City of Garden Grove, California

Water Quality Management Plan (WQMP)

Project Name:

Civil and Soil Engineering Services, Hotel

(13650 Harbor Blvd, Garden Grove, CA 92843)

(APN: 101-080-27&66)

Prepared By: Hank Jong

Water Quality Management Plan (WQMP)

Project Name:

Home 2 Suites by Hilton

Prepared for:

Garden Grove Hotel LLC

13650 Harbor Blvd

Garden Grove, CA 92843

714.476.7778

Prepared by:

EGL ASSOCIATES, INC.

Engineer Hank JONG Registration No. 45846

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6/25/2018

Project Owner's Certification

Permit/Application No.		Grading Permit No.	
Tract/Parcel Map No.		Building Permit No.	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			101-080-27&66

This Water Quality Management Plan (WQMP) has been prepared for Garden Grove Hotel, LLC by EGL Associates, INC. The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan as part of the environmental review process under CEQA.

The undersigned, while it owns the subject property, will be 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 current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the Final WQMP. An appropriate number of approved and signed copies of Final WQMP shall be available on the subject site in perpetuity.

Each Project Final WQMP will be stored within the City's files, and will continue with the property after the completion of the construction phase, and the City will require that the terms, conditions and requirements be recorded with the County Recorder's office by the property owner or any successive owner as authorized by the Water Quality Ordinance. The City will also require the Project Final WQMP to include a Notice of Transfer Responsibility Form, which serves to notify the City that a change in ownership has occurred and notify the new owner of its responsibility to continue implementing the Project WQMP.

The final Project WQMP must include calculations to support the structural integrity of the selected LID or treatment control BMP as appropriate and be prepared by or under the direction of a California Registered Civil Engineer and affixed with their stamp.

Owner: Garden Grove Hotel, LLC			
Title	Owner		
Company	**Garden Grove Hotel, LLC**		
Address	13650 Harbor Blvd, Garden Grove, CA 92843		
Email	BINH@ZBTGROUP.COM		
Telephone #	714-476-7778		
Signature		Date	

Contents

Page No.

Section I Discretionary Permit(s) and Water Quality Conditions 3
Section II Project Description 4
Section III Site Description 10
Section IV Best Management Practices (BMPs) 12
Section V Inspection/Maintenance Responsibility for BMPs 24
Section VI Site Plan and Drainage Plan 26
Section VII Educational Materials 27

Attachments

Attachment A . ..... **Educational Materials**
Thank you for making water protection a priority
Runoff, rainwater and reuse
The ocean begins at your front door
Household Tips
Pollution Prevention
Tips for maintaining a septic tank system
Responsible pest control
Tips for landscaping and gardening
Tips for pet care
Tips for pool maintenance
Attachment B . ..... **WQMP Site &Drainage Plan**
Attachment C . ..... **Percolation Test Result**
Attachment D . ..... **Hydrology Report**

Section I Discretionary Permit(s) and Water Quality Conditions

Provide discretionary permit and water quality information. *Refer to Section 2.1 in the Technical Guidance Document (TGD) available from the Orange County Stormwater Program (ocwatersheds.com).*

Project Infomation			
Permit/Application No.		Tract/Parcel Map No.	
Additional Information/ Comments:	APN：101-080-27&66		
Water Quality Conditions			
Water Quality Conditions (list verbatim)	1. A geotechnical study prepared by a registered geotechnical engineer is required. The report shall analyze the liquefaction potential of the site and make recommendations. The report shall analyze sub-surface issues related to the past uses of the site, including sub-surface tanks and basement and septic facilities. Any soil or underground contamination shall be remediated prior to the issuance of a building permit in a manner meeting the approval of the City Engineer in concert with the Orange County Health Department. The report shall make recommendations for pavement design the interior streets and parking spaces. The report shall also test and analyze soil condition for LID (Low Impact Development) principles and implementations, including potential infiltration alternatives, soil compaction, saturation, permeability and groundwater levels. a. WQMP i. Prior to the issuance of any grading or building permits or prior to recordation upon subdivision of land if determined applicable by the City Building Official, the applicant shall submit to		

	the City for review and approval a Water Quality Management Plan that: - Addresses Site Design BMPs such as minimizing impervious areas, maximizing permeability, minimizing directly connected impervious areas, creating reduced or "zero discharge" areas, and conserving natural areas - Incorporates the applicable Routine Source Control BMPs as defined in the DAMP - Incorporates structural and Treatment Control BMPs as defined in DAMP - Generally describes the long-term operation and maintenance requirements for the Treatment Control BMPs - Identifies the entity that will be responsible for long-term operation and maintenance of the Treatment Control BMPs - Describes the mechanism for funding the long-term operation and maintenance of the Treatment Control BMPs 2. Prior to grading or building permit closeout and/or the issuance of a certificate of use or a certificate of occupancy, the applicant shall: - Demonstrate that all structural best management practices (BMPs) described in the Project WQMP have been constructed and installed in conformance with approved plans and specifications - Demonstrate that applicant is prepared to implement all non-structural BMPs described in the Project WQMP - Demonstrate that an adequate number of copies of the approved Project WQMP are available onsite

	- Submit for review and approval by the City an operations and Maintenances (O&M) Plan for all structural BMPs
Watershed-Based Plan Conditions	
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	No WIHMP and TMDL for the Blosa Chica Channel Watershed

Section II Project Description

II.1 Project Description

Provide a detailed project description including:

- Project areas;
- Land uses;
- Land cover;
- Design elements;
- A general description not broken down by drainage management areas (DMAs).

Include attributes relevant to determining applicable source controls. *Refer to Section 2.2 in the TGD for information that must be included in the project description.*

Description of Proposed Project				
Development Category (Verbatim from WQMP):	All significant redevelopment projects, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety.			
Project Area (ft²): 64676	Number of Dwelling Units: 124 rooms		SIC Code: 236220	
Narrative Project Description:	A Two-story Hotel and Swimming Pool will be constructed to replace the previous commercial building. The building area is approximately 12845 SF. A.C. driveway, parking lot will be constructed with concrete curb & gutter, and trash enclosure.			
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	6465 SF	0.1	58211 SF	0.9
Post-Project Conditions	6465 SF	0.1	58211 SF	0.9
Drainage Patterns/Connections	Existing drainage pattern goes from Southeast to West. Proposed drainage pattern will be same as existing and proposed catch basin and underground pipe will captured the run-off and drained to the infiltration basin for treatment and discharged to the street via parkway drain.			

II.2 Potential Stormwater Pollutants

Determine and list expected stormwater pollutants based on land uses and site activities. *Refer to Section 2.2.2 and Table 2.1 in the TGD for guidance.*

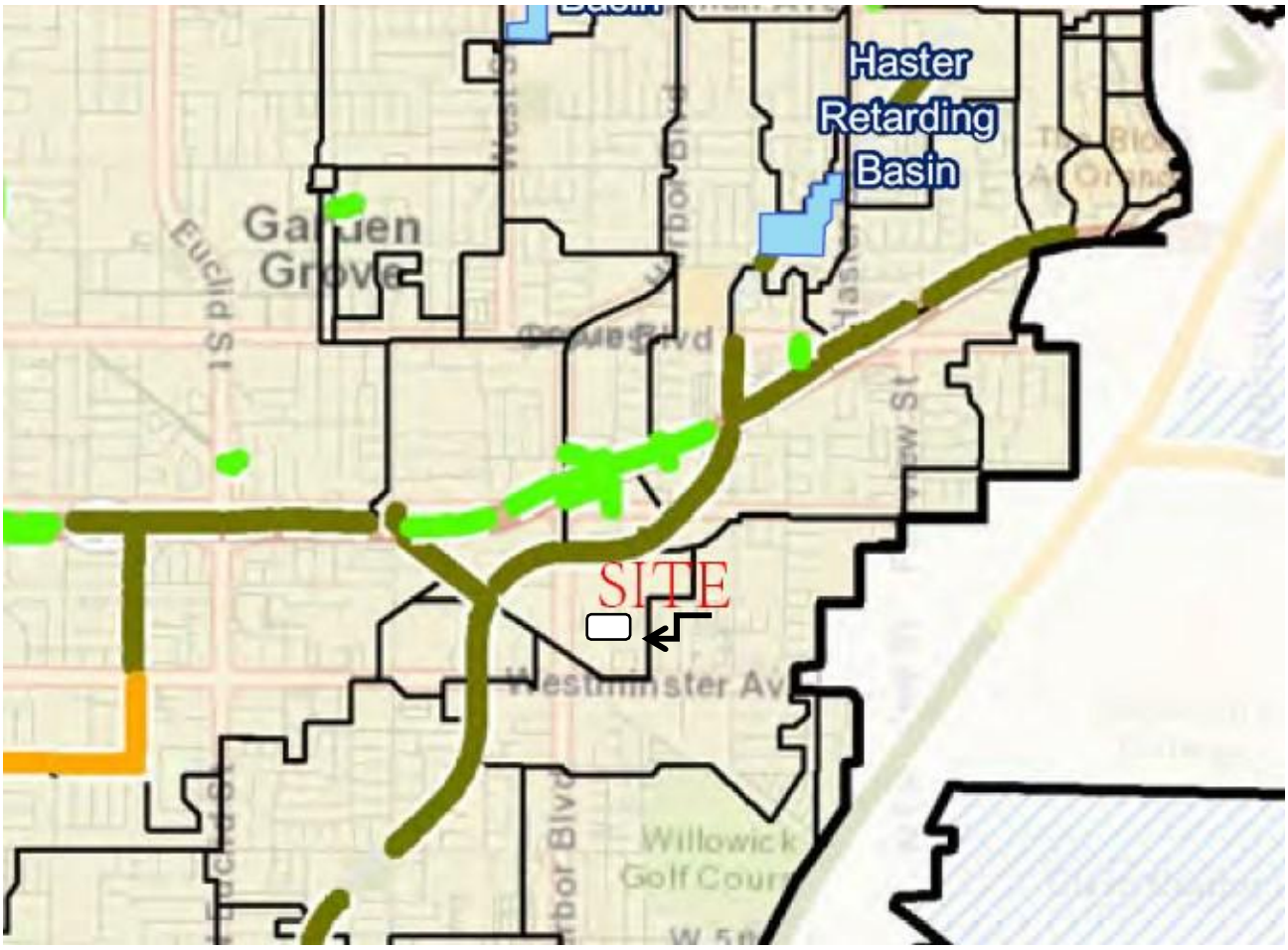
Pollutants of Concern			
Pollutant	Circle One: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E	N	
Nutrients	E	N	
Heavy Metals	E	N	
Pathogens (Bacteria/Virus)	E	N	
Pesticides	E	N	
Oil and Grease	E	N	
Toxic Organic Compounds	E	N	
Trash and Debris	E	N	

II.3 Hydrologic Conditions of Concern

Determine if streams located downstream from the project area are determined to be potentially susceptible to hydromodification impacts. *Refer to Section 2.2.3.1 in the TGD for* NOC *or Section 2.2.3.2 for* <SOC>.

☒ No – Show map

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



II.4 Post Development Drainage Characteristics

Describe post development drainage characteristics. Refer *to Section 2.2.4 in the TGD.*

A Two-story Hotel and Swimming Pool will be constructed to replace the previous commercial building. The building area is approximately 12845 SF. A.C. driveway, parking lot will be constructed with concrete curb & gutter, and trash enclosure. The drainage at post development will be diverted into the driveway and at the end of the driveway, there will be catch basin equipped with flogard plus filters. The flow will then go to an infiltration basin that will be held until it overflows towards Harbor Blvd.

II.5 Property Ownership/Management

Describe property ownership/management. *Refer to Section 2.2.5 in the TGD.*

Public Street: Harbor Blvd, City of Garden Grove

Private Street: ZBT Group

On-Site Landscaping Area: ZBT Group

On-Site Building: ZBT Group

On-Site Open Space: ZBT Group

Section III Site Description

III.1 Physical Setting

Fill out table with relevant information. *Refer to Section 2.3.1 in the TGD.*

Planning Area/ Community Name	N/A
Location/Address	13650 Harbor Blvd,
	Garden Grove, CA 92843
Land Use	Commercial
Zoning	C-3
Acreage	1.45ac
Predominant Soil Type	Group B

III.2 Site Characteristics

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. Refer to Section 2.3.2 in the TGD.

Precipitation Zone	0.77 inch design capture storm depth
Topography	The project site is generally sloping from southeast to west with an approximately 1% slope.
Drainage Patterns/Connections	Existing drainage pattern flows from southeast to west.
Soil Type, Geology, and Infiltration Properties	The project site is located on Soil group B, which is typically silt loams and loams. Per Figure XVI-2a in the TGD document, the project site is not located within a potential landslide area.

Site Characteristics (continued)	
Hydrogeologic (Groundwater) Conditions	The groundwater water table for this site is 22 feet below surface, thus not a concern for the project site.
Geotechnical Conditions (relevant to infiltration)	A percolation Test was conducted by TGR, 5.0 inches per hour infiltration rate is the result of the test.
Off-Site Drainage	Based on filed investigation, there is no off-site drainage for the subject area
Utility and Infrastructure Information	The public street is owned City of Garden Grove. On-site drainage devices and system will be privately owned and maintained. The drainage at existing condition drains over the channel drain to the public street, at the post development the on site drainage will be collected at the northwest and southwest of the property by two infiltration basin until it overflows towards Harbor Blvd.

III.3 Watershed Description

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.3 in the TGD.*

Receiving Waters	Blosa Chica Channel
303(d) Listed Impairments	Metal
Applicable TMDLs	No TMDLs are listed for Blosa Chica Channel
Pollutants of Concern for the Project	Suspended Solid/Sediments, Nutrients, Pathogens (Bacteria/Virus), Pesticides, Oil & Grease, Toxic Organic Compounds, Trash & Debris.
Environmentally Sensitive and Special Biological Significant Areas	No known environmentally sensitive and Special Biological Significant Areas within the vanity of project site.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

Describe project performance criteria. Several steps must be followed in order to determine what performance criteria will apply to a project. These steps include:

- If the project has an approved WIHMP or equivalent, then any watershed specific criteria must be used and the project can evaluate participation in the approved regional or sub-regional opportunities. The local Permittee planning or NPDES staff should be consulted regarding the existence of an approved WIHMP or equivalent.
- Determine applicable hydromodification control performance criteria. *Refer to Section 7.II-2.4.2.2 of the Model WQMP.*
- Determine applicable LID performance criteria. *Refer to Section 7.II-2.4.3 of the Model WQMP.*
- Determine applicable treatment control BMP performance criteria. *Refer to Section 7.II-*3.2.2 *of the Model WQMP.*
- Calculate the LID design storm capture volume for the project. *Refer to Section 7.II-2.4.3 of the Model WQMP.*

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

Project Performance Criteria (continued)	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	The project site does not fall into the area that is susceptible to hydromodification impacts, therefore, HCOC does not exist from the project site.
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	Infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume). LID BMPs must be designed to retain, on-site, (infiltrate, harvest and use, or evapotranspire) storm water runoff up to 80 percent average annual capture efficiency.
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	If it is not feasible to meet LID performance criteria through retention and/or biotreatment provided on-site or at a sub-regional/regional scale, then treatment control BMPs shall be provided on-site or off-site prior to discharge to waters of the US. Sizing of treatment control BMPs shall be based on either the unmet volume after claiming applicable water quality credits, if appropriate.
Calculate LID design storm capture volume for Project.	<u>Area 1</u> Area = 0.80 ac C: Runoff coefficient (=0.75 x Imp. + 0.15 = 0.75 x 0.9 + 0.15 = 0.83) V = C d A (where, d=storm depth, 0.77" per map attached) = 0.83 x 0.77 x 0.8 x 43560/12 = 1856 cf

	<u>Area 2</u> Area = 0.68 ac C: Runoff coefficient (=0.75 x Imp. + 0.15 = 0.75 x 0.9 + 0.15 = 0.83) V = C d A (where, d=storm depth, 0.77" per map attached) = 0.83 x 0.77 x 0.68 x 43560/12 = 1578 cf

IV.2. SITE DESIGN AND DRAINAGE PLAN

Describe site design and drainage plan including

- A narrative of site design practices utilized or rationale for not using practices;
- A narrative of how site is designed to allow BMPs to be incorporated to the MEP
- A table of DMA characteristics and list of LID BMPs proposed in each DMA.
- Reference to the WQMP plot plan.
- Calculation of Design Capture Volume (DCV) for each drainage area.
- A listing of GIS coordinates for LID and Treatment Control BMPs (unless not required by local jurisdiction).

Refer to Section 2.4.2 in the TGD.

Infiltration basins are used in this project. There are two infiltration basins in the northeast and southeast of the site. The drainage at post development will be diverted into the driveway. At the end of the driveway, there will be catch basins that will lead the water into the northwest and southwest of the property. From here water will flow into an infiltration basin that will be held until it overflows towards Harbor Blvd. **The Catch Basins will be Equipped with Flogard Plus catch basin filter to collect debris and other pollutants and a Stormtech MC-3500 or equivalent will be provided as an infiltration basin.**

See Project WQMP Site & Drainage Plan for Details.

Calculation of Design Capture Volume (DCV):

First 85TH percentile rainfall will be stored on-site before discharging to the street.

V@A1 = 1856 cf

STORMTECH MC-3500 will be used for infiltration basin,

and its volume capacity=184 cf/ea for chamber, 48.6 cf/ea for end cap

Use 10 chambers and 4 end caps = (10 x 184 cf) + (4 x 48.6) = 2034.4 cf >1856 cf o.k.

V@A2 = 1578 cf

STORMTECH MC-3500 will be used for infiltration basin,

and its volume capacity=184 cf/ea for chamber, 48.6 cf/ea for end cap

Use 8 chambers and 4 end caps = (8 x 184 cf) + (4 x 48.6) = 1666.4 cf >1578 cf o.k.

IV.3 LID BMP SELECTION AND PROJECT CONFORMANCE ANALYSIS

Each sub-section below documents that the proposed design features conform to the applicable project performance criteria via check boxes, tables, calculations, narratives, and/or references to worksheets. *Refer to Section 2.4.2.3 in the TGD for selecting LID BMPs and Section 2.4.3 in the TGD for conducting conformance analysis with project performance criteria.*

IV.3.1 Hydrologic Source Controls

If required HSCs are included, fill out applicable check box forms. If the retention criteria are otherwise met with other LID BMPs, include a statement indicating HSCs not required.

