APPENDIX E

PRELIMINARY
WATER QUALITY MANAGEMENT PLAN

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PRELIMINARY PRIORITY
WATER QUALITY MANAGEMENT PLAN
(WQMP)

For:

St. Joseph Orange MOB
331, 353, 393 Main Street
Orange, CA 92686

Prepared for:
PMB Orange 2 LLC
3394 Carmel Mountain Rd
San Diego, CA 92121
898-794-1900

Prepared by:
Kimley-Horn & Associates, Inc.
Tyler Holst, P.E. Registration No. 71438
765 the City Drive
Orange, CA 92868
714-705-1328

Original Date: April 30, 2020
Revision Date: October 22, 2020

_____ _____
Public Works Director **Date**

_____ _____
City Engineer **Date**

OWNER'S CERTIFICATION

WATER QUALITY MANAGEMENT PLAN

FOR

(St. Joseph MOB)

This Water Quality Management Plan (WQMP) for the St. Joseph MOB has been prepared for PMB Orange 2 LLC. This WQMP is intended to comply with the requirements of the City of Orange's Tract/Parcel Map #__, Conditional Use Permit #__, and/or Site Development Permit/Application #__ requiring the preparation of a Water Quality Management Plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the City of Orange Local Implementation Plan (LIP), and the intent of NPDES Permit and Waste Discharge Requirements for the City of Orange, County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region.

This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party having responsibility for implementing portions of this WQMP. Maintenance requirements within Section V and Appendix D will be adhered to with particular emphasis on maintaining the BMPs described within Sections IV and V. The Owner's Annual Self Certification Statement along with a BMP maintenance implementation table will be submitted by June 30th every year following project completion. At least one copy of the approved WQMP shall be available on the subject property in perpetuity.

Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. The City of Orange will be notified of the change of ownership and the new owner will submit a new certification.

Signature: _____ Date: _____

Name: _Pietro Martinez_____

Title: _Project Manager_____

Company: PMB Orange 2 LLC

Address: 3394 Carmel Mountain Road, Suite 200, San Diego, CA

Telephone Number: 858-794-1900

Notice of Transfer of Responsibility

Water Quality Management Plan (WQMP)

WQMP Number – As assigned by the City of Orange: ____

Submission of this Notice of Transfer of Responsibility constitutes notice to the City that responsibility for the Water Quality Management Plan (WQMP) for the subject property identified below, and implementation of that plan, is being transferred from the Previous Owner (and his/her agent) of the site (or portion thereof) to the New Owner, as further described below.

I. Owner/ Responsible Party Information

Company/ Individual: PMB Orange 2 LLC Contact Person: Pietro Martinez

Street Address: 3394 Carmel Mountain Rd, Suite 200 Title: Project Manager

City San Diego State CA Zip 92121 Phone: 858-794-1900

II. Information about Site Relevant to WQMP

Name of Project: St. Joseph Orange MOB
Title of WQMP applicable to site: Preliminary WQMP for St. Joseph Orange MOB
Street Address of the site: 331, 353, 393 Main Street, Orange, CA 92686
Date of Transfer of Responsibility: _____

III. New Owner (Upon Transfer)/ Responsible Party Information

Company/ Individual:_____ Contact Person:_____

Street Address:_____ Title:_____

City _____State____ Zip_____ Phone:_____

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List of Tables

I. Discretionary Permit Number(s), Water Quality Condition Number(s) and Conditions of Approval

APN: 390-681-0006, 390-681-0025, 390-681-0026

GPS Coordinates: 33.783129; -117.867060

Water Quality Conditions (WQMP conditions listed below)

A complete copy of the signed Conditions of Approval will be included as Appendix A upon receipt.

Conditions of Approval:

Prior to the issuance of any grading permits the applicant shall submit a Priority Project WQMP for review and approval to the Public Works Department that:

a. Prioritizes the use of Low Impact Development principles as follows: preserves natural features; minimizes runoff and reduces impervious surfaces; and utilizes infiltration of runoff as the method of pollutant treatment. Infiltration BMPs to be considered include the use of permeable materials such as concrete and concrete pavers, infiltration trenches, infiltration planters, and other infiltration BMPs as applicable,

b. Incorporates the applicable Site Design, Routine Source, Structural Control and Low Impact BMPs as defined in the Model Water Quality Management Plan and Technical Guidance Document,

c. Maintains the hydrologic characteristics of the site by matching time of concentration, runoff, velocity, volume and hydrograph for a 2-year storm event,

d. Minimizes the potential increase in downstream erosion and avoids downstream impacts to physical structures, aquatic and riparian habitat,

e. Generally describes the long-term operation and maintenance requirements for structural and Treatment Control BMPs,

f. Identifies the entity or employees that will be responsible for long-term operation, maintenance, repair and or replacement of the structural and Treatment Control BMPs and the training that qualifies them to operate and maintain the BMPs,

g. Describes the mechanism for funding the long-term operation and maintenance of all structural and Treatment Control BMPs,

h. Includes a copy of the forms to be used in conducting maintenance and inspection activities,

i. Meets recordkeeping requirements (forms to be kept for 5 years).

j. Includes a copy of the form to be submitted annually by the project owner to the Public Works Department that certifies that the project's structural and treatment BMPs are being inspected and maintained in accordance with the project's WQMP.

Prior to the issuance of certificates for use of occupancy, the applicant shall demonstrate the following to the Public Works Department:

a. That all structural and treatment control best management practices (BMPs) described in the Project WQMP have been constructed and installed in conformance with the approved plans and specifications,

b. That the applicant is prepared to implement all non-structural BMPs described in the Project WQMP,

c. That an adequate number of copies of the project's approved final Project WQMP are available for the future occupiers

Prior to the issuance of certificates for use of occupancy or final signoff by the Public Works Department, the applicant shall demonstrate to the satisfaction of Public Works, that the preparer of the WQMP has reviewed the BMP maintenance requirements in Section V of the WQMP with the responsible person and that a copy of the WQMP has been provided to that person. A certification letter from the WQMP preparer may be used to satisfy this condition.

Prior to issuance of building permits, the applicant shall review the approved Water Quality Management Plan (WQMP) and grading plan to ensure the structure's downspouts or drainage outlet locations are consistent with those documents. Copies of the building or architectural plans specifically showing the downspouts and drainage outlets shall be submitted to the Public Works Department for review.

The project applicant shall maintain all structural, treatment and low impact development BMPs at the frequency specified in the approved WQMP. Upon transfer of ownership or management responsibilities for the project site, the applicant shall notify the City of Orange Public Works Department of the new person(s) or entity responsible for maintenance of the BMPs.

Prior to City approval of the landscape plans, the applicant shall review the approved Water Quality Management Plan and ensure the proposed landscape plans are consistent with the project grading plans. The plans must show any proposed storm water treatment Best Management Practices such as bioretention planters, drywells, permeable pavers, or any other proposed surface water quality BMPs.

II. Project Description

Planning Area (Location): St. Joseph Hospital and Children's Hospital of Orange County

Project Site Area (ac): 1.22 ac

Project Disturbed Area (ac): 1.22 ac

Percent Change in Impermeable Surfaces: 3%

SIC Code: 8011 - Offices and Clinics of Doctors of Medicine

Project Description

The project is a proposed medical office building for the St. Joseph Hospital – Orange and is located at 331, 353, 393 Main Street in the City of Orange California. The project site is located on the northwest corner of West Stewart Dr and Main Street.

As part of this project, the existing buildings, parking areas, landscape and adjacent asphalt will be demolished. Under proposed conditions, a new four-story medical office building (MOB) (approx. 38,400 sq ft) and adjacent improvements will be constructed. Adjacent improvements include parking areas, sidewalks, and drive aisles and make up the remaining 14,200 sq ft. The hospital building will sit atop a proposed 5-level underground parking structure. Landscape areas and above ground planter boxes will be located around the MOB.

The proposed MOB will be a rectangle-oriented north to South between West Columbia Place and West Stewart Drive. A building overhang will extend along the south, west and north perimeters of the building. The north overhang will extend and fully cover West Columbia Place. The outdoor parking area will be located North of West Columbia Place. A ramp along the east perimeter of the site will lead traffic to the underground parking structure. The proposed underground parking structure will cover most of the project area.

The MOB and overhang areas will drain to the southwest of the site and discharge to four planter boxes ((BMP-1A, -1B, -2A, and -2B). Drainage from the ramp along the east perimeter will be collected in a trench drain and be pumped to a planter box (BMP-3) near the southeast corner of the ramp. "Planter box" refers to a rectangular, cast-in-place concrete box to be filled with Filterra Bioscape soil media or approved equal. The planter boxes will be above ground so as to not interfere with the underground parking structure. An underground storm drain system will also be installed to convey the site runoff from the planter boxes to the existing public storm drains around the site. Drainage from the site enters a public storm drain system which discharges to the Santa Ana River, and ultimately the Pacific Ocean. Project Purpose and Activities

The proposed site will serve as a medical office building for the St. Joseph Hospital Orange. Above ground parking will be provided north of West Columbia Place. A drive aisle will be provided along the east perimeter of the site to allow traffic to enter the underground parking structure. Routine outdoor activities include garbage truck emptying dumpsters, street sweeping, vehicle parking, pedestrian traffic, and landscape maintenance; other activities shall be prohibited.

Potential Storm Water Pollutants

Pollutants of Concern			
Pollutant	Circle One: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E ☒	N ☐	Resulting from limited air and hydrological transport of sediments both on and around the subject site.
Nutrients	E ☒	N ☐	
Heavy Metals	E ☒	N ☐	Resulting from automobiles parking in the above ground parking area.
Pathogens (Bacteria/Virus)	E ☒	N ☐	
Pesticides	E ☒	N☐	Pesticides expected to be used in landscaping.
Oil and Grease	E ☒	N ☐	Resulting from automobiles parking and using drive aisles.
Toxic Organic Compounds	E ☐	N ☒	No Toxic Organic Compounds anticipated.
Trash and Debris	E ☒	N ☐	Trash enclosure proposed

Hydrologic Conditions of Concern

There are no hydrologic conditions of concern. According to Figure 3: Susceptibility Analysis Santa Ana River from Appendix XVI.3 of the Orange County Technical Guidance Document, the project area is not in a potential area of Erosion, Habitat, & Physical Structure Susceptibility. The Facility discharges to a public storm drain system which ultimately discharges to the Lower Santa Ana River. The portion of the River where the storm drain discharges and the following approx. 1.7 miles has an earth bottom but has been stabilized by grade control structure. The next portion of the river

has a concrete bottom and is stabilized. The last portion of the river south of Yorktown Avenue has an earth bottom and is also stabilized. Refer to Figure 3 in Section VI.

Post Development Drainage Characteristics

In the proposed condition, the stormwater runoff from the building and overhang, drainage areas A-1, and A-2, will discharge to roof drains and be conveyed to four planter boxes (BMP-1A, -1B, -2A, and -2B). Roof drains will be designed by others during final construction design phase so that flow is split evenly between the planter boxes. The planter boxes will be above ground so that the system invert is above the underground parking structure. Treated runoff will be collected in an underground perforated pipe in the planter boxes. This runoff will then discharge to the existing public storm drain via a steel pipe. The planter boxes will have a reverse bend overflow pipe or atrium drain.

Drainage area A-3 consists of the ramp down to the underground parking structure located on the eastern perimeter of the project area. Runoff from this area will be collected in trench drains and pumped to a planter box (BMP-3) near the southeast corner of the drainage area. Treated runoff will be collected in an underground perforated pipe in the planter boxes. This runoff will then connect to a proposed storm drain line which will eventually connect to the existing public storm drain. The planter boxes will have a reverse bend overflow pipe or atrium drain.

Drainage area A-4 consists of the parking area and driveway north of W. Columbia Ln and is located atop the underground parking structure. Runoff from A-4 generally flows in the western direction and will discharge via a parkway drain to Main Street. A Triton TDAM filter will be installed in the parkway drain for full trash capture and to treat this runoff.

Commercial Projects

The project is a commercial development and will serve as a medical office building. A cafeteria with no kitchen is proposed inside the MOB. An outdoor trash enclosure is proposed on the northeast corner of the above ground parking area. No outdoor storage areas, onsite vehicle washing areas are proposed.

Residential Projects

N/A

Site Ownership and any Easements

The property is owned by PMB Orange 2 LLC. This company will maintain the private facility including any private storm drainage structure. Existing easements will be removed, and no new easements are proposed onsite.

III. Site Description

Reference Location Map:

Site Address: 331, 353, 393 Main Street, Orange, CA

Zoning: Commercial

Predominant Soil type: B soils per Figure XVI-2a.

Pre-project percent pervious: 5% **Post-project percent pervious: 2%**

Pre-project percent impervious: 95% **Post-project percent impervious: 98%**

Site Characteristics

The site is located on the northeast corner of Main Street and West Stewart Drive. The existing site has two vacant medical buildings, one motel building, adjacent parking areas, sidewalks and drive aisles. The three existing buildings comprise approximately 16,990 sf. The total site area is 1.22 ac and is 95% impervious. The project is in a 0.8" precipitation zone. The topography is generally flat and generally flows in the southwesterly direction. No water features are located onsite.

Per Geotechnical Investigation completed by Geotechnical Professionals Inc, subsurface soils consist of undocumented fill. The undocumented fill is overlying natural soils consisting of sandy clay, silty clays, clayey silts, medium dense to dense clayey sands, silty sands and sands. Additionally, groundwater was encountered at 98 feet below ground surface (bgs); however, historical groundwater level has been determined at 40 feet bgs. No infiltration tests were conducted at the site. However, the geotechnical report has determined that stormwater infiltration at the site is not feasible based on the clay layers that were encountered during the subsurface investigation and the seasonally high groundwater level.

Watershed Characteristics

Watershed: Lower Santa Ana River

Downstream Receiving Waters: Santa Ana River and Pacific Ocean

Water Quality Impairments (if applicable): Santa Ana River Reach 2 has bacteria listed in the 303(d) list and was delisted in 2016.

Hydromodification susceptibility: The Facility discharges to a public storm drain system which ultimately discharges to the Lower Santa Ana River. The portion of the River where the storm drain discharges and the following approx. 1.7 miles has an earth bottom but has been stabilized by grade control structure. The next portion of the river has a concrete bottom and is stabilized. The last portion of the river south of Yorktown Avenue has an earth bottom and is also stabilized. Refer to Figure 3 in Section VI.

Identify watershed management priorities: N/A

IV. Best Management Practices

Stormwater runoff from drainage areas A-1, A-2 and A-3 will be treated via planter boxes. These planter boxes will use Filterra Bioscape soil media (or approved equal) to allow for a loading rate of 100 inches per hour and will be sized as a flow-through system to achieve 80% capture efficiency. Runoff from drainage areas A-1 and A-2 will enter the planter boxes (BMP-1A, -1B, -2A, and -2B) via roof downspouts. Runoff from drainage area A-3 will be collected in trench drains and be pumped to the planter box (BMP-3). Per the Geotechnical Report dated March 10, 2020 completed by Geotechnical Professionals Inc, infiltration at the site is not recommended.

IV.1 Site Design and Drainage Characteristics

Table 1

Site Design BMPs

Technique	Included?		If no, state justification.
	Yes	No	
Minimize Directly Connected Impervious Areas (DCIAs) (C-Factor Reduction)		x	Diversion not feasible due to unavailable pervious areas with adequate infiltration per HSC-1.
Create Reduced or "Zero Discharge" Areas (Runoff Volume Reduction)[1]		x	Runoff volume reduction not feasible.
Minimize Impervious Area/Maximize Permeability (C-Factor Reduction)[2]		x	Impervious areas in the above ground parking area will be minimized in design by maximizing available landscape areas. However, since imperviousness is increasing, no c-factor reduction will be applied.
Conserve Natural Areas (C-Factor Reduction)		x	No natural areas to conserve.

1 Detention and retention areas incorporated into landscape design provide areas for retaining and detaining stormwater flows, resulting in lower runoff rates and reductions in volume due to limited infiltration and evaporation. Such Site Design BMPs may reduce the size of Treatment Control BMPs.

2 The "C Factor" is a representation of the ability of a surface to produce runoff. Surfaces that produce higher volumes of runoff are represented by higher C Factors. By incorporating more pervious, lower C Factor surfaces into a development, lower volumes of runoff will be produced. Lower volumes and rates of runoff translate directly to lowering treatment requirements.

IV.2 Source Control BMPs

IV.2.1 Routine Non-Structural BMPs

Table 2

Routine Non-Structural BMPs

BMP No.	Name	Check One		If not applicable, state brief reason.
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	X		
N2	Activity Restriction	X		
N3	Common Area Landscape Management	X		
N4	BMP Maintenance	X		
N5	Title 22 CCR Compliance		X	No hazardous wastes will be generated at the site.
N6	Local Water Quality Permit Compliance		X	This BMP is not applicable. The City of Orange does not issue water quality permits.
N7	Spill Contingency Plan		X	No fuel storage or tanks stored onsite.
N8	Underground Storage Tank Compliance		X	No underground storage tanks proposed.
N9	Hazardous Materials Disclosure Compliance		X	No hazardous materials will be stored at the site.
N10	Uniform Fire Code Implementation		X	No hazardous materials/wastes proposed to be stored at the site.
N11	Common Area Litter Control	X		
N12	Employee Training	X		
N13	Housekeeping of Loading Docks		X	No loading docks proposed.
N14	Common Area Catch Basin Inspection	X		
N15	Street Sweeping Private Streets and Parking Lots	X		

Implementation of Non-Structural BMPS

N1. Education of Property Owners, Tenants and Occupants.

Responsible Party: Owner

Implementation Frequency: Orientation shall be given to new owners, tenants, and occupants within 30 days of startup and annually thereafter.

Practical information shall be provided by the property owner on general good housekeeping BMPs and other practices that contribute to protection of storm water quality. This WQMP shall be provided with emphasis placed on the materials included in, but not limited to, Sections V, VI and VII of this report. For additional information, see the BMP Maintenance Responsibility /Frequency Matrix in Section V. Educational Materials to be used include, but are not limited to IC10, Outdoor Loading/Unloading of Materials, IC21, Waste Handling and Disposal, IC3, Building Maintenance, IC15, Parking/Storage Area Maintenance, and The Ocean Begins at Your Front Door. Additional resources are available at the following websites: http://www.cityoforange.org/depts/publicworks/storm_water_npdes/lip ; http://www.ocwatersheds.com. See Table V-1 in Section V for inspection and maintenance activity requirements.

N2. Activity Restrictions.

Responsible Party: Owner

Implementation Frequency: Daily management of operation. Orientation shall be given New employees within 30 days of starting. Refreshing orientation shall be given annually.

Parking restrictions include, but are not limited to, provisions regulating vehicle and truck deliveries, vehicle and truck parking, loading and unloading activities, etc. Some other common restrictions to be adhered to are as follows:

- No discharges of fertilizer, pesticides, and wastes to streets or storm drains
- No blowing or sweeping of debris into streets or storm drains
- No hosing down of paved surfaces
- No vehicle washing or maintenance.
- Do not perform paint cleanup activities in paved areas or allow rinse water from these activities to enter the storm drain system. Clean brushes containing water-based paint in a sink that is connected to the sanitary sewer system.
- Do not use detergents or other chemical additives when washing concrete sidewalks or building exteriors, use potable water only and collect wash water runoff using a vacuum truck, for proper offsite disposal.
- Keep premises, as well as trash container areas, free of litter. See Table V -1 in Section V for inspection and maintenance activity requirements.

In addition, onsite activities shall be limited to the requirements of this WQMP as described herein.

N3. Common Area Landscape Management.

Responsible Party: Owner

Implementation Frequency: Landscape areas shall be maintained on a weekly basis through Grounds and Maintenance personnel and when new personnel are hired.

Maintenance shall include: Plant vegetation that reduces water, fertilizer, herbicide, and pesticide use. Waste shall be disposed of by composting or at a permitted landfill and shall not be raked or blown into the street, gutter, or storm drains. Irrigation systems shall be inspected monthly for leaks. Leaks shall be repaired as soon as they are observed. Over-watering of vegetation is prohibited. If excessive runoff is observed, automatic timers shall be adjusted. Fertilizers, herbicides, and pesticides shall be used as directed on the label. If fertilizer is spilled on a paved surface it should be swept up immediately and placed in its container. Water shall not be used to clean fertilizer spills unless necessary and only after the area has been thoroughly cleaned using dry cleaning methods. Pesticides, herbicides, and fertilizers shall not be applied within 48 hours prior to rain or if wind speeds exceed 5 mph. For additional information, see Help Prevent Ocean Pollution - Proper Maintenance Practices for Your Business included in Appendix B of this report. Also refer to IC3, Building Maintenance, included in Appendix B and the BMP Maintenance Responsibility /Frequency Matrix in Section V for details.

N4. BMP Maintenance.
Responsible Party: Owner

Implementation Frequency: Individual BMPs shall be inspected based on the required frequency of each BMP as suggested in the Maintenance Responsibility /Frequency Matrix.

See the BMP Maintenance Responsibility /Frequency Matrix in Section V for details.

N11. Common Area Litter Control
Responsible Party**:** Owner

Implementation Frequency: Daily

In order to reduce the likelihood of polluting storm water runoff, regular maintenance will be conducted. This will consist of, at a minimum, site-wide litter control, emptying of trash receptacles in common areas, sweeping of dumpster enclosure areas, and reporting trash disposal violations to the owner. Employees will be instructed to look for litter or trash on a daily basis. The landscape maintenance may be contracted for common area litter control as well. See Table V-1 in Section V for inspection and maintenance activity requirements.

N12. Employee Training
Responsible Party**:** Owner

Implementation Frequency: Training every year and within 30 days of when new employees are hired

The developer or owner will prepare an educational manual for future employees. Manual will contain, but not be limited to; copies of the educational information listed in Section VII and included in Appendix B shall be provided to educate them in the protection of storm water quality. Owner shall be responsible for training their personnel in the importance of maintaining the on-site storm drain system free of debris and other pollutants. Personnel shall be reminded on a regular basis that storm drains are intended to be for storm water only, and that employees are prohibited from discharging anything into the storm drain system. See Table V -1 in Section V for inspection and maintenance activity requirements.

N14. Common Area Catch Basin Inspection.
Responsible Party: Owner

Implementation Frequency: No catch basins are proposed onsite. Trench drains in drainage areas A-3 and A-4, and a parkway drain in drainage area A-4 are proposed which will be maintained monthly during wet season and inspected prior to October 1st.

Inspected for trash/ debris and other obstructions and cleaned as necessary. Cleaning should take place in the late summer/ early fall prior to the start of the rainy season. This should occur no later than October 1 of each year. Records will be kept documenting the annual maintenance. See Section VII and the BMP Maintenance Responsibility /Frequency Matrix in Section V.

N15. Street Sweeping Private Streets and Parking Lots.
Responsible Party: Owner

Implementation Frequency: Weekly

The owner shall be responsible for sweeping the surrounding parking lot on a weekly basis to remove debris.

IV.2.2 Routine Structural BMPs

Table 3

Routine Structural BMPs

Name	Check One		If not applicable, state brief reason
	Included	Not Applicable	
Provide storm drain system stenciling and signage- "No Dumping – Drains to Ocean"	X		
Design and construct outdoor material storage areas to reduce pollution introduction		X	No material storage proposed.
Design and construct trash and waste storage areas to reduce pollution introduction	X		
Use efficient irrigation systems & landscape design	X		
Protect slopes and channels and provide energy dissipation		X	No existing natural slopes or channels on-site.
Incorporate requirements applicable to individual project features			
a. Dock areas		X	No dock area
b. Maintenance bays		X	No maintenance bay
c. Vehicle or community wash areas		X	No vehicle wash area
d. Outdoor processing areas		X	No outdoor processing
e. Equipment wash areas		X	No outdoor equipment
f. Fueling areas		X	No fueling necessary
g. Hillside landscaping		X	No hillside
h. Wash water control for food preparation areas		X	A cafeteria with no food preparation areas is proposed.

Implementation of Structural BMPs

S1. Storm Drain System Stenciling and Signage

Responsible Party: Owner

Implementation Frequency: Minimum once per year and repair as necessary, no later than October 1st of each year.

Phrase "No-Dumping- Drains to Oceans" to be placed on each catch basin and storm drain inlet to inform the public of the destination of pollutants discharged into stormwater. Catch basin signage shall be inspected for legibility no less than once per year. The catch basin stencil shall be kept onsite. Catch basins shall be re-stenciled when phrase is no longer legible. Locations of stenciling can be found on the BMP Location Map in Section VI. All onsite private catch basins will remain the property of the owner.

S3. Design and construct trash and waste storage areas to reduce pollution introduction

Responsible Party: Owner

Implementation Frequency: Waste containers will be regularly inspected, repaired and/or replaced. Trash dumpster pickup shall be a minimum of once a week.

Loose trash will be picked up daily and placed in containers. The proposed trash storage areas will be paved with an impervious surface. The trash storage area will be emptied at the minimum of once a week. All trash receptables in common areas shall have lids to prevent storm water introduction. Signs shall be posted to inform users that hazardous materials are not to be disposed of therein. Cleaning of trash storage areas to sheet flow to BMP is not acceptable. All water used to clean isolated trash areas will be collected for disposal. For additional information, see the BMP Maintenance Responsibility /Frequency Matrix in Section V.

S4. Use efficient irrigation systems & landscape design

Responsible Party: Owner

Implementation Frequency: Inspect irrigation equipment on a weekly basis. Check water sensors and adjust irrigation heads and timing monthly.

The proposed landscape and irrigation system shall group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Monthly inspection of the irrigation system shall be conducted to ensure efficient water uses. See IC3, Building Maintenance in Appendix B for more information. Also refer to the BMP Maintenance Responsibility /Frequency Matrix in Section V.

IV.3 Low Impact Development BMP Selection

IV.3.1 Hydrologic Source Controls

N/A.

Table 4

Hydrologic Source Control BMPs

Name	Check If Used
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☐
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐

No HSC present or proposed.

IV.3.2 Infiltration BMPs

Table 5

Infiltration BMPs

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

Per the Geotechnical Report, infiltration at the site is infeasible and no infiltration BMPs are proposed at the site. Refer to Worksheet I and Table 2.7 in Section IV.8.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Table 6

Evapotranspiration, Rainwater Harvesting BMP

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

There is insufficient demand for water to justify Harvey and reuse. Refer to Worksheet J in Section IV.8.

IV.3.4 Biotreatment BMPs

Table 7
Biotreatment BMPs

Bioretention with underdrains	☐
Storm water planter boxes with underdrains	☒
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☒
Wet extended detention basin	☐
Dry extended detention basins	☐
Other:	☐
Other:	☐

Planter boxes have been proposed for drainage areas A-1, A-2, and A-3. Runoff from areas A-1 and A-2 will enter their respective planter boxes and be evenly distributed via roof drains. Runoff from area A-3 will be pumped to the planter box. Each planter box will use Filterra's Bioscape soil media, or approved equal, which has a hydraulic loading rate of 100 in/hr. The Filterra Bioscape soil media has received approval from the Washington Department of Ecology (Refer to Appendix C). The planter boxes will be designed as flow-based system to achieve 80% capture efficiency. Soil media is to be selected to meet the requirements set in the MISC-1 and MISC-2 fact sheets in the TGD. Removal efficiencies for the selected proprietary soil have been included in Appendix C.

IV.3.5 Hydromodification Control BMPs
N/A

IV.3.6 Regional/Sub-Regional LID BMPs
N/A

IV.3.7 Treatment Control BMPs
N/A

IV. 4 Water Quality Credits
N/A

IV.5 Alternative Compliance Plan
N/A

IV.6 Vector Control

The design flow rate for each planter box is 0.103 cfs. The loading rate of the soil media will be minimum 100 inches per hour which will allow for the runoff to be treated in less than the 48-hour maximum for vector control issues.

IV.7 Drainage Management Area (DMA)

DMA Number	BMPs	Area Treated
A-1	Planter box (BMP 1-A, 1-B)	0.44 ac
A-2	Planter box (BMP 2-A, 2-B)	0.44 ac
A-3	Planter box (BMP 3)	0.18 ac
A-4	Triton TDAM Filter (BMP 4)	0.16 ac
Total Area		1.22 ac

Total Project Area= 1.22 ac

Runoff from drainage areas A-1 and A-2 will be evenly distributed via roof drains to be designed by others during final design and be evenly distributed between four planter boxes as described in the table above. Planter box locations and dimension limits have

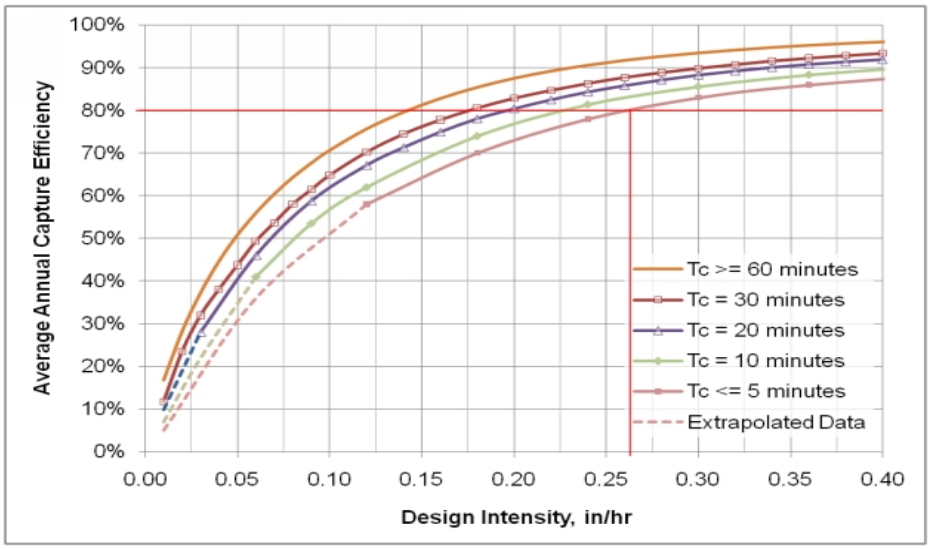
been selected based on site constraints as shown on the site plan. Drainage area A-3 will be collected in trench drains and pumped to a planter box which will be located above ground near the southeast corner of the area. All planter boxes will use a reverse bend pipe or atrium drain for overflows. Drainage area A-4 is located above the underground parking structure and proposed surface is at ground level. BMPs cannot be located at surface level due to underground garage; therefore, a Triton TDAM Filter has been proposed in the parkway drain to treat the 1-year, 1-hour runoff from this area. The Triton TDAM Filter selected meets “100% full trash capture – 2.4 mm” specification (Refer to appendix C). Refer to the Site Plan for BMP locations.

IV.8 Calculations

Providence St Joseph (Orange)
Worksheet D: Capture Efficiency Method for Flow-Based BMPs
DMA A-1

Step 1: Determine the design intensity used for calculating design flow rate				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c =	5	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1 =	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC} =	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2 =	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2 =	0	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design} =	0.26	
Step 2: Calculate the Design Flow Rate				
1	Enter Project area tributary to BMP, A (acres)	A =	0.44	acres
2	Enter Project Imperviousness, imp (unitless)	imp =	1.00	
3	Calculate runoff coefficient, C = (0.75 x imp) + 0.15	C =	0.90	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design} =	0.103	cfs
Supporting Calculations				
1	Loading Rate		100	in/hr
			0.0023	ft/s
2	Required Area (Q_{design}/Loading Rate)		45	sq ft
3	Area Provided		45	sq ft
Describe System: Planter box will be constructed. Filterra's Bioscape soil media will be used, or approved equivalent per OC TGD, and have a minimum loading rate of 100 in/hr (refer to appendix C) while maintaining biological activity and soil mix standard as required in the TGD. Refer to Drainage Area map for a BMP typical cross section.				
Provide time of concentration assumptions: Time of concentration was conservatively assumed as 5 minutes which provides the largest design intensity possible for 80% annual capture efficiency.				

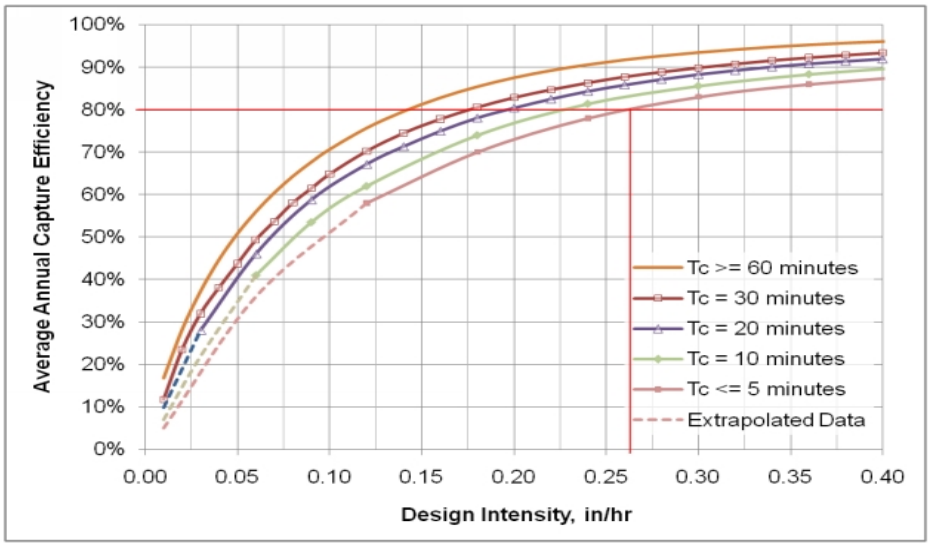
Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



Providence St Joseph (Orange)
Worksheet D: Capture Efficiency Method for Flow-Based BMPs
DMA A-2

Step 1: Determine the design intensity used for calculating design flow rate				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c =	5	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1 =	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC} =	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2 =	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2 =	0	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design} =	0.26	
Step 2: Calculate the Design Flow Rate				
1	Enter Project area tributary to BMP, A (acres)	A =	0.44	acres
2	Enter Project Imperviousness, imp (unitless)	imp =	1.00	
3	Calculate runoff coefficient, C = (0.75 x imp) + 0.15	C =	0.90	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design} =	0.103	cfs
Supporting Calculations				
1	Loading Rate		100	in/hr
			0.0023	ft/s
2	Required Area (Q_{design}/Loading Rate)		45	sq ft
3	Area Provided		45	sq ft
Describe System: Planter box will be constructed. Filterra's Bioscape soil media will be used, or approved equivalent per OC TGD, and have a minimum loading rate of 100 in/hr (refer to appendix C) while maintaining biological activity and soil mix standard as required in the TGD. Refer to Drainage Area map for a BMP typical cross section.				
Provide time of concentration assumptions: Time of concentration was conservatively assumed as 5 minutes which provides the largest design intensity possible for 80% annual capture efficiency.				

