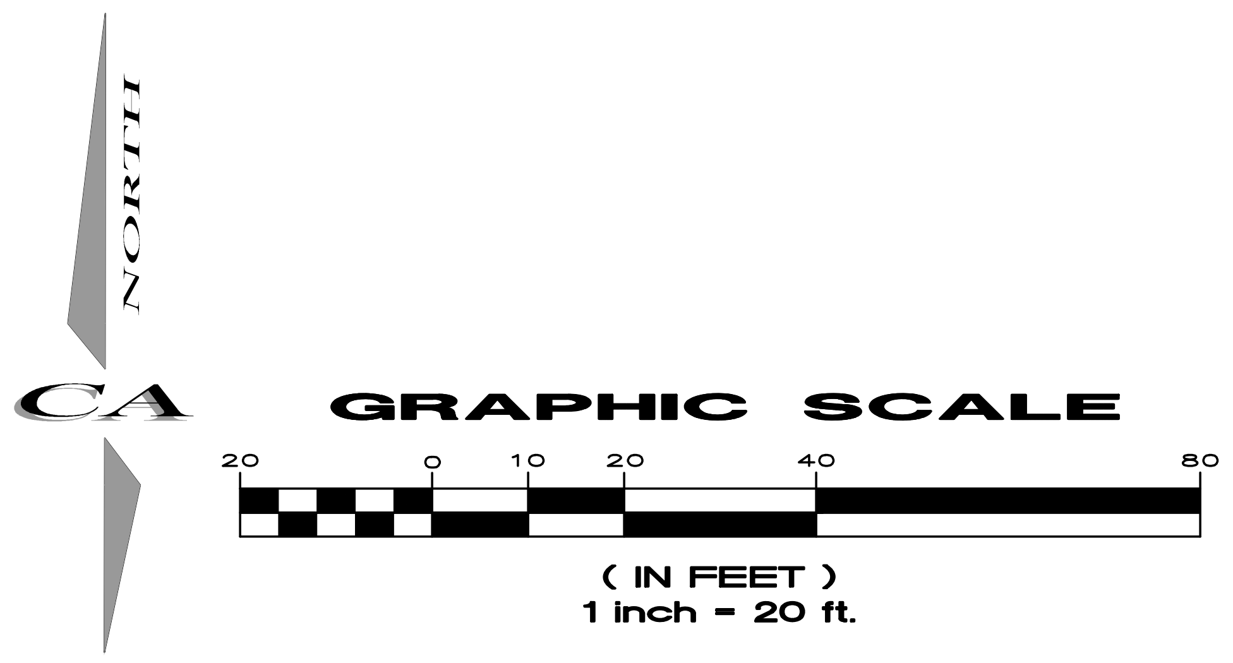
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/29/2025 at 1:33 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

EXHIBIT D: WQMP SITE PLAN





BMP LEGEND

▬	DRAINAGE AREAS **AREA 1**
←	FLOW DIRECTION
▭	UNDERGROUND STORM DRAIN INFILTRATION CHAMBER
▨	LANDSCAPE AREA EFFICIENT IRRIGATION LANDSCAPE AREA RUNOFF–MINIMIZING DESIGN
▨	TRASH ENCLOSURE
▨	BUILDING
▨	CONCRETE HARDSCAPE
▭	ASPHALT CONCRETE DRIVE AISLES
■	CATCH BASIN INSERT FILTERS
—SD—	PROPOSED STORM DRAIN
—SS—	PROPOSED SEWER
—SS—	EXISTING SEWER
—WT—	PROPOSED WATER
—WT—	EXISTING WATER

PROJECT DATA:

TOTAL SITE AREA OF PROPOSED
DEVELOPMENT: 1.80 AC (78,537 SF)

BUILDING FOOTPRINT: 30,930 SF
WALKWAYS / CONC. GUTTER / DOCK AREAS: 8,096 SF
DRIVEWAYS / DRIVE AISLES / PARKING AREAS: 23,233 SF

16,278 SF LANDSCAPING PROVIDED
(20.7% PERVIOUS AREA)

CURRENT USE: COMMERCIAL
PROPOSED USE: RESIDENTIAL

WATERSHED:
ANAHEIM BAY – HUNTINGTON HARBOR

WATER QUALITY CALCULATIONS

FORMULAS

C = 0.75 * IMP % + 0.15
D = DESIGN CAPTURE STORM DEPTH (FIGURE III.1) = 0.77
Dremainder = D - Dhsc = 0.77 - 0 = 0.77
DCV = C * Dremainder * AREA (AC) * 43,560SF/AC * 1/12
A = DCV / Dp
INFILTRATION BASIN VOLUME (cf) = PROVIDED AREA * Dp

WQMP CALCULATIONS	AREA 1	AREA 2	AREA 3	TOTAL
AREA (sf)	20,945	31,680	25,912	**78,537**
% OF TOTAL AREA	26.7%	40.3%	33.0%	**100.0%**
AREA (ac)	0.48	0.73	0.59	**1.80**
LANDSCAPE (sf)	4,264	6,678	5,336	**16,278**
IMPERVIOUS %	79.6%	78.9%	79.4%	**79.3%**
C - RUNOFF COEFFICIENT	0.75	0.74	0.75	**0.74**
D - DESIGN STORM DEPTH	0.77	0.77	0.77	-
D-Remainder	0.77	0.77	0.77	-
DCV - DESIGN CAPTURE VOLUME (cf)	1,006	1,510	1,237	**3,753**
Dp - PONDING DEPTH (ft)	3.75	3.75	3.75	-
A - REQUIRED INFILTRATION BASIN AREA (sf)	268	403	330	-
PROVIDED INFILTRATION BASIN AREA (sf)	350	610	480	-
INFILTRATION BASIN VOLUME (cf)	1,313	2,288	1,800	-

PREPARED BY:

CA ENGINEERING, INC.
Planning • Engineering • Surveying
4101 BIRCH ST., STE 140
NEWPORT BEACH, CA 92660
949-724-9480 949-724-9484 FAX

OWNER:

MELIA HOMES INC.
9860 Irvine Center Drive
Irvine, CA 92618
Contact: Mr. Chad Brown
(949) 759-4367

Nov 03 2025

WATER QUALITY MANAGEMENT PLAN
BMP EXIBIT (SITE PLAN)
TR# 19447
9822 RUSSELL AVENUE
Garden Grove, CA 92844

SHEET 1 OF 1

S:\491-22 Garden Grove russell\WQMP\491-22 PRELIM WQMP SITE PLAN.dwg Last Modified: 30 Oct 2025 - 6:39pm
Plotted on: 03 Nov 2025 - 5:58pm by cward

APPENDIX L

WATER QUALITY CONDITIONS OF APPROVAL

(TO BE INCLUDED IN FINAL WQMP)

APPENDIX M

ENGINEER’S CERTIFICATION FORM