Name	Included?
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☐
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐

IV.3.2 Infiltration BMPs

Identify infiltration BMPs to be used in project. If design volume cannot be met state why BMPs cannot be met

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

Show calculations below to demonstrate if the LID Design Strom Capture Volume can be met with infiltration BMPs. If not document how much can be met with infiltration and document why it is not feasible to meet the full volume with infiltration BMPs.

First 85TH percentile rainfall will be stored on-site before discharging to the street.

V@A1 = 1856 cf

STORMTECH MC-3500 will be used for infiltration basin,

and its volume capacity=184 cf/ea for chamber, 48.6 cf/ea for end cap

Use 10 chambers and 4 end caps = (10 x 184 cf) + (4 x 48.6) = 2034.4 cf >1856 cf o.k.

V@A2 = 1578 cf00

STORMTECH MC-3500 will be used for infiltration basin,

and its volume capacity=184 cf/ea for chamber, 48.6 cf/ea for end cap

Use 8 chambers and 4 end caps = (8 x 184 cf) + (4 x 48.6) = 1666.4 cf >1578 cf o.k.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, describe any evapotranspiration, rainwater harvesting BMPs.

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

Show calculations below to demonstrate if the LID Design Strom Capture Volume can be met with evapotranspiration, rainwater harvesting BMPs in combination with infiltration BMPs. If not document how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with either of these BMPs categories.

Evapotranspiration, Rainwater Harvesting BMPs are not proposed for this project. The DCV will be met by infiltration BMPs.

IV.3.4 Biotreatment BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, and/or evapotranspiration and rainwater harvesting BMPs, describe biotreatment BMPs. Include sections for selection, suitability, sizing, and infeasibility, as applicable.

Name	Included?
Bioretention with underdrains	☐
Stormwater planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☐
Wet extended detention basin	☐
Dry extended detention basins	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Strom Capture Volume can be met with infiltration, evapotranspiration, rainwater harvesting and/or biotreatment BMPs. If not document how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with either of these BMPs categories.

Biotreatment BMPs are not proposed for this project. The DCV will be met by infiltration BMPs.

IV.3.5 Hydromodification Control BMPs

Describe hydromodification control BMPs. See Section 5 TGD. Include sections for selection, suitability, sizing, and infeasibility, as applicable. Detail compliance with Prior Conditions of Approval.

Hydromodification Control BMPs	
BMP Name	**BMP Description**
N/A	This project is exempt from Hydromodification Control BMPs.

IV.3.6 Regional/Sub-Regional LID BMPs

Describe regional/sub-regional LID BMPs in which the project will participate. *Refer to Section 7.II-2.4.3.2 of the Model WQMP*.

Regional/Sub-Regional LID BMPs
N/A

IV.3.7 Treatment Control BMPs

Treatment control BMPs can only be considered if the project conformance analysis indicates that it is not feasible to retain the full design capture volume with LID BMPs. Describe treatment control BMPs including sections for selection, sizing, and infeasibility, as applicable.

Treatment Control BMPs	
BMP Name	**BMP Description**

IV.3.8 Non-structural Source Control BMPs

Fill out non-structural source control check box forms or provide a brief narrative explaining if non-structural source controls were not used.

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

IV.3.9 Structural Source Control BMPs

Fill out structural source control check box forms or provide a brief narrative explaining if Structural source controls were not used.

Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No permanent Outdoor Material Storage areas at post development
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	No Steep Slope in Site
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☐	☒	Not Applicable to this project
S6	Dock areas	☐	☒	Not Dock Areas On Site
S7	Maintenance bays	☐	☒	No Maintenance Bays On Site
S8	Vehicle wash areas	☐	☒	No Vehicle wash Areas On Site
S9	Outdoor processing areas	☐	☒	No Outdoor Processing Areas
S10	Equipment wash areas	☐	☒	No Equipment Wash Areas onsite
S11	Fueling areas	☐	☒	No Fueling Areas On Site
S12	Hillside landscaping	☐	☒	No Hillside Landscaping
S13	Wash water control for food preparation areas	☐	☒	No Food Preparation Areas onsite
S14	Community car wash racks	☐	☒	No Community Car Wash Areas

IV.4 ALTERNATIVE COMPLIANCE PLAN (IF APPLICABLE)

IV.4.1 Water Quality Credits

Determine if water quality credits are applicable for the project. *Refer to Section 3.1 of the Model WQMP for description of credits and Appendix VI of the TGD for calculation methods for applying water quality credits.*

Description of Proposed Project				
Project Types that Qualify for Water Quality Credits (Select all that apply):				
☐Redevelopment projects that reduce the overall impervious footprint of the project site.	☐Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.		☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).	
☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).		☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned		☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).
☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.	☐ Developments in a city center area.	☐ Developments in historic districts or historic preservation areas.	☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.	☐In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.

Calculation of Water Quality Credits (if applicable)	Not Applicable

IV.4.2 Alternative Compliance Plan Information

Describe an alternative compliance plan (if applicable). Include alternative compliance obligations (i.e., gallons, pounds) and describe proposed alternative compliance measures. *Refer to Section 7.II 3.0 in the WQMP.*

None needed, Project DCV will be fully mitigated using infiltration BMPs.

Section V Inspection/Maintenance Responsibility for BMPs

Fill out information in table below. Prepare and attach an Operation and Maintenance Plan. Identify the mechanism through which BMPs will be maintained, including any documenting forms, required permits (if any) . Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies. *Refer to Section 7.II 4.0 in the Model WQMP.*

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
S1 Provide storm drain system stenciling and signage	Garden Grove Hotel, LLC	Replace Stencilling as Needed	Annually/As Needed
S3 Design and construct trash and waste storage areas to reduce pollution introduction	Garden Grove Hotel, LLC	Provide Regular Maintenance and Cleaning of Storage Ares	Monthly/As Needed
S4 Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Garden Grove Hotel, LLC	Repair/Maintain Irrigation Systems and Controllers as Needed.	Annually/As Needed
Catch Basin Filters	Garden Grove Hotel, LLC	A Contracting Company should provide regular maintenance of the Filtered Catch Basins	Quarterly/Before Each Major Storm Event

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
Storm Water Planter Box	Garden Grove Hotel, LLC	A Contracting Company should provide regular maintenance of the Planter Boxes	Quarterly/Before Each Major Storm Event
INF-7 Underground Infiltration	Garden Grove Hotel, LLC	The owner shall contract a company to remove liter and debris from underground tank at least once a year.	Annually
PRE-2 Catch Basin Insert	Garden Grove Hotel, LLC	The owner shall contract a company to inspect and maintain drain inserts at least once a year.	Annually
N1. Education for Property Owners, Tenants and occupants	Garden Grove Hotel, LLC	The property owner will be provided educational material distributed in attachment B in this WQMP.	Ongoing
N2. Activity Restrictions	Garden Grove Hotel, LLC	The owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property.	Ongoing

N3. Common Area Landscape Management	Garden Grove Hotel, LLC	Maintenance shall be consistent with City requirements, plus fertilizer and/or pesticide usage shall be consistent with County guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Weekly
N4. BMP maintenance	Garden Grove Hotel, LLC	Records of inspections and BMP maintenance shall be maintained by the Owner and documented with the WQMP, and shall be available for review upon request.	Ongoing

N5. Title 22 CCR Compliance (How development will comply)	Garden Grove Hotel, LLC	The owner shall verify Title 22 California Code of Regulations compliance on an annual basis.	Annually
N10. Uniform Fire Code Implementation	Garden Grove Hotel, LLC	The owner shall verify compliance with Article 80 of the Uniform Fire Code enforced by a fire protection agency on an annual basis.	Annually
N11. Common Area Litter Cotnrol	Garden Grove Hotel, LLC	Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with maintenance activities. Litter collection and removal shall be performed on a weekly basis.	Weekly
N12. Employee Training	Garden Grove Hotel, LLC	The Owner shall educate all new employees/managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis.	Anually

N14. Common Area Catch Basin Inspection	Garden Grove Hotel, LLC	Catch basin inlets, area drains, swales, curb-and-gutter systems and other drainage systems shall be inspected after each storm event and, if necessary, cleaned prior to the storm season by Oct 1 each year.	Annually
N15. Street Sweeping Private Streets and Parking Lots	Garden Grove Hotel, LLC	Streets & parking lots must be swept at least quarterly (every 3 months), including prior to the start of the rainy season (October 1st).	Annually

Section VI Site Plan and Drainage Plan

VI.1 SITE PLAN AND DRAINAGE PLAN

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural BMP locations
- Drainage delineations and flow information
- Drainage connections
- BMP details

Section VII Educational Materials

Refer to the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available. For the copy submitted to the Permittee, only attach the educational materials specifically applicable to the project. Other materials specific to the project may be included as well and must be attached.

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)	☐	Percolation Test Result	☒
Recycle at Your Local Used Oil Collection Center (Central County)	☐	Preliminary Hydrology Study	☒
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☒		☐
Responsible Pest Control	☒		☐
Sewer Spill	☐		☐
Tips for the Home Improvement Projects	☐		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☒		☐
Tips for Pool Maintenance	☒		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐		☐
Tips for Projects Using Paint	☐		☐

Appendix A:

Education Material

The Pollution Solution

[illegible]

1 Pesticides and Fertilizer

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

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

2 Dirt and Sediment

- **Pollution:** Dirt or sediment can impede the flow of the stormwater and negatively impact stream habitat as it travels through the waterway and reaches downstream. Pollutants may attach to sediment, which can then be transported through our waterways.
- **Solution:** Prevent dirt and sediment by covering them with tarps or mulch plants nearby to prevent dirt or mud from adhering dirt or sediment to make the storm drain and the

3 Vehicle

- **Pollution:** Motor oil and other toxic products in car washes can have important pollution, which turns the flow of the water from clean.
- **Solution:** Take your car to a commercial car wash where the wash water is recycled and treated at a local wastewater treatment plant.

DID YOU KNOW?

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

4 Pet Waste

- **Pollution:** Pet waste carries bacteria through our environment and eventually will be washed into the oceans. This can have a health risk to swimmers and surfers.
- **Solution:** Pick up after your pets!

5 Trash and Debris

- **Pollution:** Trash and debris can enter waterways by wind. Starting out careless maintenance of trash receptacles, street dumpsters collects some of this trash, however, much of it will still migrate and end up in our storm drain system where it flows unimpeded out to the ocean.

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

6 Motor Oil / Vehicle Fluids

- **Pollution:** Oil and petroleum products from our vehicles are toxic to people, wildlife and plants.
- **Solution:** Fix any leaks from your vehicle and wash the oil/grease off on your car. The absorbent material can be cut into oil spills then bagged, tied and disposed of in the trash. Recycle used motor oil at a local Household Hazardous Waste Collection Center.

A TEAM EFFORT

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

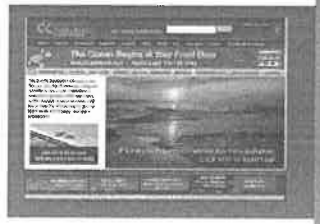
Low Impact Development (LID) and sustainable water use prevents water pollution and conserves water for drinking and reuse. Reducing your water use and the amount of water flowing from your home protects the environment and saves you money.

Thank you for making water protection a priority!

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

www.mwdoc.com

www.uccemg.com



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

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

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

Homeowners Guide for Sustainable Water Use

Low Impact Development, Water Conservation & Pollution Prevention

The Ocean Begins at Your Front Door

RUNOFF, RAINWATER AND REUSE

Where Does Water Runoff Go?

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

Water Conservation

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

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

What is Low Impact Development (LID)?

Low Impact Development (LID) is a method of development that seeks to maintain the natural hydrologic character of a parcel. LID provides an alternative and pollution prevention approach to water management.

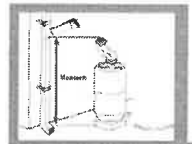
New water quality regulations require implementation of LID in Orange County and encourage implementation of LID at other locations. Implementing LID practices can reduce pollution and flow volumes, conserve potable water and reduce your water bill.

OPTIONS FOR RAINWATER HARVESTING AND REUSE

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

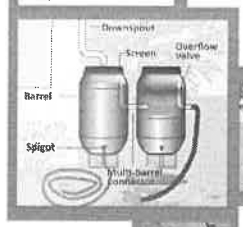
Downspout Disconnection/Redirection

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



Rain Barrels

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

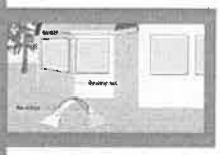


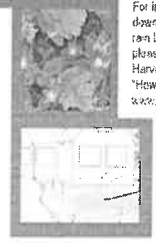
Mosquito growth prevention is very important when installing a rain barrel. The best way to prevent mosquito breeding is to eliminate entry points by ensuring all openings are sealed tightly. If these methods are unsuccessful, products are available to kill mosquito larvae, but that are harmless to animals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

Rain Gardens

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

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





For information on how to disconnect a downspout or to install and maintain a rain barrel or rain garden at your home, please see the Los Angeles Rainwater Harvesting Program, A Homeowner's "How-To" Guide, November 2003 at www.lowimpactdevelopment.org.

OTHER WATER CONSERVATION AND POLLUTION PREVENTION TECHNIQUES

Native Vegetation and Maintenance

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

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

Weed Free Yards

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

Soil Amendments

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

IRRIGATE EFFICIENTLY

Smart Irrigation Controllers

Smart Irrigation Controllers [illegible] water based on weather conditions, [illegible] and soil moisture.

- Adjust sprinklers so that only the plants in your yard are watered. By simply adjusting the direction of your sprinklers you can save water, prevent water pollution from runoff, keep your lawn healthy and save money.

Set a timer for your sprinklers - Know about how much water your yard is actually using. Water for minutes of watering per day instead. Time your sprinklers, when water begins running off your lawn, you can be sure that your yard has had all the water it can take on that particular watering time.

Water at Sunrise - Water at night in the summer will reduce water use due to evaporation. Additionally, bacteria in the air thrive in the warm evening so the water will go to the lawn as intended.

Water by hand - Instead of using sprinklers, consider watering your yard by hand. Hand watering ensures that all plants get the proper amount of water so you will prevent any water runoff, which is warm and carries pollutants into our waterways.

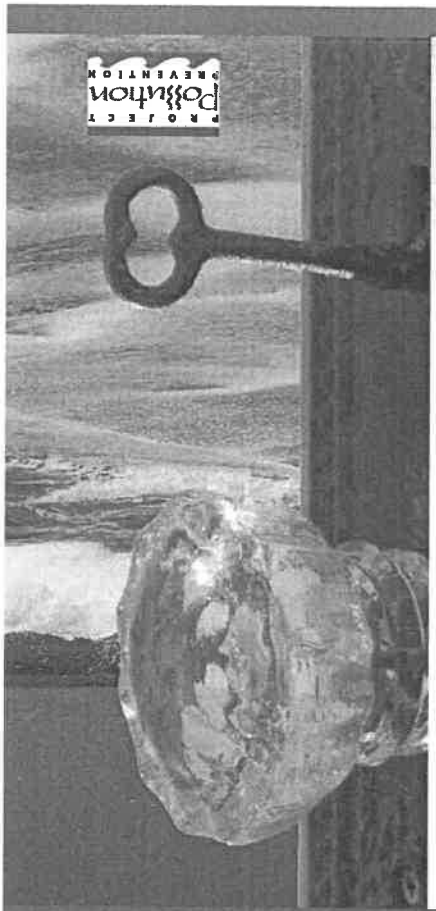
Fix leaks - Automatic irrigation systems can [illegible] if even a few of them [illegible] enough water to cause the water clock of home to [illegible]. If your garden hose is leaking, replace the washer under hose bibb and make a tight connection. Fix broken sprinkler immediately.

The Ocean Begins at Your Front Door

Orange County Stormwater Program

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

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



For More Information

California Environmental Protection Agency
www.calepa.ca.gov

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

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

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

Integrated Waste Management Dept. of Orange County (714) 834-6752 or visit www.ochealthfile.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 octstormwaterinfo-join@list.ocwatersheds.com

Also Viejo. . . . . (949) 425-2535
Aliaheim 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)
Online Water Pollution Problem Reporting Form
www.ocwatersheds.com

Recycle Printed Paper

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.

The Ocean Begins at Your Front Door

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

Follow these simple steps to help reduce water pollution:

Household Activities

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

Automotive

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

Pool Maintenance

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

Landscape and Gardening

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

Trash

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

Pet Care

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

Common Pollutants

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

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

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

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

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

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

Litter, oil, chemicals and other substances that are left on your yard or driveway can be blown or washed into storm drains that flow to the ocean. Over-watering your lawn and washing your car can also flush materials into the storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated.

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

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

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

For emergencies, dial 911.

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

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

RECYCLE USED OIL

Help Prevent Ocean Pollution:

Household Tips

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Pollution Prevention

Household Activities

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

Household Hazardous Wastes include:

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

Gardening Activities

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

Washing and Maintaining Your Car

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

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

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 sewage spill during
normal business hours
(8:00 AM to 5:00 PM), call the
Health Care Agency
at **(714) 433-6419**
To report a sewage spill AFTER
normal business hours, on
weekends or holidays,
call **(714) 628-7008**

For emergencies, dial 911.

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

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Tips for Maintaining a Septic Tank System

The Ocean Begins
at Your Front Door

PROJECT
Pollution
PREVENTION

Tips for Maintaining a Septic Tank System

Households that are not served by public sewers usually depend on a septic tank system* to treat and dispose of wastewater. A well designed, installed and regularly maintained septic system can provide years of reliable service. However, when these systems fail to operate properly, significant damage can occur to property and the environment. The homeowner is responsible for these damages and may be subject to fines. Therefore, it is important to follow these simple tips when using a septic tank system:

Conserve Water

The more wastewater produced, the more the soil must absorb. By conserving water, the life of the drain field will be extended and the chance of a system failure is decreased.