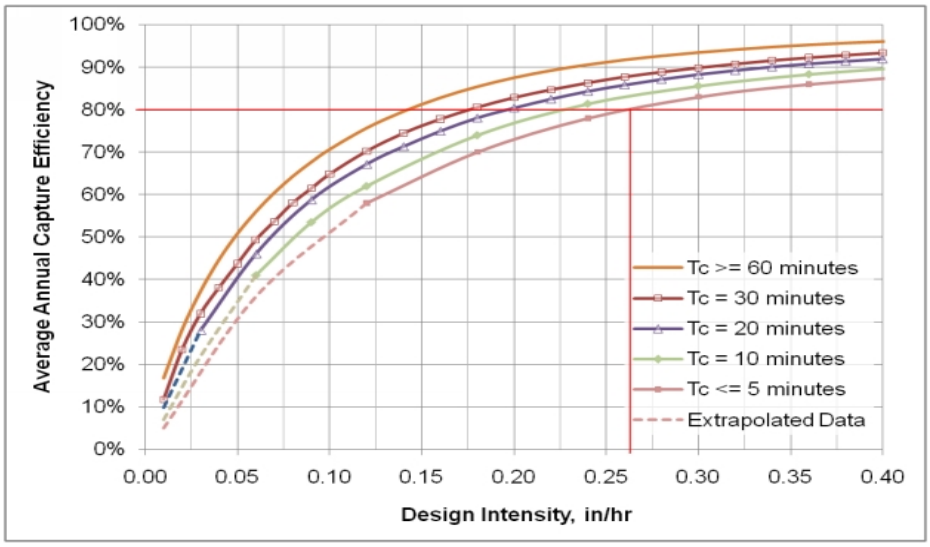
Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



Providence St Joseph (Orange)
Worksheet D: Capture Efficiency Method for Flow-Based BMPs
DMA A-2

Step 1: Determine the design intensity used for calculating design flow rate				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c =	5	min
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1 =	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC} =	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2 =	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2 =	0	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design} =	0.26	
Step 2: Calculate the Design Flow Rate				
1	Enter Project area tributary to BMP, A (acres)	A =	0.18	acres
2	Enter Project Imperviousness, imp (unitless)	imp =	1.00	
3	Calculate runoff coefficient, C = (0.75 x imp) + 0.15	C =	0.90	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design} =	0.042	cfs
Supporting Calculations				
1	Loading Rate		100	in/hr
			0.0023	ft/s
2	Required Area (Q_{design}/Loading Rate)		18	sq ft
3	Area Provided		20	sq ft
Describe System: Planter box will be constructed. Filterra's Bioscape soil media will be used, or approved equivalent per OC TGD, and have a minimum loading rate of 100 in/hr (refer to appendix C) while maintaining biological activity and soil mix standard as required in the TGD. Refer to Drainage Area map for a BMP typical cross section.				
Provide time of concentration assumptions: Time of concentration was conservatively assumed as 5 minutes which provides the largest design intensity possible for 80% annual capture efficiency.				

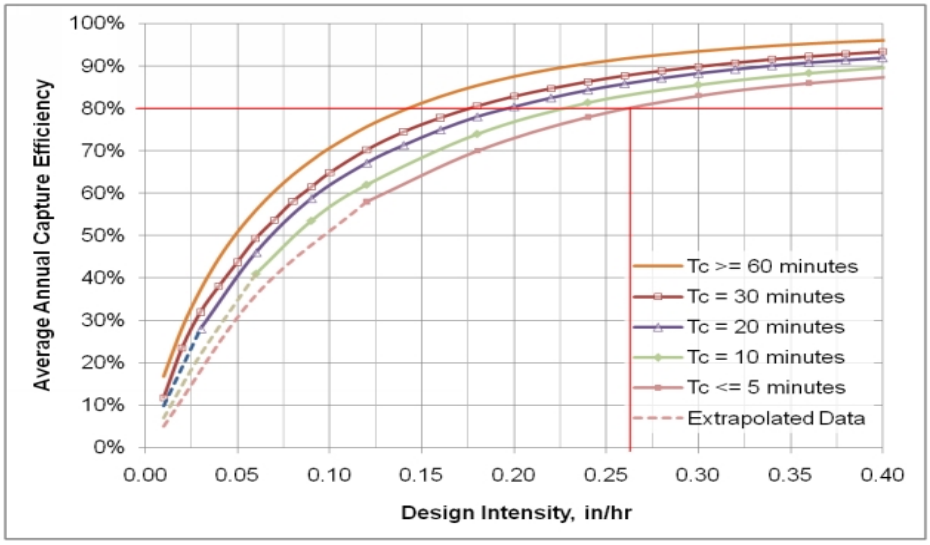
Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County



Providence St Joseph (Orange)
Worksheet D: Capture Efficiency Method for Flow-Based BMPs
Drainage Area A-4

Step 1: Determine the design intensity used for calculating design flow rate				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c =	5	min
2	1-year, 1-hour storm intensity, I_1	I_1 =	0.406	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC} =	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2 =	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2 =	0	
6	Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$	I_{design} =	0.406	
Step 2: Calculate the Design Flow Rate				
1	Enter Project area tributary to BMP, A (acres)	A =	0.16	acres
2	Enter Project Imperviousness, imp (unitless)	imp =	0.98	
3	Calculate runoff coefficient, C = (0.75 x imp) + 0.15	C =	0.90	
4	Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$	Q_{design} =	0.058	cfs
Supporting Calculations				
Describe System: Triton TDAM Filter (Model TDAM12 standard) has been proposed. Filter flow rate capacity is 0.26 cfs and meets "100% full trash capture 2.4 mm" specification (Refer to Appendix C).				
Provide time of concentration assumptions: Time of concentration was conservatively assumed as 5 minutes which provides the largest design intensity possible for 80% annual capture efficiency.				

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



Providence St Joseph (Orange)
Worksheet J: Rainwater Harvesting Feasibility

Step 1: Determine the design capture storm depth used for calculating volume				
1	Minimum irrigation area required based on conservation landscape design (Table X.8)		1.14	acres
2	Proposed project irrigated area (multiply conservation landscaping by 1; multiply active turf by 2)		0.03	acres
3	Is partial capture potentially feasible? (Line 2 > Line 1)		NO	

Table X.8: Minimum Irrigated Area for Potential Partial Capture Feasibility

General Landscape Type	Conservation Design: K_L = 0.35			Active Turf Areas: K_L = 0.7		
Closest ET Station	*Irvine*	*Santa Ana*	*Laguna*	*Irvine*	*Santa Ana*	*Laguna*
Design Capture Storm Depth, inches	**Minimum Required Irrigated Area per Tributary Impervious Acre for Potential Partial Capture, ac/ac**					
0.60	0.66	0.68	0.72	0.33	0.34	0.36
0.65	0.72	0.73	0.78	0.36	0.37	0.39
0.70	0.77	0.79	0.84	0.39	0.39	0.42
0.75	0.83	0.84	0.90	0.41	0.42	0.45
0.80	0.88	0.90	0.96	0.44	0.45	0.48
0.85	0.93	0.95	1.02	0.47	0.48	0.51
0.90	0.99	1.01	1.08	0.49	0.51	0.54
0.95	1.04	1.07	1.14	0.52	0.53	0.57
1.00	1.10	1.12	1.20	0.55	0.56	0.60

Worksheet I: Summary of Groundwater-related Feasibility Criteria

1	Is project large or small? (as defined by **Table VIII.2**) circle one	Large	Small		
2	What is the tributary area to the BMP?	A	0.88	acres	
3	What type of BMP is proposed?	Planter Box with proprietary ammended soil media			
4	What is the infiltrating surface area of the proposed BMP?	A_{BMP}	0	sq-ft	Total
5	What land use activities are present in the tributary area (list all)	Current lot is existing with parking lot and existing buildings. Proposed land use is a medical office building.			
6	What land use-based risk category is applicable?	L	M	H	
7	If M or H, what pretreatment and source isolation BMPs have been considered and are proposed (describe all):				
8	What minimum separation to mounded seasonally high groundwater applies to the proposed BMP? See Section **VIII.2** (circle one)	5 ft	10 ft		
9	Provide rationale for selection of applicable minimum separation to seasonally high mounded groundwater:	Historical high groundwater depth is approximately 40 ft bgs according to the Geotechnical Report dated March 10, 2020 completed by Geotechnical Professionals Inc.			
10	What is separation from the infiltrating surface to seasonally high groundwater?	SHGWT	40	ft	
11	What is separation from the infiltrating surface to mounded seasonally high groundwater?	Mounded SHGWT	N/A	ft	
12	Describe assumptions and methods used for mounding analysis:	N/A			
13	Is the site within a plume protection boundary (See **Figure**	Y	N	N/A	

Worksheet I: Summary of Groundwater-related Feasibility Criteria

	VIII.2)?	
14	Is the site within a selenium source area or other natural plume area (See Figure VIII.2)?	Y (N) N/A
15	Is the site within 250 feet of a contaminated site?	Y (N) N/A
16	If site-specific study has been prepared, provide citation and briefly summarize relevant findings: See site specific Geotechnical report dated 03/10/2020 completed by Geotechnical Professionals Inc. The onsite soils consisted of fill soils (silty sands, clays, silty clayes and sandy clays) and natural soils which consisted of interbeeded layers of firm to stiff sandy clay, silty clays, and clayey silts. Based on the soil type and depth to groundwater, deep infiltration below the underground parking structure is not recommended per the geotechnical engineer.	
17	Is the site within 100 feet of a water supply well, spring, septic system?	Y (N) N/A
18	Is infiltration feasible on the site relative to groundwater-related criteria?	Y (N)

Provide rationale for feasibility determination:

Based solely on groundwater related criteria, infiltration is not feasible as supported by the Geotechnical report dated 03/10/2020.

Note: if a single criterion or group of criteria would render infiltration infeasible, it is not necessary to evaluate every question in this worksheet.

Table 2.7: Infiltration BMP Feasibility Worksheet

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

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

	Partial Infeasibility Criteria	*Yes*	*No*
4	Is proposed infiltration facility **located on HSG D soils** or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?	X	
Provide basis: See site specific Geotechnical report dated 03/10/2020 completed by Geotechnical Professionals Inc. The onsite soils consisted of fill soils (silty sands, clays, silty clayes and sandy clays) and natural soils which consisted of interbeeded layers of firm to stiff sandy clay, silty clays, and clayey silts.			
5	Is **measured infiltration rate below proposed facility less than 0.3 inches per hour**? This calculation shall be based on the methods described in **Appendix VII**.		
Provide basis: Recommendations from geotechnical engineer state that infiltration is not feasible due to soil type; therefore, no infiltration test was completed.			
6	Would **reduction of over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: N/A			
7	Would **an increase in infiltration over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: N/A			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

Infiltration Screening Results (check box corresponding to result):		
8	Is there substantial evidence that infiltration from the project would result in a significant increase in I&I to the sanitary sewer that cannot be sufficiently mitigated? (See **Appendix XVII**) Provide narrative discussion and supporting evidence: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.	N/A
9	If any answer from row 1-3 is yes: infiltration of any volume is **not feasible** within the DMA or equivalent. Recommendations from geotechnical engineer state that infiltration is not feasible due to soil type and depth to groundwater below the proposed underground parking structure.	Yes
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. Recommendations from geotechnical engineer state that infiltration is not feasible due to soil type and depth to groundwater below the proposed underground parking structure.	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.	

V. Implementation, Maintenance and Inspection Responsibility for BMPs (O&M Plan)

Responsible Party Information (Local Contact Information)

Name: Pietro Martinez Title: Project Manager

Company: PMB Orange 2 LLC Phone Number: 858-794-1900

Table 8 - Frequency Inspection Matrix

BMP Inspection/Maintenance			
BMP	**Responsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N1 - Education for Property Owners, Tenants, and Occupants	Owner	Inform tenants of the requirements of this WQMP with environmental awareness educational materials as these units are leased and occupied. Enforcement of WQMP including regular maintenance and training for all employees.	Within 30 days of employee starting and annually thereafter

N2 - Activity Restrictions	Owner	No discharges of fertilizer, pesticides, and wastes to streets or storm drains. No blowing or sweeping or debris into streets or storm drains. No hosing down of paved surfaces. Do not use detergents or other chemical additives when washing concrete sidewalks or building exteriors, use potable water only and collect wash water runoff using a vacuum truck for proper offsite disposal. No vehicle maintenance or washing onsite. Keep premises, as well as trash container areas, free of litter.	Daily management of operation. Orientation shall be given to new employees within 30 days of startup. Refreshing orientation shall be given annually.
N3 - Common Area Landscape Management	Owner	Training on landscape management consistent with City Water Conservation Resolution shall be conducted for all new field landscape maintenance personnel	Weekly and when new field landscaping personnel are hired.
N11 - Common Area Litter Control	Owner	Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities	Daily
N12 - Employee Training	Owner	Consisting at a minimum of the distribution of the educational materials attached to this report regarding the protection of surface waters through pollution prevention.	Training within 30 days of new employee being hired Annually thereafter

N14 - Common Area Catch Basin Inspection	Owner	Litter and debris removal, illicit discharge violations investigation and reporting and shall be performed in conjunction with maintenance activities.	The onsite catch basins will be maintained monthly during wet season and inspected prior to October 1st
N15 - Street Sweeping Private Streets and Parking Lots	Owner	Parking areas within the project shall be swept at a minimum frequency of once a week.	Weekly
S3 - Design and construct trash and waste storage areas to reduce pollution introduction	Owner	The proposed trash storage areas will be paved with an impervious surface. Loose trash will be picked up daily and placed in trash containers. The trash storage area will be emptied at the minimum of once a week. Lined bins will be inspected for leaks and fixed/replaced upon identification. Signs shall be posted on all dumpsters that hazardous materials are not to be disposed of therein.	Daily pickup. Weekly Removal. Monthly Inspection. Annually at the start of the rainy season, and as needed prior to storm events.
S1 - Provide storm drain system stenciling and signage	Owner	All proposed inlets shall be marked with the appropriate “No Dumping. Drains to Ocean.” Stencil. The stencils must be repainted when they become illegible but at a minimum once every five years.	Twice a year and no later than October 1st of each year.

S4 - Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Owner	Verify that landscape design continues to function properly by correcting and adjusting to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in according with water demands given time of year, and day or nighttime temperatures.	Weekly
Triton TDAM Filter (Full Capture Trash Device) – BMP# 4	Owner	Inspect filters to ensure debris and pollutant accumulation exceeds no more than 80% of filter capacity. Remove debris on a regular basis and immediately after storm events to prevent clogging.	On a recurring basis (at least three times per year). Frequency and length between inspections may vary based on local weather conditions and pollutant loading.
Planter Box – BMP# 1-A, 1-B, 2-A, 2-C, and 3	Owner	Irrigate plants as needed. Inspect flow splash pads, ponding area, and overflow drains periodically. Replace soil, plant material, and/or mulch layer if erosion has occurred.	On a recurring basis (at least two times per year).

Regulatory Permits

N/A

Funding

Owner will be responsible for installation and on-going maintenance for all BMPs.

OWNER SELF CERTIFICATION STATEMENT

As the owner representative of the St. Joseph Orange MOB for which a Water Quality Management Plan (WQMP) was approved by the City, I hereby certify under penalty of law that all Best Management Practices contained within the approved Project WQMP have been maintained and inspected in accordance with the schedule and frequency outlined in the approved WQMP Maintenance Table.

The maintenance activities and inspections conducted are shown in the attached table and have been performed by qualified and knowledgeable individuals. Structural Treatment BMPs have been inspected and certified by a licensed professional engineer.

To the best of my knowledge, the information submitted is true and accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and citations for violating water quality regulations.

Signed: _____

Name: _____

Title: _____

Company: _____

Address: _____

Telephone Number: _____

Date: _____

BMP Implementation Tracking Table

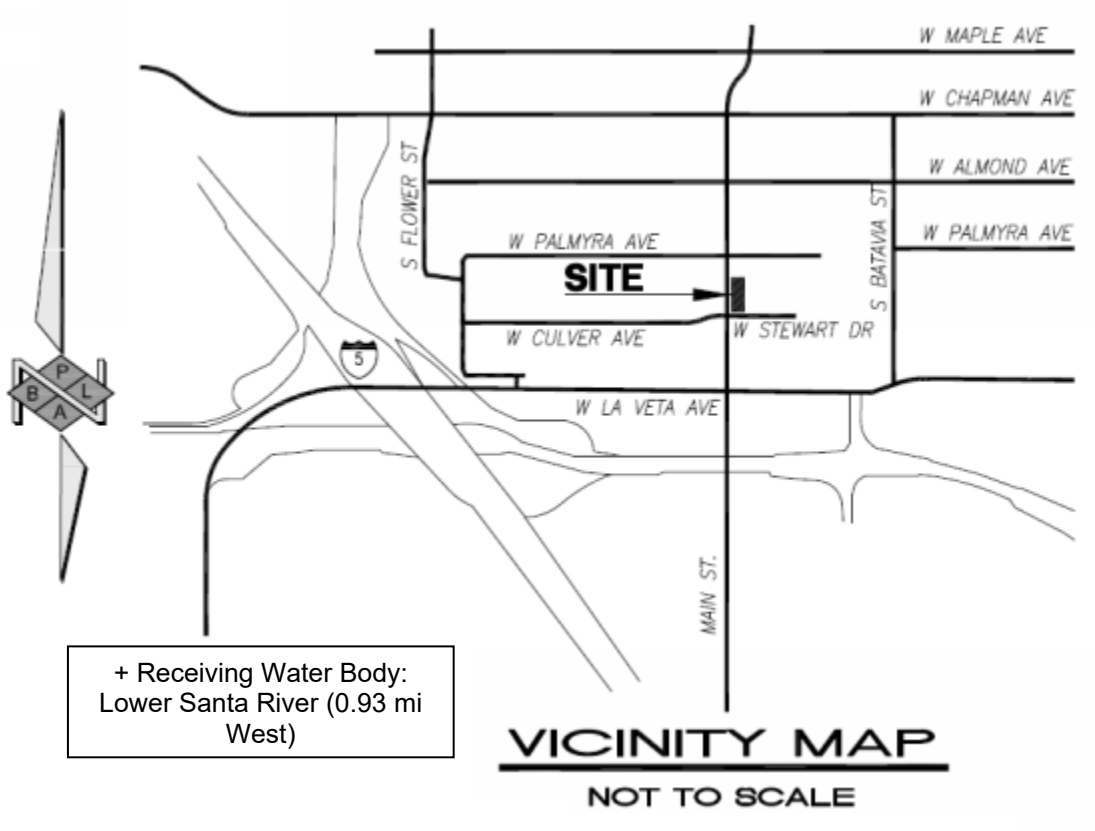
BMP	Activity	Completion Dates or Frequency	Initial
Source Control BMPs (Structural and Nonstructural)			
N1 - Education for Property Owners, Tenants, and Occupants	Inform tenants of the requirements of this WQMP with environmental awareness educational materials as these units are leased and occupied. Enforcement of WQMP including regular maintenance and training for all employees.	Annually	
N2 - Activity Restrictions	No discharges of fertilizer, pesticides, and wastes to streets or storm drains. No blowing or sweeping or debris into streets or storm drains. No hosing down of paved surfaces. Do not use detergents or other chemical additives when washing concrete sidewalks or building exteriors, use potable water only and collect wash water runoff using a vacuum truck for proper offsite disposal. No vehicle maintenance or washing onsite. Keep premises, as well as trash container areas, free of litter.	Daily management of operation.	
N3 - Common Area Landscape Management	Training on landscape management consistent with City Water Conservation Resolution shall be conducted for all new field landscape maintenance personnel	Weekly.	
N11 - Common Area Litter Control	Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities	Daily	
N12 - Employee Training	Consisting at a minimum of the distribution of the educational materials attached to this report regarding the protection of surface waters through pollution prevention.	Annually	

N14 - Common Area Catch Basin Inspection	Litter and debris removal, illicit discharge violations investigation and reporting and shall be performed in conjunction with maintenance activities.	Monthly during wet season and prior to October 1st	
N15 - Street Sweeping Private Streets and Parking Lots	Parking areas within the project shall be swept at a minimum frequency of once a week.	Weekly	
S3 - Design and construct trash and waste storage areas to reduce pollution introduction	The proposed trash storage areas will be paved with an impervious surface. Loose trash will be picked up daily and placed in trash containers. The trash storage area will be emptied at the minimum of once a week. Lined bins will be inspected for leaks and fixed/replaced upon identification. Signs shall be posted on all dumpsters that hazardous materials are not to be disposed of therein.	Daily pickup. Weekly Removal. Monthly Inspection. Annually at the start of the rainy season, and as needed prior to storm events.	
S1 - Provide storm drain system stenciling and signage	All proposed inlets shall be marked with the appropriate “No Dumping. Drains to Ocean.” Stencil. The stencils must be repainted when they become illegible but at a minimum once every five years.	Twice a year and no later than October 1st of each year.	
S4 - Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Verify that landscape design continues to function properly by correcting and adjusting to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in according with water demands given time of year, and day or nighttime temperatures.	Weekly	

Low Impact Development and Treatment BMPs			
Triton TDAM Filter (Full Capture Trash Device) – BMP# 4	Inspect filters to ensure debris and pollutant accumulation exceeds no more than 80% of filter capacity. Remove debris on a regular basis and immediately after storm events to prevent clogging.	Quarterly	
Planter Box – BMP# 1-A, 1-B, 2-A, 2-C, and 3	Irrigate plants as needed. Inspect flow splash pads, ponding area, and overflow drains periodically. Replace soil, plant material, and/or mulch layer if erosion has occurred.	On a recurring basis (at least two times per year).	

* This sheet is to be submitted annually with the Owner Self Certification Statement.
* Structural Treatment BMPs should be certified by a Licensed Professional Engineer.

VI. Location Map, Site Plan, and BMP Details



Susceptibility

Potential Areas of Erosion, Habitat, & Physical Structure Susceptibility

Channel Type

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

Tidel Influence

- <= Mean High Water Line (4.28')

Water Body

- Basin
- Dam
- Lake
- Reservoir

Forest Areas

- Cleveland National Forest

Federal Lands

- Amarus Salt Marsh

Project Location

Stabilized by Grade Control Structure

San Gabriel-Coyote Creek Watershed

San Bernardino County

Riverside County

South Orange County

Newport Bay Watershed

AnaheimBay-HuntingtonHarbor Watershed

Carbon Canyon

Yorba Linda Reservoir

Miller Retarding Basin

Anaheim Lake

Kraemer Basin

Warner Basin

Olive Hills

Fletcher Retarding Basin

Walnut Canyon Reservoir

Villa Park Dam

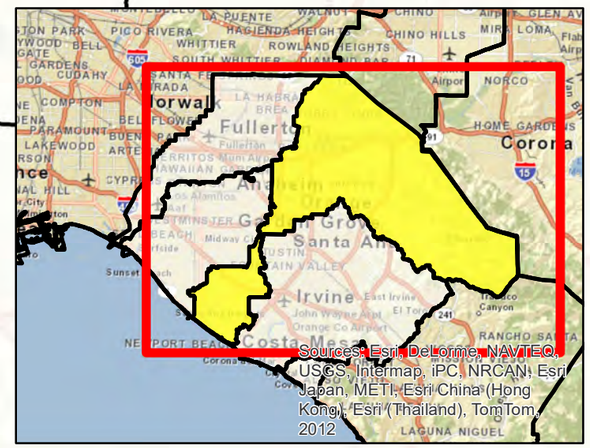
Peters Canyon Reservoir

Irvine Lake

Cleveland National Forest

SOUTHPARK PUMP STATION

Bartlett Retarding Basin



0 12,000 24,000 Feet

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

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

TITLE: SUSCEPTIBILITY ANALYIS SANTA ANA RIVER

JOB: ORANGE COUNTY WATERSHED MASTER PLANNING ORANGE CO. CA

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

PACE Advanced Water Engineering

FIGURE 3

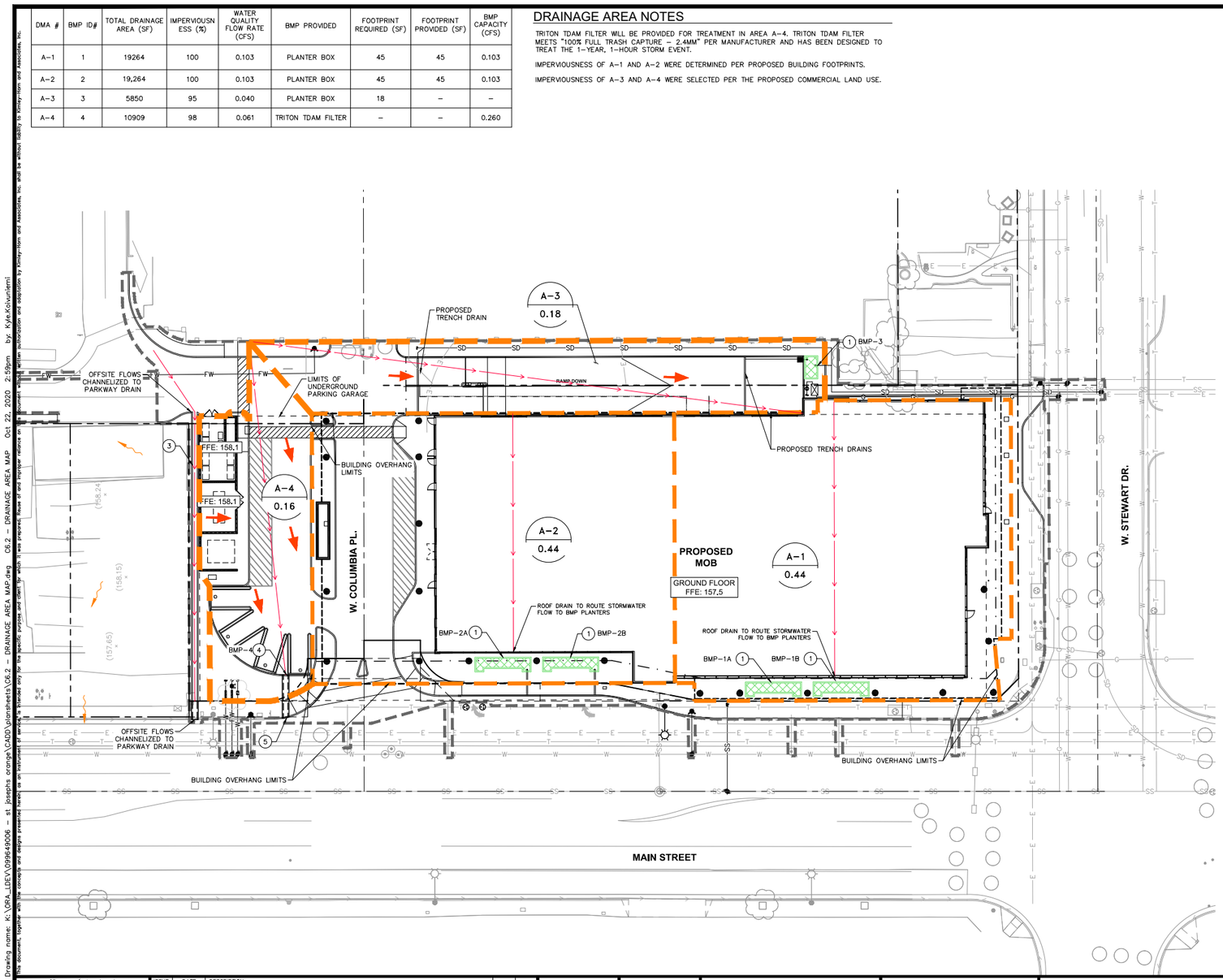
DMA #	BMP ID#	TOTAL DRAINAGE AREA (SF)	IMPERVIOUSNESS (%)	WATER QUALITY FLOW RATE (CFS)	BMP PROVIDED	FOOTPRINT REQUIRED (SF)	FOOTPRINT PROVIDED (SF)	BMP CAPACITY (CFS)
A–1	1	19264	100	0.103	PLANTER BOX	45	45	0.103
A–2	2	19,264	100	0.103	PLANTER BOX	45	45	0.103
A–3	3	5850	95	0.040	PLANTER BOX	18	–	–
A–4	4	10909	98	0.061	TRITON TDAM FILTER	–	–	0.260

DRAINAGE AREA NOTES

TRITON TDAM FILTER WILL BE PROVIDED FOR TREATMENT IN AREA A–4. TRITON TDAM FILTER MEETS "100% FULL TRASH CAPTURE – 2.4MM" PER MANUFACTURER AND HAS BEEN DESIGNED TO TREAT THE 1–YEAR, 1–HOUR STORM EVENT.

IMPERVIOUSNESS OF A–1 AND A–2 WERE DETERMINED PER PROPOSED BUILDING FOOTPRINTS.

IMPERVIOUSNESS OF A–3 AND A–4 WERE SELECTED PER THE PROPOSED COMMERCIAL LAND USE.



LEGEND

- CENTER LINE
- PROPERTY LINE
- RIGHT–OF–WAY LINE / LEASE LINE
- EASEMENT LINE / SETBACK LINE
- EXISTING STORM DRAIN LINE
- PROPOSED STORM DRAIN LINE
- LONGEST PROPOSED FLOW PATH
- DENOTES DRAINAGE AREA BOUNDARY
- LANDSCAPE/PLANTER AREA
- PLANTER BOX
- 715.50 TC / 715.00 FS — PROPOSED SPOT ELEVATION
- PROPOSED SURFACE FLOW DIRECTION
- PROPOSED STORM DRAIN PIPE FLOW DIRECTION
- EXISTING SURFACE FLOW DIRECTION

STRUCTURAL BMP NOTES

1. PROPOSED PLANTER BOX. REFER TO DETAIL 1, SHEET C6.3 FOR MORE INFORMATION. REFER TO GRADING PLANS FOR FINAL CONFIGURATION.
2. "NO DUMPING–DRAINS TO OCEAN" STENCIL ON CURB ADJACENT TO CURB CUT. REFER TO DETAIL 2, SHEET C8.1.
3. TRASH ENCLOSURE.
4. TRENCH DRAIN WITH TRITON TDAM FILTER (MODEL TDAM12 STANDARD–REM–FOG MEDIA).
5. PARKWAY DRAIN.

RECEIVING WATERS

LOWER SANTA ANA RIVER

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40
1" = 20'
WHEN PRINTED AT FULL SIZE (24" X 36")

DIGALERT — DIAL BEFORE YOU DIG — TWO WORKING DAYS BEFORE YOU DIG — TOLL FREE 1–800–227–2600 — A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

ISSUE	DATE	DESCRIPTION
1	06/05/20	100% SD
2	08/21/20	100% SD REISSUED

DRAWN BY: LAC
CHECKED BY: TH
RECOMMENDED: NK

ENGINEERS SEAL — REGISTERED PROFESSIONAL ENGINEER — TYLER HOLST — RCE NO. 71438 — STATE OF CALIFORNIA — CIVIL

Kimley»Horn
765 THE CITY DRIVE, SUITE 200
ORANGE, CA 92868
(714)-705-1328
PREPARED UNDER THE DIRECT SUPERVISION OF:
TYLER HOLST, R.C.E. NO. C71438 — DATE: 10/22/2020 — EXP. 12/31/2020

CITY OF ORANGE
APPROVED BY:
CITY ENGINEER — DATE
RCE # _____ EXP _____

CITY OF ORANGE

DRAINAGE AREA MAP

C6.2

PROJECT NUMBER
194244.00

DRAWN BY

DATE
10.30.2020

REVISIONS

NO.	DESCRIPTION	DATE

BOULDER ASSOCIATES
ARCHITECTS

Boulder Associates, Inc.
Architecture + Interior Design
300 Spectrum Center Dr, Suite 730
Irvine, California 92618
949.727.9000 F 949.727.9001
www.boulderassociates.com

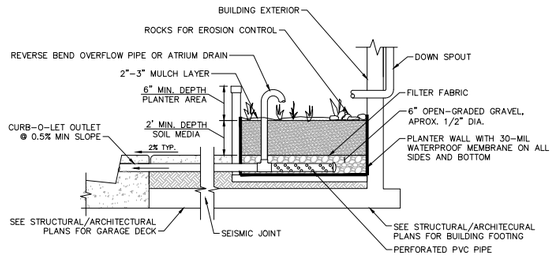
PROJECT
ST. JOSEPH ORANGE MOB

ADDRESS
331, 353, 393 Main St.
Orange, CA

100% DESIGN DOCUMENT SET

SHEET TITLE
DRAINAGE AREA MAP

SHEET NUMBER
C6.2



NOTES:

1. OVERFLOW RISER AND PIPES TO BE INSTALLED AT BIORETENTION SYSTEMS SHOWN PER PLAN.
2. WHERE AN OVERFLOW RISER WILL NOT BE INSTALLED A CURB CUT HAS BEEN PROVIDED TO SERVE AS AN OVERFLOW. REFER TO PLANS FOR LOCATIONS.
3. SOIL MEDIA TO BE DESIGNED PER ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT MISC-1 FACT SHEET. SOIL MEDIA TO PROVIDE MINIMUM 100 IN/HR LOADING RATE.

PLANTER_BOX
N.T.S.

REV. DATE: 2020-05 (1)

DIGALERT
DIAL BEFORE YOU DIG — TWO WORKING DAYS BEFORE YOU DIG
TOLL FREE 1-800-227-2600
A PUBLIC SERVICE BY:
UNDERGROUND SERVICE ALERT

ISSUE	DATE	DESCRIPTION
1	06/05/20	100% SD
2	08/21/20	100% SD REISSUED

LAC
DRAWN BY
TH
CHECKED BY
NK
RECOMMENDED

ENGINEERS SEAL
TYLER HOLST
No. 71438
REGISTERED PROFESSIONAL ENGINEER
CIVIL
STATE OF CALIFORNIA

Kimley»Horn
765 THE CITY DRIVE, SUITE 200
ORANGE, CA 92868
(714)-705-1328
PREPARED UNDER THE DIRECT SUPERVISION OF:
TYLER HOLST, R.C.E. NO. C71438 DATE: 10/22/2020 EXP: 12/31/2020

CITY OFORANGE
APPROVED BY:
CITY ENGINEER RCE # _____ EXP _____ DATE

CITY OF ORANGE

DRAINAGE AREA DETAILS

C6.3

PROJECT NUMBER
194244.00

DRAWN BY

DATE
10.30.2020

REVISIONS

NO.	DESCRIPTION	DATE

BOULDER ASSOCIATES
ARCHITECTS

Boulder Associates, Inc.
Architecture + Interior Design
300 Spectrum Center Dr, Suite 730
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949.727.9000 F 949.727.9001
www.boulderassociates.com

PROJECT
ST. JOSEPH ORANGE MOB

ADDRESS
331, 353, 393 Main St.
Orange, CA

100% DESIGN DOCUMENT SET

SHEET TITLE
DRAINAGE AREA DETAILS

SHEET NUMBER
C6.3

VII. Educational Materials

Refer to the City's website www.cityoforange.org or the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available. Attach *only* the educational materials specifically applicable to the project.

Education Materials			
Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☐	Tips for the Food Service Industry	☒
Homeowners Guide for Sustainable Water Use	☐	Proper Maintenance Practices for Your Business	☒
Household Tips	☐	**Other Material**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☐		
Recycle at Your Local Used Oil Collection Center (North County)	☐	IC3. Building Maintenance	☒
Recycle at Your Local Used Oil Collection Center (Central County)	☐	IC10. Outdoor Loading/Unloading of Materials	☒
Recycle at Your Local Used Oil Collection Center (South County)	☐	IC15. Parking and Storage Area Maintenance	☒
Tips for Maintaining a Septic Tank System	☐	IC17. Spill Prevention and Cleanup	☒
Responsible Pest Control	☒	IC21. Waste Handling and Disposal	☒
Sewer Spill Response	☒		☐
Tips for the Home Improvement Projects	☐		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☐		☐
Tips for Pool Maintenance	☐		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐		☐
Tips for Projects Using Paint	☐		☐

Appendix A:

Conditions of Approval

Resolution Number_____ dated_____

(Conditions of Approval will be added upon receipt)

Appendix B:

Educational Material

The Ocean Begins at Your Front Door

Follow these simple steps to help reduce water pollution:

Household Activities

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

Automotive

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

Pool Maintenance

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

Landscape and Gardening

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

Trash

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

Pet Care

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

Common Pollutants

Home Maintenance

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

Lawn and Garden

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

Automobile

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

The 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

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

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

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

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

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

For emergencies, dial 911.

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

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

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Responsible Pest Control

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

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

California Office of Emergency Services
(800) 852-7550

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

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

DTP113 Rev 4/06
printed on recycled paper

Sewage Spill
Reference Guide

Your Responsibilities as a Private Property Owner

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

Orange County Sanitation District

Health Care Agency
Environmental Health

PROJECT Pollution PREVENTION
www.ocwatersheds.com

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

What is a Sewage Spill?

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

Common Causes of Sewage Spills

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

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

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

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

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

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

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

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

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

Overflowing cleanout pipe located on private property

You Could Be Liable

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

What to Look For

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

Look for:

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

Caution

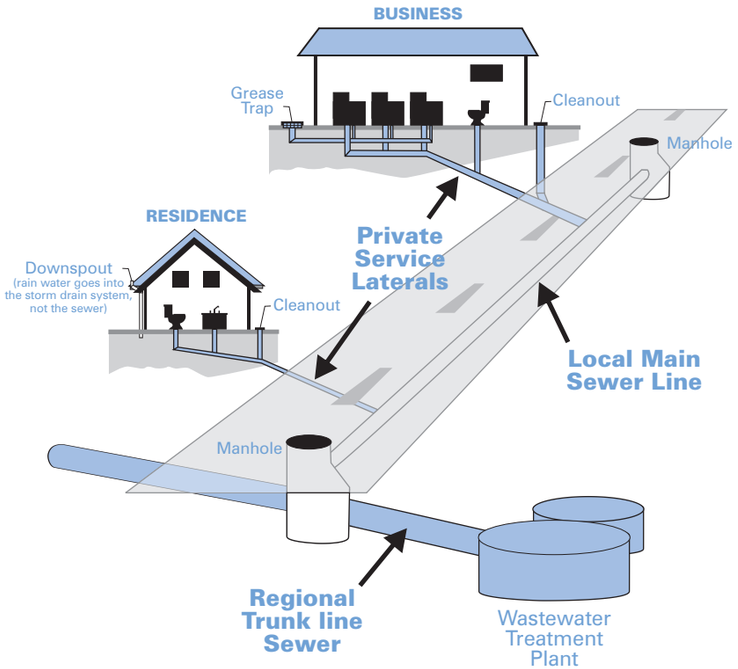
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

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

How a Sewer System Works

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

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



How You Can Prevent Sewage Spills

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

Preventing Grease Blockages

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

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

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

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

Orange County Agency Responsibilites

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

You Could Be Liable for Not Protecting the Environment

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

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

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

Report Sewage Spills!

City Sewer/Public Works Departments

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

Public Sewer/Water Districts

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

Other Agencies

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

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

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

The tips contained in this brochure provide useful information to help prevent water pollution while landscaping or gardening.

Additional detailed information is available from the **UCCE Master Gardener Hotline: (714) 708-1646**

To report a spill during normal business hours, please call the **City of Orange Public Works Department** at **(714) 532-6480** or visit **www.cityoforange.org.**

To report a spill after normal business hours, or on weekends, please call the **City of Orange 24-Hour Water Pollution Problem Reporting Hotline** at **(714) 538-1961.**

For emergencies, dial 911.

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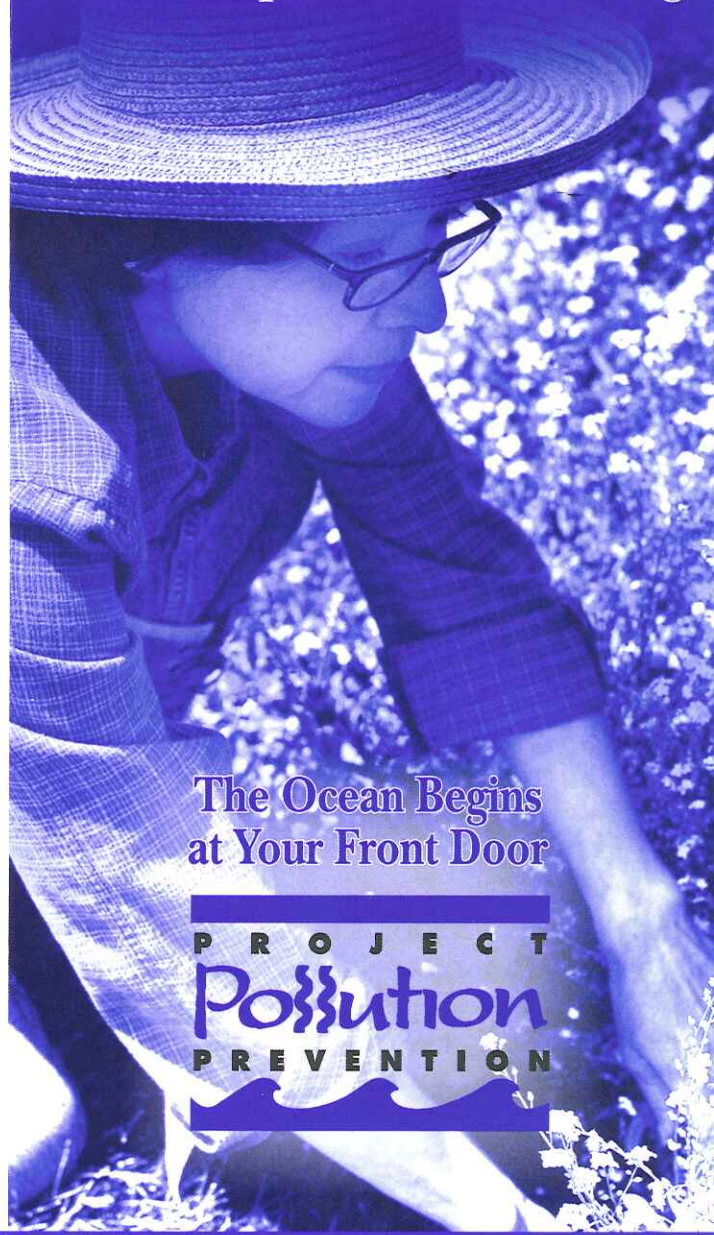
Help Prevent Ocean Pollution:

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.

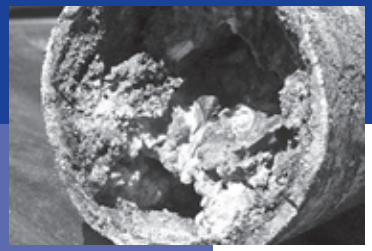
- Use slow-release fertilizers to minimize leaching, and use organic fertilizers.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered 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. Fats, oils and grease from restaurants and food service facilities can cause sewer line blockages that may result in sewage overflow into your facility and into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways and should never contain washwater, trash, grease or other materials.

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

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

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

For emergencies, dial 911.

CALIFORNIA Restaurant ASSOCIATION SINCE 1906

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Help Prevent Ocean Pollution:

Tips for the Food Service Industry

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Best Kitchen Practices

Food Waste Disposal

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

Grease & Oil Disposal

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

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

Minor Spill Cleanup

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

Major Spill Cleanup

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

Dumpster Cleanup

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

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

Floor Mat Cleaning

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

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

Washwater Disposal

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

PROJECT Pollution PREVENTION

Preventing water pollution at your commercial/industrial site

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

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

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

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

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

For emergencies, dial 911.

RECYCLE USED OIL

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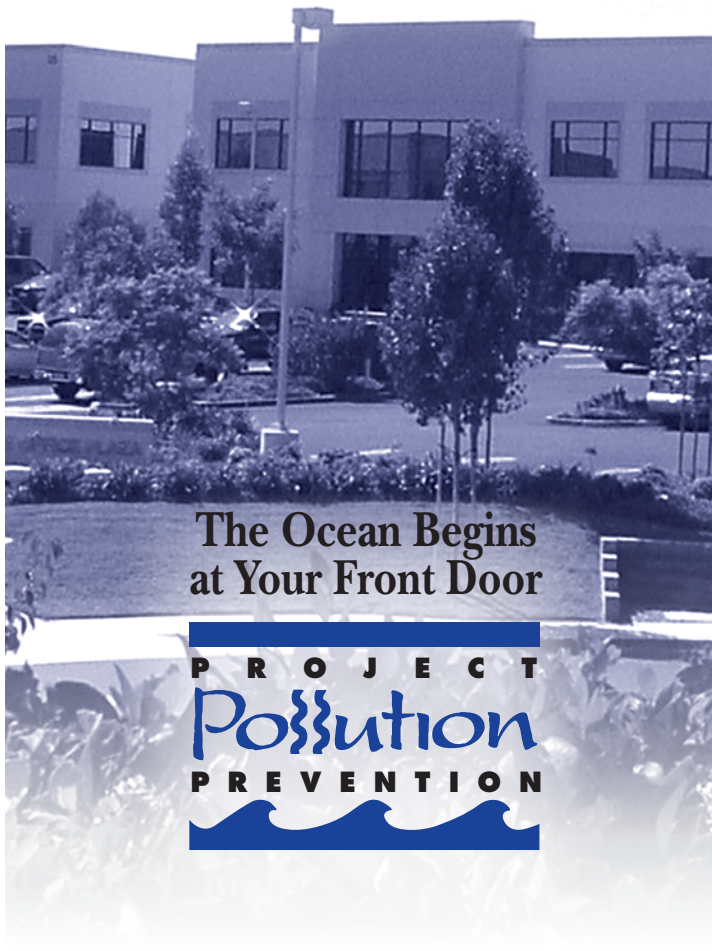
Help Prevent Ocean Pollution:

Proper Maintenance Practices for Your Business



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Proper Maintenance Practices for your Business

Landscape Maintenance

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

Building Maintenance

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

Never Dispose of Anything in the Storm Drain.

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

PROJECT Pollution PREVENTION

IC3. BUILDING MAINTENANCE

1. Properly collect and dispose of water when pressure washing buildings, rooftops, and other large objects.
2. Properly prepare work area before conducting building maintenance.
3. Properly clean and dispose of equipment and wastes used and generated during building maintenance.
4. Employ soil erosion and stabilization techniques when exposing large areas of soil.
5. Store toxic material under cover when not in use and during precipitation events.
6. Properly dispose of fluids from air conditioning, cooling tower, and condensate drains.
7. Regularly inspect air emission control equipment under AQMD permit.
8. Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.

OPTIONAL:

9. Switch to non-toxic chemicals for maintenance when possible.
10. Use chemicals that can be recycled.

Pollution Prevention

Consider pollution prevention measures at all times for improving pollution control. Implementation of pollution prevention measures may reduce or eliminate the need to implement other more costly or complicated procedures.

The following pollution prevention principles apply to most industries:

- Affirmative Procurement - Use alternative, safer, or recycled products.
- Redirect storm water flows away from areas of concern.
- Reduce use of water or use dry methods.
- Reduce storm water flow across facility site.
- Recycle and reuse waste products and waste flows.
- Move or cover potential pollution from storm water contact.
- Provide on-going employee training in pollution prevention.

Best Management Practices

1. **Properly collect and dispose of water when pressure washing buildings, rooftops, and other large objects.**
    - If pressure washing where the surrounding area is paved, use a water collection device that enables collection of wash water and associated solids. Use a sump pump, wet vacuum or similarly effective device to collect the runoff and loose materials. Dispose of the collected runoff and solids properly.
    - If pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.
2. **Properly prepare work area before conducting building maintenance.**
    - Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
    - Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
    - Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a storm drain.

3. **Properly clean and dispose of equipment and wastes used and generated during building maintenance.**
    - Clean paint brushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. 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.
    - Properly dispose of wash water, sweepings, and sediments.
    - Properly store equipment, chemicals, and wastes.
    - Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.

    OPTIONAL:
    - Recycle residual paints, solvents, lumber, and other materials to the maximum extent practicable
4. **Employ soil erosion and stabilization techniques when exposing large areas of soil.**
    - Confine excavated materials to pervious surfaces away from storm drain inlets, sidewalks, pavement, and ditches. Material must be covered if rain is expected.
    - Use chemical stabilization or geosynthetics to stabilize bare ground surfaces.
5. **Store toxic material under cover when not in use and during precipitation events.**
6. **Properly dispose of fluids from air conditioning, cooling tower, and condensate drains.**
7. **Regularly inspect air emission control equipment under AQMD permit.**

8. **Training**

    1. **Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.**
    2. **Train employees on proper spill containment and cleanup.**
        - Establish training that provides employees with the proper tools and knowledge to immediately begin cleaning up a spill.
        - Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
        - BMP IC17 discusses Spill Prevention and Control in detail.
    3. **Establish a regular training schedule, train all new employees, and conduct annual refresher training.**
    4. **Use a training log or similar method to document training.**

OPTIONAL:

9. **Switch to non-toxic chemicals for maintenance when possible.**
    - If cleaning agents are used, select biodegradable products whenever feasible
    - Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).
10. **Use chemicals that can be recycled.**
    - Buy recycled products to the maximum extent practicable

References

California Storm Water Best Management Practice Handbooks. Industrial/Commercial 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.

King County Stormwater Pollution Control Manual. Best Management Practices for Businesses. King County Surface Water Management. July 1995. On-line: http://dnr.metrokc.gov/wlr/dss/spcm.htm

Stormwater Management Manual for Western Washington. Volume IV Source Control BMPs. Prepared by Washington State Department of Ecology Water Quality Program. Publication No. 99-14. August 2001.

For additional information contact:

City of Orange
Public Works Department – Surface Water Quality
714-532-6480
or visit our website:
www.cityoforange.org

IC10. OUTDOOR LOADING/UNLOADING OF MATERIALS

1. Properly design loading/unloading areas to prevent storm water runon, runoff of spilled liquids, etc.
2. Park vehicles and conduct loading/unloading only in designated loading/unloading areas so that spills or leaks can be contained.
3. Clean loading/unloading areas regularly to remove potential sources of pollutants.
4. Reduce exposure of materials to rain.
5. Use drip pans underneath hose and pipe connections and other leak-prone spots during liquid transfer operations, and when making and breaking connections.
6. Inspect equipment regularly.
7. If possible, conduct loading and unloading in dry weather.
8. Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.

Pollution Prevention

Consider pollution prevention measures at all times for improving pollution control. Implementation of pollution prevention measures may reduce or eliminate the need to implement other more costly or complicated procedures.

The following pollution prevention principles apply to most industries:

- Affirmative Procurement - Use alternative, safer, or recycled products.
- Redirect storm water flows away from areas of concern.
- Reduce use of water or use dry methods.
- Reduce storm water flow across facility site.
- Recycle and reuse waste products and waste flows.
- Move or cover potential pollution from storm water contact.
- Provide on-going employee training in pollution prevention.

Best Management Practices

1. **Properly design loading/unloading areas to prevent storm water runon, runoff of spills, etc.**
    - Grade and/or berm the area to prevent runon.
    - Position roof downspouts to direct stormwater away from the area.
    - Grade and/or berm the loading/unloading area to a drain that is connected to a dead-end.
    - The area where truck transfers take place should be paved. If the liquid is reactive with the asphalt, Portland cement should be used to pave the area.
    - Avoid placing loading/unloading areas near storm drains.
2. **Park vehicles and conduct loading/unloading only in designated loading/unloading areas so that spills or leaks can be contained.**
3. **Clean loading/unloading areas regularly to remove potential sources of pollutants.** This includes outside areas that are regularly covered by containers or other materials.
4. **Reduce exposure of materials to rain.**
    - Cover the loading/unloading areas.
    - If a cover is unfeasible, use overhangs, or seals or door skirts to enclose areas.
5. **Use drip pans underneath hose and pipe connections and other leak-prone spots during liquid transfer operations, and when making and breaking connections.**
6. **Inspect equipment regularly**
    - Designate a responsible party to check under delivery vehicles for leaking fluids, spilled materials, debris, or other foreign materials.
    - Check loading/unloading equipment regularly for leaks.
7. **If possible, conduct loading and unloading in dry weather.**

8. Training

1. **Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.**
2. **Train employees on proper spill containment and cleanup.**
   - Establish training that provides employees with the proper tools and knowledge to immediately begin cleaning up a spill.
   - Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
   - BMP IC17 discusses Spill Prevention and Control in detail.
3. **Train employees on the proper techniques used during liquid transfers to avoid leaks and spills.**
4. **Train forklift operators on the proper loading and unloading procedures.**
5. **Establish a regular training schedule, train all new employees, and conduct annual refresher training.**
6. **Use a training log or similar method to document training.**

References

California Storm Water Best Management Practice Handbooks. Industrial/Commercial 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.

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 (Revised February 2002 by the California Coastal Commission).

Stormwater Management Manual for Western Washington. Volume IV Source Control BMPs. Prepared by Washington State Department of Ecology Water Quality Program. Publication No. 99-14. August 2001.

For additional information contact:

City of Orange
Public Works Department – Surface Water Quality
714-532-6480
or visit our website:
www.cityoforange.org

IC15. PARKING AND STORAGE AREA MAINTENANCE

1. Conduct regular cleaning.
2. Properly collect and dispose of wash water.
3. Consider use of source treatment BMPs to treat runoff.
4. Keep the parking and storage areas clean and orderly.
5. When cleaning heavy oily deposits:
6. When conducting surface repair work:
7. Conduct inspections on a regular basis.
8. Keep accurate maintenance logs to evaluate materials removed/stored and improvements made.
9. Arrange rooftop drains to prevent drainage directly onto paved surfaces.
10. Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.

Pollution Prevention

Consider pollution prevention measures at all times for improving pollution control. Implementation of pollution prevention measures may reduce or eliminate the need to implement other more costly or complicated procedures.

The following pollution prevention principles apply to most industries:

- Affirmative Procurement - Use alternative, safer, or recycled products.
- Redirect storm water flows away from areas of concern.
- Reduce use of water or use dry methods.
- Reduce storm water flow across facility site.
- Recycle and reuse waste products and waste flows.
- Move or cover potential pollution from storm water contact.
- Provide on-going employee training in pollution prevention.

Best Management Practices

1. **Conduct regular cleaning.**
    - Sweeping or vacuuming the parking facility is encouraged over other methods.
    - Sweep all parking lots at least once before the onset of the wet season.

    OPTIONAL:
    - Establish frequency of sweeping based on usage and field observations of waste accumulation.
2. **Properly collect and dispose of wash water.**
    - Block the storm drain or contain runoff.
    - Wash water should be collected and pumped to the sanitary sewer or discharged to a pervious surface, do not allow wash water to enter storm drains. **DO NOT** discharge wash water to sanitary sewer until contacting the local sewer authority to find out if pretreatment is required.
    - Dispose of parking lot sweeping debris and dirt at a landfill.
3. **Consider use of source treatment BMPs to treat runoff.**
    - Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
    - Utilize sand filters or oleophilic collectors for oily waste in low quantities.
4. **Keep the parking and storage areas clean and orderly.**
    - Clean out and cover litter receptacles frequently to prevent spillage.
    - Remove debris in a timely fashion.

    OPTIONAL:
    - Post “No Littering” signs.
5. **When cleaning heavy oily deposits:**
    - If possible, clean oily spots with absorbent materials.
    - Do not allow discharges to the storm drain.
    - Appropriately dispose of spilled materials and absorbents.

6. **When conducting surface repair work:**
    - Pre-heat, transfer or load hot bituminous material away from storm drain inlets.
    - Conduct surface repair work during dry weather to prevent contamination from contacting stormwater runoff.
    - Cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and clean any debris for proper disposal.
    - To avoid runoff, use only as much water as necessary for dust control.
    - Use drip pans or absorbent material to catch drips from paving equipment that is not in use. Dispose of collected material and absorbents properly.
7. **Conduct inspections on a regular basis.**
    - Designate personnel to conduct inspections of the parking facilities and stormwater conveyance systems associated with them.
    - Inspect cleaning equipment/sweepers for leaks on a regular basis.
8. **Keep accurate maintenance logs to evaluate materials removed/stored and improvements made.**
9. **Arrange rooftop drains to prevent drainage directly onto paved surfaces.**

10. **Training**

    1. **Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.**
    2. **Train employees on proper spill containment and cleanup.**
        - Establish training that provides employees with the proper tools and knowledge to immediately begin cleaning up a spill.
        - Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
        - BMP IC17 discusses Spill Prevention and Control in detail.
    3. **Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.**
    4. **Establish a regular training schedule, train all new employees, and conduct annual refresher training.**
    5. **Use a training log or similar method to document training.**

References

California Storm Water Best Management Practice Handbooks. Industrial/Commercial 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.

King County Stormwater Pollution Control Manual. Best Management Practices for Businesses. King County Surface Water Management. July 1995. On-line: http://dnr.metrokc.gov/wlr/dss/spcm.htm

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 (Revised February 2002 by the California Coastal Commission).

Stormwater Management Manual for Western Washington. Volume IV Source Control BMPs. Prepared by Washington State Department of Ecology Water Quality Program. Publication No. 99-14. August 2001.

For additional information contact:

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Public Works Department – Surface Water Quality
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or visit our website:
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IC17. SPILL PREVENTION AND CLEANUP

1. Develop procedures to prevent/mitigate spills to storm drain systems.
2. Post "No Dumping" signs with a phone number for reporting illegal dumping and disposal.
3. Conduct routine cleaning, inspections, and maintenance.
4. Properly store and handle chemical materials.
5. Utilize secondary containment systems for liquid materials.
6. Protect materials stored outside from stormwater runon.
7. Secure drums stored in an area where unauthorized persons may gain access to prevent accidental spillage, pilferage, or any unauthorized use.
8. Identify key spill response personnel.
9. Adopt the Orange County Hazardous Materials Area Plan or an equivalent plan.
10. Clean up leaks and spills immediately.
11. Report and track spills.
12. Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.

Pollution Prevention

Consider pollution prevention measures at all times for improving pollution control. Implementation of pollution prevention measures may reduce or eliminate the need to implement other more costly or complicated procedures.

The following pollution prevention principles apply to most industries:

- Affirmative Procurement - Use alternative, safer, or recycled products.
- Redirect storm water flows away from areas of concern.
- Reduce use of water or use dry methods.
- Reduce storm water flow across facility site.
- Recycle and reuse waste products and waste flows.
- Move or cover potential pollution from storm water contact.
- Provide on-going employee training in pollution prevention.

Best Management Practices

Spill Prevention

1. **Develop procedures to prevent/mitigate spills to storm drain systems.** Standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.
2. **Post "No Dumping" signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.**
3. **Conduct routine cleaning, inspections, and maintenance.**
    - Sweep and clean storage areas consistently at a designated frequency (e.g. weekly, monthly). **DO NOT** hose down areas to storm drains.
    - Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Reuse, recycle, or properly dispose of any collected liquids or soiled absorbent materials.
    - Check tanks (and any containment sumps) frequently for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.
    - Check for external corrosion of material containers, structural failures, spills and overfills due to operator error, failure of piping system, etc.
    - Inspect tank foundations, connections, coatings, and tank walls and piping system.

4. **Properly store and handle chemical materials.**
    - Designate a secure material storage area that is paved with Portland cement concrete, free of cracks and gaps, and impervious in order to contain leaks and spills.
    - Do not store chemicals, drums, or bagged materials directly on the ground. Place these items in secondary containers.
    - Keep chemicals in their original containers, if feasible.
    - Keep containers well labeled according to their contents (e.g., solvent, gasoline).
    - Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).
    - Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).
5. **Utilize secondary containment systems for liquid materials.**
    - Surround storage tanks with a berm or other secondary containment system.
    - Slope the area inside the berm to a drain.
    - Drain liquids to the sanitary sewer if available.
    - Pass accumulated stormwater in petroleum storage areas through an oil/water separator.
    - Use catch basin filtration inserts.
    - **DO NOT** discharge wash water to sanitary sewer until contacting the local sewer authority to find out if pretreatment is required.
    - If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collect runoff from the storage tank area.
6. **Protect materials stored outside from stormwater runon.** Construct a berm around the perimeter of the material storage area to prevent the runon of uncontaminated stormwater from adjacent areas as well as runoff of stormwater from the material.
7. **Secure drums stored in an area where unauthorized persons may gain access to prevent accidental spillage, pilferage, or any unauthorized use.**

Spill Control and Cleanup Activities

8. **Identify key spill response personnel.**
9. **Adopt the Orange County Hazardous Materials Area Plan or an equivalent plan, which includes a set of planned responses to hazardous materials emergencies addressing chain-of-command, public agency participation, and allocation of authority. The plan should include such items as:**
    - Description of the facility, owner and address, activities and chemicals present
    - Facility map
    - Notification and evacuation procedures
    - Cleanup instructions
    - Identification of responsible departments

10. Clean up leaks and spills immediately.

- Place a stockpile of spill cleanup materials where they will be readily accessible (e.g. near storage and maintenance areas).
- Utilize dry cleaning methods to clean up spills to minimize the use of water. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use brooms, shovels, sweepers, or plows.
- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Clean up chemical materials with absorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

11. Reporting

1. **Report spills that pose an immediate threat to human health or the environment to local agencies, such as the fire department, and the Regional Water Quality Control Board.**
2. **Establish a system for tracking incidents. The system should be designed to identify the following:**
   - Types and quantities (in some cases) of wastes
   - Patterns in time of occurrence (time of day/night, month, or year)
   - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
   - Responsible parties
3. **Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).**

12. Training

1. **Educate employees about spill prevention and cleanup.**
   - Establish training that provides employees with the proper tools and knowledge to immediately begin cleaning up a spill.
   - Educate employees on aboveground storage tank requirements.
   - Train all employees upon hiring and conduct annual refresher training.
2. **Train employees responsible for aboveground storage tanks and liquid transfers on the Spill Prevention Control and Countermeasure Plan**.

References

California Storm Water Best Management Practice Handbooks. Industrial/Commercial 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.

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 (Revised February 2002 by the California Coastal Commission).

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IC21. WASTE HANDLING AND DISPOSAL

1. Prevent waste materials from coming in direct contact with wind or rain.
2. Design waste handling and disposal area to prevent stormwater runon.
3. Design waste handling and disposal area to contain spills.
4. Keep waste collection areas clean.
5. Secure solid waste containers when not in use.
6. Regularly inspect, repair, and/or replace waste containers.
7. Do not fill waste containers with washout water or any other liquid.
8. Use all of a product before disposing of the container.
9. Segregated wastes by type and label and date wastes.
10. Label and store hazardous wastes according to hazardous waste regulations.
11. Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.

OPTIONAL:

12. Minimize waste.

Pollution Prevention

Consider pollution prevention measures at all times for improving pollution control. Implementation of pollution prevention measures may reduce or eliminate the need to implement other more costly or complicated procedures.

The following pollution prevention principles apply to most industries:

- Affirmative Procurement - Use alternative, safer, or recycled products.
- Redirect storm water flows away from areas of concern.
- Reduce use of water or use dry methods.
- Reduce storm water flow across facility site.
- Recycle and reuse waste products and waste flows.
- Move or cover potential pollution from storm water contact.
- Provide on-going employee training in pollution prevention.

Best Management Practices

1. **Prevent waste materials from coming in direct contact with wind or rain.**
    - Cover the waste management area with a permanent roof.
    - If this is not feasible, cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropylene, or hypalon.
    - Cover dumpsters to prevent rain from washing out waste materials.
2. **Design waste handling and disposal area to prevent stormwater runon.**
    - Enclose the waste handling and disposal area or build a berm around it.
    - Position roof downspouts to direct stormwater away from waste handling and disposal area.
3. **Design waste handling and disposal area to contain spills.**
    - Place dumpsters or other waste receptacles on an impervious surface.
    - Construct a berm around the area to contain spills.
    - Install drains connected to the public sewer or the facility's process wastewater system within these contained areas. **DO NOT** discharge to a public sewer until contacting the local sewer authority to find out if pretreatment is required.
4. **Keep waste collection areas clean.**
    - When cleaning around waste handling and disposal areas use dry methods when possible (e.g. sweeping, use of absorbents).
    - If water must be used, collect water and discharge to the sewer if permitted to do so. **DO NOT** discharge to a public sewer until contacting the local sewer authority to find out if pretreatment is required. If discharge to the sanitary sewer is not allowed, pump water to a tank and dispose of properly.

OPTIONAL:

- Post "No Littering" signs.

5. **Secure solid waste containers when not in use.**
6. **Regularly inspect, repair, and/or replace waste containers.**
7. **Do not fill waste containers with washout water or any other liquid.**
8. **Use all of a product before disposing of the container.**
9. **Segregate wastes by type and label and date wastes.**
    - Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.
    - Ensure that only appropriate solid wastes are added to solid waste containers.
    - Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc. may not be disposed of in solid waste containers.
10. **Label and store hazardous wastes according to hazardous waste regulations.**
    - Consult your local hazardous waste agency or Fire Department for details.
    - Obtain a hazardous waste generator license or permit.

11. **Training**

    1. **Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.**
    2. **Train employees in proper waste handling and disposal.**
    3. **Train employees on proper spill containment and cleanup.**
        - Establish training that provides employees with the proper tools and knowledge to immediately begin cleaning up a spill.
        - Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
        - BMP IC17 discusses Spill Prevention and Control in detail.
    4. **Establish a regular training schedule, train all new employees, and conduct annual refresher training.**
    5. **Use a training log or similar method to document training.**

OPTIONAL:

12. **Minimize waste.**
    - Recycle materials whenever possible.
    - Modify processes or equipment to increase efficiency.
    - Identify and promote use of non-hazardous alternatives.
    - Reduction in the amount of waste generated can be accomplished using many different types of source controls such as:
        - Production planning and sequencing
        - Process or equipment modification
        - Raw material substitution or elimination
        - Loss prevention and housekeeping
        - Waste segregation and separation

        - Close loop recycling
    - Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.

OPTIONAL:

- Reduction in the amount of waste generated can be accomplished using many different types of source controls such as:
    - Production planning and sequencing
    - Process or equipment modification
    - Raw material substitution or elimination
    - Loss prevention and housekeeping
    - Waste segregation and separation
    - Close loop recycling

Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.

References

California Storm Water Best Management Practice Handbooks. Industrial/Commercial 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.

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 (Revised February 2002 by the California Coastal Commission).

For additional information contact:

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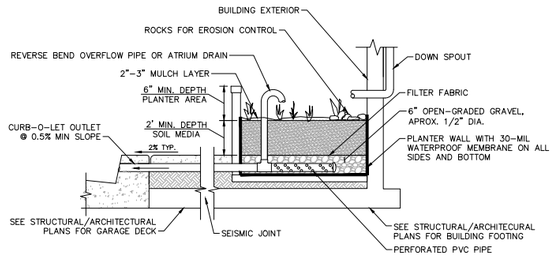
Appendix C:

BMP Details



NOTES:

1. OVERFLOW RISER AND PIPES TO BE INSTALLED AT BIORETENTION SYSTEMS SHOWN PER PLAN.
2. WHERE AN OVERFLOW RISER WILL NOT BE INSTALLED A CURB CUT HAS BEEN PROVIDED TO SERVE AS AN OVERFLOW. REFER TO PLANS FOR LOCATIONS.
3. SOIL MEDIA TO BE DESIGNED PER ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT MISC-1 FACT SHEET. SOIL MEDIA TO PROVIDE MINIMUM 100 IN/HR LOADING RATE.