Reduce your water use by:

- Using water saving devices
- Repairing leaky faucets and plumbing fixtures
- Reducing toilet reservoir volume or flow
- Taking shorter showers
- Washing only full loads of dishes and laundry

Never Flush Harmful Materials Into The Septic Tank

Grease, cooking oils, newspaper, paper towels, rags, coffee grounds, sanitary napkins and cigarettes do not easily decompose in the tank. Chemicals such as solvents, oils, paints and pesticides are harmful to the system's operation and may pollute the groundwater. For information on the proper disposal of household hazardous waste, call **1-800-CLEANUP**. Also, never use septic tank additives, commercial septic tank cleaners, yeast, sugar, etc. These products are not necessary and some may be harmful to your system.

Keep Runoff Away From The System

Water from surfaces such as roofs, driveways or patios should be diverted away from the septic tank and drain field area.

Protect The System From Damage

Keep traffic, such as vehicles, heavy equipment or livestock off your drain field or replacement area. The pressure can compact the soil or damage pipes. Also check your septic system map prior to constructing buildings or a pool on the property. The area over the absorption field and tank should be left undisturbed with only grass on top. Trees or shrubs, which may clog and damage the drain, should be created from the area.

Keep Records

Know where the septic tank is and have a diagram of its location. Also, keep up-to-date, accurate maintenance records.

Inspect The System

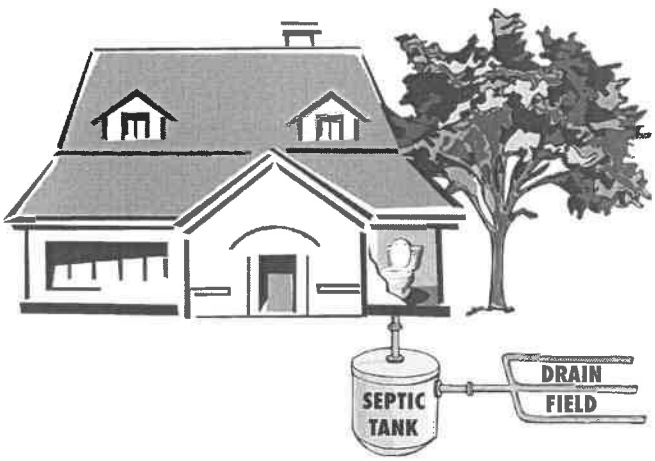
Monitor the system yearly to insure it is not at an "early warning level." Inspect the drain field and down slope areas for odors, wet spots, or surfacing of sewage. This may be an early indication of a problem with the system. Also, have the system inspected by a licensed septic tank professional every three to five years.

Pump The Tank When Needed

Routine pumping can prevent failures, such as clogging and backup into the home.

Never Enter The Septic Tank

Poisonous gases or the lack of air can be fatal. A professional should complete any work to the tank.



* Contact your local collection agency or city for assistance in determining if your home is served by a septic tank.

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).

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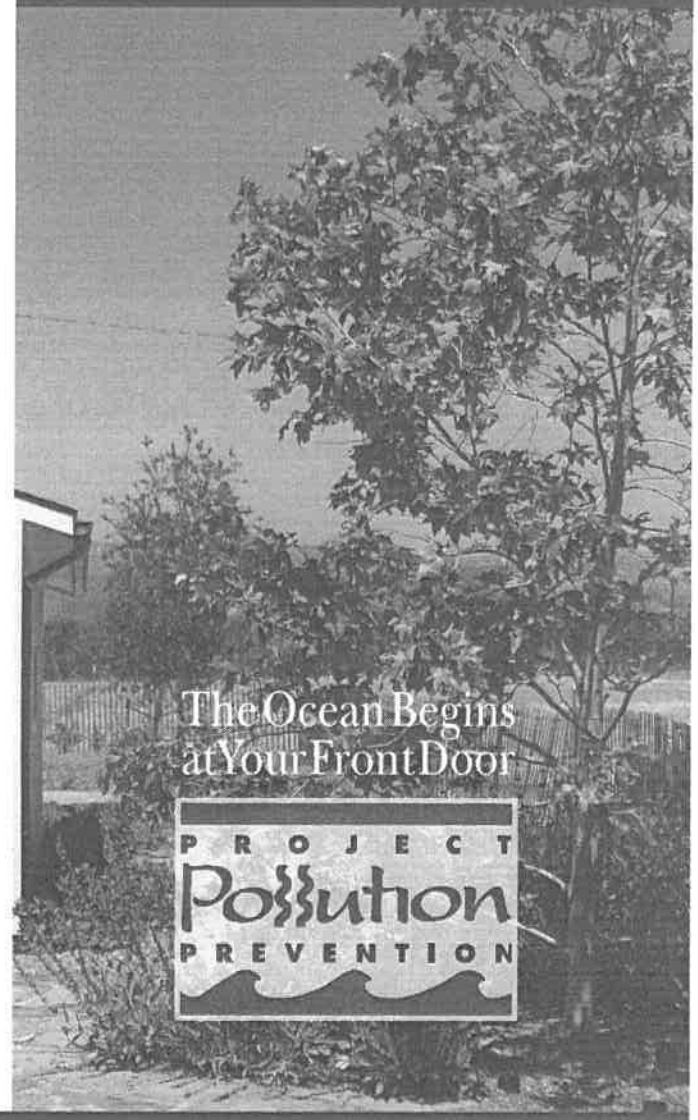
Help Prevent Ocean Pollution:

Responsible Pest Control



Tips for Pest Control

Key Steps to Follow:

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

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

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

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

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

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

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

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

UC CE University of California Cooperative Extension

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Store unused chemicals in a locked cabinet.

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

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

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

PROJECT Pollution PREVENTION

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

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

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

UCCE Master Gardener Hotline:
(714) 708-1646

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

For emergencies, dial 911.

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

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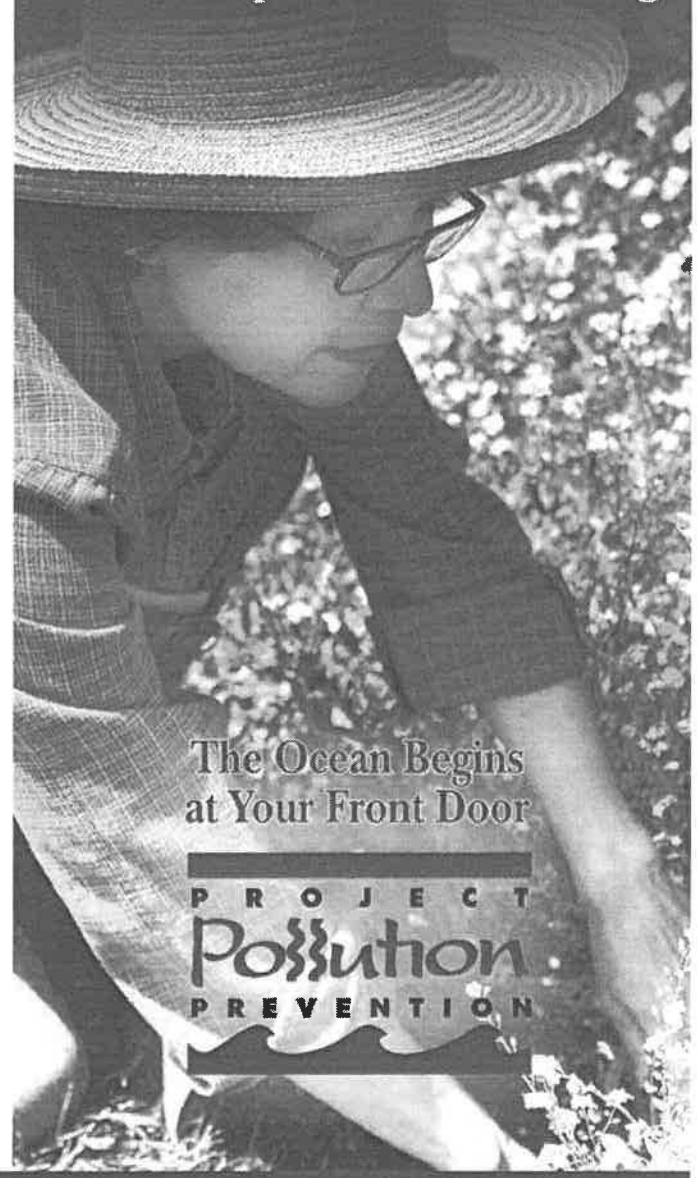
Help Prevent Ocean Pollution:

Tips for Landscape & Gardening



Tips for Landscape & Gardening

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

General Landscaping Tips

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

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

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.

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

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

Household Hazardous Waste Collection Centers

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

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

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

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

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

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

For emergencies, dial 911.

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

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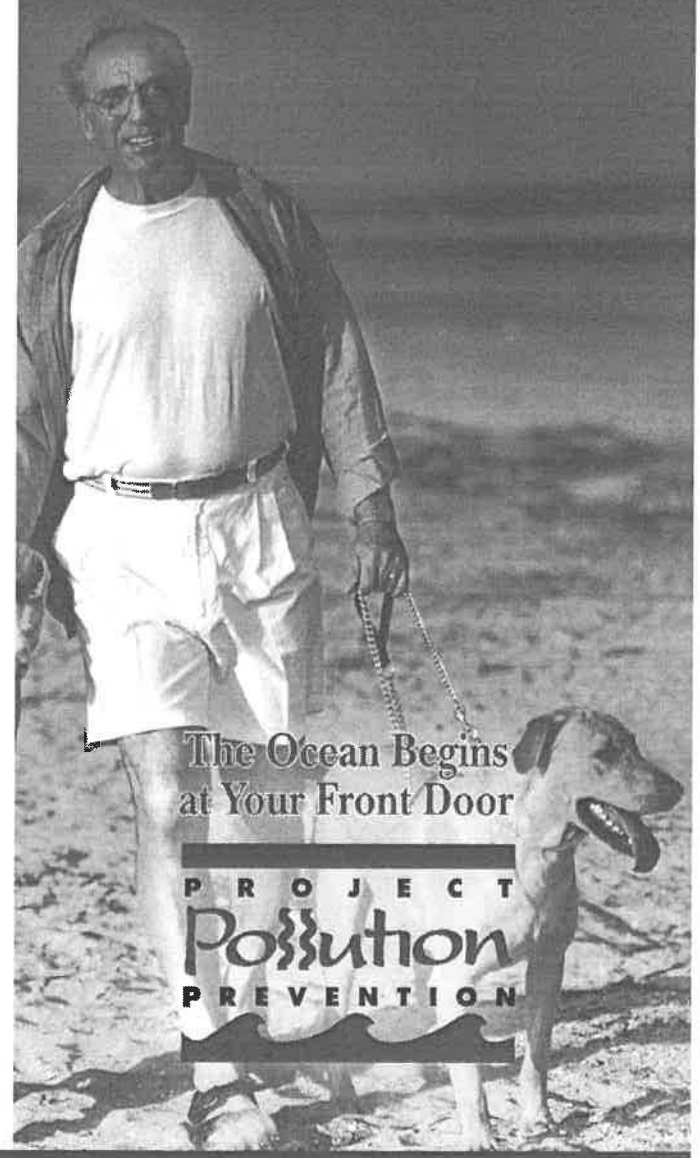
Help Prevent Ocean Pollution:

Tips for Pet Care



Tips for Pet Care

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

Washing Your Pets

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

- If possible, bathe your pets indoors using less-toxic shampoos or have your pet professionally groomed. Follow instructions on the products and clean up spills.

- If you bathe your pet outside, wash it on your lawn or another absorbent/ permeable surface to keep the washwater from running into the street, gutter or storm drain.

Flea Control

- Consider using oral or topical flea control products.

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

Why You Should Pick Up After Your Pet

It's the law! Every city has an ordinance requiring you to pick up after your pet. Besides being a nuisance, pet waste can lead to water pollution, even if you live inland. During rainfall, pet waste left outdoors can wash into storm drains. This waste flows directly into our waterways and the ocean where it can harm human health, marine life and the environment.

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

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

- Take a bag with you on walks to pick up after your pet.

- Dispose of the waste in the trash or in a toilet.

PROJECT Pollution PREVENTION

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. Swimming pools and spas are common in Orange County, but they must be maintained properly to guarantee that chemicals aren't allowed to enter the street, where they can flow into the storm drains and then into the waterways. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

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

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

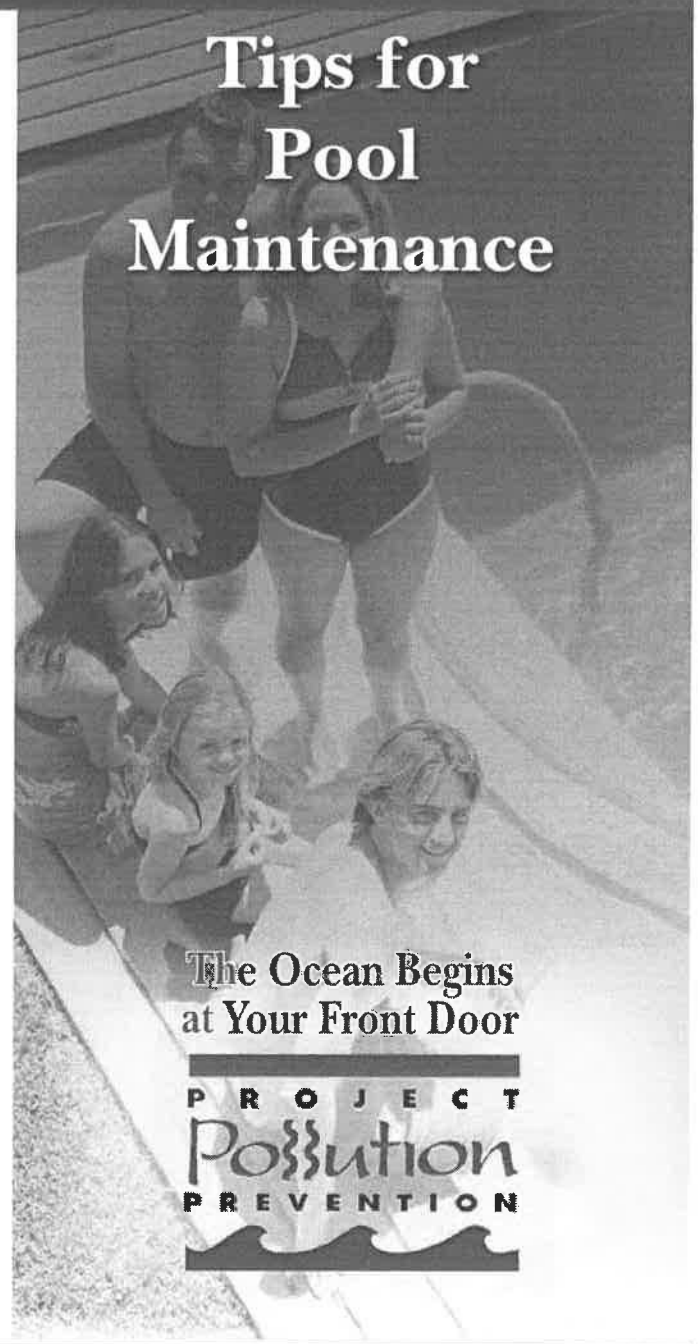
To report a spill,
call the
Orange County 24-Hour
Water Pollution Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

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

Help Prevent Ocean Pollution:

Tips for Pool Maintenance



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Tips for Pool Maintenance

Many pools are plumbed to allow the pool to drain directly to the sanitary sewer. If yours is not, follow these instructions for disposing of pool and spa water.

Acceptable and Preferred Method of Disposal

When you cannot dispose of pool water in the sanitary sewer, the release of dechlorinated swimming pool water is allowed if all of these tips are followed:

- The residual chlorine does not exceed 0.1 mg/l (parts per million).
- The pH is between 6.5 and 8.5.
- The water is free of any unusual coloration, dirt or algae.
- There is no discharge of filter media.
- There is no discharge of acid cleaning wastes.
- Some cities may have ordinances that do not allow pool water to be disposed into a storm drain. Check with your city.

How to Know if You're Following the Standards

You can find out how much chlorine is in your water by using a pool testing kit. Excess chlorine can be removed by discontinuing the use of chlorine for a few days prior to discharge or by purchasing dechlorinating chemicals from a local pool supply company. Always make sure to follow the instructions that come with any products you use.

Doing Your Part

By complying with these guidelines, you will make a significant contribution toward keeping pollutants out of Orange County's creeks, streams, rivers, bays and the ocean. This helps to protect organisms that are sensitive to pool chemicals, and helps to maintain the health of our environment.

PROJECT Pollution PREVENTION

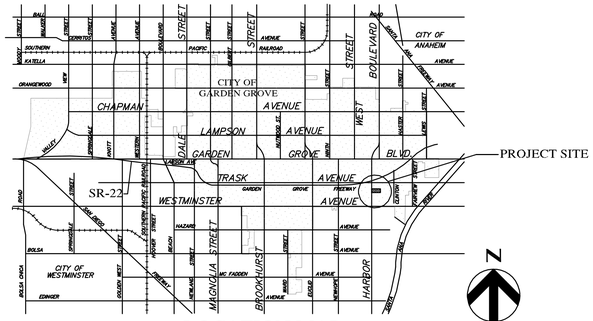
Appendix B:

WQMP Site &Drainage Plan

WQMP SITE & DRAINAGE GROVE

13650 HARBOR BLVD.

GARDEN GROVE, CA



LOCATION MAP

SCALE: AS SHOWN APPROX.

N

SCALE: 1"=20'

0 10' 20' 30'

CONSTRUCTION NOTES

BENCH MARK: OCS-1F-160-92
ELEVATION: 92.747 FEET
DATUM: NAVD-88 (GG2012 ADJ)
YEAR LEVELED: 2012
IN THE SOUTHWEST COR. OF A 6 FT. BY TRASK AVE. & HARBOR BLVD., 72 FT. V CONC. CATCH BASIN. MON. IS LOCATED IN THE NORTHEAST COR. OF THE INT. OF NORTHERLY OF THE CL OF TRASK AVE. & 52 FT. EASTERLYOF THE CL OF HARBOR BLVD.

LEGAL DESCRIPTION

REAL PROPERTY IN THE CITY OF GARDEN GROVE, COUNTY OF ORANGE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCEL 1:

THE WESTERLY 330.00 FEET OF THE NORTH 199.00 FEET OF THE SOUTH HALF OF THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER SECTION 3, TOWNSHIP 5 SOUTH, RANGE 10 WEST, IN HE RANCHO LAS BOLSAS, IN THE CITY OF GARDEN GROVE, COUNTY OF ORANGE, STATE OF CALIFORNIA, AS SHOWN ON A MAP RECORDED IN BOOK 51, PAGE 12 OF MISC. MAPS, RECORD OF ORANGE COUNTY, CALIFORNIA.