PLANTER_BOX
N.T.S.

REV. DATE: 2020-05 (1)

DIGALERT
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A PUBLIC SERVICE BY:
UNDERGROUND SERVICE ALERT

ISSUE	DATE	DESCRIPTION
1	06/05/20	100% SD
2	08/21/20	100% SD REISSUED

LAC
DRAWN BY
TH
CHECKED BY
NK
RECOMMENDED

ENGINEERS SEAL
TYLER HOLST
No. 71438
REGISTERED PROFESSIONAL ENGINEER
CIVIL
STATE OF CALIFORNIA

Kimley»Horn
765 THE CITY DRIVE, SUITE 200
ORANGE, CA 92868
(714)-705-1328
PREPARED UNDER THE DIRECT SUPERVISION OF:
TYLER HOLST, R.C.E. NO. C71438 DATE: 10/22/2020 EXP: 12/31/2020

CITY OFORANGE
APPROVED BY:
CITY ENGINEER RCE # _____ EXP _____ DATE

CITY OF ORANGE

DRAINAGE AREA DETAILS

C6.3

PROJECT NUMBER
194244.00

DRAWN BY

DATE
10.30.2020

REVISIONS

NO.	DESCRIPTION	DATE

BOULDER ASSOCIATES
ARCHITECTS

Boulder Associates, Inc.
Architecture + Interior Design
300 Spectrum Center Dr, Suite 730
Irvine, California 92618
949.727.9000 F 949.727.9001
www.boulderassociates.com

PROJECT
ST. JOSEPH ORANGE MOB

ADDRESS
331, 353, 393 Main St.
Orange, CA

100% DESIGN DOCUMENT SET

SHEET TITLE
DRAINAGE AREA DETAILS

SHEET NUMBER
C6.3

WASHINGTON STATE DEPARTMENT OF ECOLOGY

June 2015

GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS), ENHANCED, PHOSPHORUS & OIL TREATMENT
CONDITIONAL USE LEVEL DESIGNATION FOR BASIC AND ENHANCED AT 100 IN/HR

For

Americast Filterra®

Ecology's Decision:

Based on Americast's submissions, including the application dated May 15, 2015, Final Technical Evaluation Reports, dated March 27, 2014, December 2009 and additional information provided to Ecology dated October 9, 2009, Ecology hereby issues the following use level designations:

1. A General Use Level Designation for Basic, Enhanced, Phosphorus, and Oil Treatment at the following water quality design hydraulic loading rates:

Treatment	Hydraulic Conductivity* (in/hr) for use in Western Washington Sizing	Infiltration Rate (in/hr) for use in eastern Washington Sizing
Basic	70.92	100
Phosphorus	70.92	100
Oil	35.46	50
Enhanced	24.82	35

*****calculated based on listed infiltration rate and a hydraulic gradient of 1.41 inch/inch.

2. A Conditional Use Level Designation for Basic and Enhanced Treatment at the following water quality design hydraulic loading rates:

Treatment	Hydraulic conductivity* (in/hr) for use in Western Washington Sizing	Infiltration Rate (in/hr) for use in Eastern Washington Sizing
Basic	70.92	100
Enhanced	70.92	100

3. The Filterra® unit is not appropriate for oil spill-control purposes.
4. Ecology approves the Filterra® units for treatment at the hydraulic loading rates listed above, to achieve the maximum water quality design flow rate. Calculate the water quality design flow rates using the following procedures:

- Western Washington: for treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the sand filter module in the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model. The model must indicate the unit is capable of processing 91 percent of the influent runoff file.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three flow rate based methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

5. This General Use Level Designation has no expiration date but Ecology may revoke or amend the designation, and is subject to the conditions specified below.
6. The Basic and Enhanced CULD expires on June 30, 2018 unless extended by Ecology.

Ecology's Conditions of Use:

Filterra® units shall comply with these conditions shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the Filterra® units in accordance with applicable Americast Filterra® manuals, document, and the Ecology Decision.
2. Each site plan must undergo Americast Filterra® review before Ecology can approve the unit for site installation. This will ensure that site grading and slope are appropriate for use of a Filterra® unit.
3. Filterra® media shall conform to the specifications submitted to and approved by Ecology.
4. Maintenance includes removing trash, degraded mulch, and accumulated debris from the filter surface and replacing the mulch layer. Use inspections to determine the site-specific maintenance schedules and requirements. Follow maintenance procedures given in the most recent version of the Filterra® Operation and Maintenance Manual.
5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.
    - Filterra designs their systems for a target maintenance interval of 6 months. Maintenance includes removing accumulated sediment and trash from the surface area of the media, removing the mulch above the media, replacing the mulch, providing plant health evaluation, and pruning the plant if deemed necessary.
    - Conduct maintenance following manufacturer's guidelines.
6. Filterra® units come in standard sizes.

7. The minimum size filter surface-area for use in western Washington is determined by using the sand filter module in the latest version of WWHM or other Ecology approved continuous runoff model for western Washington. Model inputs include
    a) Filter media depth: 1.8 feet
    b) Effective Ponding Depth: 0.75 feet (This is equivalent to the 6-inch clear zone between the top of the mulch and the bottom of the slab plus 3-inches of mulch.)
    c) Side slopes: Vertical
    d) Riser height: 0.70 feet
    e) Filter Hydraulic Conductivity: Use the Hydraulic Conductivity as listed in the table above (use the lowest applicable hydraulic conductivity depending on the level of treatment required) under Ecology's Decision, above.

8. The minimum size filter surface-area for use in eastern Washington is determined by using the design water quality flow rate (as determined in item 3, above) and the Infiltration Rate from the table above (use the lowest applicable Infiltration Rate depending on the level of treatment required). Calculate the required area by dividing the water quality design flow rate (cu-ft/sec) by the Infiltration Rate (converted to ft/sec) to obtain required surface area (sq ft) of the Filterra unit.
9. Discharges from the Filterra® units shall not cause or contribute to water quality standards violations in receiving waters.
10. Contech commits to submitting a QAPP for Ecology approval by October 1, 2015 that meets the TAPE requirements for attaining a GULD for Basic and Enhanced Treatment
11. Contech shall complete all required testing and submit a TER on TSS and dissolved metals removal for Ecology's review by December 31, 2017
12. Contech may request Ecology to grant deadline or expiration date extensions, upon showing cause for such extensions.

Approved Alternate Configurations

Filterra® Internal Bypass - Pipe (FTIB-P)

1. The Filterra® Internal Bypass – Pipe allows for piped-in flow from area drains, grated inlets, trench drains, and/or roof drains. Design capture flows and peak flows enter the structure through an internal slotted pipe. Filterra® inverted the slotted pipe to allow design flows to drop through to a series of splash plates that then disperse the design flows over the top surface of the Filterra® planter area. Higher flows continue to bypass the slotted pipe and convey out the structure.
2. To select a FTIB-P unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra® Internal Bypass – Curb (FTIB-C)

1. The Filterra® Internal Bypass –Curb model (FTIB-C) incorporates a curb inlet, biofiltration treatment chamber, and internal high flow bypass in one single structure. Filterra® designed the FTIB-C model for use in a "Sag" or "Sump" condition and will accept flows from both directions along a gutter line. An internal flume tray weir component directs treatment flows entering the unit through the curb inlet to the biofiltration treatment chamber. Flows in excess of the water quality treatment flow rise above the flume tray weir and discharge through a standpipe orifice; providing bypass of untreated peak flows. Americast manufactures the FTIB-C model in a variety of sizes and configurations and you may use the unit on a continuous grade when a single structure providing both treatment and high flow bypass is preferred. The FTIB-C model can also incorporate a separate junction box chamber to allow larger diameter discharge pipe connections to the structure.
2. To select a FTIB-C unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra® Shallow

1. The Filterra® Shallow provides additional flexibility for design engineers and designers in situations where there is limited depth and various elevation constraints to applying a standard Filterra® configuration. Engineers can design this system up to six inches shallower than any of the previous Filterra unit configurations noted above.
2. Ecology requires that the Filterra® Shallow provide a contact time equivalent to that of the standard unit. This means that with a smaller depth of media, the surface area must increase.
3. To select a Filterra® Shallow System unit, the designer must first identify the size of the standard unit using the modeling guidance described above.
4. Once you establish the size of the standard Filterra® unit using the sizing technique described above, use information from the following table to select the appropriate size Filterra® Shallow System unit.

Shallow Unit Basic, Enhanced, and Oil Treatment Sizing

Standard Depth	Equivalent Shallow Depth
4x4	4x6 or 6x4
4x6 or 6x4	6x6
4x8 or 8x4	6x8 or 8x6
6x6	6x10 or 10x6
6x8 or 8x6	6x12 or 12x6
6x10 or 10x6	13x7

Notes:
1. Shallow Depth Boxes are less than the standard depth of 3.5 feet but no less than 3.0 feet deep (TC to INV).

Applicant: Filterra® Bioretention Systems, division of Contech Engineered Solutions, LLC.

Applicant's Address: 11815 NE Glenn Widing Drive
Portland, OR 97220

Application Documents:

- State of Washington Department of Ecology Application for Conditional Use Designation, Americast (September 2006)
- Quality Assurance Project Plan Filterra® Bioretention Filtration System Performance Monitoring, Americast (April 2008)
- Quality Assurance Project Plan Addendum Filterra® Bioretention Filtration System Performance Monitoring, Americast (June 2008)
- Draft Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (August 2009)
- Final Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (December 2009)
- Technical Evaluation Report Appendices Filterra® Bioretention Filtration System Performance Monitoring, Americast, August 2009
- Memorandum to Department of Ecology Dated October 9, 2009 from Americast, Inc. and Herrera Environmental Consultants
- Quality Assurance Project Plan Filterra® Bioretention System Phosphorus treatment and Supplemental Basic and Enhanced Treatment Performance Monitoring, Americast (November 2011)
- Filterra® letter August 24, 2012 regarding sizing for the Filterra® Shallow System.
- University of Virginia Engineering Department Memo by Joanna Crowe Curran, Ph. D dated March 16, 2013 concerning capacity analysis of Filterra® internal weir inlet tray.
- Terraphase Engineering letter to Jodi Mills, P.E. dated April 2, 2013 regarding Terraflume Hydraulic Test, Filterra® Bioretention System and attachments.
- Technical Evaluation Report, Filterra® System Phosphorus Treatment and Supplemental Basic Treatment Performance Monitoring. March 27th, 2014.
- State of Washington Department of Ecology Application for Conditional Use Level Designation, Contech Engineered Solutions (May 2015)
- Quality Assurance Project Plan Filterra® Bioretention System, Contech Engineered Solutions (May 2015)

Applicant's Use Level Request:

General Level Use Designation for Basic (100 in/hr), Enhanced (35 in/hr), Phosphorus (100 in/hr), and Oil Treatment (50 in/hr).

Conditional Use Level Designation for Basic and Enhanced at 100 in/hr

Applicant's Performance Claims:

Field-testing and laboratory testing show that the Filterra® unit is promising as a stormwater treatment best management practice and can meet Ecology's performance goals for basic, enhanced, phosphorus, and oil treatment.

Findings of Fact:

Field Testing 2013

1. Filterra® completed field-testing of a 6.5 ft x 4 ft. unit at one site in Bellingham, Washington. Continuous flow and rainfall data collected from January 1, 2013 through July 23, 2013 indicated that 59 storm events occurred. The monitoring obtained water quality data from 22 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. The system treated 98.9 percent of the total 8-month runoff volume during the testing period. Consequently, the system achieved the goal of treating 91 percent of the volume from the site. Stormwater runoff bypassed during four of the 59 storm events.
3. Of the 22 sampled events, 18 qualified for TSS analysis (influent TSS concentrations ranged from 25 to 138 mg/L). The data were segregated into sample pairs with influent concentration greater than and less than 100 mg/L. The UCL95 mean effluent concentration for the data with influent less than 100 mg/L was 5.2 mg/L, below the 20-mg/L threshold. Although the TAPE guidelines do not require an evaluation of TSS removal efficiency for influent concentrations below 100 mg/L, the mean TSS removal for these samples was 90.1 percent. Average removal of influent TSS concentrations greater than 100 mg/L (three events) was 85 percent. In addition, the system consistently exhibited TSS removal greater than 80 percent at flow rates at a 100 inches per hour [in/hr] infiltration rate and was observed at 150 in/hr.
4. Ten of the 22 sampled events qualified for TP analysis. Americast augmented the dataset using two sample pairs from previous monitoring at the site. Influent TP concentrations ranged from 0.11 to 0.52 mg/L. The mean TP removal for these twelve events was 72.6 percent. The LCL95 mean percent removal was 66.0, well above the TAPE requirement of 50 percent. Treatment above 50 percent was evident at 100 in/hr infiltration rate and as high as 150 in/hr. Consequently, the Filterra® test system met the TAPE Phosphorus Treatment goal at 100 in/hr. Influent ortho-P concentrations ranged from 0.005 to 0.012 mg/L; effluent ortho-P concentrations ranged from 0.005 to 0.013 mg/L. The reporting limit/resolution for the ortho-P test method is 0.01 mg/L, therefore the influent and effluent ortho-P concentrations were both at or near non-detect concentrations.

Field Testing 2008-2009

1. Filterra® completed field-testing at two sites at the Port of Tacoma. Continuous flow and rainfall data collected during the 2008-2009 monitoring period indicated that 89 storm events occurred. The monitoring obtained water quality data from 27 storm events. Not

all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.

2. During the testing at the Port of Tacoma, 98.96 to 99.89 percent of the annual influent runoff volume passed through the POT1 and POT2 test systems respectively. Stormwater runoff bypassed the POT1 test system during nine storm events and bypassed the POT2 test system during one storm event. Bypass volumes ranged from 0.13% to 15.3% of the influent storm volume. Both test systems achieved the 91 percent water quality treatment-goal over the 1-year monitoring period.
3. Consultants observed infiltration rates as high as 133 in/hr during the various storms. Filterra® did not provide any paired data that identified percent removal of TSS, metals, oil, or phosphorus at an instantaneous observed flow rate.
4. The maximum storm average hydraulic loading rate associated with water quality data is <40 in/hr, with the majority of flow rates < 25 in/hr. The average instantaneous hydraulic loading rate ranged from 8.6 to 53 inches per hour.
5. The field data showed a removal rate greater than 80% for TSS with an influent concentration greater than 20 mg/l at an average instantaneous hydraulic loading rate up to 53 in/hr (average influent concentration of 28.8 mg/l, average effluent concentration of 4.3 mg/l).
6. The field data showed a removal rate generally greater than 54% for dissolved zinc at an average instantaneous hydraulic loading rate up to 60 in/hr and an average influent concentration of 0.266 mg/l (average effluent concentration of 0.115 mg/l).
7. The field data showed a removal rate generally greater than 40% for dissolved copper at an average instantaneous hydraulic loading rate up to 35 in/hr and an average influent concentration of 0.0070 mg/l (average effluent concentration of 0.0036 mg/l).
8. The field data showed an average removal rate of 93% for total petroleum hydrocarbon (TPH) at an average instantaneous hydraulic loading rate up to 53 in/hr and an average influent concentration of 52 mg/l (average effluent concentration of 2.3 mg/l). The data also shows achievement of less than 15 mg/l TPH for grab samples. Filterra® provided limited visible sheen data due to access limitations at the outlet monitoring location.
9. The field data showed low percentage removals of total phosphorus at all storm flows at an average influent concentration of 0.189 mg/l (average effluent concentration of 0.171 mg/l). We may relate the relatively poor treatment performance of the Filterra® system at this location to influent characteristics for total phosphorus that are unique to the Port of Tacoma site. It appears that the Filterra® system will not meet the 50 percent removal performance goal when you expect the majority of phosphorus in the runoff to be in the dissolved form.

Laboratory Testing

1. Filterra® performed laboratory testing on a scaled down version of the Filterra® unit. The lab data showed an average removal from 83-91% for TSS with influents ranging from 21 to 320 mg/L, 82-84% for total copper with influents ranging from 0.94 to 2.3 mg/L, and 50-61% for orthophosphate with influents ranging from 2.46 to 14.37 mg/L.
2. Filterra® conducted permeability tests on the soil media.

3. Lab scale testing using Sil-Co-Sil 106 showed percent removals ranging from 70.1% to 95.5% with a median percent removal of 90.7%, for influent concentrations ranging from 8.3 to 260 mg/L. Filterra® ran these laboratory tests at an infiltration rate of 50 in/hr.
4. Supplemental lab testing conducted in September 2009 using Sil-Co-Sil 106 showed an average percent removal of 90.6%. These laboratory tests were run at infiltration rates ranging from 25 to 150 in/hr for influent concentrations ranging from 41.6 to 252.5 mg/l. Regression analysis results indicate that the Filterra® system's TSS removal performance is independent of influent concentration in the concentration rage evaluated at hydraulic loading rates of up to 150 in/hr.

Contact Information:

Applicant:
Sean Darcy
Contech Engineered Solutions, LLC.
11815 Glenn Widing Dr
Portland, OR 97220
(503) 258-3105
darcys@conteches.com

Applicant's Website: http://www.conteches.com

Ecology web link: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html

Ecology:
Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

Date	Revision
December 2009	GULD for Basic, Enhanced, and Oil granted, CULD for Phosphorus
September 2011	Extended CULD for Phosphorus Treatment
September 2012	Revised design storm discussion, added Shallow System.
January 2013	Revised format to match Ecology standards, changed Filterra contact information
February 2013	Added FTIB-P system
March 2013	Added FTIB-C system
April 2013	Modified requirements for identifying appropriate size of unit
June 2013	Modified description of FTIB-C alternate configuration
March 2014	GULD awarded for Phosphorus Treatment. GULD updated for a higher flow-rate for Basic Treatment.
June 2014	Revised sizing calculation methods
March 2015	Revised Contact Information
June 2015	CULD for Basic and Enhanced at 100 in/hr infiltration rate

SPECIFIER CHART TRITON TDAM FILTERS	INLET (ID) INSIDE DIMENSION Of Trench Drain	MEDIA REM - BFTG* FILTERED Flow Rate	MEDIA REM - FOG** FILTERED Flow Rate	MEDIA REM - FOG & BFTG*** FILTERED Flow Rate	DEBRIS HOLDING CAPACITY
MODEL:	*(inch width)*	CFS	CFS	CFS	CUBIC FEET
			Standard		
TT2.0	**4" Wide Trench**				
TT2.0 (4" wide, Rounded at Bottom Trench Drain)		0.12	0.05	0.05	0.13
TDAM5	**5" Wide Trench**				
TDAM5 - PK (3.5" Ht.)		0.1	0.04	0.04	0.48
TDAM5 (5" Ht.) **§ (Standard)**		0.24	0.1	0.1	0.69
TDAM5 (10" Ht.)		0.49	0.2	0.2	1.39
TDAM6	**6" Wide Trench**				
TDAM6 - PK (3.5" Ht.)		0.2	0.08	0.08	0.7
TDAM6 (5" Ht.) **§ (Standard)**		0.29	0.11	0.11	1
TDAM6 (10" Ht.)		0.59	0.23	0.23	1.66
TDAM8	**8" Wide Trench**				
TDAM8 - PK (3.5" Ht.)		0.27	0.11	0.11	0.78
TDAM8 (5" Ht.) **§ (Standard)**		0.39	0.15	0.15	1.11
TDAM8 (10" Ht.)		0.78	0.3	0.3	2.22
TDAM10	**10" Wide Trench**				
TDAM10 - PK (3.5" Ht.)		0.34	0.13	0.13	0.97
TDAM10 (5" Ht.) **§ (Standard)**		0.39	0.15	0.15	1.39
TDAM10 (10" Ht.)		0.78	0.3	0.3	2.78
TDAM12	**12" Wide Trench**				
TDAM12 - PK (3.5" Ht.)		0.41	0.18	0.18	1.16
TDAM12 (5" Ht.) **§ (Standard)**		0.59	0.26	0.26	1.66
TDAM12 (10" Ht.)		1.18	0.52	0.52	3.33
TDAM15	**15" Wide Trench**				
TDAM15 - PK (3.5" Ht.)		0.52	0.2	0.2	1.46
TDAM15 (5" Ht.) **§ (Standard)**		0.74	0.28	0.28	2.08
TDAM15 (10" Ht.)		1.47	0.56	0.56	4.17
TDAM18	**18" Wide Trench**				
TDAM18 - PK (3.5" Ht.)		0.62	0.24	0.24	1.75
TDAM18 (5" Ht.) **§ (Standard)**		0.88	0.34	0.34	2.5
TDAM18 (10" Ht.)		1.76	0.68	0.68	5
TDAM24	**24" Wide Trench**				
TDAM24 - PK (3.5" Ht.)		0.83	0.32	0.32	2.33
TDAM24 (5" Ht.)		1.18	0.45	0.45	3.33
TDAM24 (10" Ht.) **§ (Standard)**		2.35	0.9	0.9	6.66
TDAM36	**36" Wide Trench**				
TDAM36 - PK (3.5" Ht.)		1.24	0.54	0.54	3.5
TDAM36 (5" Ht.)		1.77	0.68	0.68	5
TDAM36 (10" Ht.) **§ (Standard)**		3.53	1.35	1.35	9.99
TDAM48	**48" Wide Trench**				
TDAM48 - PK (3.5" Ht.)		1.66	0.72	0.72	4.66
TDAM48 (5" Ht.)		2.36	0.9	0.9	6.66
TDAM48 (10" Ht.) **§ (Standard)**		4.7	1.8	1.8	13.32

Notes:

§ Signifies the most common (standard) TDAM height for the trench drain width given. If the trench drain requires more capturing capacity and has the needed depth, taller filters can be made. The TDAM heights are listed in the ( ) of the model.

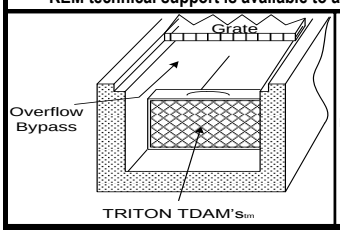
* REM - BFTG: Bioflex (BFTG) Media is designed to capture debris, trash and sediment while sustaining very high treatment rates. Mesh density of 3.5 ounces per square foot minimizes occlusion and blinding while capturing 100% of particles at 5mm or greater in size. Excellent media for Trash Capture applications.

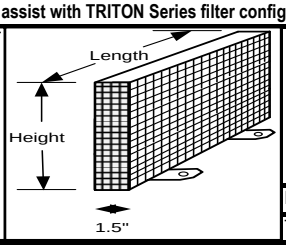
** REM - FOG: The FOG media is housed in a mono-filament weaved geotextile containment pack. FOG media effectively encapsulates liquefied petroleum hydrocarbons (Fats, Oils, & Grease including animal fats). It's highly hydrophobic characteristic allows for increased polish of flow resulting in the reduction of Total Suspended Solids (TSS). Tss reduction (but is not limited to) debris, trash, silt, sediment and agglomerated heavy metals. This is the standard media that is configured for Drop Inlet Filters. Media options for other pollutants are also available.

*** REM - FOG -BFTG: Media configuration utilizes both BFTG and FOG media strategies. The BFTG Media serves as a pre-screen to treat for larger debris, trash, and sediment. The FOG media pack captures fine suspended solids and liquefied hydrocarbons.

**** Filter debris capacities are based on 4' sections (length) of the trench drain. Volume capacities can be increased when TDAM's are placed further apart. Volume capacities can also be increased depending upon the depth a the trench drain. Taller sections of TDAM will add additional capacity. The area above each TDAM has been designed to leave a 25% opening between the top of the filter and the bottom of the grate. This opening has been designed to allow for larger storm events to bypass the TDAM unobstructed, when needed.

REM technical support is available to assist with TRITON Series filter configurations, media strategies and customization of models.





Revel Environmental Manufacturing Inc.
sales@remfilters.com (888) 526-4736 Lic. No. 857410

Northern California
960-B Detroit Avenue
Concord, California 94518
P: (925) 676-4736
F: (925) 676-8676

Southern California
2110 South Grand Avenue
Santa Ana, California 92705
P: (714) 557-2676
F: (714) 557-2679

REM
www.remfilters.com

Filter Series	Drawing No.	Date	Sheet
TRITON TDAM Filters	TTF -0001	3/3/2013	1 of 1

Appendix D:

BMP Maintenance Information

Inspection Activities	Suggested Frequency
■ Inspect soil and repair eroded areas.	Monthly
■ Inspect for erosion or damage to vegetation, preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the strips are ready for winter. However, additional inspection after periods of heavy runoff is desirable.	Semi-annual inspection
■ Inspect to ensure grass is well established. If not, either prepare soil and reseed or replace with alternative species. Install erosion control blanket. ■ Check for debris and litter, and areas of sediment accumulation. ■ Inspect health of trees and shrubs.	
Maintenance Activities	**Suggested Frequency**
■ Water plants daily for 2 weeks.	At project completion
■ Remove litter and debris.	Monthly
■ Remove sediment. ■ Remulch void areas. ■ Treat diseased trees and shrubs. ■ Mow turf areas. ■ Repair erosion at inflow points. ■ Repair outflow structures. ■ Unclog underdrain. ■ Regulate soil pH regulation.	As needed
■ Remove and replace dead and diseased vegetation.	Semi-annual
■ Add mulch. ■ Replace tree stakes and wires.	Annual
■ Mulch should be replaced every 2 to 3 years or when bare spots appear. Remulch prior to the wet season.	Every 2-3 years, or as needed

Additional Information

Landscaping is critical to the function and aesthetic value of bioretention areas. It is preferable to plant the area with native vegetation, or plants that provide habitat value, where possible. Another important design feature is to select species that can withstand the hydrologic regime they will experience. At the bottom of the bioretention facility, plants that tolerate both wet and dry conditions are preferable. At the edges, which will remain primarily dry, upland species will be the most resilient. It is best to select a combination of trees, shrubs, and herbaceous materials.

References

Metropolitan Council, Urban Small Sites Best Management Practices Manual. Available at: http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm

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, revised February, 2002.

U.S. Environmental Protection Agency, Post-Construction Stormwater Management in New Development & Redevelopment BMP Factsheets. Available at: cfpub.epa.gov/npdes/stormwater/menuofbmps/bmp_files.cfm

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

REM TRITON Filter Recommended Maintenance Procedures:

Maintenance and Inspections:

In order to ensure proper operation, REM (Revel Environmental Manufacturing, Inc.) recommends that REM Stormwater filters be serviced and maintained when debris and pollutant accumulations exceed no more than 80% of the filter's capacity. REM recommends that the filters are inspected and serviced at a minimum of three times (3X's) per seasonal cycle year. The frequency and length of duration between inspections and maintenance may fluctuate based on specific site conditions such as local weather conditions, site use, and pollutant type and loading volume.

Filter Media Replacement:

In order to ensure proper operation, REM recommends that the FOG Media, or other specified media (such as Activated Carbon, and/or Zeolite) be replaced when the outer surface of media is no more than 50% coated with contaminants. (The surface area of REM's standard FOG media is stark white in color. The media will blacken with encapsulated contaminants over time.) It is recommended that REM media packs and Bioflex be replaced a minimum of one time (1X) per seasonal cycle year. Sites with higher pollutant loading concentrations may require more frequent service and media replacement. Purchase replacement media packs from REM at (888) 526-4736 or sales@remfilters.com. Custom media configurations are available upon.

Disposal:

Captured pollutant debris and spent media must be disposed of in accordance with all Federal, State, and Local Laws and Regulations.

On-site Procedures for Triton Catch Basin Filter Inserts:

1. Secure area (proceed with traffic and pedestrian control plan).
2. Clean surface area immediately around each storm drain utilizing a stiff bristled push-broom, flat shovel or industrial vacuum.
3. Proceed with confined space procedures as necessary.
4. Remove grate or manhole cover and set aside.
5. Inspect perimeter filter flange gasket. Confirm media cartridge is secure in the filter basin.
6. Remove debris trapped in grate slot openings.
7. Utilize an industrial vacuum to remove debris from within filter basin.
8. Pressure wash media pack through the stainless steel cartridge. (Avoid discharge by utilizing an industrial vacuum to remove excess water while pressure washing).
9. Inspect media housed inside stainless steel cartridge. REM recommends replacing the filter media a minimum of once a year (see *Filter Media Replacement* above).
10. Place grate or manhole cover back on catch basin grate frame.
11. Secure dated service lock-out tag on grate lid.
12. Identify catch basin on site map for tracking and reporting.
13. Note observations, concerns or recommendation regarding specific filter on maintenance report.
14. Remove pedestrian and/or traffic control barricades.

Appendix E:

Geotechnical Information

(Storm water infiltration BMP evaluation)

GEOTECHNICAL PROFESSIONALS INC.

GEOTECHNICAL INVESTIGATION
PROPOSED PHASE 1 MEDICAL OFFICE BUILDING
ST. JOSEPH HOSPITAL
NEC S. MAIN STREET AND W. STEWART DRIVE
ORANGE, CALIFORNIA

Prepared for:
PMB Orange 2 LLC
3394 Carmel Mountain Road, Suite 200
San Diego, California 92121

Prepared by:
Geotechnical Professionals Inc.
5736 Corporate Avenue
Cypress, California 90630
(714) 220-2211

Project No. 2981.I

March 10, 2020

GEOTECHNICAL PROFESSIONALS INC.

March 10, 2020

PMB Orange 2 LLC
3394 Carmel Mountain Road, Suite 200
San Diego, California 92121

Attention: Mr. Peter Jeong

Subject: Report of Geotechnical Investigation
Proposed Phase 1 Medical Office Building
NEC S. Main Street and W. Stewart Drive
Orange, California
GPI Project No. 2981.I

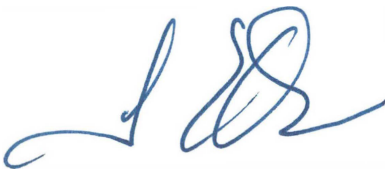
Dear Mr. Jeong:

Transmitted herewith is our report of geotechnical investigation for the subject project. The report presents our evaluation of the foundation conditions at the site and recommendations for design and construction.

We are providing this report in an electronic format. When requested, we will provide wet signed originals for submittal to regulatory agencies.

We appreciate the opportunity of offering our services on this project and look forward to seeing the project through its successful completion. Feel free to call us if you have any questions regarding our report or need further assistance.

Very truly yours,
Geotechnical Professionals Inc.



James E. Harris, G.E.
Principal

5736 Corporate Avenue • Cypress, CA 90630 • (714) 220-2211 , FAX (714) 220-2122

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LIST OF FIGURES

1.0 INTRODUCTION

1.1 GENERAL

This report presents the results of a geotechnical investigation performed by Geotechnical Professionals Inc. (GPI) for the proposed Phase 1 Medical Office Building (MOB) project located at St. Joseph Hospital in Orange, California. The site location is shown on the Site Location Map, Figure 1.

1.2 PROJECT DESCRIPTION

The proposed project will consist of a concrete podium type building consisting of 3 levels above grade and 4 to 5 levels of below grade parking. The ground level will consist tenant space, parking entry ramps and Columbia Street extending through the building. The upper 2 levels will consist of tenant space for the MOB. The below grade levels will consist of parking garage. The building will cover a footprint of approximately 44,400 square feet (sf).

Current plans indicate that the structure will be constructed 4 to 5-levels of below grade concrete parking, 1-level of a concrete podium, and 2 levels of a steel frame structure for the MOB over the podium. Based on the number of subterranean levels, we have assumed foundations will extend up to to 53 feet below existing grades.

The proposed site configuration is shown on the site plan, Figure 2.

Based on our experience with similar projects, we assume maximum column loads of approximately 700 to 1,000 kips for the MOB/parking garage.

Our recommendations are based upon the above structural and finish grade information. We should be notified if the actual loads and/or grades differ or change during the project design to either confirm or modify our recommendations. Also, when the project shoring and foundation plans become available, we should be provided with a copy for review and comment.

1.3 PURPOSE OF INVESTIGATION

The primary purpose of this investigation and report is to provide an evaluation of the existing geotechnical conditions at the site as they relate to the design and construction of the proposed development. More specifically, this investigation was aimed at providing geotechnical recommendations for earthwork and design of shoring and foundations.

2.0 SCOPE OF WORK

Our scope of work for this investigation consisted of review of existing information, field exploration, laboratory testing, engineering analysis, and the preparation of this report.

Our field exploration consisted of five exploratory borings. The locations of the subsurface explorations are shown on the Site Plan, Figure 2.

The exploratory borings were drilled using truck-mounted hollow-stem auger drilling equipment to depths of 81 to 101 feet below existing site grades. Details of the drilling and Logs of Borings are presented in Appendix A.

Laboratory soil tests were performed on selected representative samples as an aid in soil classification and to evaluate the engineering properties of the soils. The geotechnical laboratory testing program included determinations of moisture content and dry density, grain size distribution, fines content, shear strength, consolidation, expansion potential, and soil corrosivity. Laboratory testing procedures and results are summarized in Appendix B.

Soil corrosivity testing was performed by HDR under subcontract to GPI. Their test results are presented in Appendix C.

Terra Geosciences performed seismic shear-wave survey to assess the average shear wave velocity of the subsurface soils. The results of the testing and the report by Terra Geosciences are presented in Appendix C.

Engineering evaluations were performed to provide earthwork criteria, foundation and slab design parameters and assessments of seismic hazards. The results of our evaluations are presented in the remainder of the report.

3.0 SITE CONDITIONS

3.1 SURFACE CONDITIONS

The site is located at the northeast corner of S. Main Street and W. Steward Drive within the western portion of St. Joseph Hospital in Orange, California. The site is currently occupied by a small single-story motel building, a two-story hospital building, a single-story community clinic building, parking lots, and a street into an existing parking structure. The 3-level parking garage is located along nearly the entire eastern side of the proposed MOB

The site is bounded on the north by an empty lot with small abandoned buildings, on the west by S. Main Street, on the south side by W. Stewart Drive, and on the east by an existing parking garage, a dental office parking lot, and drives within the hospital.