PARCEL 2:

THE EASTERLY 55.00 FEET OF THE WESTERLY 385.00 FEET OF THE NORTH 199.00 FEET OF THE SOUTH HALF OF THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 3, TOWNSHIP 5 SOUTH, RANGE 10 WEST, IN THE RANCHO LAS BOLSAS, IN THE CITY OF GARDEN GROVE, COUNTY OF ORANGE, STATE OF CALIFORNIA, AS SHOWN ON A MAP RECORDED IN BOOK 51, PAGE 12 OF MISC. MAPS, RECORD OF ORANGE COUNTY, CALIFORNIA.

PARCEL 3:

AN APPURTENANT NON-EXCLUSIVE EASEMENT FOR ENCROACHMENT PURPOSES AS SAID EASEMENT SHOWN ON ATTACHMENT A IN THAT CERTAIN "GRANT OF NON-INCLUSIVE EASEMENT" RECORDED JAN. 23, 1991, AS INSTRUMENT NO. 91-032600 OF OFFICIAL RECORDS OF ORANGE COUNTY, CALIFORNIA.

APN : 101-080-66 AND 101-080-27

LEGEND

(414.53)	EXISTING ELEVATION
520.00	PROPOSED ELEVATION
(530)	EXISTING CONTOUR
	DRAINAGE PATTERN
	EXISTING STRUCTURE
	PROPERTY LINE
	FIRE HYDRANT
	CATCH BASIN
	DRAIN INLET
	PROPOSED STRUCTURE
	RETAINING WALL

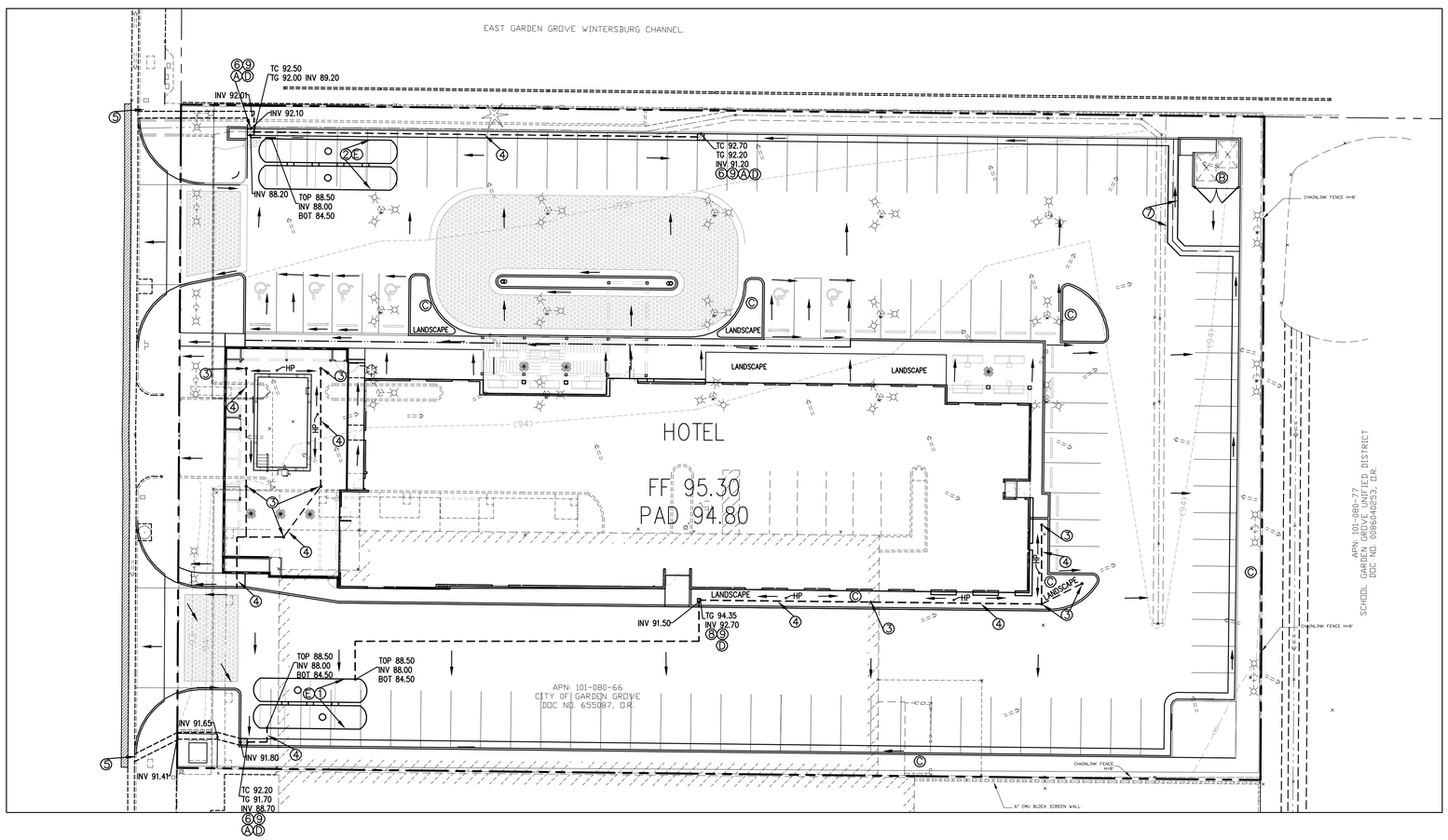
TG	TOP GRATE
INV	INVERT ELEVATION
FS	FINISH SURFACE
TC	TOP OF CURB
F.S.	FINISH SURFACE
F.F.	FINISH FLOOR
H.P.	HIGH POINT
T.W.	TOP OF RETAINING WALL
T.F.	TOP OF FOOTING
EH	EXPOSED WALL HEIGHT
FG	FINISHED GRADE
EX	EXISTING
FC	FINISHED CONCRETE
EC	END OF CONCRETE
EP	END OF PAVEMENT

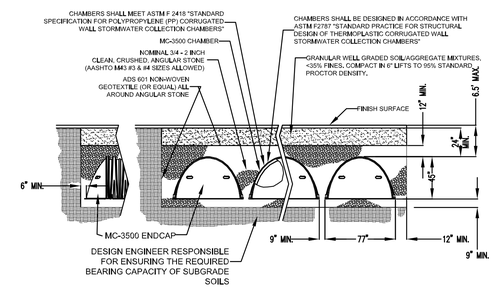
CONSTRUCTION NOTES

1. CONSTRUCT STORMTECH MC-3500 INFILTRATION BASIN OR EQUIVALENT. (8-CHAMBERS, 4-END CAPS)
2. CONSTRUCT STORMTECH MC-3500 INFILTRATION BASIN OR EQUIVALENT. (10-CHAMBERS, 4-END CAPS)
3. PROPOSED AREA DRAIN.
4. PROPOSED PVC SCH. DRAIN PIPE.
5. PROPOSED PARKWAY DRAIN PER CITY STD. B-209.
6. PROPOSED CATCH BASIN W/TRAFFIC COVER.
7. PROPOSED WIDE CONC. SWALE.
8. PROPOSED CATCH BASIN W/NON-TRAFFIC COVER.
9. PROPOSED FLOGARD+ CATCH BASIN FILTER OR EQUIVALENT.

BMP NOTES

- (A) S1, STORM DRAIN SIGNAGE
- (B) S3, TRASH STORAGE AREAS
- (C) S4, EFFICIENT IRRIGATION
- (D) PRE-2, CATCH BASIN INSERTS
- (E) INF-7, INFILTRATION BASIN

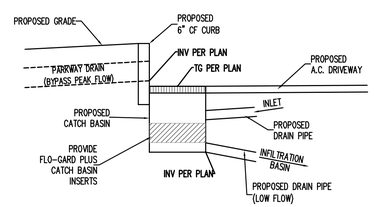




1. THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
2. PERIMETER STONE MUST ALWAYS BE BROUGHT UP EVENLY WITH BACKFILL OF BED. PERIMETER STONE MUST EXTEND HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH STRAIGHT OR SLOPED SIDEWALLS.

MC-3500 CROSS SECTION (2)(E)
(NOT TO SCALE)

STORM DRAIN SYSTEM STENCILING AND SIGNAGE (A)
(NTS)



CATCH BASIN DETAIL
(NOT TO SCALE) (6)(9)(A)(D)

EGL JOB #: 17-294-003

DESIGNED BY:	DRAWN BY:	CHECKED BY:
GB	GB	HJ

PLANS PREPARED UNDER SUPERVISION OF
HANK JONG
DATE R.C.E. NO. 45846

REFERENCE PLANS FOR THESE IMPROVEMENTS

DATE	BY	DESCRIPTION	APP'D
		REVISIONS	

ARCHITECT
ZBT GROUP
401 MARION BLVD.
FULLERTON, CA 92835
Tel.: (714) 476-7778
E-mail: binh@zbtgroup.com

OWNER
GARDEN GORVE HOTEL LLC
13650 HARBOR BLVD
GARDEN GROVE, CA 92843

APPROVED BY : _____ DATE : _____
CITY ENGINEER R.C.E. No. 52125 DIRECTOR OF PUBLIC WORKS
THIS PLAN IS SIGNED BY THE PUBLIC WORKS DEPARTMENT FOR CONCEPT AND ADHERENCE TO CITY STANDARDS AND REQUIREMENTS ONLY. THE PUBLIC WORKS DEPARTMENT IS NOT RESPONSIBLE FOR DESIGN, DESIGN ASSUMPTIONS OR ACCURACY.

CITY OF GARDEN GROVE
WQMP SITE & DRAINAGE PLAN
13650 HARBOR BLVD.

G-1700
DRAWING NUMBER
1
SHEET 1 OF 1

Appendix C:

Percolation Test Result

Geotechnical
Environmental
Hydrogeology
Material Testing
Construction Inspection

July 26, 2017

Project No. 17-6513

Mr. Binh Tran
ZBT group
Land Development Consultants
401 Marion Blvd
Fullerton, CA 92835

Subject: Preliminary Geotechnical Investigation Report Including Percolation Testing, Proposed 5-Story Hotel, 13650 South Harbor Blvd, Garden Grove, California

Binh,

In accordance with your request and authorization, TGR Geotechnical, Inc. (TGR) has performed a preliminary geotechnical investigation for the proposed hotel at the subject site. The site is currently occupied by a former automotive building with associated repair docks and parking areas. It is our understanding that the existing structures will be demolished and the proposed development will consist of a 5-story hotel with a pool, planter areas, and associated drive lanes and parking. This report presents the findings of our geotechnical investigation, including site seismicity and provides geotechnical design recommendations for the proposed development.

Based on our investigation the proposed development is feasible from a geotechnical viewpoint provided the recommendations presented in this report are implemented during design and construction.

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

Respectfully submitted,

TGR GEOTECHNICAL, INC.

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Attachments:

Plate 1 - Boring Location Map
Figure 1 - Site Location Map
Figure 2 - Regional Geology Map
Figure 3 - Historic High Groundwater Map
Figure 4 - Regional Fault Map
Figure 5 - Seismic Hazard Zone Map

Appendix A – References
Appendix B – Log of Borings
Appendix C – Laboratory Testing Procedures and Results
Appendix D – Liquefaction Analysis

INTRODUCTION

Site Descriptions and Proposed Project Development

The subject site is located at 13650 South Harbor Boulevard, within the City of Garden Grove, California (Site Location Map, Figure 1). The subject site is currently occupied by a former automotive center with parking, repair docks, and retail building. It is our understanding that the existing structures will be demolished and the proposed development will consist of a 5-story hotel with a pool, associated drive aisles, parking lot, and planter space.

Scope of Work

The scope of work for this geotechnical investigation included the following:

- Site reconnaissance.
- Excavation of four (4) hollow stem auger borings to the approximate depths ranging from 26.5 to 51.5 feet below the existing grade.
- Percolation testing of one location to a depth of 5 feet utilizing a hollow stem auger drill rig.
- Laboratory testing of selected samples for In-situ moisture and density, maximum dry density and optimum moisture content, shear, sieve, consolidation, and corrosion.
- Engineering evaluation for liquefaction and seismic settlement, foundation and pavement design.
- Preparing this report summarizing current subsurface soil conditions, findings, and presenting our recommendations for the proposed development.

Field Investigation

Field exploration was performed on June 30, 2017 by a representative from our firm who logged the borings and obtained representative samples, which were subsequently transported to the laboratory for further review and testing. The approximate locations of the borings are indicated on the enclosed Boring Location Map (Plate 1).

The subsurface conditions were explored by drilling, sampling, and logging four (4) borings with a truck mounted hollow stem drill rig. Boring B-2 was advanced to an approximate depth of 51.5 feet below existing grade. Borings B-1, B-3, and B-4 were advanced to approximately 26.5 feet below existing grade. One additional boring, P-1, was advanced to approximately 5 feet below existing grade and utilized for percolation testing of the near-surface soils. Subsequent to drilling, all borings were backfilled with cuttings and surface repaired with cold patch asphalt. The logs of borings together with an explanation of symbols used are given in Appendix B.

The drill rig was equipped with a sampling apparatus to allow for recovery of driven modified California Ring Sampler (CRS), 3-inch outside diameter, and 2.42-inch inside diameter samples. Driven samples and bulk samples of the earth materials encountered at selected intervals were recovered from the borings. From the borings, all samples were secured in moisture-resistant

bags as soon as taken to minimize the loss of field moisture while being transported to the laboratory. The locations and depths of the soil samples recovered are indicated on the logs in Appendix B.

Laboratory Testing

Laboratory tests were performed on representative samples to verify the field classification of the recovered samples and to evaluate the geotechnical properties of the subsurface soils. The following tests were performed:

- In-situ moisture content (ASTM D2216) and dry density (ASTM D7263);
- Maximum Dry Density and Optimum Moisture Content (ASTM D1557);
- Corrosion series:
    1. Soluble Sulfate (CAL.417A);
    2. Soluble Chlorides (CAL.422);
    3. Minimum Resistivity (CAL.643); and
    4. pH
- Sieve Analysis (ASTM D6913);
- Consolidation potential (ASTM D2435); and
- Direct shear strength (ASTM D3080).

Laboratory tests for geotechnical characteristics were performed in general accordance with the ASTM procedures. The results of the in-situ moisture content and density tests are shown on the boring log (Appendix B). The results of the laboratory tests are presented in Appendix C.

GEOTECHNICAL FINDINGS

Geology

Regional Geologic Setting

The subject property is located near the southern extent of the Los Angeles Basin. The Los Angeles Basin is considered part of the Transverse Ranges geomorphic province of California. The Transverse Ranges extends about 325 miles from Point Arguello and San Miguel Island on the west into Joshua Tree National Monument on the east where it merges with the Mojave and Colorado Desert provinces. The Transverse Ranges province has an irregular east-west shape and varies from about 40 to 60 miles wide.

The Los Angeles Basin is situated at the junction of two major convergent fault systems. The first group includes the northwest-trending high angle strike slip faults of the San Andreas system projecting from the northern terminus of the Peninsular Ranges province. Faults in this group include the Palos Verdes, Newport-Inglewood and Whittier-Elsinore fault zones. The second group includes the east-west trending low angle reverse or reverse-oblique faults bounding the south margin of the Transverse Range province. Faults in this group include the Malibu-Santa Monica, Hollywood, Raymond and Sierra Madre fault zones. The Los Angeles Basin is bounded by active faults on all sides and is underlain by alluvial sediments and buried thrust faults. The seismic hazard for the Los Angeles Basin and vicinity is high. Figure 2, Regional Geologic Map,

presents the location of the project site with respect to regional geology of the project site and vicinity.

Earth Units

At the subject site, the upper 15 feet of subsurface soils are generally slightly moist to moist, brown, silty sand to sand with varying amounts of sand and silt. At approximately 15 feet below ground surface, a thin layer of silt to silty sand occurs to approximately 20 feet. The material below this is generally fine to coarse sand with varying amounts of silt in a wet and loose condition to approximately 45 feet below grade. Below this the material becomes silty sand at 45 feet and silt at 50 feet to the maximum depth explored, approximately 51.5 feet below grade. A detailed description of soils encountered is included on the boring logs, Appendix B. The site soils are generally consistent with the young alluvial fan deposits described in the geologic map for the area (Morton and Miller, 2006).

Infiltration Testing

The infiltration testing was performed in general accordance with the test procedures outlined in the Orange County Model Water Quality Management Plan (WQMP), dated May 19, 2011.

The results of our testing are as follows:

P-1 5.0 inches per hour design infiltration rate

The design infiltration rate includes a safety factor of 2.5.

Groundwater

A review of the seismic hazard report for the Anaheim quadrangle indicates that the historic high groundwater at the subject site is approximately 8 feet below existing ground surface. The Historic High Groundwater Map is presented on Figure 3, attached. Groundwater was encountered at a depth of approximately 22 feet below ground surface at the time of our investigation. Seasonal and long-term fluctuations in the groundwater may occur as a result of variations in subsurface conditions, rainfall, run-off conditions and other factors. Therefore, variations from our observations may occur. Groundwater is not anticipated to negatively impact grading operations during construction.

Seismic Review

Faulting and Seismicity

The subject site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto and Elsinore fault zones. These fault systems produce approximately 5 to 35 millimeters per year of slip between the plates.

By definition of the State Mining and Geology Board, an active fault is one which has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). The State

Mining and Geology Board has defined a potentially active fault as any fault which has been active during the Quaternary Period (approximately the last 1,600,000 years). These definitions are used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Geologic Hazard Zones Act of 1972 and as subsequently revised in 1994 (Hart, 1997) as the Alquist-Priolo Geologic Hazard Zoning Act and Earthquake Fault Zones.

The intent of the act is to require fault investigations on sites located within Special Studies Zones to preclude new construction of certain inhabited structures across the trace of active faults.

The subject site is not included within any Earthquake Fault Zones as created by the Alquist-Priolo Earthquake Fault Zoning Act (Hart, 1997). Our review of geologic literature pertaining to the site area indicates that there are no known active or potentially active faults located within or immediately adjacent to the subject property. The nearest known active fault is the El Modeno Fault located approximately 5.8 miles northeast of the subject site. The next nearest known active fault is the Peralta Hills Fault located approximately 6.6 miles northeast of the subject site. The Newport-Inglewood Fault is located approximately 6.3 miles south of the subject site. The Regional Fault Map (Figure 4) shows the subject site in relation to the faults in the area.

Secondary Seismic Hazards

Surface Fault Rupture and Ground Shaking

Since no known faults are located within the site, surface fault rupture is not anticipated. However, due to the close proximity of known active and potentially active faults, severe ground shaking should be expected during the life of the proposed structures.

Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs when these ground conditions exist: 1) Shallow groundwater; 2) Low density, fine, clean sandy soils; and 3) High-intensity ground motion. Effects of liquefaction can include sand boils, settlement, and bearing capacity failures below foundations.

Based on our review of Seismic Hazard Zones in California the subject site is located within a mapped liquefaction zone (Figure 5). Due to the presence of loose sandy soils below the historic high water table, the potential for liquefaction at the subject site is high.

Groundwater was observed in the borings at an approximate depth of 22 feet below ground surface. Liquefaction analysis and seismic settlement calculations were performed based on a peak ground acceleration of 0.53g (PGA_M), moment magnitude of 6.6 and a historic high groundwater of 8 feet below existing grade. Results of the liquefaction study are presented in Appendix D. The subsurface soils have a potential for liquefaction from a depth of approximately 8 feet to 45 feet. Due to excessive liquefaction induced seismic settlement ground improvement utilizing deep soil cement mixing or stone columns is recommended to reduce the future liquefaction induced settlement.

Seismically Induced Settlement

Ground accelerations generated from a seismic event can produce settlements in sands or in granular earth materials both above and below the groundwater table. This phenomenon is often referred to as seismic settlement and is most common in relatively clean sands, although it can also occur in other soil materials. The liquefaction induced settlement is estimated to be 8.2 inches. The seismic settlement of dry sand is estimated to be negligible after remedial grading. Calculations for liquefaction induced settlement are presented in Appendix D. Ground improvement comprising of deep soil cement columns or stone columns is recommended to control the seismic settlement.

Lateral Spreading

Seismically induced lateral spreading involves primarily movement of earth materials due to earth shaking. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The topography in the vicinity of the subject site is relatively flat with a lined channel. Therefore, the potential for lateral spreading at the subject site is considered very low.

DISCUSSIONS AND CONCLUSIONS

General

Based on our field exploration, laboratory testing, and geotechnical engineering analysis, the proposed improvements are considered suitable from a geotechnical viewpoint, provided that the recommendations contained in this report are incorporated into the design and construction phases of the project.

Conclusions

Based on our findings and analyses, the subject site is likely to be subjected to moderate to severe ground shaking due to the proximity of known active and potentially active faults. This may reasonably be expected during the life of the structure and should be designed accordingly.

The engineering evaluation performed concerning site preparation and the recommendations presented are based on information provided to us and obtained by us during our office and fieldwork. This report is prepared for the proposed 5-story hotel at the site. In the event that any significant changes are made to the proposed development, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the recommendations of this report are verified or modified in writing by TGR.

RECOMMENDATIONS

Seismic Design Parameters

When reviewing the 2016 California Building Code the following data should be incorporated into the design.

Latitude (degree)	33.7651
Longitude (degree)	-117.9196
Site Class	D
Site Coefficient, F_a	1.0
Site Coefficient, F_v	1.5
Mapped Spectral Acceleration at 0.2-sec Period, S_s	1.459 g
Mapped Spectral Acceleration at 1.0-sec Period, S_1	0.534 g
Spectral Acceleration at 0.2-sec Period Adjusted for Site Class, S_{MS}	1.459 g
Spectral Acceleration at 1.0-sec Period Adjusted for Site Class, S_{M1}	0.801 g
Design Spectral Acceleration at 0.2-sec Period, S_{DS}	0.973 g
Design Spectral Acceleration at 1.0-sec Period, S_{D1}	0.534 g

The structural consultant should review the above parameters and the 2016 California Building Code to evaluate the seismic design.

Conformance to the criteria presented in the above table for seismic design does not constitute any type of guarantee or assurance that significant structural damage or ground failure will not occur during a large earthquake event. The intent of the code is "life safety" and not to completely prevent damage of the structure, since such design may be economically prohibitive.

Foundation Design Recommendations

Presented below are preliminary foundation recommendations for the proposed structures. We have assumed that the proposed 5-story Hotel will have typical column loads (dead plus live) of up to 200 kips. These recommendations assume that the near surface soils are graded in accordance with the grading requirements presented in grading section of this report.

Shallow Foundation Supported on Deep Soil-Cement Mix Columns (5-story Hotel)

The proposed 5-story hotel buildings may be supported on shallow pad footings with grade beams in two perpendicular directions supported on deep soil-cement mix columns (DSM). The purpose of DSM is to limit the total and differential seismic settlement.

The DSM columns shall be designed to limit the total and differential seismic settlement to 1.5-inches and 0.75 inches over 30 feet, respectively. A higher settlement may be allowed if acceptable to the project structural engineer and approved by the geotechnical engineer. The soil-cement mix columns will be located in a grid pattern connecting the column location. The

spacing and depth of the columns shall be designed by the specialty contractor in coordination with the geotechnical engineer and approved by the geotechnical engineer of record. The overall area replacement ratio shall be at least 42 percent within a minimum soil mix column diameter of 3-feet and a minimum overlap of 6-inches. Soil cement columns will also be located under columns with the number of soil-cement columns depending on individual column loading. The column loads will be transmitted through pad footings and will be directly and entirely supported by the soil-cement columns. The soil-cement mix columns shall have a minimum 28-day compressive strength of 150 psi. A specialty contractor with a minimum experience of 5 years in DSM of similar nature shall prepare the DSM design and layout in coordination with the project structural and geotechnical engineer. The layout shall incorporate the recommendations presented in this report.

For pad and continuous foundations supported on deep soil cement mix columns, an allowable bearing pressure of 2800 pounds per square foot may be used in design.

All shallow foundations for 5-story structures shall be embedded a minimum of thirty (30) inches below the lowest adjacent grade and supported on DSM columns. The minimum recommended footing width is twenty-four (24) inches. A minimum reinforcement of two No. 5 steel bars top and two No. 5 steel bars bottom is required for continuous footings from a geotechnical viewpoint.

A one-third (1/3) increase on the aforementioned bearing pressure may be used in design for short-term wind or seismic loads.

The post construction total and differential static settlements between adjacent footings supported on compacted fill are not anticipated to exceed 0.6- inch and 0.5-inch over 30 feet, respectively. Anticipated (design) seismic settlement is presented earlier.

Resistance to lateral loads can be assumed to be provided by passive earth pressure and by friction acting on structural components in permanent contact with the subgrade soils.

Lateral resistance on the sides of footings may be computed using a passive pressure of 275 pounds per square foot per foot of embedment, subject to a maximum of 2750 pounds per square foot. An allowable friction coefficient of 0.40 may be assumed with dead load forces between concrete and the supporting soils.

Mat Foundation Supported on Stone Columns (5-story Hotel)

The proposed structure may be supported on mat foundation with stone columns. The stone columns shall be designed by a specialty contractor in coordination with the geotechnical engineer for the acceptable total and differential static and seismic settlement for the mat foundation. The stone columns shall have a maximum spacing of 8 foot on center with a minimum diameter of 3-foot. The installation shall be performed by vibro-replacement method with bottom feed. The stones shall consist of hard, durable, clean, crushed rock and shall comply with the following gradation requirements:

Sieve Opening	Percent Passing
1.5 inch	100
1 inch	90 - 100
½ inch	5 - 60
N0 4	0 - 5

The specialty ground improvement contractor shall ensure that the proposed stone column meet the intent of the design (seismic total and differential settlement of less than 1.5 inch and 0.75 inch over 30 feet, respectively) and a mat foundation bearing capacity of 1500 psf with a total and differential settlement of 1.5-inch and 0.75-inch over 30 feet. The ground improvement contractor should also evaluate any impact of vibration during stone column installation on adjoining properties and structures.

Mat foundation shall be a minimum of 14-inches thick with a minimum embedment of 12-inches supported on a minimum two (2) feet of crushed aggregate base compacted to a minimum 95 percent relative compaction. If pumping conditions are observed, the base may be underlain by Tensar BX1200 (or equivalent) with an additional 12-inch of ¾-inch crushed rock.

The modulus of subgrade reaction may be taken as 150 pci (K_1) for a one (1) square foot mat founded on improved soils. This value should be reduced for change in size per the following formula.

$$K = K_1 \left(\frac{B+1}{2B}\right)^2$$

Where B = Width of Mat;
K = Coefficient of Subgrade Reaction of Footings Measuring B(ft) x B(ft).

Verification Testing of the ground improvement shall be performed by the geotechnical engineer or the contractor and approved by the geotechnical engineer. Post-improvement CPT shall be advanced to ensure that the intended settlement and bearing capacity for the project has been achieved by installation of the stone columns. If the intended design requirements are not achieved additional stone columns may be recommended.

Lateral resistance on the sides of footings may be computed using a passive pressure of 275 pounds per square foot per foot of embedment, subject to a maximum of 2750 pounds per square foot. An allowable friction coefficient of 0.40 may be assumed with dead load forces between concrete and the supporting soils.

Shallow Spread Foundation for Canopies/ancillary structures (Light Weight):
An allowable vertical bearing value of 1,500 pounds per square foot (psf) may be used for design of pad and continuous footings founded on a minimum 3 feet of engineered fill. Pad (square) footings should be a minimum of 24-inches wide and 24-inches deep and continuous footings shall be a minimum of 18-inches wide and 24-inches deep. The above value may be

increased by one-third when considering short duration seismic or wind loads. The reinforcement should be designed by the project structural engineer. Significant seismic settlement (up to 8-inches) is anticipated during a seismic event. If the adverse impact of seismic settlement is unacceptable, ground improvement as stated earlier in the report may be considered to control seismic settlement.

The total and differential settlements due to footing loads are estimated to be on the order of 1-inch and ½-inch between columns, respectively.

Resistance to lateral loads including wind and seismic forces may be provided by frictional resistance between the bottom of concrete and the underlying fill soils and by passive pressure against the sides of the foundations. A coefficient of friction of 0.4 may be used between concrete foundation and underlying soil. The recommended passive pressure of the engineered fill may be taken as an equivalent fluid pressure of 275 pounds per cubic foot (2750 pcf maximum).

Cement Type and Corrosion

Concrete used should be designed in accordance with the provisions of ACI 318-11, Chapter 4 for Exposure Class S0.

Results of corrosion testing on the subsurface soils indicates that the soils are not considered corrosive to ferrous materials in contact with site soils. TGR does not practice corrosion engineering. If needed, a qualified specialist should review the site conditions and evaluate the corrosion potential of the site soil to the proposed improvements and to provide the appropriate corrosion mitigations for the project.

Building Slab-On-Grade

Building slab-on-grade for light loads should be a minimum of 6-inches thick and reinforced with a minimum of No. 5 reinforcing bar on 18-inch centers in two horizontally perpendicular directions. Reinforcing should be properly supported to ensure placement near the vertical midpoint of the slab. "Hooking" of the reinforcement is not considered an acceptable method of positioning the steel. The subgrade material should be compacted to a minimum of 90 percent of the maximum laboratory dry density (ASTM 1557) to a minimum depth of three (3) feet below existing grade. Prior to placement of concrete, the subgrade soils should be well moistened to at least near optimum moisture content and verified by our field representative.

Per CALGreen Code, a 4-inch thick base of ½-inch or larger clean aggregate shall be provided with a vapor retarder in direct contact with concrete and a concrete mix design which will address bleeding, shrinkage and curling. Alternatively, concrete floor slabs should be underlain with a moisture vapor retarder consisting of a polyvinyl chloride membrane such as 10-mil Visqueen, or equivalent. All laps within the membrane should be overlapped by at least 6 inches, and at least 2 inches of clean sand should be placed over the membrane to promote uniform curing of the concrete. To reduce the potential for punctures, the membrane should be placed on a pad surface that has been graded smooth without any sharp protrusions. If a smooth surface cannot be achieved by grading, consideration should be given to placing a 1-inch thick leveling course of sand across the pad surface prior to placement of the membrane. To prevent warped, curled, or bubbled floor coverings, the moisture emission through the

concrete and the alkalinity/ pH, and relative humidity of the concrete should meet the flooring or adhesive manufacturer's recommendations and requirements. Concrete floors to receive resilient flooring should be prepared in accordance with ASTM F710-03. Unless a qualified specialist is retained for the flooring design, the above should be incorporated in the design and construction of concrete floors to receive resilient flooring.

The actual thickness and reinforcement of the slab shall be designed by the structural engineer and should include the anticipated loading condition.

Flatwork

Flatwork should be a minimum of 4-inches thick should be reinforced with a minimum of No. 3 reinforcing bar on 18-inch centers in two horizontally perpendicular directions. Reinforcing should be properly supported to ensure placement near the vertical midpoint of the slab. "Hooking" of the reinforcement is not considered an acceptable method of positioning the steel. The subgrade material should be compacted to a minimum of 90 percent of the maximum laboratory dry density (ASTM 1557) to a minimum depth of two (2) feet. Prior to placement of concrete, the subgrade soils should be well moistened to at least near optimum moisture content and verified by our field representative. The actual thickness and reinforcement of the slab shall be designed by the structural engineer and should include the anticipated loading condition. Some movement of the flatwork is anticipated with time.

Preliminary Pavement Design

The County of Orange/Caltrans method of design was utilized to develop the following asphalt pavement section. The section was developed based on an assumed "R-Value" of 25 for silty sand subgrade soils.

A traffic index of 4.5 and 6 was assumed for use in the evaluation of automobile parking stalls and driveways, respectively. The traffic indices are subject to approval by controlling authorities and shall be approved by the project civil engineer.

ASPHALT PAVEMENT SECTION				
Pavement Utilization	Traffic Index	Asphalt (Inch)	Aggregate Base (Inch)	Total (Inch)
Parking Stalls	4.5	3.0	6.0	9
Auto Driveways	6.0	4.0	8.0	12

Aggregate base material should consist of CAB/CMB complying with the specifications in Section 200.2.2 of the current "Standard Specifications for Public Works Construction" and should be compacted to at least ninety-five (95) percent of the maximum dry density (ASTM D1557). The surface of the aggregate base should exhibit a firm and unyielding condition just prior to the placement of asphalt concrete paving. The pavement subgrade should be

constructed in accordance with the recommendations presented in the grading section of this report.

The R-value and the associated pavement section should be confirmed at the completion of site grading and pavement section updated as necessary.

Lateral Earth Pressures

The following soil parameters may be used for the design of retaining walls up to 6 feet high with level backfill:

Conditions	Equivalent Fluid Pressure (psf/ft) On-Site Materials
Active (Level)	38
At Rest	56
Passive	275 (maximum 2750 psf)

- Any import backfill shall be granular non-expansive select fill, with minimum sand equivalent of 30, tested and approved by TGR prior to backfill.
- An allowable coefficient of friction between properly compacted on-site fill soil and concrete of 0.40 may be used with the dead-load forces.
- The passive pressure in the upper 6 inches of soil not confined by slabs or pavement should be neglected.

Retaining structures should be provided with a drainage system to prevent buildup of hydrostatic pressure behind the walls. Provisions should be made to collect and dispose of excess water away from the wall. Wall drainage may be provided by a perforated pipe encased in gravel or crushed rock and enclosed by geo-synthetic filter fabric. We do not recommend omitting the drains behind walls.

In addition to the above lateral forces due to retained earth, surcharge due to improvements, such as an adjacent structure, should be considered in the design of the retaining wall. A minimum vertical surcharge load of 300 psf should be used in design of walls due to adjacent traffic unless the traffic is kept at least 6 feet from the walls. Loads applied within a 1:1 projection from any surcharging structure on the stem of the wall shall be considered as lateral surcharge. For uniform lateral surcharge conditions applied to free-to-deflect walls and restrained walls, we recommend utilizing a minimum horizontal load equal to 33 percent and 50 percent of the vertical load, respectively, and should be applied uniformly over the entire height of the wall. This horizontal load should be applied below the 1:1 projection plane. To minimize the surcharge load from an adjacent footing, deepened footings may be considered.

Retaining wall footings should have a minimum embedment of 24 inches below the lowest adjacent grade unless deeper footings are needed for other reasons. The retaining walls footings shall be supported on a minimum 3 feet of compacted engineered-fill compacted to a minimum 90 percent relative compaction as per ASTM D1557.

Pool/Spa Recommendations

The following presents our general recommendations for the proposed future pool/spa at the subject site. These recommendations do not incorporate the impact of seismic settlement on the performance of the pool/spa. The site's underlying materials have been determined to be negligible in expansion potential. Provided below are general design, construction and inspection recommendations:

1. Free standing pool walls need to be designed for an equivalent fluid pressure of 63 lbs./cu.ft. When the pool is empty the walls should be designed as recommended above.

2. The geotechnical consultant should observe the bottom of the pool excavation as pool subgrade soils are exposed.

3. The pool and spa should conform to setback criteria pertaining to slopes as established in the 2016 California Building Code.

4. Where the pool is planned near any structure, appropriate surcharge loads need to be incorporated into design and construction.

5. Hydrostatic pressure relief valves may be incorporated into the pool and spa design.

6. All fittings and pipe joints, particularly fittings in the side of the pool or spa, should be properly sealed to prevent water from leaking into the adjacent soil materials.

7. An elastic expansion joint (waterproof sealant) should be installed to prevent water from seeping into the soil at all deck joints.

8. A reinforced grade beam should be placed around the skimmers to provide support and mitigate cracking around the skimmer face.

9. The design engineer and/or contractor should determine joint and saw cut locations for the pool deck. However, spacing should not exceed 8 feet.

10. It is imperative that the homeowner incorporate into the overall improvement scheme adequate provisions for surface drainage. Ponding water, ground saturation and flows over slope faces are all situations that must be avoided.

11. All deck slabs should be minimally reinforced with no.4 steel bar at 18 inch on center both ways. All slab reinforcement should be supported to ensure proper mid-slab positioning during placement of concrete.