The site topography is relatively flat with ground surface elevations ranging from approximately +155 to +159 feet across the site from south to north.

3.2 SUBSURFACE SOIL CONDITIONS

Our field investigation disclosed a subsurface profile consisting of undocumented fill soils overlying natural soils. Detailed descriptions of the conditions encountered are shown on the Logs of Borings in Appendix A.

We encountered undocumented fill soils to depths of approximately 5 feet or less in our exploratory borings. The fill soils consisted of silty sands, clays, silty clays, and sandy clays. Moisture contents of the fills were observed to be slightly moist to moist.

The natural soils encountered consisted of interbedded layers of firm to stiff sandy clay, silty clays, and clayey silts along with medium dense to dense clayey sands, silty sands and sands. At a depth of approximately 40 to 50 feet, a thick layer of dense to very dense sandy soil was encountered which contained varying amounts of gravel and cobbles. The borings at the southern portion of the site generally contained more gravel and cobbles. In general, the sand layer extended to a depth of 60 to 70 feet where a layer of hard clay was encountered. Interbedded layers of hard clays and very dense sands were extended to the bottom of our explorations. The sandy soils are generally dry to slightly moist. The clays are generally moist to very moist. At depths of 40 to 50 feet near the planned excavation bottoms, the sandy soils vary from medium dense to very dense and, in general, the clayey soils vary from stiff to hard. These natural soils near foundation level generally exhibit moderate to high strength and low compressibility characteristics. Detailed descriptions of the soils are shown on the Logs of Borings in Appendix A.

3.3 GROUNDWATER AND CAVING

Groundwater was encountered at 98 feet deep in one of our borings (B-4). Data published by the State of California indicates that groundwater in the site vicinity is greater than 40 feet below the existing site grades (Reference 1).

Caving was not observed within the small diameter explorations. However, caving and raveling of the dry to slightly moist sandy deposits should be expected.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 OVERVIEW

Based on the results of our investigation, it is our opinion that from a geotechnical viewpoint it is feasible to develop the site as proposed. The proposed structure can be supported on spread footings with a slab-on-grade provided the geotechnical constraints discussed below are mitigated. The most significant geotechnical issues that will affect the design and construction of the proposed structure are as follows:

- The planned excavation for the subterranean parking levels will remove the undocumented fills across the site. Details are presented in the "Earthwork" sections of this report.

- Based on limited site access, shoring will be required during excavation of the basement level. Intermittent layers of very dense layers of sands with gravels and cobbles exist in the soil profile. Driven or vibrated soldier piles may not be a feasible or economical alternative to drilled holes. The shoring contractor should evaluate the subsurface conditions when planning the installation methods for soldier piles and tieback anchors.

- Groundwater was encountered in one of our explorations at a depth of more than 40 feet below the planned excavations for the subterranean level of the building. We do not anticipate groundwater to adversely impact excavation bottoms, floor slabs, or basement walls.

- Footings for the building can be supported directly on natural soils at the lower subterranean level. Footings for at-grade minor structures can be supported on properly compacted fills.

Our recommendations related to the geotechnical aspects of the development of the site are presented in the subsequent sections of this report.

4.2 SEISMIC DESIGN

4.2.1 General

The site is located in a seismically active area typical of Southern California and is likely to be subjected to strong ground shaking due to earthquakes on nearby faults.

We assume the seismic design of the proposed building will be in accordance with the California Building Code (CBC), 2019 edition. A Site Class C may be used for the seismic design. This determination is based on a seismic shear wave survey performed by Terra Geosciences under subcontract to GPI. The average shear wave velocity of approximately 1290 feet/second was measured in the subsurface soils to approximately 100 feet below foundation levels. Appendix C contains the results of the seismic shear wave survey.

The seismic code values can be obtained directly from the tables in the building code using the above values and appropriate SEAOC/OSHPD website (Reference 2). The Project Structural Engineer should determine the seismic design method.

4.2.2 Strong Ground Motion Potential

Based on published information presented in Reference 3, the most significant faults in the proximity of the site are the San Joaquin Hills and Puente Hills Faults, which are located approximately 6 to 7 miles from the site.

During the life of the project, the site will likely be subject to strong ground motions due to earthquakes on nearby faults. Based on the SEAOC/OSHPD website (Reference 2), we computed that the site could be subjected to a peak ground acceleration (PGA_M) of 0.68g for a modal magnitude 6.5 earthquake. This acceleration has been computed using the mapped Maximum Considered Geometric Mean peak ground acceleration from ASCE 7-16 (Reference 4) and a site coefficient (F_{PGA}) based on site class. The predominant earthquake magnitude was determined using a 2-percent probability of exceedance in a 50-year period, or an average return period of 2,475 years.

The structural design will need to incorporate measures to mitigate the effects of strong ground motion.

4.2.3 Potential for Ground Rupture

There are no known active faults crossing or projecting through the site. The site is not located in an Alquist-Priolo Earthquake Fault Zone. Therefore, ground rupture due to faulting is considered unlikely at this site.

4.2.4 Liquefaction

Liquefaction is a phenomenon in which saturated cohesionless soils undergo a temporary loss of strength during severe ground shaking and acquire a degree of mobility sufficient to permit ground deformation. In extreme cases, the soil particles can become suspended in groundwater, resulting in the soil deposit becoming mobile and fluid-like. Liquefaction is generally considered to occur primarily in loose to medium dense deposits of saturated sandy soils. Thus, three conditions are required for liquefaction to occur: (1) a sandy soil of loose to medium density; (2) saturated conditions; and (3) rapid, large strain, cyclic loading, normally provided by earthquake motions.

The site is not located within an area shown as having a potential for soil liquefaction in accordance with the Seismic Hazards Mapping Act as shown in the Orange Quadrangle (Reference 5). Soil liquefaction is not likely to occur at the project site because the soils below the historical high groundwater level are dense to very dense.

4.2.5 Seismic Ground Subsidence

Seismic ground subsidence (not related to liquefaction induced settlements) occurs when strong earthquake shaking results in the densification of loose to medium dense sandy soils above the groundwater. The sands below the planned excavation level of the subterranean parking are medium dense to very dense. Ground subsidence below the excavation level will not likely occur during a major seismic event.

4.3 SUBSURFACE DRAINAGE

Groundwater was encountered in one of our explorations at a depth of more than 40 feet below the planned excavations for the subterranean level of the building. A historical high groundwater level as provided by the State (Reference 1) indicates a depth of greater than 40 feet below existing grades. Except for limited layers of clayey soils, the soils in our samples were dry to slightly moist above a depth of 90 feet below existing grades. Based on the above information, we do not anticipate groundwater to adversely impact excavation bottoms, floor slabs, or basement walls.

4.4 EARTHWORK

The earthwork anticipated at the project site will consist of demolition of existing buildings, improvements and pavements, clearing and grubbing, excavation for the subterranean parking, subgrade preparation, and the placement and compaction of fill.

4.4.1 Clearing and Grubbing

Prior to grading, performing excavations, or constructing the proposed improvements, the areas to be developed should be stripped of vegetation and cleared of existing structures, debris, and pavements. Buried obstructions, such as footings, abandoned utilities, and tree roots should be removed from areas to be developed. Deleterious material generated during the clearing operation, including organic topsoil, should be removed from the site. If approved by the owner and regulatory agency, inert demolition debris, such as concrete and asphalt may be crushed for reuse in engineered fills outside the planned building areas in accordance with the criteria presented in the "Materials for Fill" section of this report.

If cesspools or septic systems are encountered during grading, they should be removed in their entirety. The resulting excavation should be backfilled as recommended in the "Subgrade Preparation" and "Placement and Compaction of Fill" sections of this report. As an alternative, cesspools can be backfilled with lean sand-cement slurry. At the conclusion of the clearing operations, a representative of GPI should observe and accept the site prior to further grading.

4.4.2 Excavations

Excavations at this site will include the subterranean parking excavation, removals of undocumented fills if not removed by the excavation, footing excavations, and trenching for new utility lines.

Based on the preliminary project plans, the minor amount of fill soils within the building limits will be removed during the planned excavation for the subterranean parking levels. For planning purposes, removals below the proposed pad elevation are not required unless the soils are disturbed. The actual depths of removal should be determined in the field during grading by a representative of GPI.

For minor at-grade supported structures, such as screen walls, canopies, or short retaining walls, the existing fills should be removed and the footings should be underlain by at least 2 feet of properly compacted fill. For pavement and hardscape outside the building, the existing soils within at least 1 foot of the existing or finished grade, whichever is lower, should be overexcavated and replaced as properly compacted fill. The actual depths of removals should be determined in the field during grading by a representative of GPI.

Where space is available, the removals for at-grade structures should extend laterally beyond the edge of footing a minimum distance equal to the depth of overexcavation/compaction below finish grade (i.e. a 1:1 projection below the edge of footings).

Where not removed by the aforementioned excavations, existing undocumented utility trench backfill remaining below new foundation areas should be removed and replaced as properly compacted fill. This is especially important for deeper fills such as existing sewers and storm drains. For planning purposes, removals over the utilities should extend to within 1-foot of the top of the pipe. The removal should extend laterally 1-foot beyond both sides of the pipe. The actual limits of removal will be confirmed in the field. We recommend that known utilities be shown on the grading plan.

Temporary construction excavations may be made vertically without shoring to a depth of 4 feet below the adjacent grade. Though not anticipated due to site constraints, for cuts up to 10 feet, the slopes should be properly shored or sloped back to at least 1:1 (horizontal to vertical) or flatter. For cuts up to 20 feet, the slopes should be properly shored or sloped back to at least 1½:1 or flatter. The inclination is measured from the top to toe of slope, and we do not recommend incorporating a vertical cut at the base of the slope. The exposed slope face should be kept moist (but not saturated) during construction to reduce local sloughing. Surcharge loads should not be permitted within a horizontal distance equal to the height of cut from the top of the excavation or 5 feet from the top of the slopes, whichever is greater, unless the cut is properly shored. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of the adjacent existing site facilities should be properly shored to maintain support of adjacent elements. Excavations and shoring systems should meet the minimum requirements given in the most current State of California Occupational Safety and Health Standards.

4.4.3 Subgrade Preparation

After removals are complete and prior to placing fills or construction of proposed at-grade structures, the subgrade soils should be scarified to a depth of 12 inches, moisture-conditioned, and compacted to dry densities equal to at least 90 percent of the maximum dry density (95 percent for sandy soils), determined in accordance with ASTM D 1557.

In areas to receive pavements (outside of the structure), the top 12 inches below the pavement base should be scarified, moisture-conditioned, and compacted to a minimum of 90 percent (95 percent for sandy soils) of the maximum dry density in accordance with ASTM D 1557.

4.4.4 Material for Fill

Soils available from on-site excavations, less debris or organic matter, will be suitable for re-use in fills. Clays and silts should not be used for fills behind retaining walls or directly beneath exterior flatwork. Retaining wall backfill and soils within 1-foot of finished grade for exterior hardscape and flatwork should consist of on-site or imported granular and be relatively non-expansive soils as described below. This recommendation is presented graphically in Figure 3.

While not anticipated for the project, imported fill material should be predominately granular (containing no more than 40 percent fines - portion passing No. 200 sieve) and non-expansive (E.I. of 20 or less). Import or on-site materials used in compacted fills should not contain particles larger than 6 inches in diameter. GPI should be provided with a sample (at least 50 pounds) and notified of the location of soils proposed for import at least 72 hours in advance

of importing. Each proposed import source should be sampled, tested and accepted for use prior to delivery of the soils to the site. Soils imported prior to acceptance by GPI may be rejected if not suitable.

In backfill areas where mechanical compaction of soil backfill is impractical due to space constraints, sand-cement slurry may be substituted for compacted backfill. The slurry should contain at least one sack of cement per cubic yard and have a maximum slump of 5 inches. When set, such a mix typically has the consistency of compacted soil.

From a geotechnical engineering standpoint, asphalt concrete or portland cement concrete can be incorporated into fills provided that they are crushed to the consistency of aggregate base and thoroughly blended with enough soil to form a well-graded mixture (typically a 3:1 soil to debris ratio). Such material should not be placed within landscape areas. Approval from the owner and City of Orange should be obtained prior to use of the inert materials within the building area.

In areas where open-graded gravel, such as pea gravel or ¾-inch crush rock, is placed, the gravel should be separated from the on-site soils with a suitable non-woven filter fabric, such as Mirafi 140N or equivalent. The purpose of the filter fabric is to reduce the potential for soil particles to migrate into the void spacing of the gravel.

4.4.5 Placement and Compaction of Fills

Fill soils should be placed in horizontal lifts, moisture-conditioned, and mechanically compacted to densities equal to at least 90 percent (95 percent for sandy soils) of the maximum dry density, determined in accordance with ASTM D1557. The optimum lift thickness will depend on the compaction equipment used and can best be determined in the field. The following uncompacted lift thickness can be used as preliminary guidelines.

Plate compactors	4-6 inches
Small vibratory or static rollers (5-ton±) or track equipment	6-8 inches
Heavy loaders or vibratory rollers	8-12 inches

The maximum lift thickness should not be greater than 12 inches and each lift should be thoroughly compacted and accepted prior to subsequent lifts.

Fills consisting of the on-site clays should be placed at a moisture content of 1 to 3 percent over the optimum moisture content in order to achieve the required compaction and reduce the potential for future swelling. On-site or imported granular fills should be placed at a moisture content of 0 to 2 percent over the optimum moisture content. The moisture content of the sandy soils encountered in the upper 50 feet of the explorations at the site was generally below the optimum moisture content. The clayey soils encountered in the upper 50 feet of the explorations at the site are typically over optimum conditions.

Once moisture conditioned and properly compacted, the exposed clayey soils should not be allowed to dry out prior to covering. A representative of GPI should confirm the moisture content of the subgrade soils immediately prior to placement of concrete or additional fill.

During backfill of excavations, the fill should be properly benched into the construction slopes as it is placed in lifts.

4.4.6 Shrinkage and Subsidence

Shrinkage is the loss of soil volume caused by compaction of fills to a higher density than before grading. Subsidence is the settlement of in-place subgrade soils caused by loads generated by large earthmoving equipment. Neither shrinkage nor subsidence is anticipated to be a major factor on the project because of the significant soil export. Actual shrinkage and subsidence will depend on the types of earthmoving equipment used and should be verified during grading.

4.4.7 Trench/Wall Backfill

Utility trench and wall backfill, consisting of the on-site materials (trenches only) or imported sand, should be mechanically compacted in lifts. Lift thickness should not exceed those values given in the "Compacted Fill" section of this report. Moisture conditioning of the on-site soils will be required prior to re-use as backfill. Jetting or flooding of backfill materials should not be permitted. GPI should observe and test trench and wall backfills as they are placed.

In backfill areas where mechanical compaction of soil backfill is impractical due to space constraints, sand-cement slurry may be substituted for compacted backfill. The slurry should contain one sack of cement per cubic yard and have a maximum slump of 5 inches. Within building areas, the slurry should contain two sacks of cement per cubic yard.

4.4.8 Observation and Testing

A representative of GPI should observe excavations, subgrade preparation, and fill placement activities. Sufficient in-place field density tests should be performed during fill placement and in-place compaction to evaluate the overall compaction of the soils. Soils that do not meet minimum compaction requirements should be reworked and tested prior to placement of additional fill.

4.5 FOUNDATIONS

4.5.1 Foundation Type

The proposed structure may be supported on conventional isolated and/or continuous shallow footings, provided the subsurface soils are prepared in accordance with the recommendations given in this report. All building footings should be supported on competent natural soils. Footing bottoms should be moistened immediately prior to placement of concrete.

4.5.2 Allowable Bearing Pressures

Based on the shear strength and elastic settlement characteristics of the natural soils, a static allowable net bearing pressure of up to 5,500 pounds per square foot (psf) may be used for both continuous footings and isolated column footings bearing.

The bearing pressures provided below are for dead-load-plus-live-load, and may be increased one-third for short-term, transient, wind and seismic loading. The actual bearing pressure used may be less than the value presented above and can be based on economics and structural loads to determine the minimum width for footings as discussed below. The maximum edge pressures induced by eccentric loading or overturning moments should not be allowed to exceed these recommended values.

For any at-grade minor structures, a static allowable net bearing pressure of up to 2,000 pounds per square foot (psf) may be used for both continuous footings and isolated column footings bearing on properly compacted fill consisting of on-site soils.

4.5.3 Minimum Footing Width and Embedment

The following minimum footing widths and embedments are recommended for the corresponding allowable bearing pressure for the building.

STATIC BEARING PRESSURE (psf)	MINIMUM FOOTING WIDTH (inches)	MINIMUM FOOTNG* EMBEDMENT (inches)
5,500	120	24
5,000	96	24
4,500	72	24
4,000	60	24
2,500	24	24
2,000	24	18
1,500	18	18

* Refers to minimum depth below lowest adjacent grade at the time of foundation construction.

A minimum footing width of 18 inches should be used even if the actual bearing pressure is less than 1,500 psf.

4.5.4 Estimated Settlements

We calculated settlements based on the assumed structural loads. Based on our analyses, the total static settlement under a maximum column load of 1000 kips supported on natural soils at 40 to 50 feet below existing grades, is expected to be on the order of 1-inch or less. Differential settlement between similarly loaded adjacent footings is anticipated to be on the order of ½-inch.

Total settlements of less than 1-inch are anticipated for any minor at-grade structures supported on natural soils or compacted fill derived from on-site soils. Differential settlement between similarly loaded adjacent footings is anticipated to be on the order of ½-inch.

The above estimates are based on the assumption that the recommended earthwork will be performed and that the footings will be sized in accordance with our recommendations. If the structural loads change as the design of the project progresses, we should be notified in order to confirm the estimated settlement values provided above.

4.5.5 Lateral Load Resistance

Soil resistance to lateral loads will be provided by a combination of frictional resistance between the bottom of footings and underlying soils and by passive soil pressures acting against the embedded sides of the footings. For frictional resistance, a coefficient of friction of 0.35 may be used for design. In addition, an allowable lateral bearing pressure equal to an equivalent fluid weight of 300 pounds per cubic foot may be used, provided the footings are poured tight against competent natural soils or compacted fill. These values may be used in combination without reduction.

4.5.6 Foundation Concrete

Laboratory testing by HDR (Appendix C) on samples provided by GPI indicates soluble sulfate contents of 4 to 142 mg/kg (0.001± to 0.014± percent by weight). For the 2019 CBC, foundation concrete should conform to negligible sulfate exposure per the requirements outlined in ACI 318, Section 4.3.

4.5.7 Footing Excavation Observation

Prior to placement of steel and concrete, a representative of GPI should observe and approve all footing excavations.

4.6 RETAINING STRUCTURES AND SHORING

Basement walls, cantilever retaining walls, and temporary shoring are planned for the site. The following recommendations are provided for walls up to 15 feet tall and shoring that does not extend more than 50 feet in height. We recommend that conventionally constructed walls be backfilled with sandy (granular) soils.

4.6.1 Basement and Retaining Walls

Active pressure may be used in the design of the subterranean walls if the total movement of the wall is sufficient to mobilize the active pressure (yielding at least ½-inch laterally in 10 feet of wall height). For cantilever walls with level, drained backfill comprised of granular soils, the magnitude of active pressures is equivalent to the pressures imposed by a fluid weighing 35 pounds per cubic foot (pcf). For cantilever walls retaining level, drained, undisturbed native soils, the magnitude of active pressures is equivalent to the pressures imposed by a fluid weighing 45 pcf.

At-rest pressures should be used for restrained walls that remain rigid enough to be essentially non-yielding. At-rest pressures imposed by a fluid weighing 65 pounds per cubic foot should be used for drained, natural soils.

The following pressures should be used to design the basement walls if they are waterproofed and designed to resist hydrostatic pressure below the design groundwater elevation. At-rest pressures imposed by a fluid weighing 94 pounds per cubic foot should be used for undrained natural soils for basement walls.

To account for seismic load an additional lateral earth pressure equal to 25 pcf (equivalent fluid pressure distribution) should be added to the above active pressures. If the walls are designed using the above at-rest pressure, the added seismic load plus at-rest pressures can be limited to 70 pcf for drained natural soils. The added seismic load plus at-rest pressures can be limited to 96 pcf for undrained natural soils.

Walls subject to surcharge loads should be designed for an additional uniform lateral pressure equal to one-third and one-half the anticipated surcharge pressure for unrestrained and restrained walls, respectively. Surcharge loads from the adjacent parking structure needs to be considered if the proposed basement wall extends below the zone of influence of the adjacent foundations. The zone of influence can be defined as the area below an imaginary 1:1 line extending downwards from the bottom of the nearest footing.

In addition to the recommended earth pressure, the upper 10 feet of the walls adjacent to the streets should be designed to resist a uniform lateral pressure of 100 pounds per square foot, acting as a result of an assumed 300 pound per square foot surcharge behind the shoring due to normal street traffic. If traffic is kept at least 10 feet from the walls, the traffic surcharge may be neglected.

Construction equipment, such as cranes, concrete trucks, or loaders can impose lateral surcharge loads if they are supported adjacent to the basement walls (or shoring). Therefore, surcharge effects from such equipment will need to be evaluated on a case-by-case basis and, if needed, the walls locally reinforced to support the surcharge from such loads.

The recommended pressures for the drained condition are based on the assumption that the supported earth will be fully drained, preventing the build-up of hydrostatic pressures. For traditional backfilled retaining walls, a drain consisting of perforated pipe and gravel wrapped in filter fabric should be used. One cubic foot of rock should be used for each lineal foot of pipe. The fabric (non-woven filter fabric, Mirafi 140N or equivalent) should be lapped at the top. We prefer pipe and gravel drains to weep holes to avoid potential for constant flow of surface water in front of the wall. For retaining walls constructed adjacent to temporary shoring, a composite geotextile drain may be used with a manifold-type collection drain at the design groundwater level. A representative of GPI should observe and approve wall drains prior to placement of wall backfill.

The Structural Engineer should specify the use of select, granular wall backfill on the plans for walls that are to be conventionally backfilled. Wall footings should be designed as discussed in the "Foundations" section.

4.6.2 Temporary Shoring

Where there is not sufficient space for sloped embankments, such as along the property limits, shoring will be required. Based on current plans, shoring is anticipated along all sides of the project site. One method of shoring would consist of steel soldier piles placed in drilled holes, backfilled with concrete, and tied-back with earth anchors. The tie-back anchors will require permission and be subject to limitations from the adjacent property owners and the City of Orange. Utilities in the adjacent streets should be considered when planning the shoring. Rakers providing support to the soldier piles from inside the excavation would be an option if tie-backs are not allowed in any areas of the site.

The shoring contractor should evaluate the subsurface conditions when planning the installation methods for soldier piles and tieback anchors. Because of intermittent layers of very dense layers of sands with gravels and cobbles in the upper 80 feet of the soil profile, driven or vibrated soldier piles may not be a feasible or economical alternative to drilled holes. The presence of very dense sands as well as gravel and cobbles should be considered when evaluating the alternatives for soldier piles.

For cantilever shoring with level backfill consisting of the on-site soils, the magnitude of active pressure is equivalent to the pressures imposed by a fluid weighing 35 pounds per cubic foot (pcf). For restrained shoring, such as soldier piles with tied-back earth anchors, a trapezoidal apparent earth pressure envelope may be used. The magnitude of the maximum pressure may be taken as 28H in pounds per square foot (psf) where H is the total height of the excavation being shored for the basement walls. The trapezoidal distribution is shown on Figure 4, Lateral

Earth Pressures for Tie-Back Shoring. It should be noted that the provided lateral earth pressures assume a fully drained condition and do not include hydrostatic pressures.

In addition to the recommended earth pressure, the upper 10 feet of the shoring adjacent to streets should be designed to resist a uniform lateral pressure of 100 pounds per square foot, acting as a result of an assumed 300 pound per square foot surcharge behind the shoring due to normal street traffic. If traffic is kept at least 10 feet from the shoring, the traffic surcharge may be neglected.

Shoring should also be designed for adjacent building loads of the parking structure and construction equipment in a similar manner as basement walls.

For design of soldier piles spaced at least two diameters on centers, the allowable lateral bearing value (passive value) of the soils below the excavation may be taken to be 600 pounds per square foot at the excavated surface, up to a maximum of 6,000 psf. To develop the full lateral value, provisions should be made to assure firm contact between the soldier piles and the undisturbed soils. The concrete placed in the soldier pile excavation below the excavated level may be a lean mix, but it should be of adequate strength to transfer the imposed loads to the surrounding soils. While not anticipated due to the potential for significant cobbles at the excavation level, if the soldier piles are driven or vibrated into place, the design width of the soldier piles (effective pile diameter) used in calculations should be equal to the actual width of the flange of the soldier piles.

While not anticipated to be feasible, driving of soldier piles to improve production or minimize ground vibration should only allow predrilling down to the design elevation of the excavation bottom. A continuous flight auger should be utilized to enable reversing the auger to minimize the removal of soil during the process. If soil is removed during the predrilling process, the resulting void should be backfilled with 1½ sack sand-cement slurry. The diameter of the auger used for predrilling should not exceed 80 percent of the maximum depth of the soldier pile beam section.

The frictional resistance between the soldier piles and the retained earth may be used in resisting the downward component of the anchor load. The coefficient of friction between the soldier pile and the retained earth may be taken as 0.35. This value is based on the assumption that uniform full bearing will be developed between the steel soldier beam and the lean-mix concrete and between the lean mix concrete and the retained earth. In addition, provided the portion of the soldier piles below the excavated level is backfilled with structural concrete, the soldier piles below the excavated level may be used to resist downward loads. The frictional resistance between the concrete soldier piles and the soils below the excavated level may be taken as equal to 500 pounds per square foot.

Continuous lagging will be required between the soldier piles. Careful installation of the lagging will be necessary to achieve bearing against the retained earth. We recommend that the voids between the lagging and retained earth be backfilled with a lean-mix sand-cement slurry prior to continuing the excavation deeper. The soldier piles should be designed for the full anticipated lateral pressure. However, the pressure on the lagging will be less because of arching of the soils between piles. We recommend that the lagging be designed for the recommended earth pressure but limited to a maximum value of 400 pounds per square foot, provided the soldier beam spacing is 8 feet or less.

Tie-back friction anchors may be used to resist lateral loads. For design purposes, it may be assumed that the active wedge adjacent to the shoring is defined by a plane drawn at 35 degrees from the vertical through the bottom of the excavation. The anchors should extend at least 20 feet beyond the potential active wedge and to a greater length if necessary to develop the desired capacities. The capacities of anchors should be determined by testing of the initial anchors as outlined in a following paragraph. For design purposes, it may be estimated that conventional drilled cast-in-place friction anchors will develop an average friction value of 700 pounds per square foot. Post-grouted anchors typically obtain greater capacities compared to gravity grouted anchors. In general, the obtained capacity of post-grouted tie-back anchors is primarily a function of construction methods and experience of the specialty contractor along with local site conditions. The capacity of tie-back anchors should be determined through a performance specification. Ultimately, it is the contractor's responsibility to obtain the required pullout capacity, which may require extensive post grouting and/or field modifications. A design friction value of 2,000 pounds per square foot for post-grout anchors has been used by contractors on other projects. Only the frictional resistance developed beyond the active wedge would be effective in resisting lateral loads. If the anchors are spaced at least 6 feet on-center, group action reduction in the capacity of the anchors need not be considered.

The anchors may be installed at angles of 15 to 45 degrees below the horizontal. Caving of the anchor holes should be prevented with the installation method selected. For friction gravity, grouted anchors (non post-grouted), the anchors should be filled with concrete placed by pumping from the tip out, and the concrete should extend from the tip of the anchor to the active wedge. The annular space around the tie-back tendons should not be backfilled until after anchor testing. If caving is a concern in the sandy deposits, the portion within the active wedge may be backfilled with sand and only enough cement to allow placement by pumping. Additional tendons may be required if the active wedge portion is filled to complete the 200 percent tests discussed below.

At least 10 percent of the total anchors should be selected for quick 200 percent tests. At least one anchor per row should be tested for 24 hours. The purpose of the 200 percent tests is to verify the friction value assumed in design. The anchors should be tested to develop twice the assumed friction value. Where satisfactory tests are not achieved on the initial anchors, the post grouting or anchor length should be increased until satisfactory test results are obtained. When the extent of the shoring program is known, we should review the recommended test program and make modifications as necessary. For the 24-hour 200 percent tests, the total deflection during loading should not exceed 12 inches. The deflection after the 200 percent test load has been applied should not exceed 0.75-inch during the 24-hour period. If the anchor movement after the 200 percent load has been applied for 10 hours is less than 0.5 inch, and the movement over the previous 4 hours has been less than 0.1-inch, the test may be terminated. For the quick 200 percent tests, the total deflection should not exceed 12 inches. The deflection after the 200 percent test load has been applied should not exceed 0.25 inch during a 30-minute period.

The remaining anchors should be pretested to at least 150 percent of the design load. The total deflection during the test should not exceed 12 inches. The rate of creep under the 150 percent load should not exceed 0.1 inch over a 15-minute period for the anchor to be approved for the design loading. After a satisfactory test, each production anchor should be locked-off at the design load. The locked-off load should be verified by rechecking the load in the anchor. If the locked-off load varies by more than 10 percent from the design load, the load should be reset until the target load is achieved.

Anchor testing should be performed by the contractor and observed by GPI. The contractor shall provide the necessary test equipment, including an independent fixed reference point (i.e., tripod) for placement of the dial gage for measuring anchor deflections during tensioning. Prior to testing, the contractor shall supply current calibration records of the hydraulic jack to be used for testing. Calibration records should be signed by a California registered professional engineer and be within 3 months prior of the start of testing.

It is difficult to accurately predict the amount of deflection of the shored embankment. It should be realized, however, that some deflection will occur. Adjacent to city right-of-way, the shoring should be designed to limit deflection to 1-inch. If greater deflection occurs during construction, additional bracing may be necessary. In areas where less deflection is desired, such as adjacent to existing settlement sensitive improvements, the shoring should be designed for higher lateral earth pressures. We recommend limiting the lateral deflection of shoring adjacent to the parking structure or other buildings to ½-inch.

Driven/vibrated soldier piles, while not anticipated at this project, should be limited to areas beyond 20 feet from existing buildings, and to a greater distance where adjacent structures appear to be sensitive to vibration or settlement. Ground vibrations could be monitored when driving/vibrating soldier piles adjacent to sensitive structures. A seismograph should be used to measure peak particle velocities (PPV) at the ground surface of the structures of concern. We suggest a maximum allowable PPV of 0.5 inches per second be used as a threshold value unless a lower value is required by the adjacent property owners or hospital operations. Measures should be taken to reduce vibrations if PPV limits are exceeded. Such measures could include altering the predrilling methods or changing to the installation of the soldier piles in a drilled and grouted hole.

In areas of the site where tie-back anchors for the temporary shoring will not be feasible, an option would be the use of rakers to support the temporary shoring. Based on the characteristics of the in-place soils at the planned subgrade level determined during our initial investigation, we recommend an allowable bearing pressure of 3,000 pound per square foot (psf) for the raker footings with a minimum embedment of 18 inches. Based on our analyses, the same frictional capacity values can be used for resisting upward components of the raker loads as recommended for resisting downward loads. Raker footing excavations should be cleaned of loose soils and observed by a representative of GPI prior to placing concrete.

We recommend performing a detailed survey of the improvements to be supported above the planned shoring prior to and during the shoring installation. The survey should include topographic data and a video account of the condition of the existing improvements, including cracks or signs of distress. During construction, the monitoring should consist of periodic surveying of the lateral and vertical locations of the tops of the soldier piles. We suggest weekly readings during the excavation and for the first three weeks after achieving the bottom of the excavation. After that time, the readings should be performed every other week until the completion of the basement walls.

4.7 CONCRETE FLOOR SLABS

Slab-on-grade floors should be supported on a non-expansive (Expansion Index of 20 or less), undisturbed natural or compacted granular soils as discussed in the “Placement and Compaction of Fill” section.

Although not anticipated for the subterranean parking level, a moisture vapor retarder should be placed under slabs that are to be covered with moisture-sensitive floor coverings (wood, vinyl, tile, etc.). Polyolefin in 15-mil thickness should be covered by a layer of clean sand (less than 5 percent by weight passing the No. 200 sieve) having a minimum thickness of 2 inches. Based on our explorations and laboratory testing, the soils at the site are not suitable for this purpose. The function of the sand layer is to protect the vapor retarder during construction and to aid in the uniform curing of the concrete. This layer should be nominally compacted using light equipment. The sand placed over the vapor retarder should only be slightly moist. If the sand gets wet (for example as a result of rainfall or excessive moistening) it must be allowed to dry prior to placing concrete. Care should be taken to avoid infiltration of water into the sand layer after placement of the concrete slab, such as at slab cut-outs and other exposures.

It should be noted that the material used as a vapor retarder is only one of several factors affecting the prevention of moisture accumulation under floor coverings. Other factors include maintaining a low water-cement ratio for the concrete used for the floor slab, effective sealing of joints and edges (particularly at pipe penetrations) as well as excess moisture in the concrete. The manufacturer of the floor coverings should be consulted for establishing acceptable criteria for the condition of the floor surface prior to placing moisture-sensitive floor coverings.

4.8 CORROSION

Soil corrosivity testing was performed by HDR under subcontract to GPI. The corrosivity test results are presented in Appendix B. The on-site soils should be considered moderately corrosive to buried metals. If additional corrosion consultation is required, a corrosion engineer such as HDR should be consulted.

4.9 EXTERIOR CONCRETE AND MASONRY FLATWORK

Exterior concrete and masonry flatwork should be supported on imported non-expansive compacted fill if differential heave is not acceptable. The use of clayey soils within the upper 12 inches of exterior flatwork subgrade is not recommended. Prior to placement of concrete, the subgrade should be prepared as recommended in “Subgrade Preparation” section.