12. Slabs should have a minimum thickness of four inches with the perimeter edge thickened. The thickened edge shall have minimum 18-inch embedment.

Site Development Recommendations

General

During earthwork construction, all site preparation and the general procedures of the contractor should be observed, and the fill selectively tested by a representative of TGR. If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and if warranted, modified and/or additional recommendations will be offered.

Demolition and Clearing

Within the proposed development and demolition area, all foundation, slab-on-grade, vaults, utility lines, surface vegetation, trash, demolition debris, asphaltic concrete, and portland cement concrete, if encountered, should be cleared and removed from the proposed site.

Depressions resulting from the removal of objects encountered as mentioned above should be backfilled with properly compacted engineered fill under the observation of the geotechnical consultant.

Grading

All grading should conform to the guidelines presented in the California Building Code (2016 edition), except where specifically superseded in the text of this report. Prior to grading, TGR's representative should be present at the pre-construction meeting to provide grading guidelines, if needed, and review any earthwork.

It is recommended that the entire building pad be over-excavated a minimum of 4 feet below grade and replaced with engineered fill placed at 90 percent relative compaction at near optimum moisture content. The lateral extent of removals beyond the building/structure pad limits should be eight (8) feet, where possible. A minimum of two (2) feet of engineered fill is recommended under flatwork and pavement. Site soils may be reused as engineered fill provided the recommendations presented in this report are implemented. Exposed bottoms should be scarified a minimum of 8-inches, moisture conditioned and compacted to a minimum 90 percent relative compaction.

The depth of over-excavation should be reviewed by the Geotechnical Consultant during the actual construction. Any subsurface obstruction buried structural elements, and unsuitable material encountered during grading, should be immediately brought to the attention of the Geotechnical Consultant for proper exposure, removal and processing, as recommended.

Fill Placement

Prior to any fill placement TGR should observe the exposed surface soils. The site soils may be re-used as engineered fill provided they are free of organic content and particle size greater than 4-inches. Fill shall be moisture-conditioned to near optimum and compacted to a minimum relative compaction of 90 percent in accordance with ASTM D1557. Any import soils shall be non-expansive and approved by TGR Geotechnical Inc.

Compaction

Prior to fill placement, the exposed surface should be scarified to a minimum depth of eight (8) inches, fill placed in six (6) inch thick loose lifts if cohesionless and eight (8) inch thick loose lifts if cohesive fill, moisture conditioned to near optimum for cohesionless soils or a minimum of two (2) percent over optimum moisture for cohesive soils, and compacted to a minimum relative compaction of ninety (90) percent in accordance with ASTM D 1557.

Trenching

All excavations should conform to CAL-OSHA and local safety codes.

Drainage

Positive site drainage should be maintained at all times. Water should be directed away from foundations and not allowed to pond and/or seep into the ground. Pad drainage should be directed towards the street or other approved area. Drainage shall comply with the 2016 CBC.

Utility Trench Backfill

All utility trench backfill in structural areas and beneath hardscape features should be brought to near-optimum moisture content and compacted to a minimum relative compaction of 90 percent of the laboratory standard. Flooding/jetting is not recommended.

Sand backfill, (unless trench excavation material), should not be allowed in parallel exterior trenches adjacent to and within an area extending below a 1:1 plane projected from the outside bottom edge of the footing. All trench excavations should minimally conform to CAL-OSHA and local safety codes. Soils generated from utility trench excavations may be used provided it is moisture conditioned and compacted to 90 percent minimum relative compaction.

Geotechnical Review of Plans

All grading, foundation, building, and structural plans should be reviewed and accepted by the geotechnical consultant prior to construction. Based on the review, additional or amended geotechnical recommendations may be provided. If significant time elapses since preparation of this report, the geotechnical consultant should verify the current site conditions, and provide any additional recommendations (if necessary) prior to construction.

Geotechnical Observation/Testing During Construction

The geotechnical consultant should perform observation and/or testing at the following stages:

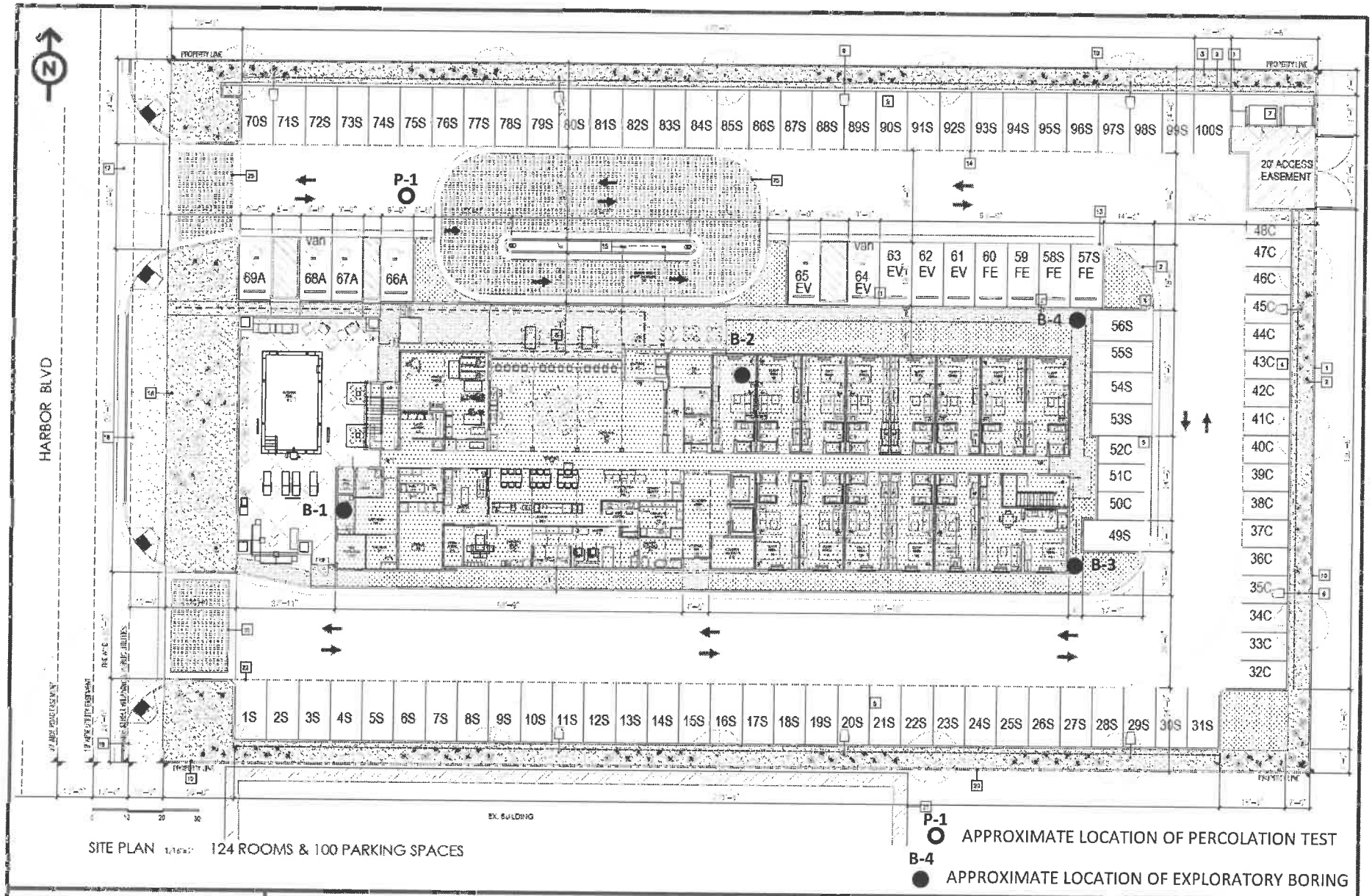
- During ground improvement
- During any grading and fill placement;
- After foundation excavation and prior to placing concrete;
- During pavement construction;
- Underground utility trench backfill;
- When any unusual soil conditions are encountered during any construction operation subsequent to issuance of this report.

Limitations

This report was prepared for a specific client and a specific project, based on the client's needs, directions and requirements at the time.

This report was necessarily based upon data obtained from a limited number of observances, site visits, soil and/or other samples, tests, analyses, histories of occurrences, spaced subsurface exploration and limited information on historical events and observations. Such information is necessarily incomplete. Variations can be experienced within small distances and under various climatic conditions. Changes in subsurface conditions can and do occur over time.

This report is not authorized for use by, and is not to be relied upon by any party except the client with whom TGR contracted for the work. Use or reliance on this report by any other party is that party's sole risk. Unauthorized use of or reliance on this report constitutes and agreement to defend and indemnify TGR from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of TGR.

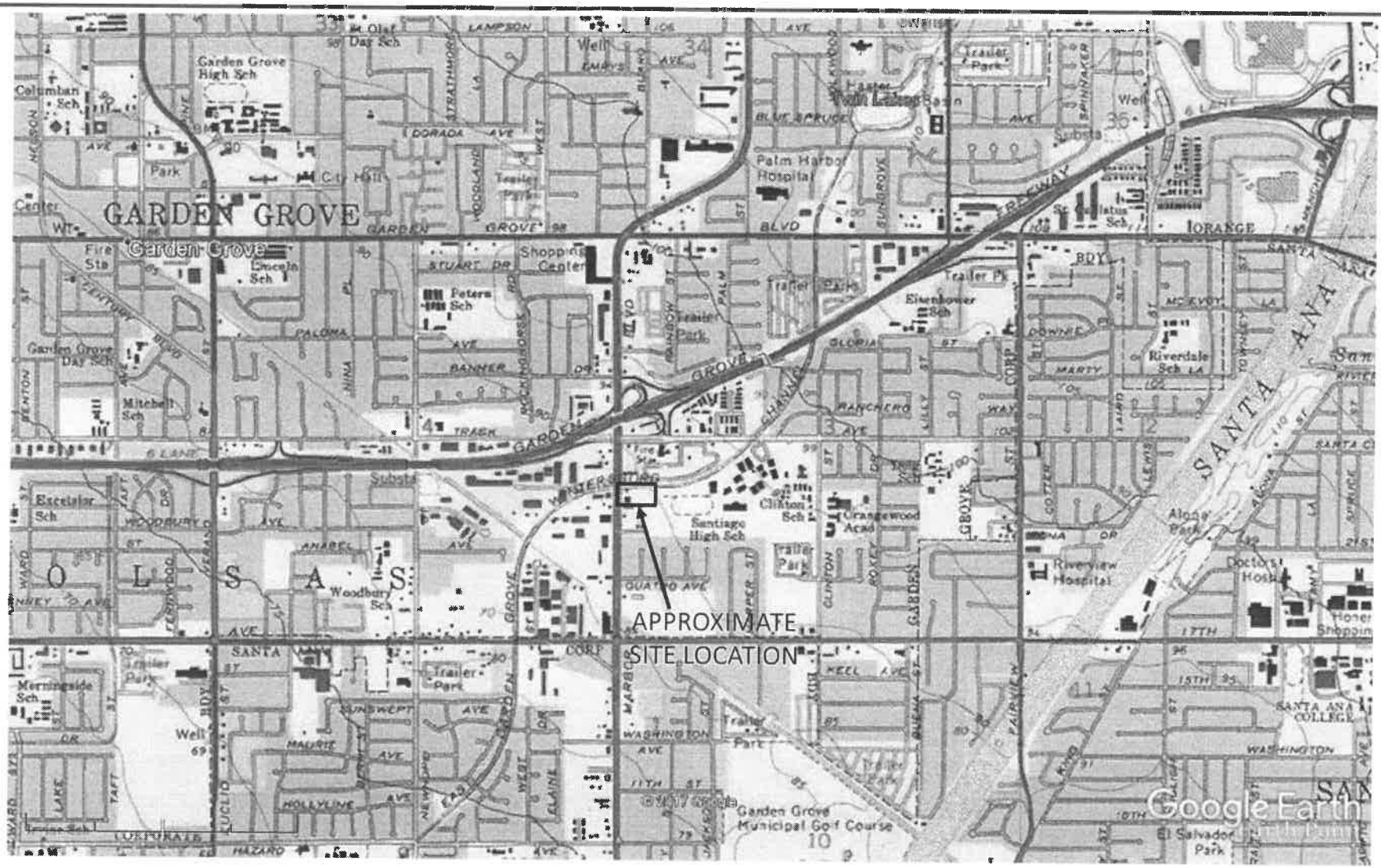


TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

BORING LOCATION MAP
13650 SOUTH HARBOR BOULEVARD
GARDEN GROVE, CALIFORNIA

PROJECT NO. 17-6513

PLATE 1



Google Earth

miles 1

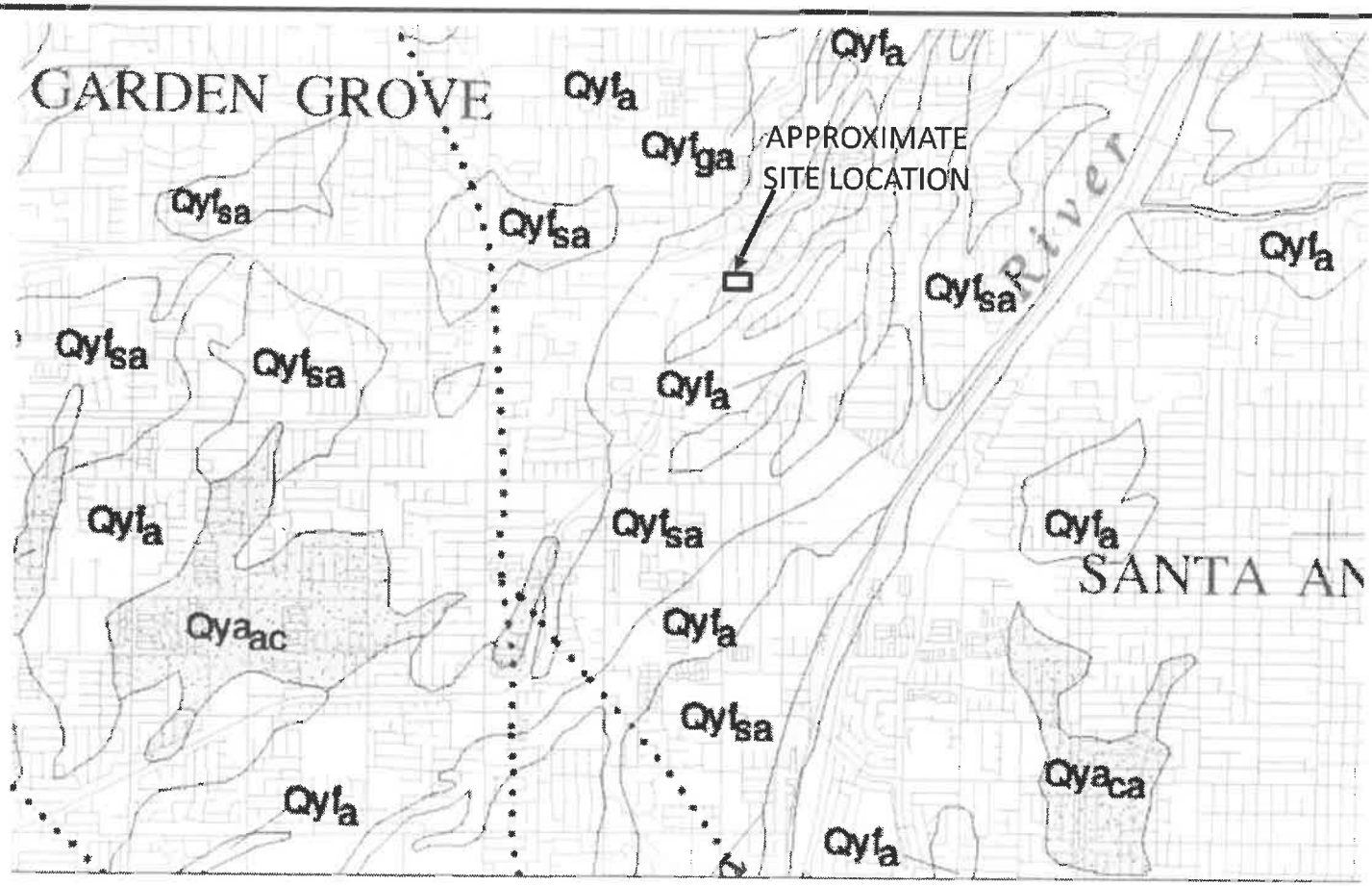
km 2

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

SITE LOCATION MAP
13650 SOUTH HARBOR BOULEVARD
GARDEN GROVE, CALIFORNIA

PROJECT NO. 17-6513

FIGURE 1



Modified From: Morton, D.M. and Miller, F.K., 2006, Geologic Map of the San Bernardino and Santa Ana 30'x60' Quadrangles, California, Version 1.0, scale 1:100,000