4.10 STORMWATER INFILTRATION

Stormwater infiltration in soils retained by basements walls should not be permitted. Infiltration at a sufficient depth below the bottom of the foundations or below the basement walls would be required. The sandy soils encountered during our investigation directly below the proposed foundation level have characteristics, which are generally suitable for on-site subsurface infiltration of stormwater. However, there is a consistent layer of hard clay at a depth of approximately 15 to 25 feet below the foundation level. This clay material will likely be relatively impermeable and will cause mounding of groundwater within the influence of foundations. Extending the infiltration beyond the clay layer with dry wells is not feasible due to the measured groundwater depth of 98 feet and the County requirement to not infiltrate within 10 feet of the seasonally high groundwater (Reference 6). For this reason, it is our opinion that stormwater infiltration at the site is not considered feasible for this project.

4.11 PAVED AREAS

Preliminary pavement design has been based on an assumed R-value of 10 for the clayey near-surface soils. The California Division of Highways Design Method was used for design of the

recommended preliminary pavement sections. These recommendations are based on the assumption that the pavement subgrades will consist of the existing soils. The subgrade soil conditions will need to be confirmed at the conclusion of rough grading.

PAVEMENT AREA	TRAFFIC INDEX	SECTION THICKNESS (inches)	
		ASPHALT/PORTLAND CONCRETE	AGGREGATE BASE COURSE
Asphalt Concrete			
Automobile Parking	4.0	3.0	6
Automobile Drives	5.0	3.0	9
Truck Drives	6.0	3.0	13
Portland Cement Concrete			
Automobile Parking	4.0	6.0	4
Automobile Drives	5.0	6.5	4
Truck Drives	6.0	7.0	4
Parking Structure	5.0	5.0	---

The pavement subgrade underlying the aggregate base should be properly prepared and compacted in accordance with the recommendations outlined under "Subgrade Preparation".

The pavement base course should be compacted to at least 95 percent of the maximum dry density (ASTM D 1557). Aggregate base should conform to the requirements of Section 26 of the California Department of Transportation Standard Specifications for Class II aggregate base (three-quarter-inch maximum) or Section 200-2 of the Standard Specifications for Public Works Construction (Green Book) for untreated base materials (except Processed Miscellaneous Base).

The above recommendations are based on the assumption that the base course will be properly drained. The design of paved areas should incorporate measures to prevent moisture build-up within the base course and subgrade, which can otherwise lead to premature pavement failure. For example, curbing adjacent to landscaped areas should be deep enough to act as a barrier to infiltration of irrigation water into the adjacent base course.

4.12 SURFACE DRAINAGE

Positive surface gradients should be provided adjacent to structures so as to direct surface water run-off and roof drainage away from foundations and slabs toward suitable discharge facilities. Long-term ponding of surface water should not be allowed on pavements or adjacent to buildings.

4.13 GEOTECHNICAL OBSERVATION AND TESTING

We recommend that a representative of GPI observe earthwork and shoring installation during construction to confirm that the recommendations provided in our report are applicable during construction. The earthwork activities include grading, compaction of fills, subgrade preparation, pavement construction and foundation excavations. If conditions are different than expected, we should be afforded the opportunity to provide an alternate recommendation based on the actual conditions encountered.

5.0 LIMITATIONS

This report, exploration logs, and other materials resulting from GPI's efforts were prepared exclusively for use by PMB Orange 2 LLC and their consultants in designing the proposed development. The report is not intended to be suitable for reuse on extensions or modifications of the project or for use on project other than the currently proposed development as it may not contain sufficient or appropriate information for such uses.

Soil deposits may vary in type, strength, and many other important properties between points of exploration due to non-uniformity of the geologic formations or to man-made cut and fill operations. While we cannot evaluate the consistency of the properties of materials in areas not explored, the conclusions drawn in this report are based on the assumption that the data obtained in the field and laboratory are reasonably representative of field conditions and are conducive to interpolation and extrapolation.

Furthermore, our recommendations were developed with the assumption that a proper level of field observation and construction review will be provided by GPI during grading, excavation, and foundation construction. If field conditions during construction appear to be different than is indicated in this report, we should be notified immediately so that we may assess the impact of such conditions on our recommendations. If others perform construction phase services, the client and new geotechnical firm must accept full responsibility for all geotechnical aspects of the project, including this report.

Our investigation and evaluations were performed using generally accepted engineering approaches and principles available at this time and the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical engineers practicing in this area. No other representation, either expressed or implied, is included or intended in our report.

Respectfully submitted,
Geotechnical Professionals Inc.

Donald A. Cords, P.E., G.E.
Principal

James E. Harris, P.E, G.E.
Principal

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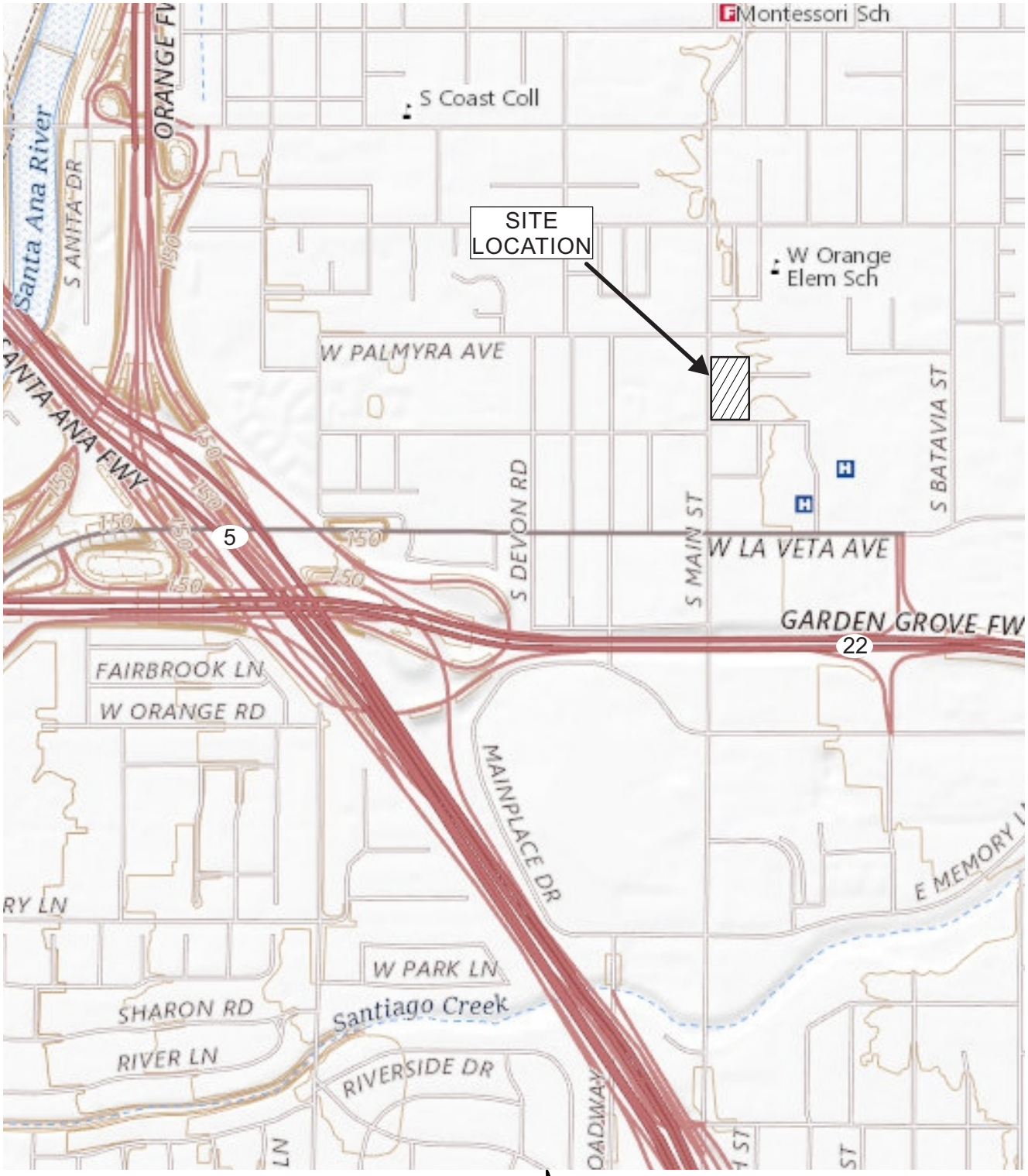
4. American Society of Civil Engineers (2017), “Minimum Design Loads and Associated Criteria for Buildings and Other Structures,” ASCE/SEI 7-16.

5. California Geological Survey, 1998, Seismic Hazard Zones Map of the Orange 7.5-Minute Quadrangle, Orange County, California,” Official Map, released April 15, 1998.

6. County of Orange, Department of Public Works, “Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs)”, Exhibit 7.III, December 20, 2014



GPI GEOTECHNICAL PROFESSIONALS, INC.

PMB ST. JOSEPH MOB

GPI PROJECT NO.: 2981.I

SCALE: 1" = 1000'

SITE LOCATION

FIGURE 1

0 100 200 FEET

N

EXPLANATION

B-1 APPROXIMATE LOCATION AND NUMBER OF EXPLORATORY BORING

PHASE 1 MEDICAL OFFICE BUILDING

BASE PLAN REPRODUCED FROM GOOGLE MAPS DATED: 2020

GPI GEOTECHNICAL PROFESSIONALS, INC.

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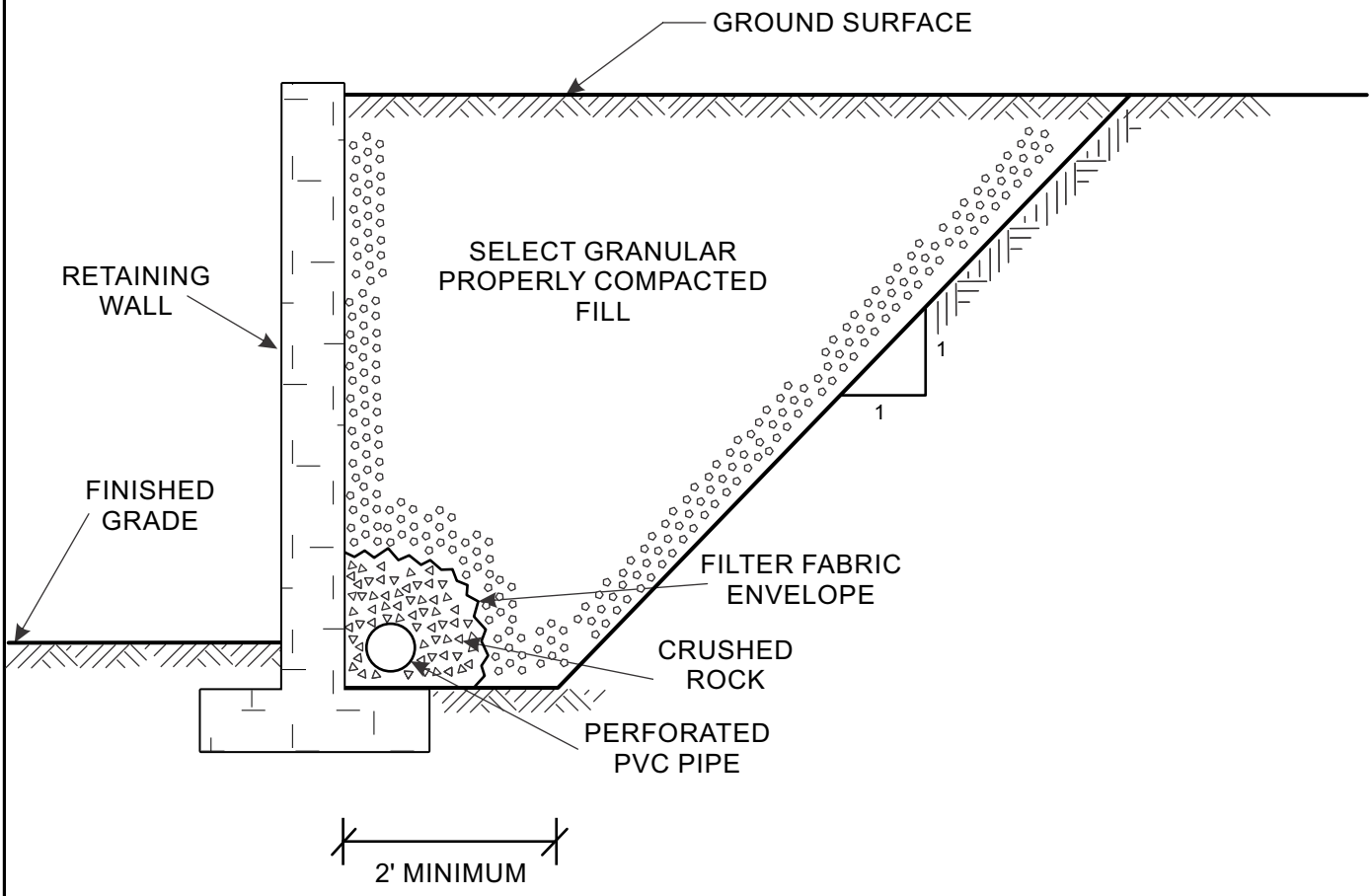
SITE PLAN

FIGURE 2



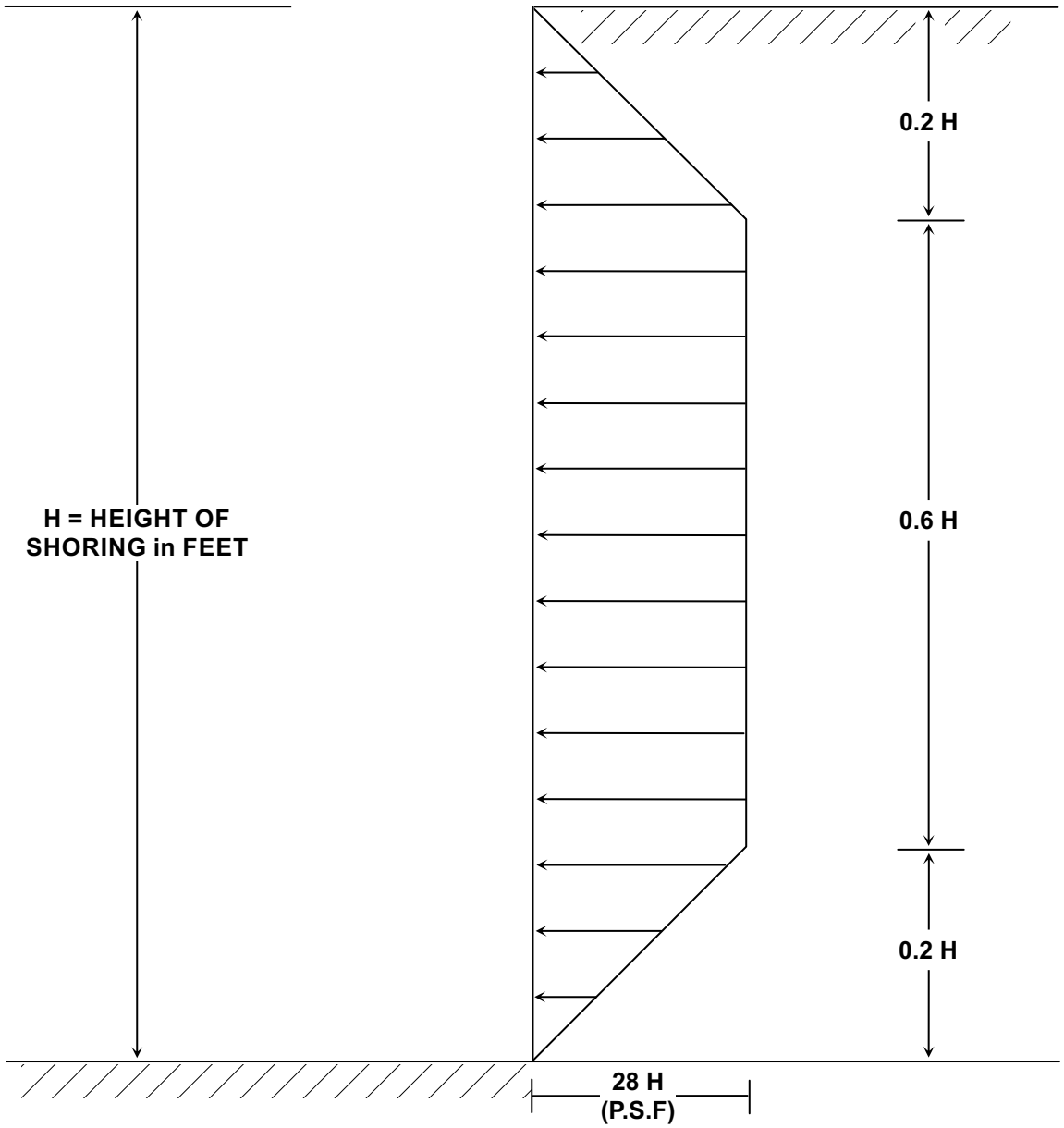
GEOTECHNICAL PROFESSIONALS, INC.

PMB ST. JOSEPH MOB

GPI PROJECT NO.:2981.C | NOT TO SCALE

RETAINING WALL BACKFILL DETAIL

FIGURE 3



GEOTECHNICAL
PROFESSIONALS, INC.

PMB ST. JOSEPH MOB

GPI PROJECT NO.: 2981.I | NO SCALE

LATERAL EARTH PRESSURES FOR TIE-BACK SHORING

FIGURE 4

APPENDIX A

APPENDIX A

EXPLORATORY BORINGS

The subsurface conditions for the site were investigated by drilling and sampling five exploratory borings. The borings were advanced to depths of 81 to 101 feet below the existing ground surface. The locations of the explorations are shown on the Site Plan, Figure 2.

The exploratory borings were drilled using truck-mounted hollow-stem auger drill equipment. Relatively undisturbed samples were obtained using a brass-ring lined sampler (ASTM D 3550). The brass-rings have an inside diameter of 2.42 inches. The ring samples were driven into the soil by a 140-pound hammer dropping 30 inches. The number of blows needed to drive the sampler into the soil was recorded as the penetration resistance.

At selected locations, disturbed samples were obtained using a split-spoon sampler by means of the Standard Penetration Test (SPT, ASTM D 6066). The spoon sampler was driven into the soil by a 140-pound hammer dropping 30 inches, employing the “free-fall” hammer described above. After an initial seating drive of 6 inches, the number of blows needed to drive the sampler into the soil a depth of 12 inches was recorded as the penetration resistance. These values are the raw uncorrected blowcounts.

The field explorations for the investigation were performed under the continuous technical supervision of GPI's representative, who visually inspected the site, maintained detailed logs of the borings, classified the soils encountered, and obtained relatively undisturbed samples for examination and laboratory testing. The soils encountered in the borings were classified in the field and through further examination in the laboratory in accordance with the Unified Soils Classification System. Detailed logs of the borings are presented in Figures A-1 through A-5 in this appendix.

Upon completion of the sampling of hollow-stem auger borings, the holes were backfilled with the excavated soils and patched with cold patch asphalt.

The boring locations were laid out in the field by measuring from existing site features. Ground surface elevations at the exploration locations were estimated from Google Earth and should be considered very approximate.

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
			B	0	2.5-Inch AC over 14-Inch BASE	
					Fill: **SANDY CLAY (CL)** brown, moist	155
				5	Natural: **CLAYEY SILT (ML)** brown, moist, firm, with sand	150
22.1	92	11	D	10	@ 10 feet, wet	145
				15		140
				20		135
				25		130
				30		125
				35		120

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-5-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-1

FIGURE A-1

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
14.5	113	21	D	40	**SILTY CLAY (CL)** orange brown, moist, stiff	115
14.6		12	S	45	@ 45 feet, firm	110
13.5	111	21	D	50	**SILTY SAND (SM)** orange brown, moist, medium dense	105
3.0		32	S	55	**SAND (SP)** light brown, dry, dense	100
2.1	106	90/11	S	60	@ 60 feet, very dense, coarse	95
				65		90
24.9	102	95/11	D	70	**CLAY (CL)** brown, very moist, hard	85
				75		80

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-5-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-1

FIGURE A-1

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
16.6	112	52	D	80	**CLAY (CL)** brown, moist, hard	
					Total Depth 81 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-5-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-1

FIGURE A-1

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
					3-Inch over 6-Inch BASE	
					Fill: **SILTY SAND (SM)** brown, moist	155
				5	Natural: **SILTY SAND (SM)/SANDY SILT (ML)** orange brown, slightly moist	
						150
			B	10		
						145
				15		
						140
1.4	107	48	D	20	**SAND (SP)** light brown, dry, dense, with gravel	
					@ 21 feet, lens of sandy clay	
						135
				25		
						130
				30		
						125
				35		
						120

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-5-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-2

FIGURE A-2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
13.2	119	61	D	40	**SANDY CLAY (CL)** orange brown, moist, hard	
						115
12.4		19	S	45		
						110
		41	D	50	**SILTY SAND (SM)** orange brown, slightly moist, medium dense, trace clay	
						105
				55		
						100
2.4	104	68	D	60	**SAND (SP)** light brown, dry, dense, trace gravel	
						95
		35	S	65	@ 66 feet, lens of silty sand	
						90
20.9	105	74	D	70	**SILTY SAND (SM)** orange brown,wet, dense	
						85
5.3				75	@ 75 feet, slightly moist	
						80

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-5-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-2

FIGURE A-2

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
						This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
	22.0	104	68	D	80	**SANDY CLAY (CL)** brown, slightly moist, hard	
						Total Depth 81 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-5-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-2

FIGURE A-2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	*DESCRIPTION OF SUBSURFACE MATERIALS*	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	5-Inch AC	
					Fill: **CLAY (CL)** brown, moist to very moist	155
				5	Natural:**CLAY (CL)** brown, moist	150
				10		145
				15		140
			B	20	**SAND WITH SILT (SP-SM)** brown, moist	135
				25		130
7.8	103	56	D	30	**SAND (SP)** brown, moist, dense, gravel and cobbles	125
				35		120

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-5-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-3

FIGURE A-3

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				40	This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
					@ 40 feet, no recovery	115
4.9		50/6"	S	45	**SANDY CLAY (CL)** brown, dry to slightly moist, hard	110
		50/3"	D	50	**SAND (SP)** light brown, dry, very dense, with gravel and cobbles	105
				55		100
2.4	104	50/6"	D	60		95
				65		90
20.9	105	51	D	70	**CLAY (CL)** orange brown, very moist, hard	85
5.3		40	S	75	**SILTY SAND (SM)** brown, slightly moist, dense, trace gravel	80

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-5-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-3

FIGURE A-3

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
						This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
	22.0	104	54	D	80	**SILTY CLAY (CL)** orange brown, very moist, hard	75
						Total Depth 81 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-5-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-3

FIGURE A-3

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
			B	0	2-Inch AC over 1.5-Inch BASE	
					Fill: **SILTY CLAY (CL)** brown, moist, trace gravel	155
15.5	100	12	D	5	Natural: **SILTY CLAY (CL)** brown, slightly moist to moist, firm	
						150
				10		
						145
				15		
						140
				20		
						135
17.3	111	34	D	25	**CLAY (CL)** orange brown, moist, very stiff	
						130
				30		
						125
				35		
						120

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-6-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): 98

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-4

FIGURE A-4

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
16.2	114	42	D	40	**CLAY (CL)** orange brown, moist, very stiff	115
18.6		12	S	45	**SANDY CLAY (CL)** orange brown, very moist, stiff	110
15.7	99	23	D	50	**SILTY SAND (SM)** orange brown, moist, medium dense	105
2.7		32	S	55	**SAND (SP)** light brown, dry, dense	100
2.4	103	68	D	60		95
				65		90
21.3	92	92/9"	D	70	**CLAYEY SILT (ML)** brown, wet, hard **SILTY SAND (SM)** brown, moist, very dense	85
				75		80

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-6-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): 98

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-4

FIGURE A-4

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
						This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
	22.6	101	52	D	80	**SILTY CLAY (CL)** orange brown, very moist, hard	75
					85		70
	18.4	103	95/10"	D	90	**SAND WITH SILT (SP-SM)** brown, wet, very dense	65
					95		60
	30.0	92	48	D	100	**CLAY (CL)** orange brown, very moist, hard	
						Total Depth 101 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-6-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): 98

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-4

FIGURE A-4

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	*DESCRIPTION OF SUBSURFACE MATERIALS*	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	2-Inch AC	155
					Fill??: **SANDY CLAY (CL)** brown, moist	
				5	Natural: **SANDY CLAY (CL)** brown, moist	150
			B	10		145
3.1	101	33	D	15	**SAND (SP)** light brown, dry, medium dense	140
				20		135
				25		130
				30		125
4.2		95/8"	D	35	**CLAYEY SAND (SC)** brown, dry, very dense, with gravel and cobble	120

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-6-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-5

FIGURE A-5

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
		50/6"	D	40	@ 40 feet, no recovery	115
3.9		50/4"	D	45	**SILTY SAND (SM)** brown,dry very dense, with gravel and cobbles	110
3.1	115	50/4"	D	50	**SAND (SP)** brown, dry to slightly moist, very dense, with gravel and cobbles	105
				55		100
3.5	103	89	D	60		95
2.6		42	S	65		90
2.4	114	50/6"	D	70		85
				75		80

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-6-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-5

FIGURE A-5

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
	6.3	91	50/6"	D	80	**SILTY SAND (SM)** brown, slightly moist, very hard, with gravel and cobbles	75
						Total Depth 81 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 2-6-20

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2981.I

ST. JOSEPH MOB

LOG OF BORING NO. B-5

FIGURE A-5

APPENDIX B

APPENDIX B

LABORATORY TESTS

INTRODUCTION

Representative undisturbed soil samples and bulk samples were carefully packaged in the field and sealed to prevent moisture loss. The samples were then transported to our Cypress office for examination and testing assignments. Laboratory tests were performed on selected representative samples as an aid in classifying the soils and to evaluate the physical properties of the soils affecting foundation design and construction procedures. Detailed descriptions of the laboratory tests are presented below under the appropriate test headings. Test results are presented in the figures that follow.

MOISTURE CONTENT AND DRY DENSITY

Moisture content and dry density were determined from a number of the ring and SPT samples from the borings. The samples were first trimmed to obtain volume and wet weight and then were dried in accordance with ASTM D 2216. After drying, the weight of each sample was measured, and moisture content and dry density were calculated. Moisture content and dry density values are presented on the boring logs in Appendix B.

PERCENTAGE PASSING NO. 200 SIEVE

Selected soil samples were dried, weighed, soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve. That portion of the material retained on the No. 200 sieve was oven-dried and weighed to determine the percentage of the material passing the No. 200 sieve. A summary of the percentages passing the No. 200 sieve is presented below.

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	PERCENT PASSING No. 200 SIEVE
B-3	20	Sand with Silt (SP-SM)	7
B-5	15	Sand (SP)	3
B-5	45	Silty Sand (SM)	13

GRAIN SIZE DISTRIBUTION

Samples were dried, weighed, soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve. That portion of the material retained on the No. 200 sieve was oven-dried and weighed to determine the percentage of the material passing the No. 200 sieve. The retained material was run through a standard set of sieves in accordance with ASTM D 422. The weight of soil retained on each sieve was recorded and the total dry weight was calculated. The grain size distribution data from the full sieve analyses is presented in Figure B-1. A summary of the percentages passing the No. 200 sieve (ASTM D1140) is presented above.

ATTERBERG LIMITS

Liquid and plastic limits were determined for select cohesive soil samples in accordance with ASTM D 4318. The results of the Atterberg Limits tests are presented in Figure B-2.

DIRECT SHEAR

Direct shear tests were performed on undisturbed samples in accordance with ASTM D 3080. The sample was placed in the shear machine, and pre-selected normal loads were applied. The samples were inundated, allowed to consolidate, and then were sheared to failure at a strain rate of 0.001 to 0.0007 inches per minute. The tests were repeated on additional test specimens under increased normal loads. Shear stress and sample deformation were monitored throughout the test. The results of the direct shear test are presented in Figures B-3 to B-9.

CONSOLIDATION

One-dimensional consolidation tests were performed on undisturbed samples in accordance with ASTM D 2435. After trimming the ends, the sample was placed in the consolidometer and loaded to up to 0.4 ksf. Thereafter, the sample was incrementally loaded to a maximum load of up to 25.6 ksf. The sample was inundated at 1.6 ksf. Sample deformation was measured to 0.0001 inch. Rebound behavior was investigated by unloading the sample back to 0.4 ksf. Results of the consolidation tests, in the form of percent consolidation versus log pressure, are presented in Figures B-10 to B-13.

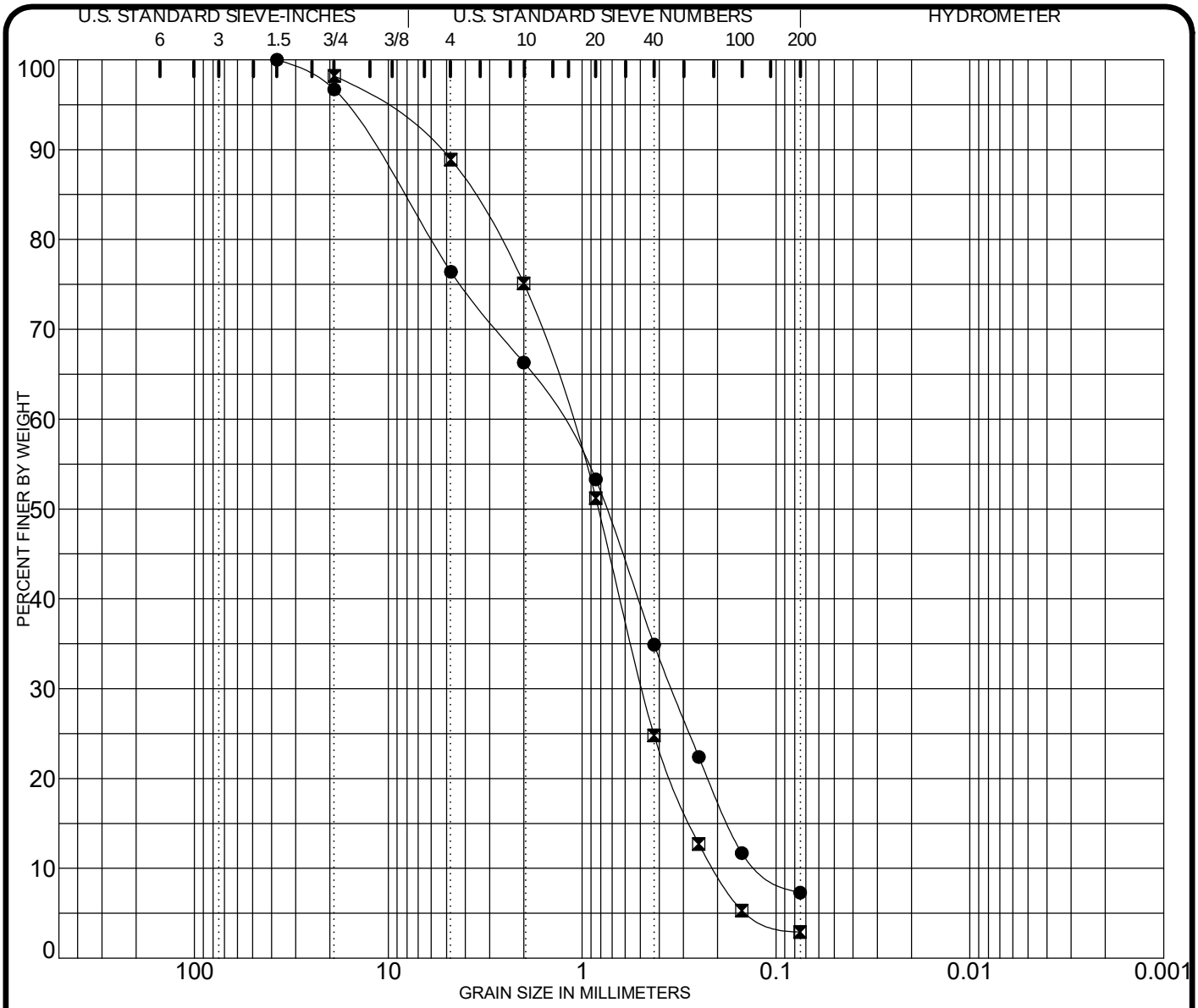
EXPANSION INDEX

An expansion index test was performed on a bulk sample. The test was performed in accordance with ASTM 4289 to assess the expansion potential of on-site soils. The results of the test are summarized below:

BORING/ TEST PIT NO.	DEPTH (ft)	SOIL DESCRIPTION	EXPANSION INDEX
B-1	0-4	Sandy Clay (CL)	10
B-4	0-4	Silty Clay (CL)	26

CORROSIVITY

Soil corrosivity testing was performed by HDR on a soil sample provided by GPI. The test results are summarized in Table 1 of this appendix.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location		Classification	MC%	LL	PL	PI	Cc	Cu
●	B-3	20.0	SAND WITH SILT (SP-SM)					0.79	11.5
⊠	B-5	15.0	SAND (SP)					0.98	5.6

	Sample Location		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-3	20.0	37.50	1.32	0.345	0.1148	23.6	69.1	7.3	
⊠	B-5	15.0	19.00	1.16	0.487	0.2075	9.3	86.0	2.9	

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PROJECT NO. 2981.I

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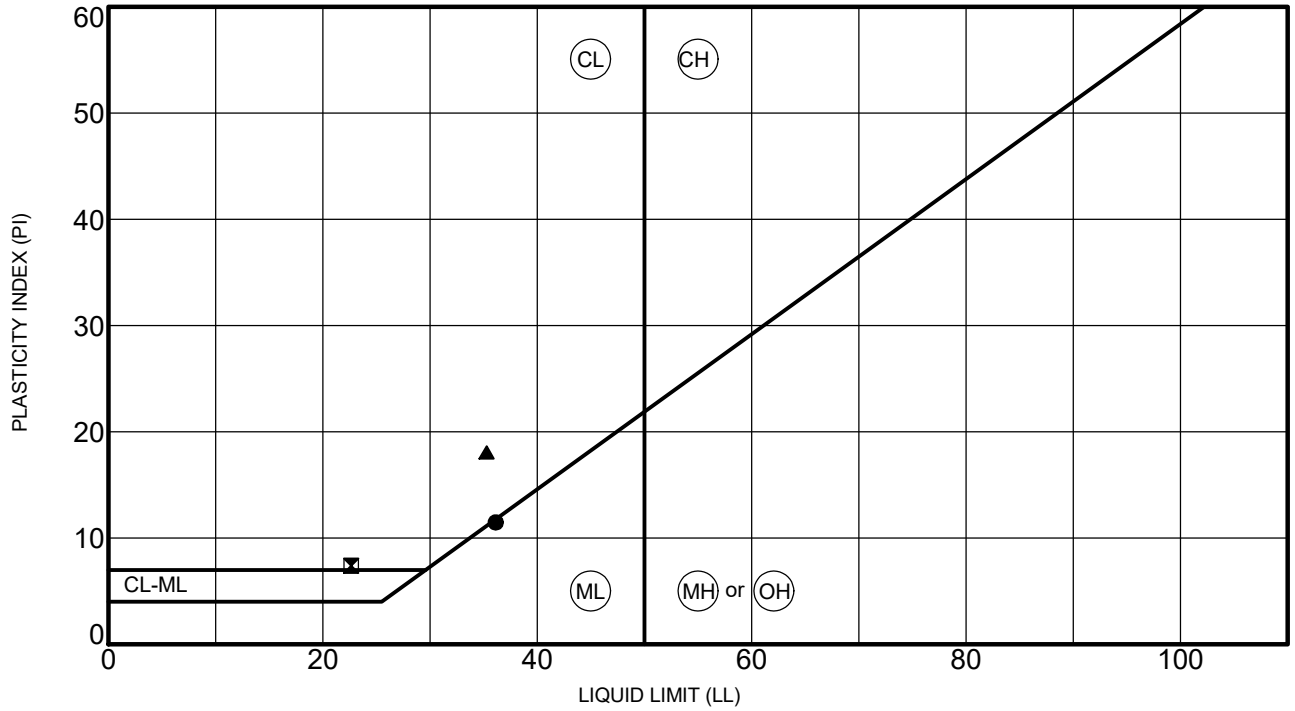
GRAIN SIZE DISTRIBUTION

FIGURE B-1



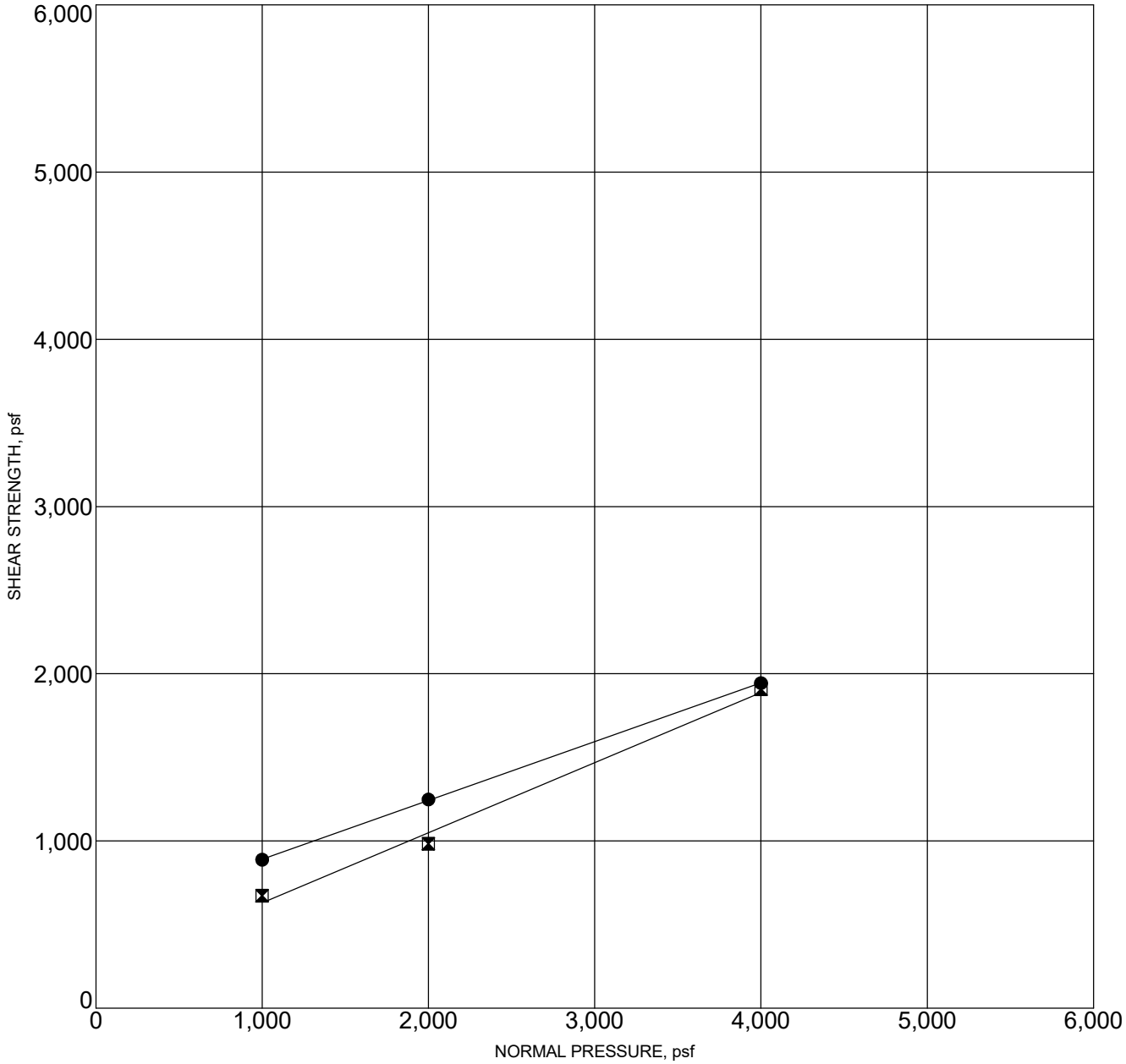
	SAMPLE LOCATION		LL	PL	PI	Fines, %	Classification
●	B-1	10.0	36	25	11		SANDY SILT (ML)
⊠	B-1	45.0	23	15	7		CLAYEY SILT (ML)
▲	B-4	25.0	35	17	18		CLAY (CL)

PROJECT: ST. JOSEPH MOB PROJECT NO. 2981.I

GPI

ATTERBERG LIMITS TEST RESULTS

FIGURE B-2



● **PEAK STRENGTH**
Friction Angle= 19 degrees
Cohesion= 540 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 23 degrees
Cohesion= 210 psf

Sample Location		Classification	DD,pcf	MC,%
B-1	10.0	SANDY SILT (ML)	92	22.1

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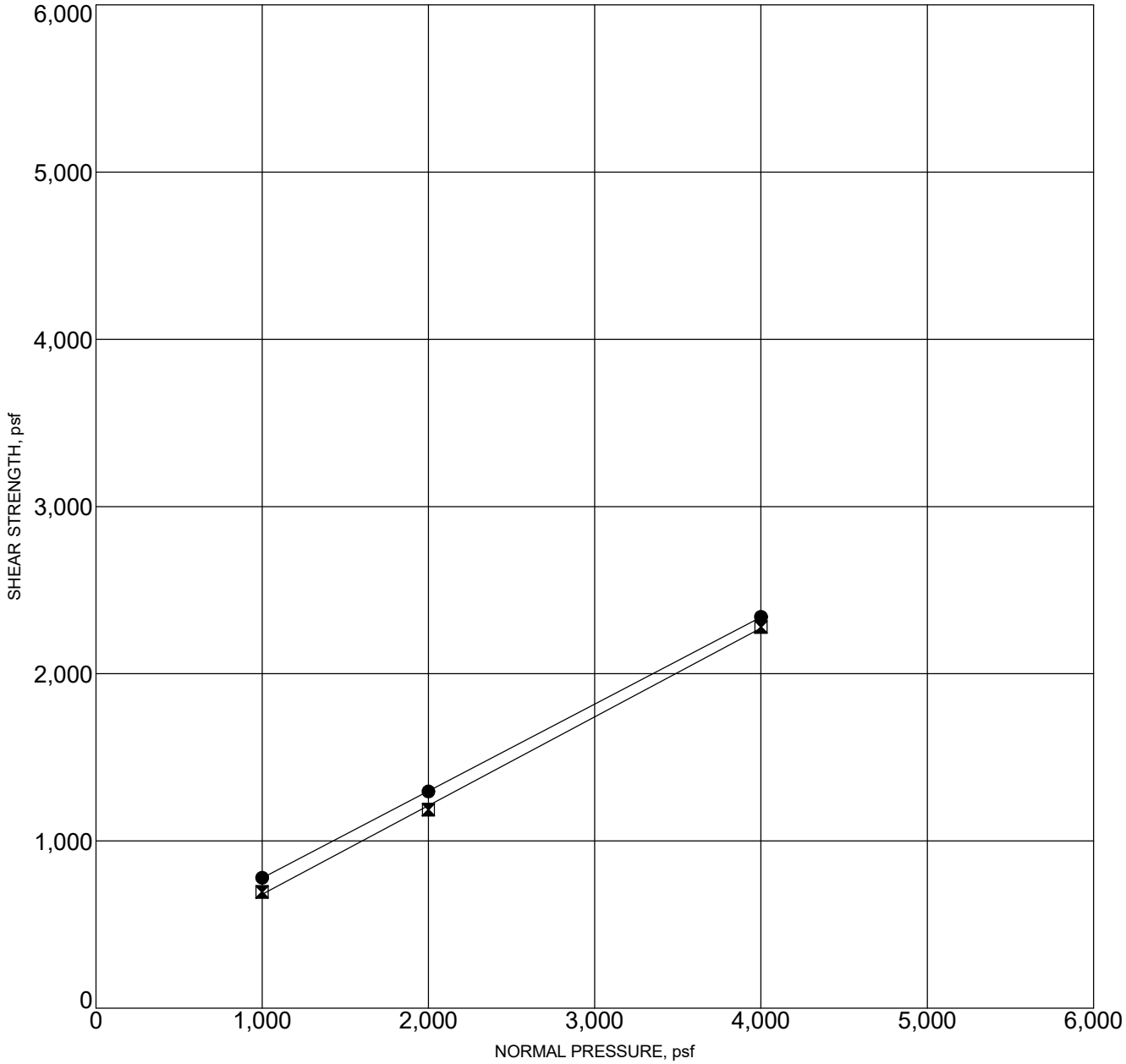
GPI

DIRECT SHEAR TEST RESULTS

FIGURE B-3



● **PEAK STRENGTH**
Friction Angle= 27 degrees
Cohesion= 258 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 28 degrees
Cohesion= 150 psf

Sample Location		Classification	DD,pcf	MC,%
B-1	40.0	SILTY CLAY (CL)	113	14.5

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PROJECT NO.: 2981.I

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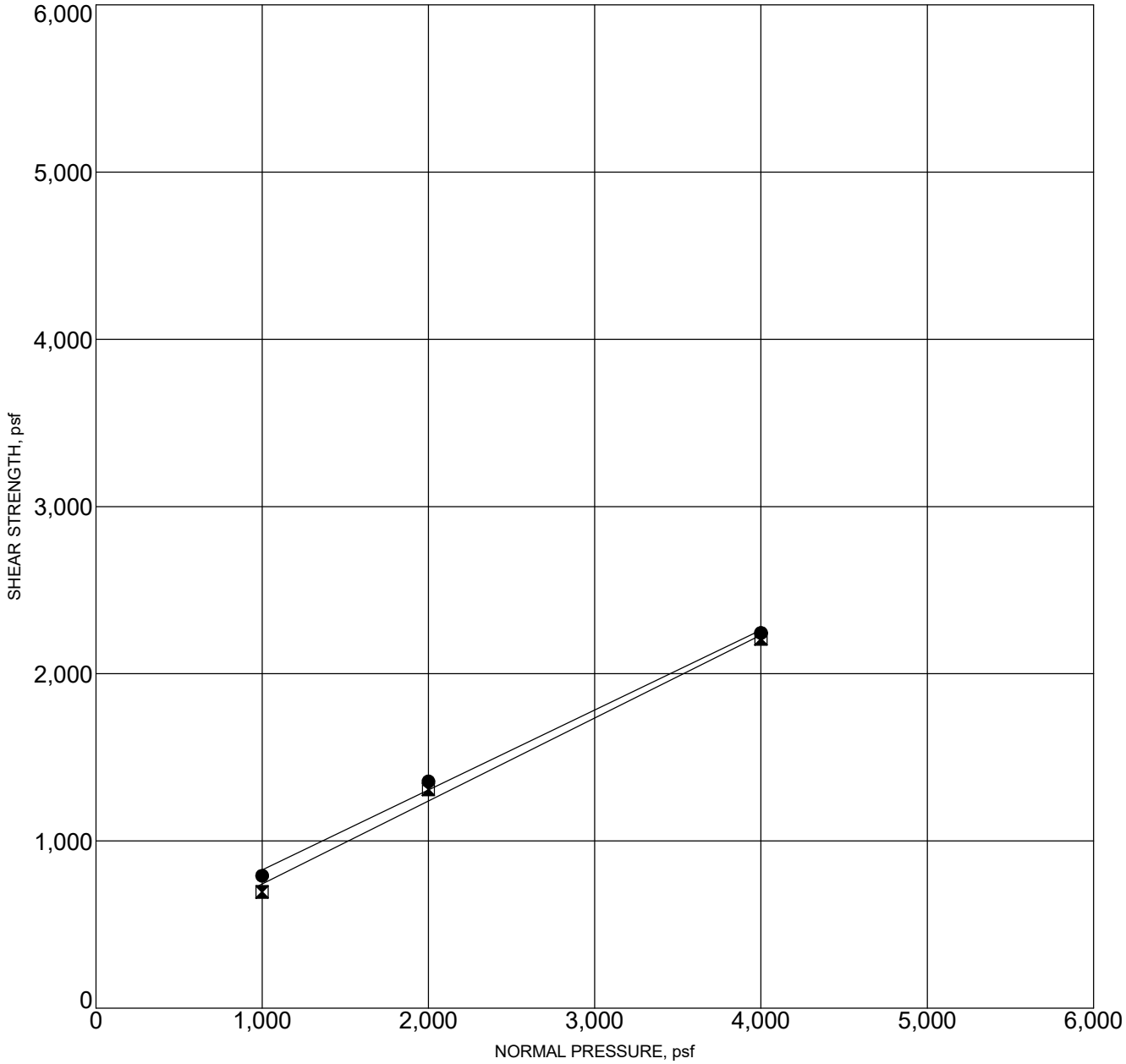
DIRECT SHEAR TEST RESULTS

FIGURE B-4



● **PEAK STRENGTH**
Friction Angle= 26 degrees
Cohesion= 348 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 26 degrees
Cohesion= 246 psf

Sample Location		Classification	DD,pcf	MC,%
B-1	50.0	SANDY SILT (ML)	111	13.5

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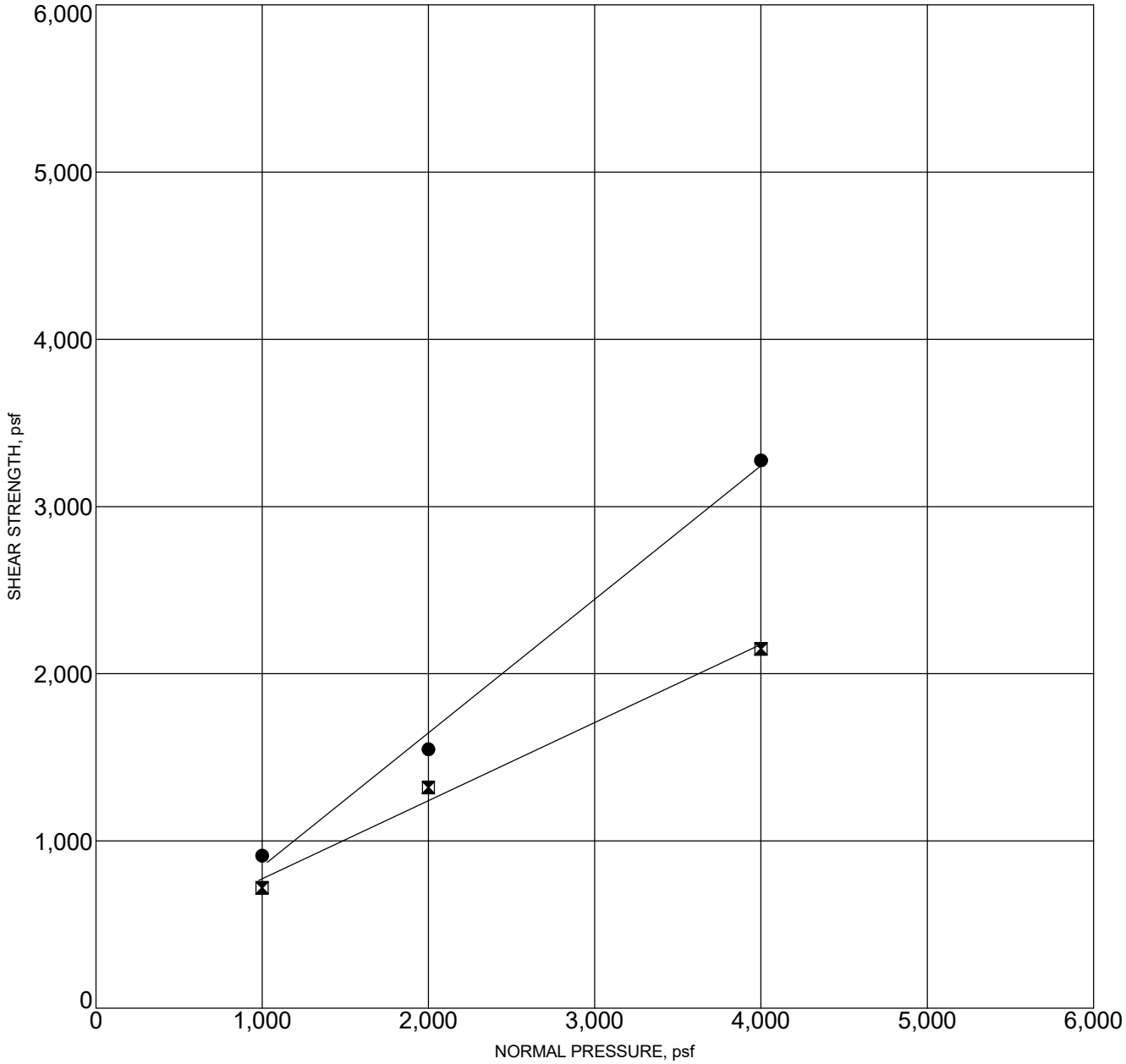
DIRECT SHEAR TEST RESULTS

FIGURE B-5



● **PEAK STRENGTH**
Friction Angle= 39 degrees
Cohesion= 48 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 25 degrees
Cohesion= 306 psf

Sample Location		Classification	DD,pcf	MC,%
B-2	40.0	CLAYEY SAND (SC)	119	13.2

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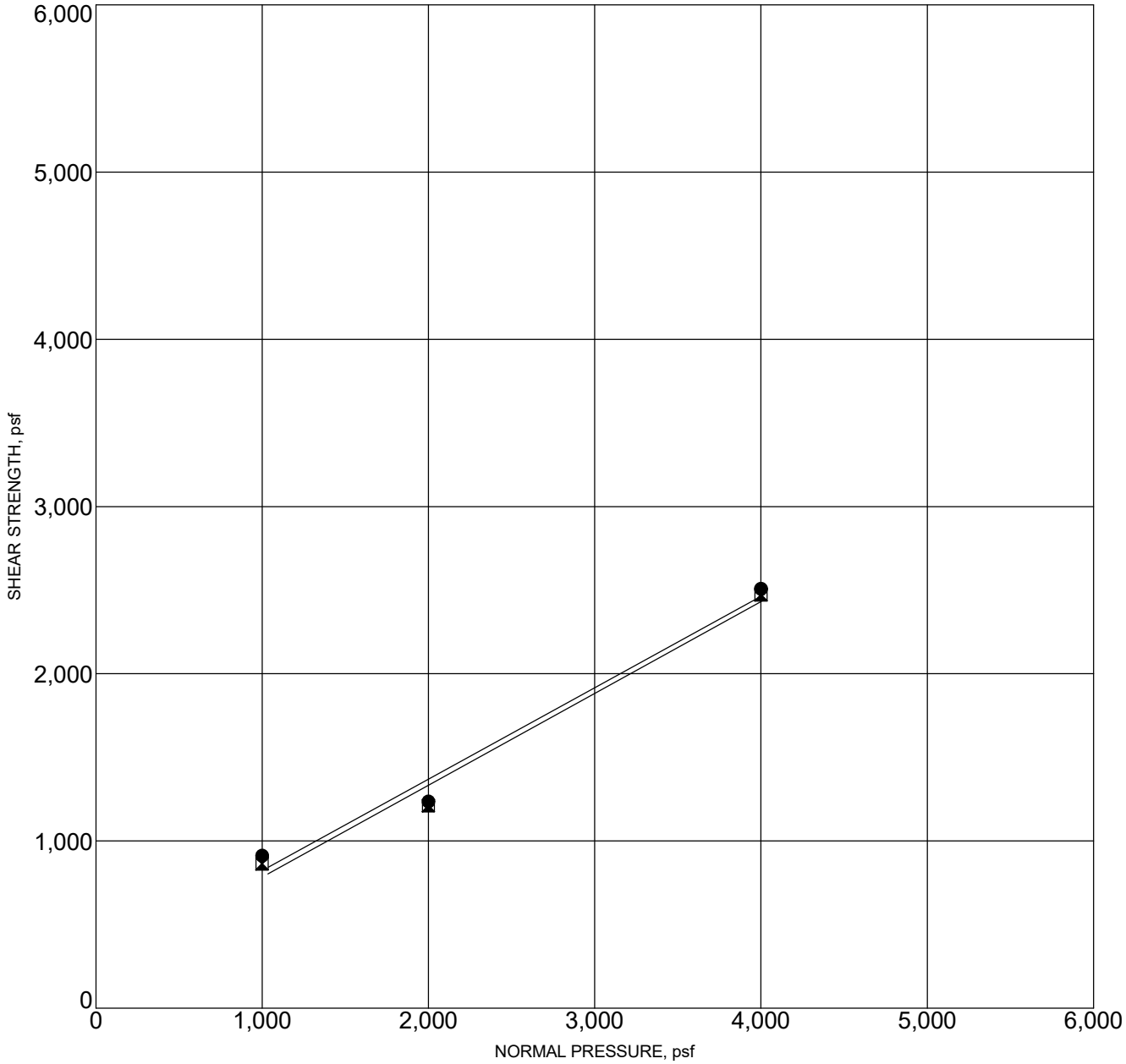
DIRECT SHEAR TEST RESULTS

FIGURE B-6



● **PEAK STRENGTH**
Friction Angle= 29 degrees
Cohesion= 276 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 29 degrees
Cohesion= 234 psf

Sample Location		Classification	DD,pcf	MC,%
B-3	30.0	SILTY SAND (SM)	103	7.8

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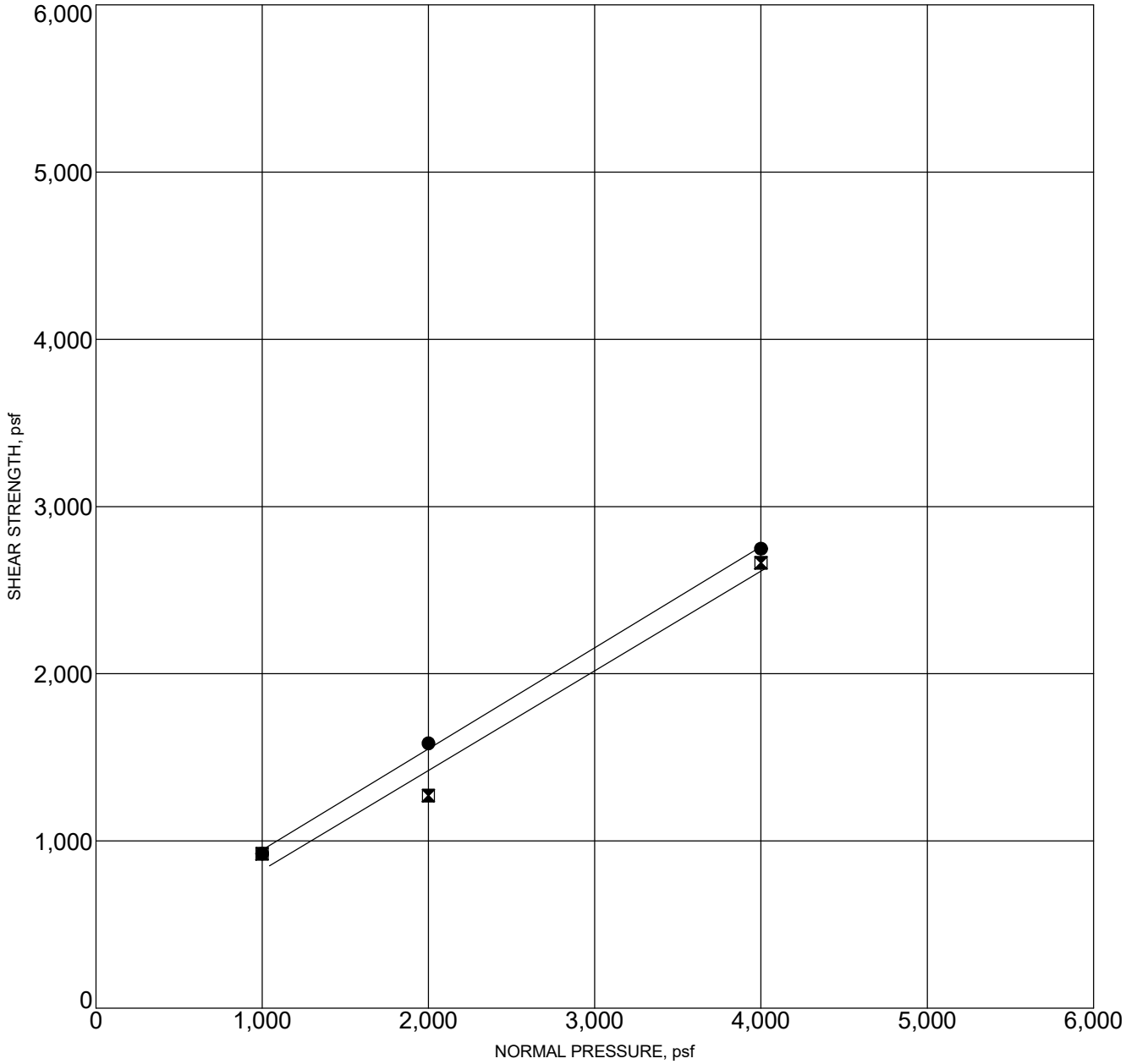
DIRECT SHEAR TEST RESULTS

FIGURE B-7



● **PEAK STRENGTH**
Friction Angle= 31 degrees
Cohesion= 342 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 31 degrees
Cohesion= 228 psf

Sample Location		Classification	DD,pcf	MC,%
B-3	60.0	SAND (SM)	104	2.4

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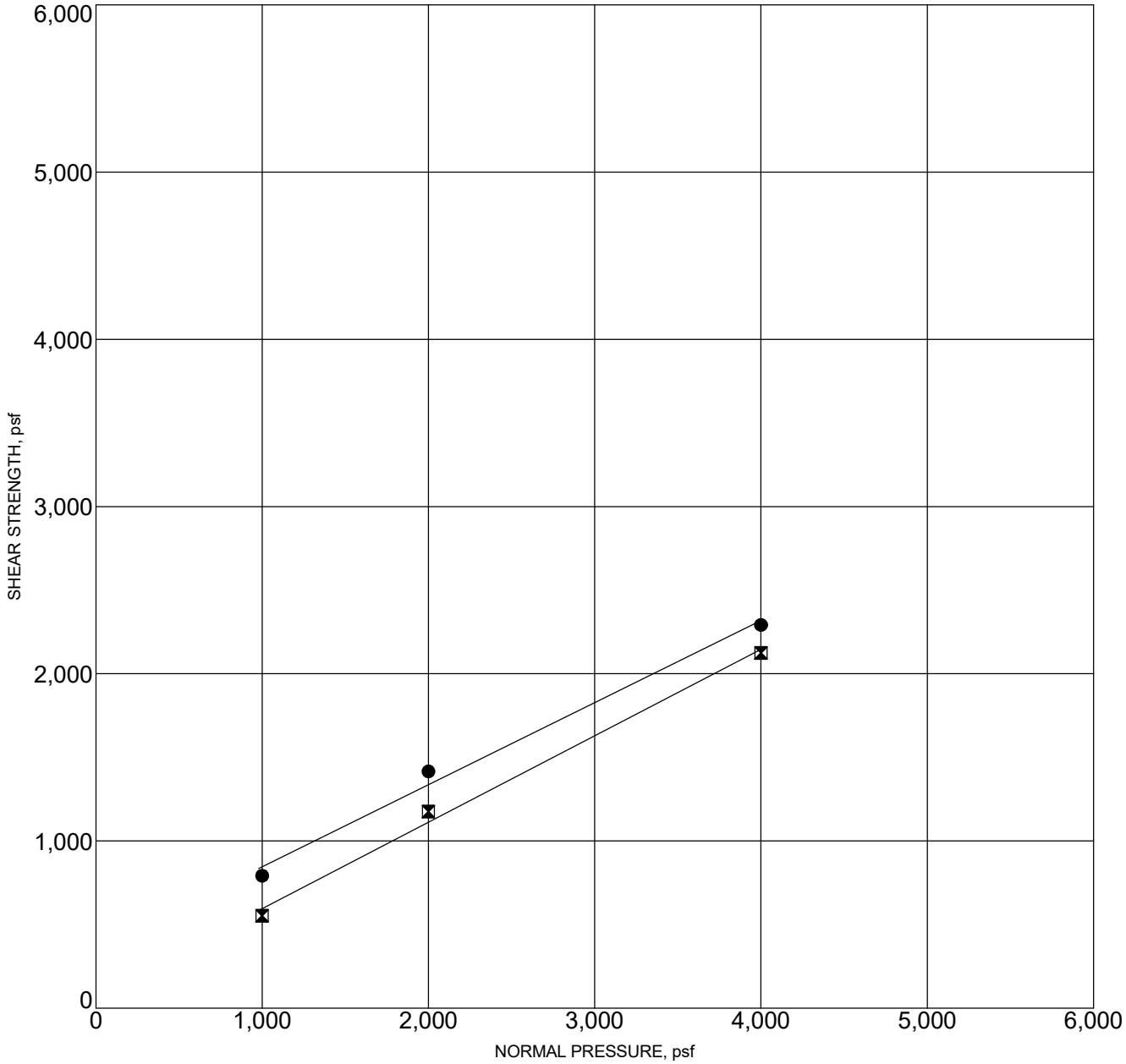
DIRECT SHEAR TEST RESULTS

FIGURE B-8



● **PEAK STRENGTH**
Friction Angle= 26 degrees
Cohesion= 354 psf

⧓ **ULTIMATE STRENGTH**
Friction Angle= 27 degrees
Cohesion= 78 psf

Sample Location		Classification	DD,pcf	MC,%
B-4	25.0	CLAY (CL)	111	17.3

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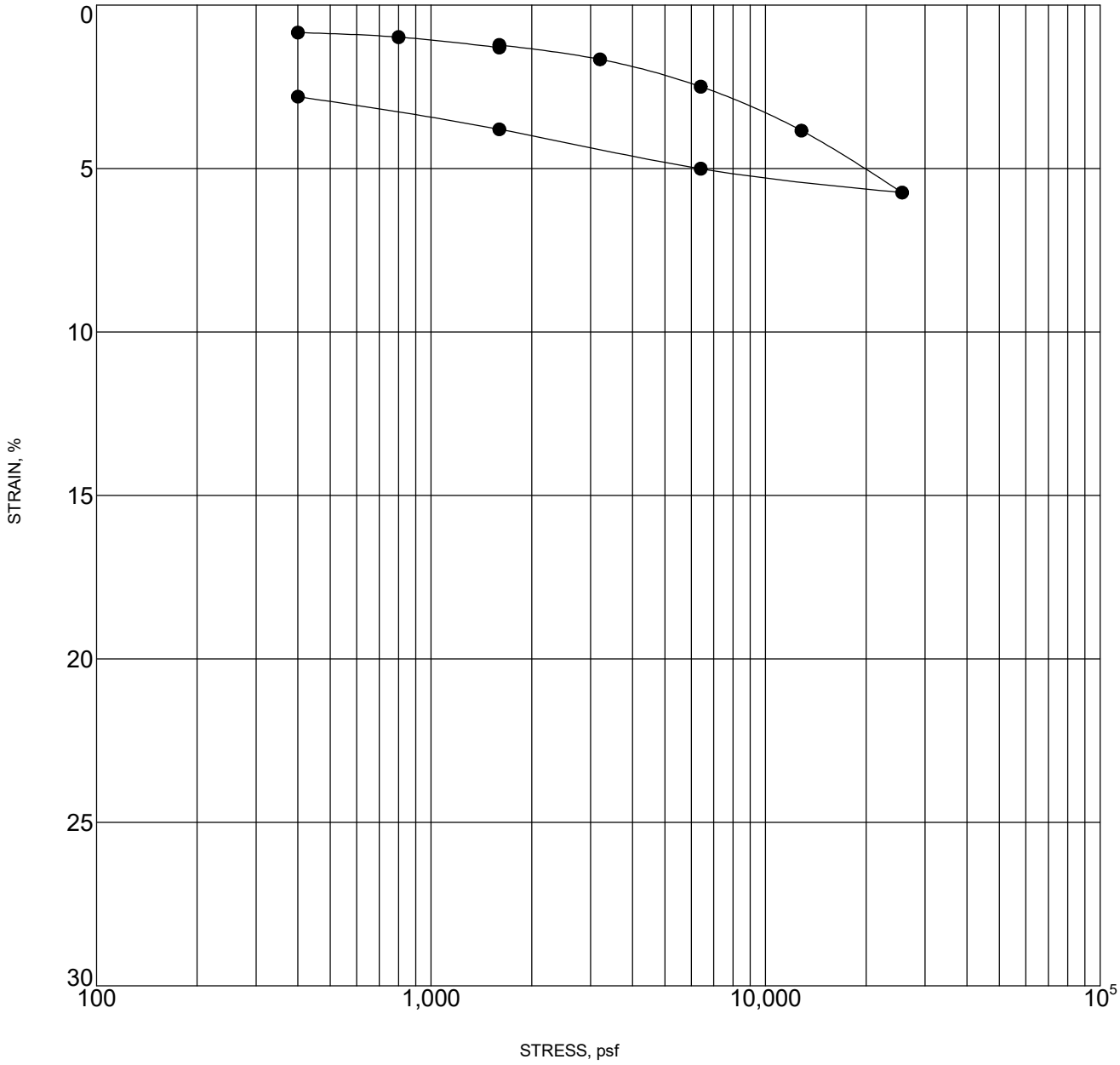
DIRECT SHEAR TEST RESULTS