1 0 1 miles 2

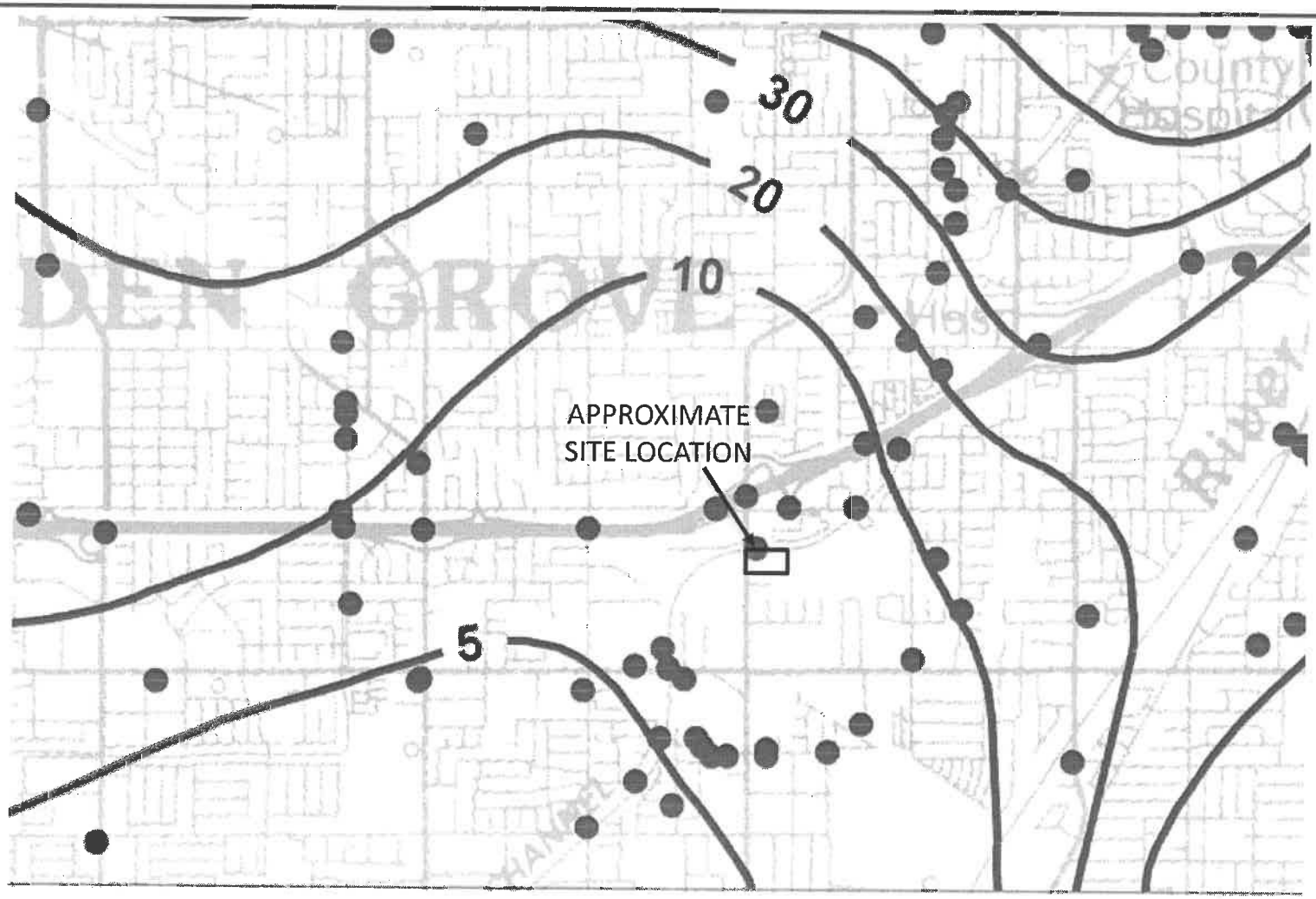
N

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

REGIONAL GEOLOGY MAP
13650 SOUTH HARBOR BOULEVARD
GARDEN GROVE, CALIFORNIA

PROJECT NO. 17-6513

FIGURE 2



ONE MILE

Modified From: California Department of Conservation, Division of Mines and Geology, 1997, Seismic Hazard Zone Report for the Anaheim and Newport Beach Quadrangles, Orange County, California, Seismic Hazard Zone Report 03.

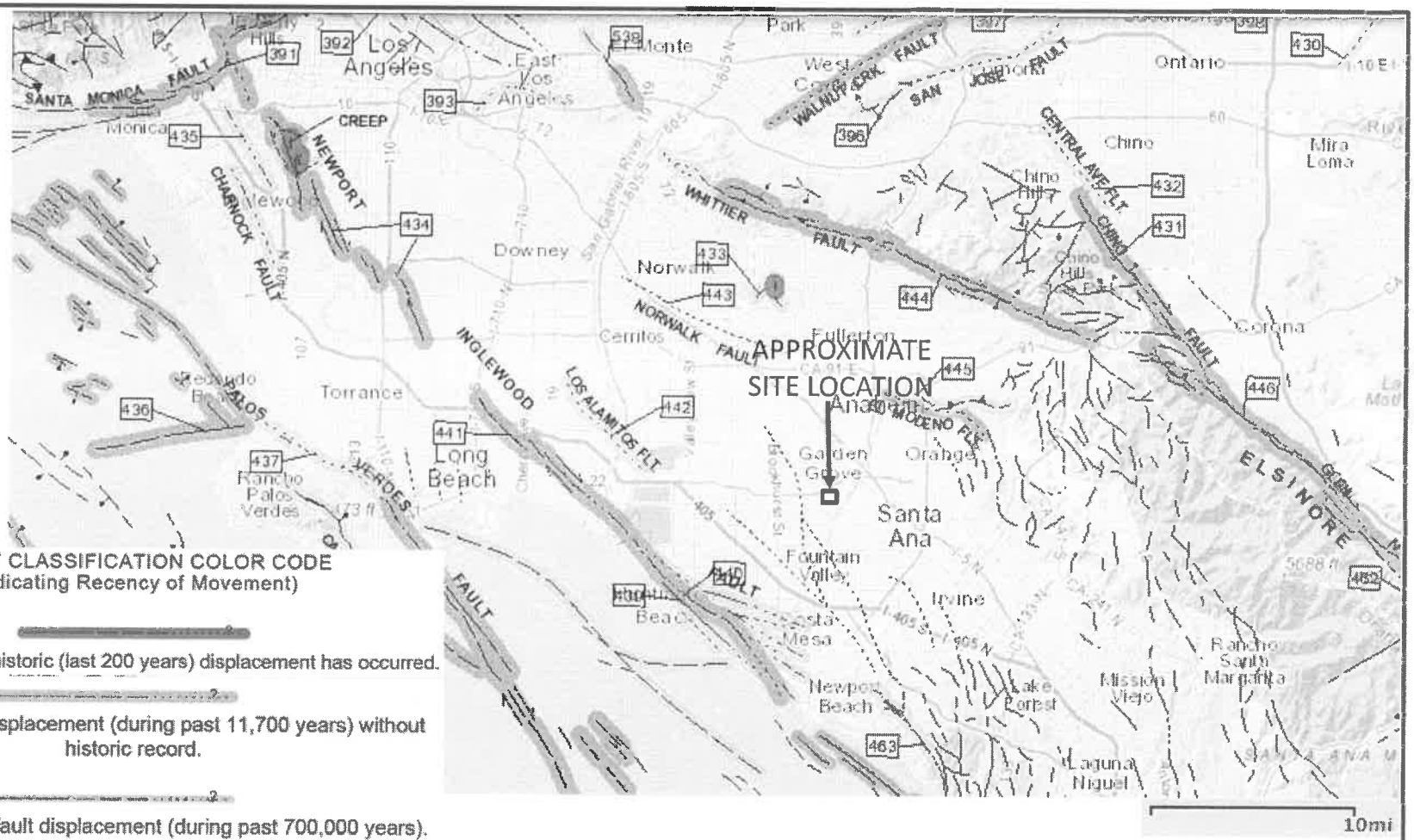
N

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

HISTORIC HIGH GROUNDWATER MAP
13650 SOUTH HARBOR BOULEVARD
GARDEN GROVE, CALIFORNIA

PROJECT NO. 17-6513

FIGURE 3



FAULT CLASSIFICATION COLOR CODE
(Indicating Recency of Movement)

Fault along which historic (last 200 years) displacement has occurred.

Holocene fault displacement (during past 11,700 years) without historic record.

Late Quaternary fault displacement (during past 700,000 years).

Quaternary fault (age undifferentiated).

Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement.

Modified From: California Geological Survey, 2010 Fault Activity Map of California, Geologic Data Map No. 6.

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

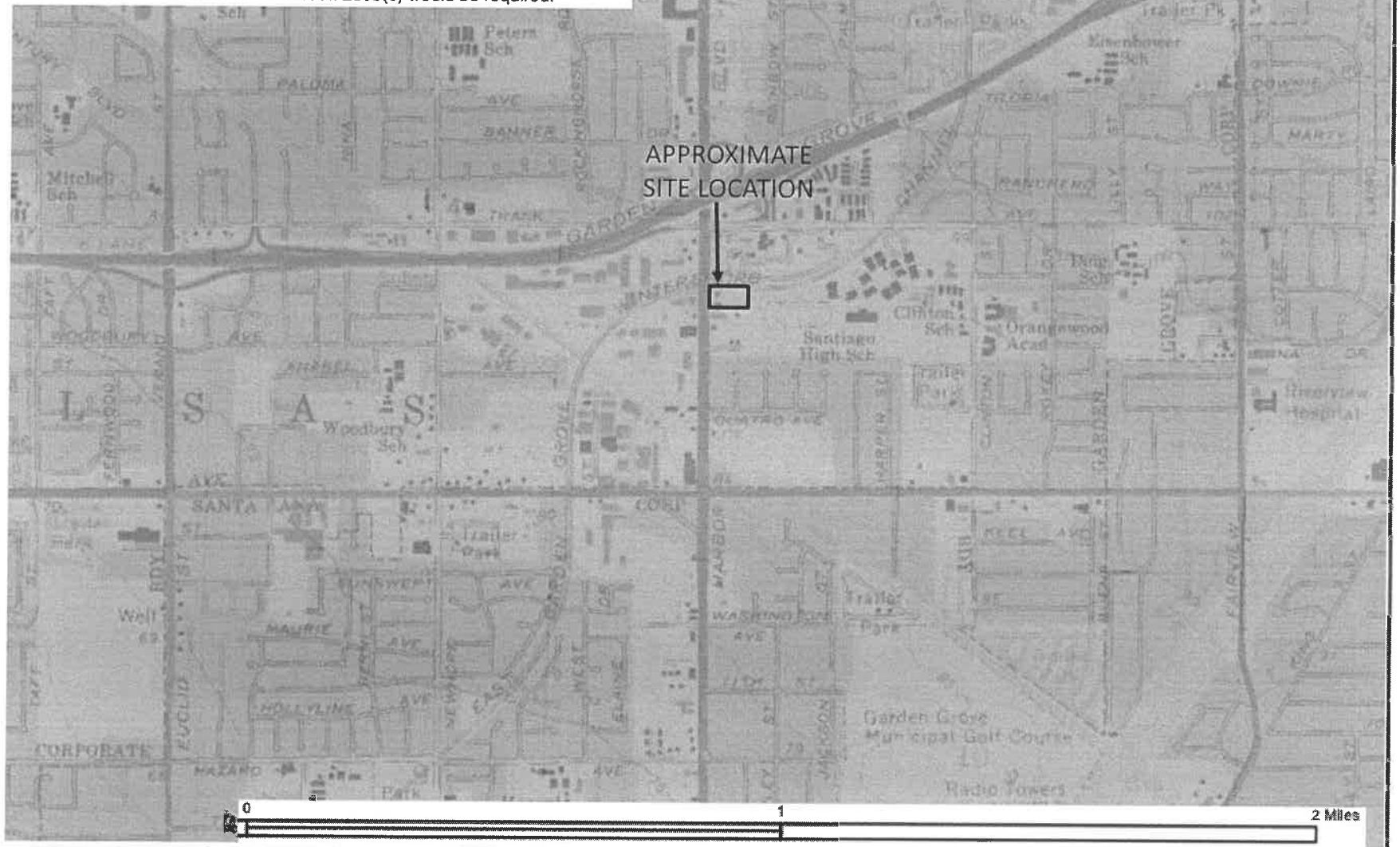
REGIONAL FAULT MAP
13650 SOUTH HARBOR BOULEVARD
GARDEN GROVE, CALIFORNIA

PROJECT NO. 17-6513

FIGURE 4

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

Modified From: California Geological Survey, Earthquake Zones of Required Investigation, Anaheim Quadrangle, Official Map dated April 15, 1998, scale 1:24,000.



TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

EARTHQUAKE ZONES OF REQUIRED INVESTIGATION MAP
13650 SOUTH HARBOR BOULEVARD
GARDEN GROVE, CALIFORNIA

PROJECT NO. 17-6513

FIGURE 5

APPENDIX A
REFERENCES

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APPENDIX A

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17-6510

Youd, Leslie, and Garris, Christopher T., Liquefaction-Induced Ground-Surface Disruption, Journal of Geotechnical Engineering, November 1995.

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APPENDIX B
LOG OF BORINGS

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THE FOLLOWING DESCRIBES THE TERMS AND SYMBOLS USED ON THE LOG OF BORINGS TO SUMMARIZE THE RESULTS OBTAINED IN THE FIELD INVESTIGATION AND SUBSEQUENT LABORATORY TESTING.

DENSITY AND CONSISTENCY

The consistency of fine grained soils and the density of coarse grained soils are described on the basis of the Standard Penetration Test as follows:

COARSE GRAINED SOILS		Estimated Unconfined Compressive Strength (Tsf)	FINE GRAINED SOILS	
Very Loose	< 4	< 0.25	Very soft	< 2
Loose	4 – 10	0.35 – 0.50	Soft	2 – 4
Medium	10 – 30	0.50 – 1.0	Firm (medium)	4 – 8
Dense	30 – 50	1.0 – 2.0	Stiff	8 – 15
Very dense	> 50	2.0 – 4.0	Very stiff	15 – 30
		> 4.0	Hard	> 30

PARTICULE SIZE DEFINITION (As per ASTM D2487 And D422)

Boulder	⇒ Larger than 12 inches	Coarse Sands	⇒ No. 10 to No. 4 sieve
Cobbles	⇒ 3 to 12 inches	Medium Sands	⇒ No. 40 to No. 10 sieve
Coarse Gravel	⇒ 3/4 to 3 inches	Fine Sands	⇒ No. 200 to 40 sieve
Fine Gravel	⇒ No. 4 to 3/4 inches	Silt	⇒ 5μm to No. 200 sieve
		Clay	⇒ Smaller than 5μm

SOIL CLASSIFICATION

Soils and bedrock are classified and described based on their engineering properties and characteristics and using ASTM D2487 and D2488.

Percentage description of minor components

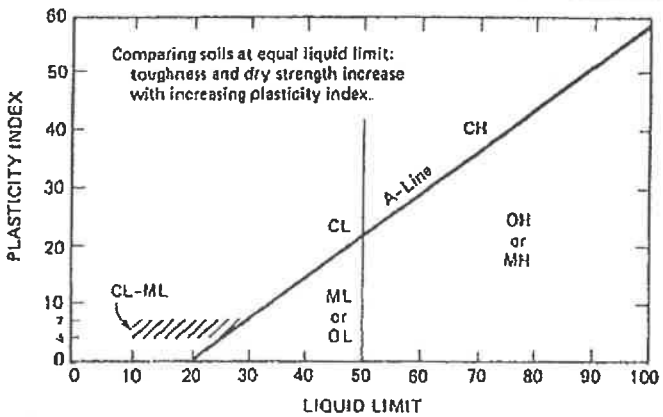
Trace	1-10 %	Some	20-35 %
Little	10-20 %	And or y	35-50 %

Stratified soils description

Parting	0 to 1/16 inch thick	Layer	½ to 12 inches thick
Seam	1/16 to ½ inch thick	Stratum	> 12 inches thick

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS	CLASSIFICATION CRITERIA
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	Not meeting all above requirements
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	Atterberg limits below "A" line or $I_p < 4$
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	Atterberg limits above "A" line or $I_p > 7$
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES	Not meeting all above requirements
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES	Atterberg limits below "A" line or $I_p < 4$
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES	Atterberg limits above "A" line or $I_p > 7$
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	$W_L < 50$
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	$W_L < 50$
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	$W_L > 50$
				CH	INORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	$W_L > 50$
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	Strong color or odor and often fibrous texture



LABORATORY TEST DESIGNATIONS

BR	Bearing Ration	PP	Pocket Penetrometer
C	Consolidation	R	R-Value
COR	Corrosion Test	S	Direct Shear
Chl	Water Soluble Chlorides	SA	Sieve Analysis
EI	Expansive Index	SE	Sand Equivalent
ER	Electrical Resistivity	Sg	Specific Gravity
K	Permeability	SO_4	Water Soluble Sulfates
MC	Moisture Content	SV	Shear Vane
OC	Organic Content	TC	Triaxial Compression
PH	PH Test	UC	Unconfined Compression

ADDITIONAL SOIL CLASSIFICATION

Fill	Ss Sandstone	Ms Siltstone	Bdr Bedrock

PARTICLE SIZE LIMITS

SILT OR CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

NO. 200 NO. 40 NO. 10 NO. 4 3/4 in. 3 in. (12 in.)

U. S. STANDARD SIEVE SIZE

TGR GEOTECHNICAL, INC.