FIGURE B-9



Sample inundated at 1600 psf

	Sample Location		Classification	DD,pcf	MC,%
●	B-4	40.0	CLAY (CL)	114	16.2

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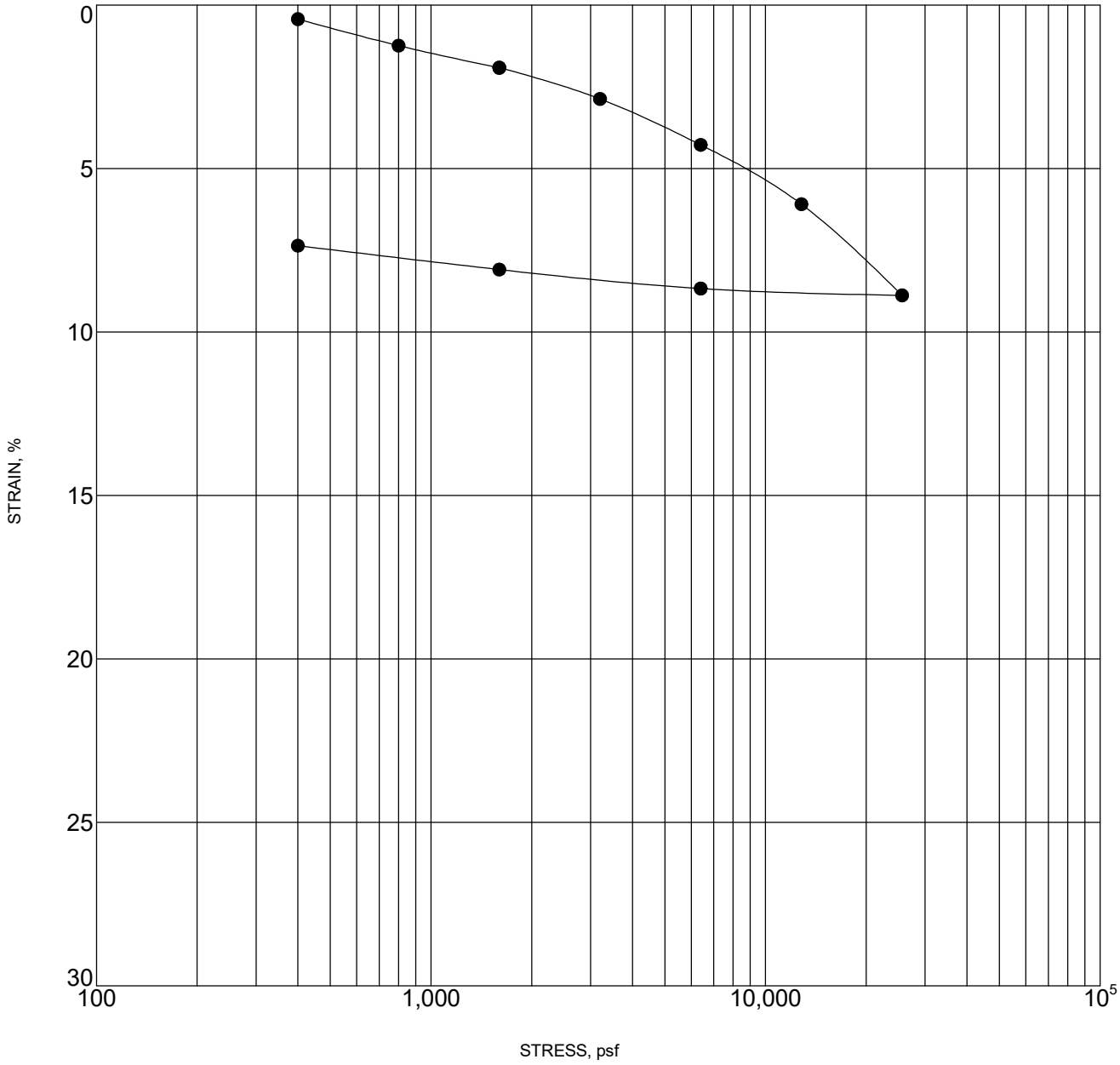
CONSOLIDATION TEST RESULTS

FIGURE B-10



Sample inundated at 1600 psf

	Sample Location		Classification	DD,pcf	MC,%
●	B-4	80.0	SILTY CLAY (CL)	101	22.6

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CONSOLIDATION TEST RESULTS

FIGURE B-11

Table 1 - Laboratory Tests on Soil Samples

Geotechnical Professionals, Inc.
PMB St. Joseph
Your #2981.I, HDR Lab #20-0082LAB
25-Feb-20

Sample ID			B-1 @ 0-4'	B-2 @ 20'
Resistivity		**Units**		
as-received		ohm-cm	11,600	1,400,000
saturated		ohm-cm	3,280	26,800
pH			8.2	9.1
Electrical Conductivity		mS/cm	0.20	0.03
Chemical Analyses				
Cations				
calcium	Ca^{2+}	mg/kg	154	30
magnesium	Mg^{2+}	mg/kg	16	4.4
sodium	Na^{1+}	mg/kg	47	19
potassium	K^{1+}	mg/kg	43	2.6
Anions				
carbonate	CO_3^{2-}	mg/kg	ND	ND
bicarbonate	HCO_3^{1-}	mg/kg	302	110
fluoride	F^{1-}	mg/kg	15	3.9
chloride	Cl^{1-}	mg/kg	2.5	0.9
sulfate	SO_4^{2-}	mg/kg	142	4.5
phosphate	PO_4^{3-}	mg/kg	ND	ND
Other Tests				
ammonium	NH_4^{1+}	mg/kg	0.9	ND
nitrate	NO_3^{1-}	mg/kg	4.6	8.8
sulfide	S^{2-}	qual	na	na
Redox		mV	na	na

Resistivity per ASTM G187, Cations per ASTM D6919, Anions per ASTM D4327, and Alkalinity per APHA 2320-B.
Electrical conductivity in millisiemens/cm and chemical analyses were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

431 West Baseline Road · Claremont, CA 91711
Phone: 909.962.5485 · Fax: 909.626.3316

APPENDIX C

TERRA GEOSCIENCES

SEISMIC SHEAR-WAVE SURVEY

PMB ST. JOSEPH PROJECT

SEC OF COLUMBIA AND MAIN STREETS

CITY OF ORANGE, CALIFORNIA

Project No. 203369-1

February 3, 2020

Prepared for:

Geotechnical Professionals, Inc.
5736 Corporate Avenue
Cypress, CA 90630

Consulting Engineering Geology & Geophysics

P.O. Box 1090, Loma Linda, CA 92354 • 909 796-4667

Geotechnical Professionals, Inc.
5736 Corporate Avenue
Cypress, CA 90630

Attention: Mr. Don Cords, Principal

Regarding: Seismic Shear-Wave Survey
PMB St. Joseph Project
SEC of Columbia and Main Streets
City of Orange, California
GPI Project No. 2981.I

INTRODUCTION

As requested, this firm has performed a seismic shear-wave survey using the multi-channel analysis of surface waves (MASW) and microtremor array measurements (MAM) methods for the above-referenced site. The purpose of this survey was to assess the one-dimensional average shear-wave velocity structure, at various depth intervals, beneath the subject survey area, to a depth of at least 100 feet. Geologic mapping by Morton and Miller (2006), indicates the local survey area to be mantled by Holocene to late Pleistocene age young alluvial fan deposits. These deposits are generally described as being comprised of unconsolidated to moderately consolidated silt, sand, pebbly cobbly sand, and bouldery earth materials, in turn underlain at depth by progressively older alluvial deposits.

The location of the seismic traverse has been approximated on a captured Google™ Earth image (Google™ Earth, 2020), which is presented as the Seismic Line Location Map, Plate 1, for reference. Additionally, photographic views of the survey line are presented on Plate 2, for visual and reference purposes. As authorized by you, the following services were performed during this study:

- ***Review of available pertinent published and unpublished geologic and geophysical data in our files pertaining to the site.***
- ***Performing a seismic surface-wave survey by a licensed State of California Professional Geophysicist that included one traverse for shear-wave velocity analysis purposes.***
- ***Preparation of this report, presenting the results of our findings with respect to the shear-wave velocities of the subsurface earth materials.***

Accompanying Map, Illustrations, and Appendices

Plate 1 - Seismic Line Location Map
Plate 2 - Survey Line Photographs
Appendix A - Shear-Wave Model and Data
Appendix B - References

SUMMARY OF SHEAR-WAVE SURVEY

Methodology

The fundamental premise of this survey uses the fact that the Earth is always in motion at various seismic frequencies. These relatively constant vibrations of the Earth's surface are called microtremors, which are very small with respect to amplitude and are generally referred to as background "noise" that contain abundant surface waves. These microtremors are caused by both human activity (i.e., cultural noise, traffic, factories, etc.) and natural phenomenon (i.e., wind, wave motion, rain, atmospheric pressure, etc.) which have now become regarded as useful signal information. Although these signals are generally very weak, the recording, amplification, and processing of these surface waves has greatly improved by the use of technologically improved seismic recording instrumentation and recently developed computer software. For this application, we are mainly concerned with the Rayleigh wave portion of the seismic signals, which is also referred to as "ground roll" since the Rayleigh wave is the dominant component of ground roll.

For the purposes of this study, there are two ways that the surface waves were recorded, one being "active" and the other being "passive." Active means that seismic energy is intentionally generated at a specific location relative to the survey spread and recording begins when the source energy is imparted into the ground (i.e., MASW survey technique). Passive surveying, also called "microtremor surveying," is where the seismograph records ambient background vibrations (i.e., MAM survey technique), with the ideal vibration sources being at a constant level. Longer wavelength surface waves (longer-period and lower-frequency) travel deeper and thus contain more information about deeper velocity structure and are generally obtained with passive survey information. Shorter wavelength (shorter-period and higher-frequency) surface waves travel shallower and thus contain more information about shallower velocity structure and are generally collected with the use of active sources. For the most part, higher frequency active source surface waves will resolve the shallower velocity structure and lower frequency passive source surface waves will better resolve the deeper velocity structure. Therefore, the combination of both of these surveying techniques provides a more accurate depiction of the subsurface velocity structure.

The assemblage of the data that is gathered from these surface wave surveys results in development of a dispersion curve. Dispersion, or the change in phase velocity of the seismic waves with frequency, is the fundamental property utilized in the analysis of surface wave methods. The fundamental assumption of these survey methods is that the signal wavefront is planar, stable, and isotropic (coming from all directions) making it independent of source locations and for analytical purposes uses the spatial autocorrelation method (SPAC). The SPAC method is based on theories that are able to detect "signals" from background "noise" (Okada, 2003). The shear wave velocity (V_s) can then be calculated by mathematical inversion of the dispersive phase velocity of the surface waves which can be significant in the presence of velocity layering, which is common in the near-surface environment.

Field Procedures

One seismic shear-wave survey traverse (Seismic Line SW-1) was performed across a portion of the site, as selected by you, as approximated on the Seismic Line Location Map, Plate 1. For data collection, the field survey employed a twenty-four channel Geometrics StrataVisor™ NZXP model signal-enhancement refraction seismograph (Geometrics, 2004). This survey employed both active (MASW) and passive (MAM) source methods to ensure that both quality shallow and deeper shear-wave velocity information was recorded (Park et al., 2005). Both the MASW and MAM surveys used the same linear geometry array that consisted of a 161-foot long spread using a series of twenty-four 4.5-Hz geophones that were spaced at regular seven-foot intervals. Since the survey area was covered by asphalt, each geophone was anchored by the use of drilled holes. For the MASW survey, the ground vibrations were recorded using a one second record length at a sampling rate of 0.5-milliseconds. Two seismic records were obtained using a 25-foot offset from the beginning and end of the survey line utilizing a 16-pound sledge-hammer as the energy source to produce the seismic waves. Each of these shot points used multiple hammer impacts (stacking) to improve the signal to noise ratio of the data.

The MAM survey did not require the introduction of any artificial seismic sources and only background ambient noise was recorded. The ambient ground vibrations were recorded using a thirty-two second record length at a two-millisecond sampling rate with 20 separate seismic records being obtained for quality control purposes. The seismic-wave forms and associated frequency spectrum that were displayed on the seismograph screen were used to assess the recorded seismic wave data for quality control purposes in the field. The acceptable records were digitally recorded on the in-board seismograph computer and subsequently transferred to a flash drive so that they could be subsequently transferred to our office computer for analysis.

Data Reduction

For analysis and presentation of the shear-wave profile and supportive illustrations, this study used the SeisImager/SW™ computer software program developed by Geometrics, Inc. (2016). Both the active (MASW) and passive (MAM) survey results were combined for this analysis (Park et al., 2005). The combined results maximize the resolution and overall depth range in order to obtain one high resolution V_s curve over the entire sampled depth range. These methods economically and efficiently estimate one-dimensional subsurface shear-wave velocities using data collected from standard primary-wave (P-wave) refraction surveys, however, it should be noted that surface waves by their physical nature cannot resolve relatively abrupt or small-scale velocity anomalies. Processing of the data proceeded by calculating the dispersion curve from the input data which subsequently created an initial shear-wave model based on the observed data. This initial model was then inverted in order to converge on the best fit of the initial model and the observed data, creating the final shear-wave model (Seismic Line SW-1) as presented within Appendix A.

Summary of Data Analysis

Data acquisition went very smoothly and the quality was considered to be very good. The seismic model data (Shear-Wave Model SW-1, see Appendix A) indicates that beneath the survey traverse there are several layers where the seismic velocity generally increases with depth, with a minor velocity reversal between 92.1 to 128.0 feet in depth, and then increasing with depth again.

We understand that the site will consist of construction of a multi-story structure where the foundations will be placed at depth. Therefore, as requested, we have provided a table indicating the average shear-wave velocity ("weighted average") for varying 100-foot block intervals, so that the proper Site Class (ASCE, 2017; Table 20.3-1) can be selected based upon the proposed construction.

TABLE 1 – CALCULATED V100 SHEAR-WAVE VALUES

Depth Interval (feet)	Shear-Wave Velocity ("weighted average")
0 to -100	**1,180.0 ft/sec**
-10 to -110	**1,217.7 ft/sec**
-20 to -120	**1,249.0 ft/sec**
-30 to -130	**1,271.5 ft/sec**
-40 to -140	**1,287.9 ft/sec**

The "weighted average" velocity is computed from a formula that is used by the ASCE (2017; Section 20.4, Equation 20.4-1) to determine the average shear-wave velocity for the upper 100 feet of the subsurface (V100). This formula is as follows:

$$V100' = 100/[(T1/V1) + (T2/V2) + ...+ (TN/VN)]$$

Where t1, t2, t3,...,tn, are the thicknesses for layers 1, 2, 3,...n, up to 100 feet, and v1, v2, v3,...,vn, are the seismic velocities (feet/second) for layers 1, 2, 3,...n. As noted above, Table 1 uses this formula and adjusts the V100 interval to account for Site Class design selection at varying 100-foot depth block intervals below the surface.

The shear-wave model displays these calculated layers and associated velocities (feet/second) to the maximum obtained depth of 215 feet, where locally sampled (dark gray shaded area on shear-wave model represents the constrained data). The associated Dispersion Curves (for both the active and passive methods) which show the data quality and picks, along with the resultant combined dispersion curve model, are also included within Appendix A for visual and reference purposes.

CLOSURE

The field survey was performed by the undersigned on February 1, 2020, using "state of the art" geophysical equipment and techniques along the selected portion of the subject study area as directed by you. It is important to note that the fundamental limitation for seismic surveys is known as nonuniqueness, wherein a specific seismic data set does not provide sufficient information to determine a single “true” earth model. Therefore, the interpretation of any seismic data set uses “best-fit” approximations along with the geologic models that appear to be most reasonable for the local area being surveyed.

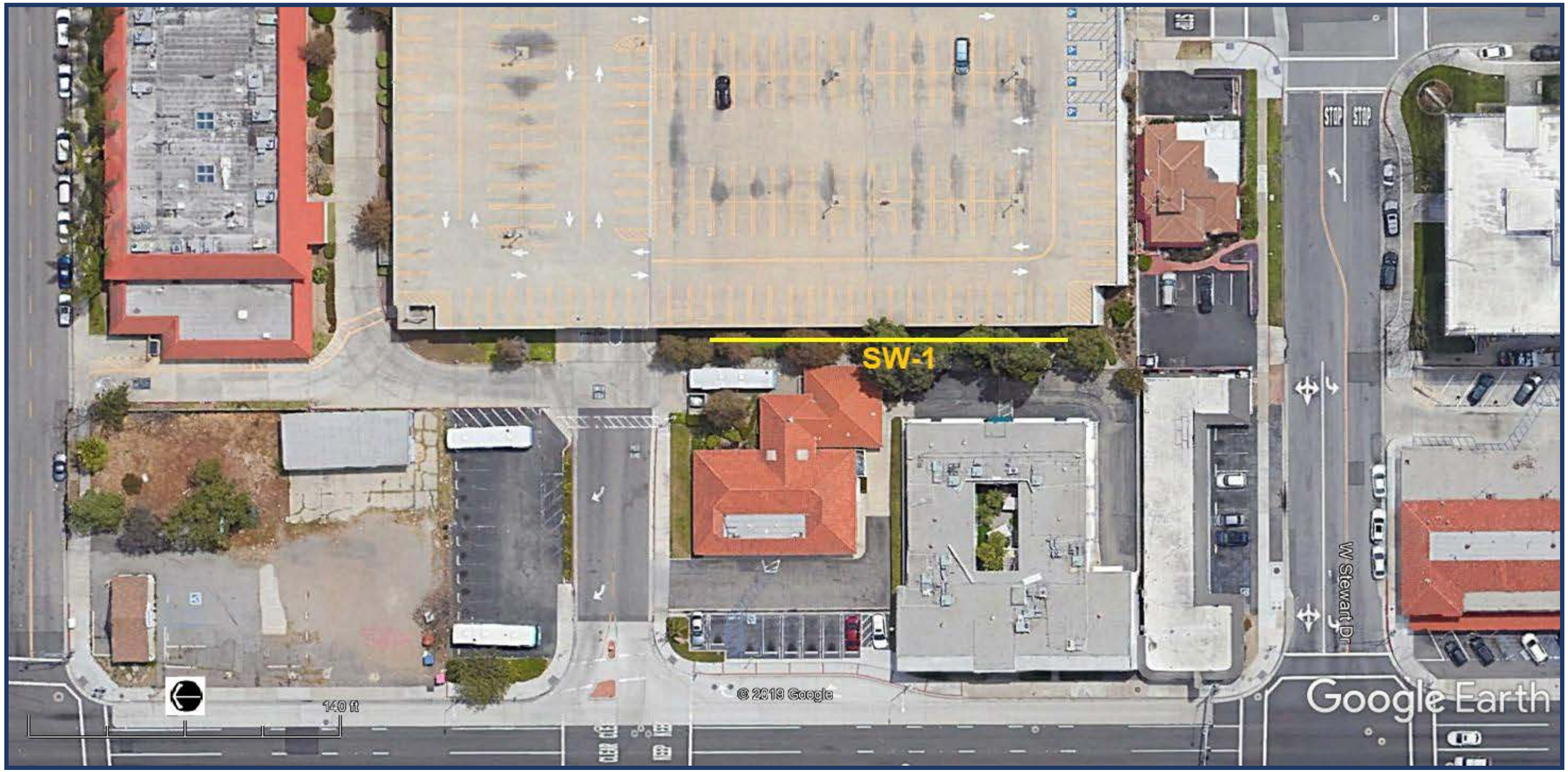
It should be noted that when compared with traditional borehole shear-wave surveys, which use vertical body waves, the sources of error (if present) using horizontal surface waves for this project are not believed to be greater than 15 percent. Client should understand that when using the theoretical geophysical principles and techniques discussed in this report, sources of error are possible in both the data obtained and, in the interpretation, and that the results of this survey may not represent actual subsurface conditions.

These are all factors beyond **Terra Geosciences** control and no guarantees as to the results of this survey can be made. We make no warranty, either expressed or implied. If the client does not understand the limitations of this geophysical survey, additional input should be sought from the consultant.

Respectfully submitted,
TERRA GEOSCIENCES

Donn C. Schwartzkopf
Principal Geophysicist
PGP 1002

SEISMIC LINE LOCATION MAP



Base map from Google™ Earth imagery (2020); Seismic shear-wave traverse SW-1 shown as yellow line.

SURVEY LINE PHOTOGRAPHS

View looking north along Seismic Line SW-1.

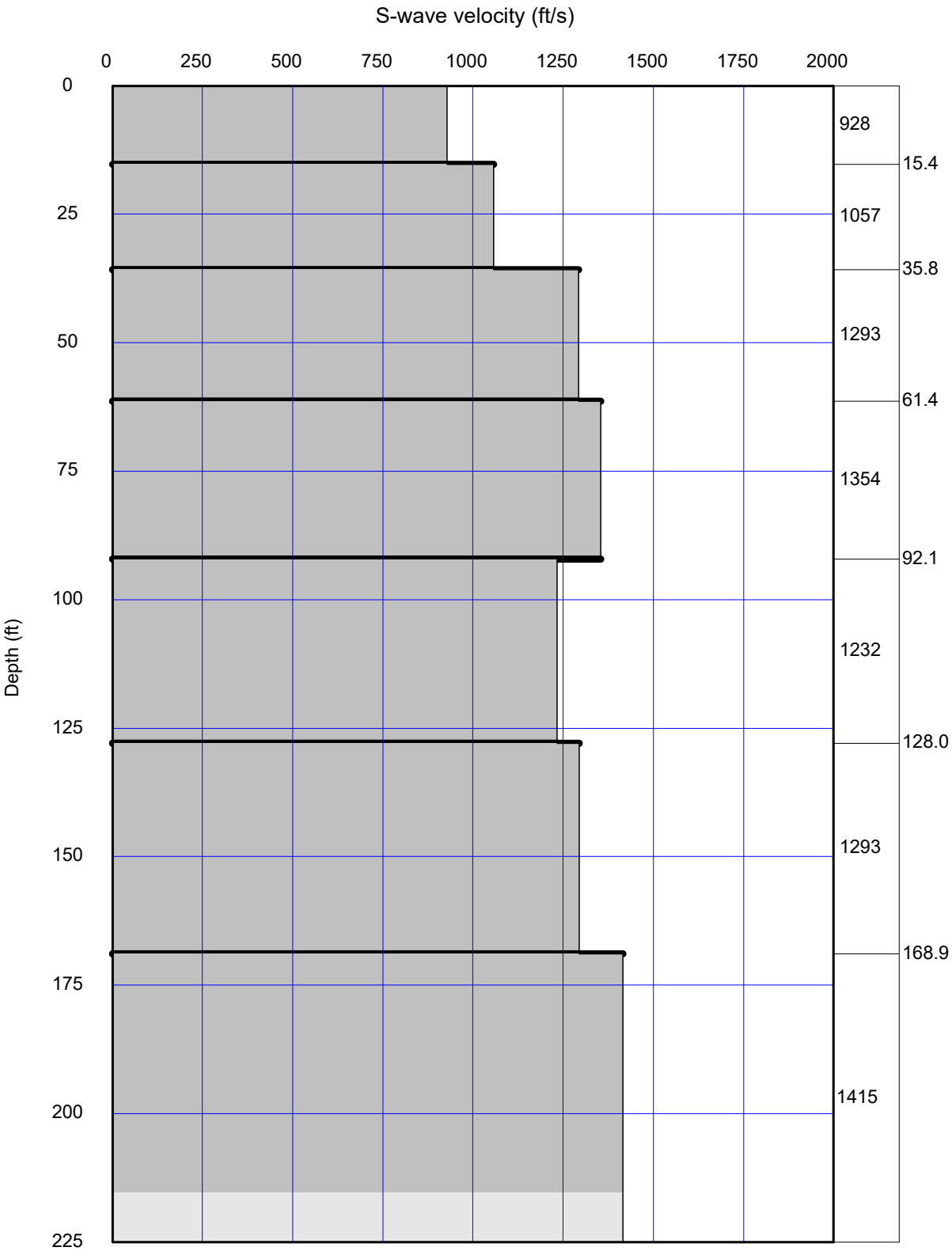
View looking south along Seismic Line SW-1.

APPENDIX A

SHEAR-WAVE MODEL AND DATA

SEISMIC LINE SW-1

SHEAR-WAVE MODEL



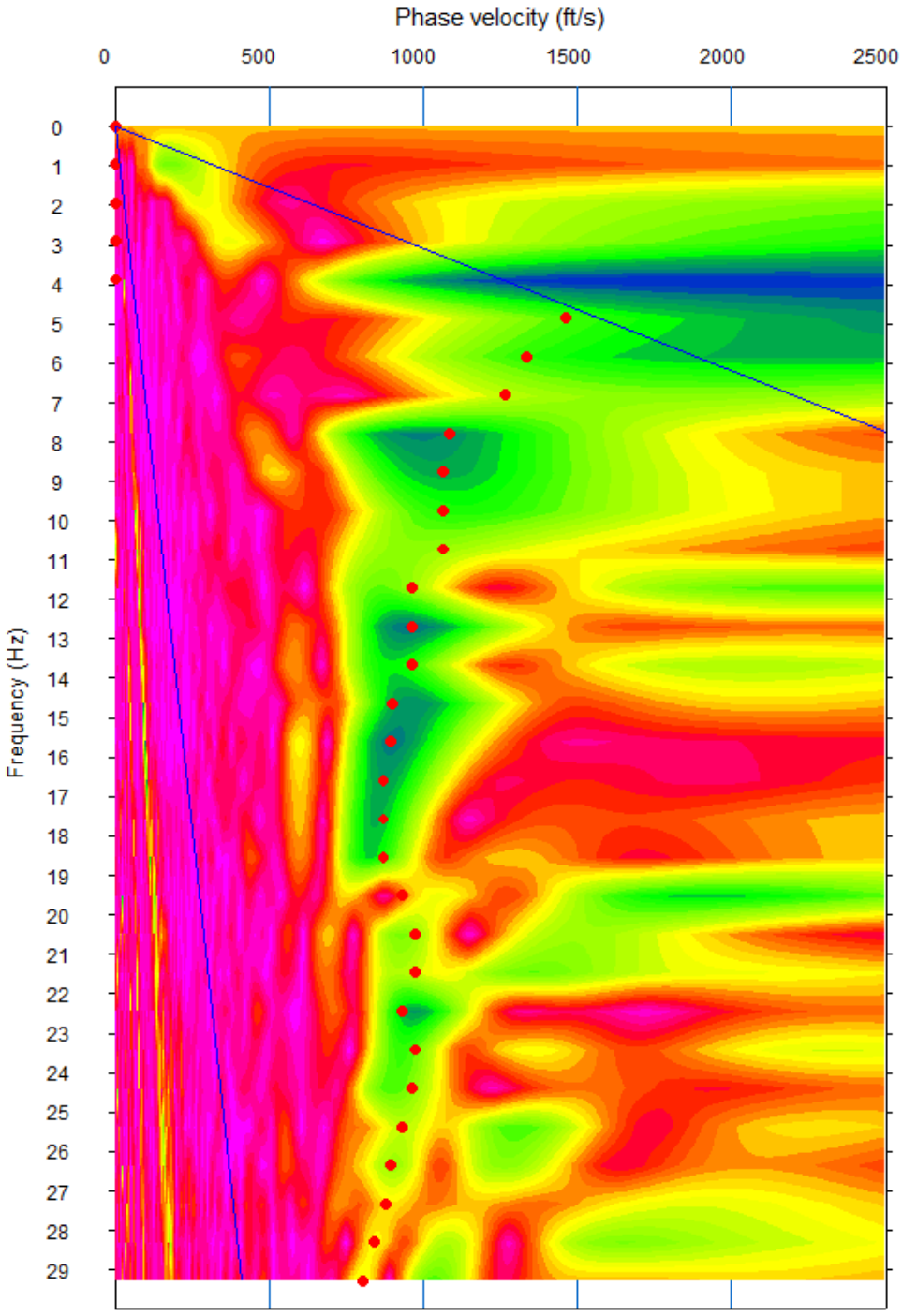
S-wave velocity model 3369 (inverted) : Final.rst

Average Vs 100ft = See Table 1

SHEAR-WAVE MODEL SW-1

COMBINED DISPERSION CURVE

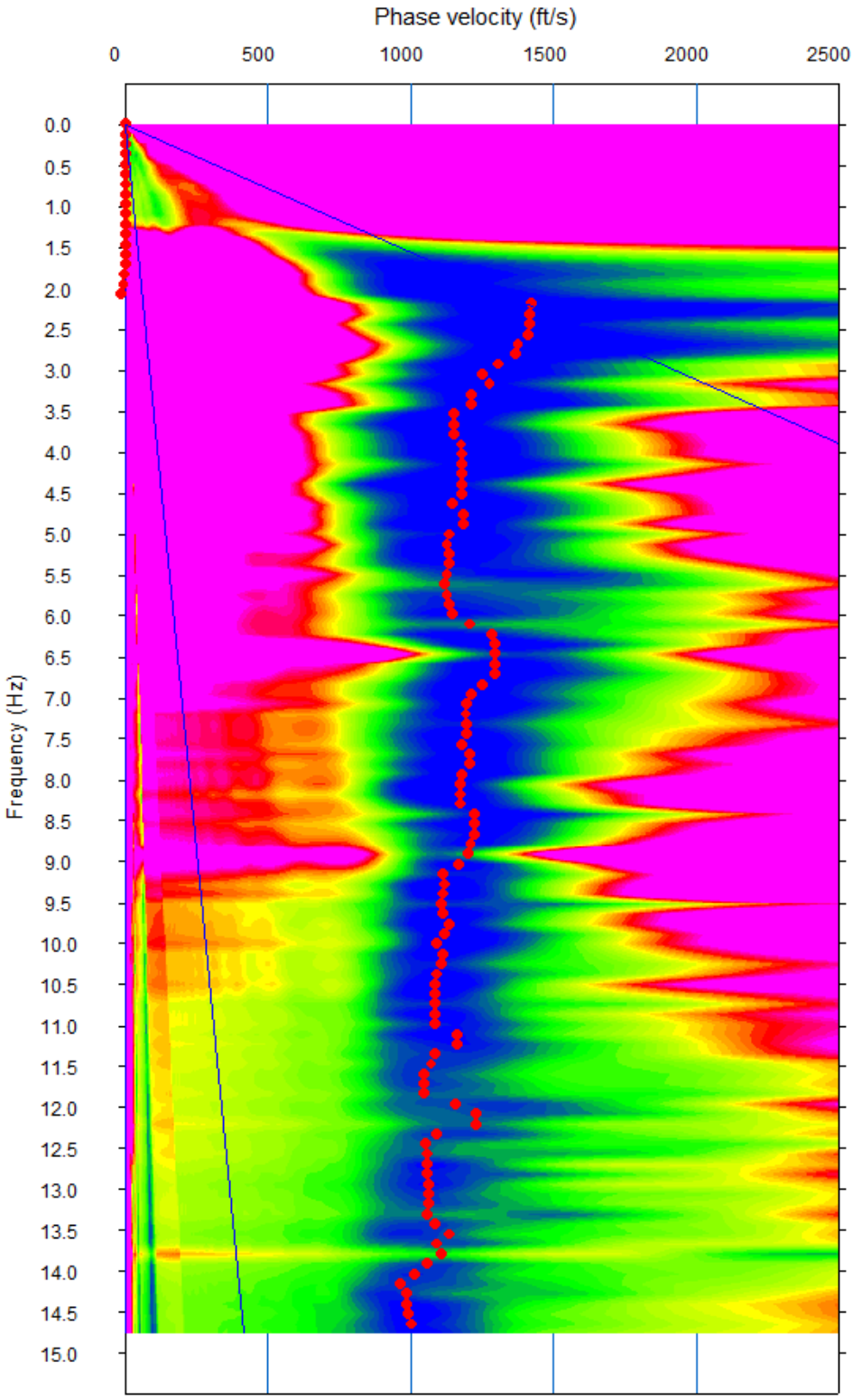
SEISMIC LINE SW-1



Dispersion Cure: Active.dat

ACTIVE DISPERSION CURVE

SEISMIC LINE SW-1



Dispersion Curve: Passive.dat

PASSIVE DISPERSION CURVE

APPENDIX B

REFERENCES

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