LOG OF BORING EXPLANATION

PLATE 1

LOG OF EXPLORATORY BORING B-1

Project Number: 17-6513
Project Name: Garden Grove Hotel
Date Drilled: 6/30/17 - 6/30/17
Ground Elev:

Logged By: WQ
Project Engineer: SG
Drill Type: Hollow Stem
Drive Wt & Drop: 140lbs / 30in

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface is 2 inches of asphalt over 4 inches of base.			
							Silty Sand- brown, slightly moist, medium dense, fine grained, trace fine gravel.			
				18		SM		15	112	
5				14		SP	Sand- mottled greyish to olive brown, slightly moist, medium dense, coarse grained, trace fine gravel.	3	98	Consol
10				19		SP		4	99	
15				8		ML	Silt- greyish brown, slightly moist, soft.	18		
20				13		SP	Sand- light grey, slightly moist, medium dense, trace fine gravel.	4	110	
							Groundwater encountered at 22 feet.			
25				22		SP	Sand- greyish brown, wet, medium dense, some silt, fine to coarse grained.			
							Total Depth: 26.5 feet below existing grade. Groundwater encountered at approximately 22 feet below existing grade. Caving to 22 feet. Boring backfilled with soil cuttings and surface repaired with cold patch asphalt upon completion.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 2

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-2

Project Number: 17-6513
Project Name: Garden Grove Hotel
Date Drilled: 6/30/17 - 6/30/17
Ground Elev:

Logged By: WQ
Project Engineer: SG
Drill Type: Hollow Stem
Drive Wt & Drop: 140lbs / 30in

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface is 2 inches of asphalt over 4 inches of base.			
							Sand- light brown, mottled, slightly moist, medium dense, coarse grained, trace fine gravel.			
			■	13		SP		3	99	
5			■	13		SP	..... same as above	2	103	
10			■	11		SP	..... same as above	3	99	Consol
15			⊠	6		SP	..... same as above	5		-200= 3.6%
20			⊠	20		SP	Sand- light brown, moist, medium dense, trace silt.	5		-200= 5.5%
25			⊠	10		SP	Sand- light brown, wet, loose.	18		-200= 5.7%

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 3

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-2

Project Number: 17-6513
Project Name: Garden Grove Hotel
Date Drilled: 6/30/17 - 6/30/17
Ground Elev:

Logged By: WQ
Project Engineer: SG
Drill Type: Hollow Stem
Drive Wt & Drop: 140lbs / 30in

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	Moisture Content (%)	Dry Density, (pcf)	Other Tests
			X	19		SP	Sand- light brown, wet, medium dense.	16		
35			X	14		SP	Sand- greyish brown, wet, loose, fine to coarse grained, trace silt.	17		-200= 6.4%
40			X	11		SP		20		
45			X	12		ML	Sandy Silt- greyish brown, wet, stiff.	24		-200= 59.4%
50			X	10		ML	Silt- greyish brown, wet, stiff, trace sand.	27		-200= 76.8%
55							Total Depth: 51.5 feet below existing grade. Groundwater encountered at approximately 22 feet below existing grade. Caving to 22 feet. Boring backfilled with soil cuttings and surface repaired with cold patch asphalt upon completion.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 4

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-3

Project Number: 17-6513
Project Name: Garden Grove Hotel
Date Drilled: 6/30/17 - 6/30/17
Ground Elev:

Logged By: WQ
Project Engineer: SG
Drill Type: Hollow Stem
Drive Wt & Drop: 140lbs / 30in

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface is 2 inches of asphalt over 4 inches of base.			
							Sand- brown, moist, loose, trace silt, fine to coarse grained.			
				3		SP		7	110	Max, Shear
5				5		SP	becomes mottled.	4	96	Conso
10				12		SP	Sand- light olive brown, slightly moist, medium dense, coarse grained, trace fine gravel.	3	99	
15				7		SM	Silty Sand- brown, loose, moist, fine grained.	15		-200= 38.3%
20				17		SP	Sand- brown, medium dense, moist, coarse grained.	5	100	
							Groundwater encountered at 22 feet.			
25				16		SP	Sand- light brown, medium dense, wet, coarse grained, fine gravel.	15		
							Total Depth: 26.5 feet below existing grade. Groundwater encountered at approximately 22 feet below existing grade. Caving to 22 feet. Boring backfilled with soil cuttings and surface repaired with cold patch asphalt upon completion.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 5

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-4

Project Number: 17-6513
Project Name: Garden Grove Hotel
Date Drilled: 6/30/17 - 6/30/17
Ground Elev:

Logged By: WQ
Project Engineer: SG
Drill Type: Hollow Stem
Drive Wt & Drop: 140lbs / 30in

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface is 2 inches of asphalt over 4 inches of base.			
							Sand- light brown, slightly moist, medium dense, fine to coarse grained, some fine gravel.			
				8		SP		2	101	Corr.
5				8		SP	Sand- light brown, slightly moist, medium dense, mottled, coarse grained.	2	100	
10				16		SP		3	104	Consol
15				19		SP	Sand- light brown, slightly moist, medium dense, fine to coarse grained.	4		
20				20		SP	Sand- light brown, moist, dense, coarse graned, trace fine gravel.	9	106	
							Groundwater encountered at 22 feet.			
25				10		SM	Silty Sand- greyish brown, wet, loose, fine to coarse grained.	16		
							Total Depth: 26.5 feet below existing grade. Groundwater encountered at approximately 22 feet below existing grade. Caving to 22 feet. Boring backfilled with soil cuttings and surface repaired with cold patch asphalt upon completion.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 6

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING P-1

Project Number: 17-6513
Project Name: Garden Grove Hotel
Date Drilled: 6/30/17 - 6/30/17
Ground Elev:

Logged By: WQ
Project Engineer: SG
Drill Type: Hollow Stem
Drive Wt & Drop: 140lbs / 30in

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface is 2 inches of asphalt over 4 inches of base.			
						SP	Sand- light brown, loose, slightly moist, some silt.	6		-200= 14.6%
5							Total Depth: 5 feet below existing grade. No groundwater encountered during drilling. No caving observed. Boring utilized for percolation testing. Boring backfilled with soil cuttings and surface repaired with cold patch asphalt upon completion.			
10										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 7

TGR GEOTECHNICAL, INC.

APPENDIX C
LABORATORY TESTING PROCEDURES AND RESULTS

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APPENDIX C

Laboratory Testing Procedures and Results

Consolidation Tests: Consolidation tests were performed on selected, relatively undisturbed ring samples. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The consolidation pressure curves are presented in the test data.

Direct Shear Tests: Direct shear test was performed on a selected remolded sample, which was soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1-hour prior to application of shearing force. The sample was tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less than 0.001 to 0.5 inches per minute (depending upon the soil type). The test result is presented in the test data.

Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the test data and in the table below:

Sample Location	Sample Description	Maximum Dry Density (Pcf)	Optimum Moisture Content (%)
B-3 @ 0-5 feet	Silty Sand	126	11.0

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed on relatively undisturbed samples obtained from the test borings. The results of these tests are presented in the boring logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

Corrosivity Test: Electrical conductivity, pH, and soluble chloride tests were conducted on representative samples and the results are provided below and attached:

Sample Location	Sample Description	Soluble Chloride (CAL.422) ppm	Electrical Resistivity (CAL.643) (ohm-cm)	PH (CAL.747)	Potential Degree of Attack on Steel
B-4 @ 0-5 feet	Sand	64	11,000	6.8	Very Low Corrosive

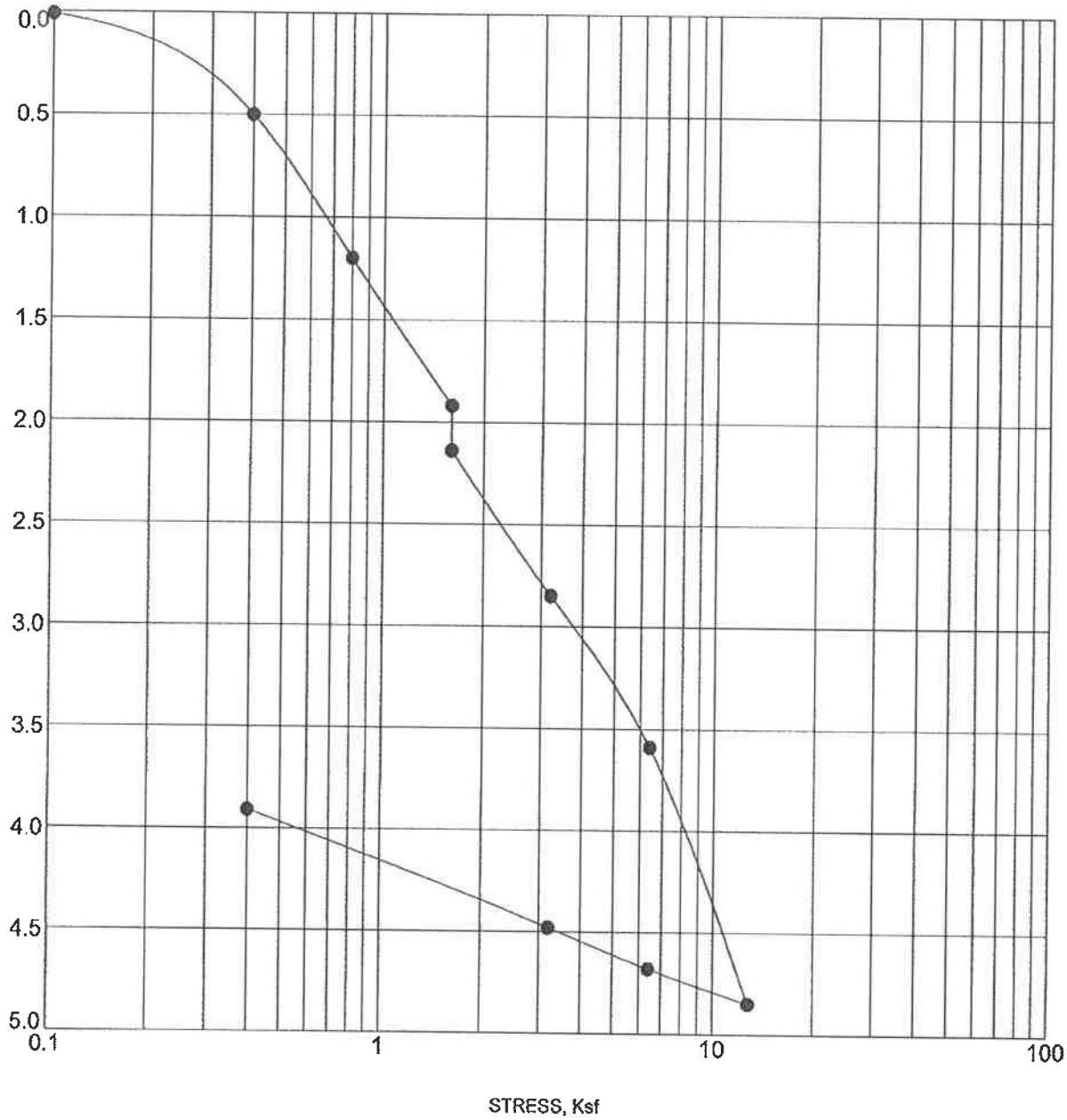
Soluble Sulfates: The soluble sulfate content of selected sample was determined by standard geochemical methods. The test result is presented in the table below:

Sample Location	Sample Description	Water Soluble Sulfate in Soil, (% by Weight)	Sulfate Content (ppm)	Exposure Class*
B-4 @ 0-5 feet	Sand	0.0292	292	S0

* Based on the current version of ACI 318-11 Building Code, Table No. 4.2.1; Exposure Categories and Classes.

Wash Sieve Test: Typical materials were washed over No. 200 sieve (ASTM Test Method D1140). The test results are presented below:

Sample Location	% Passing No. 200 Sieve
B-2 @ 15'	3.6%
B-2 @ 20'	5.5%
B-2 @ 25'	5.7%
B-2 @ 35'	6.4%
B-2 @ 45'	59.4%
B-2 @ 50'	76.8%
B-3 @ 15'	38.3%
P-1 @ 0-5'	14.6%



Specimen Identification			Classification	γ_d	MC%
●	B-2	10.0	**Sand, coarse grained, trace fine gravel.**	99	3

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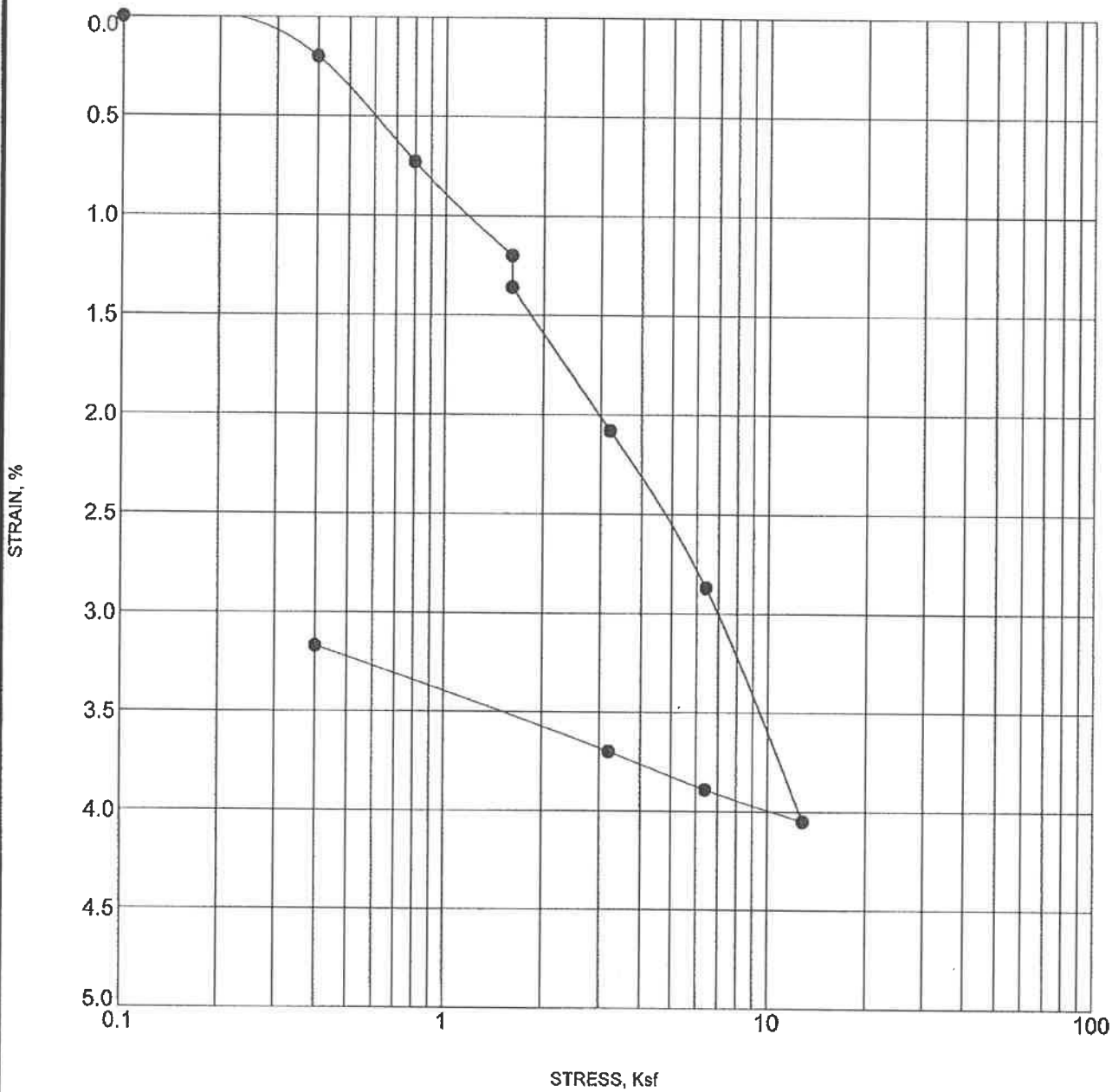
CONSOLIDATION TEST

Project Number: 17-6513

Project Name: Garden Grove Hotel

US CONSOL STRAIN 17-6513 HARBOR AND TRASK GARDEN GROVE.GPJ TGR GEOTECH.GDT 7/24/17



Specimen Identification			Classification	γ_d	MC%
●	B-1	5.0	**Sand, coarse grained, trace fine gravel**	98	3

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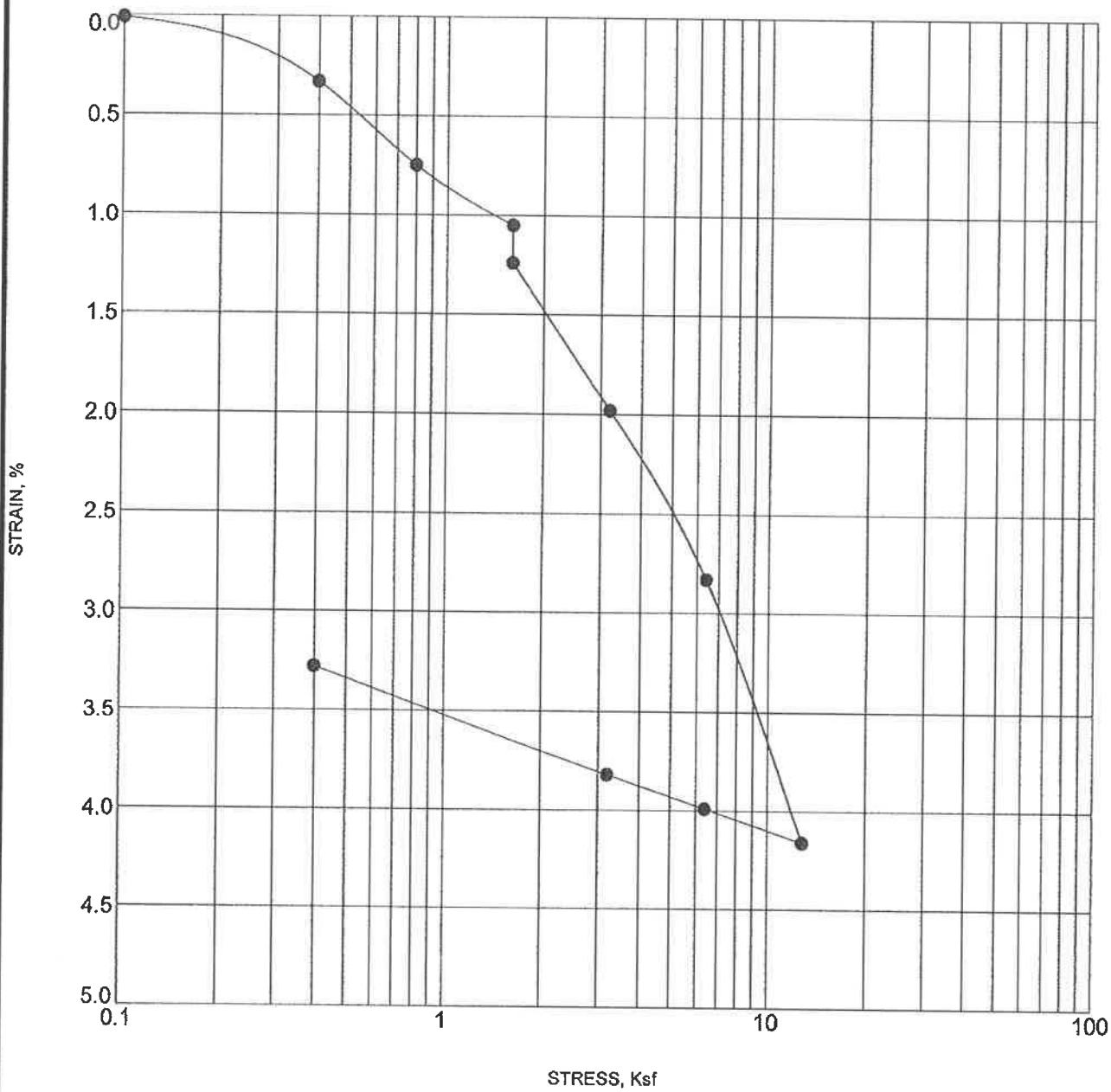

Specimen Identification			Classification	γ_d	MC%
●	B-3	5.0	**Sand, fine to coarse grained, trace silt.**	96	5

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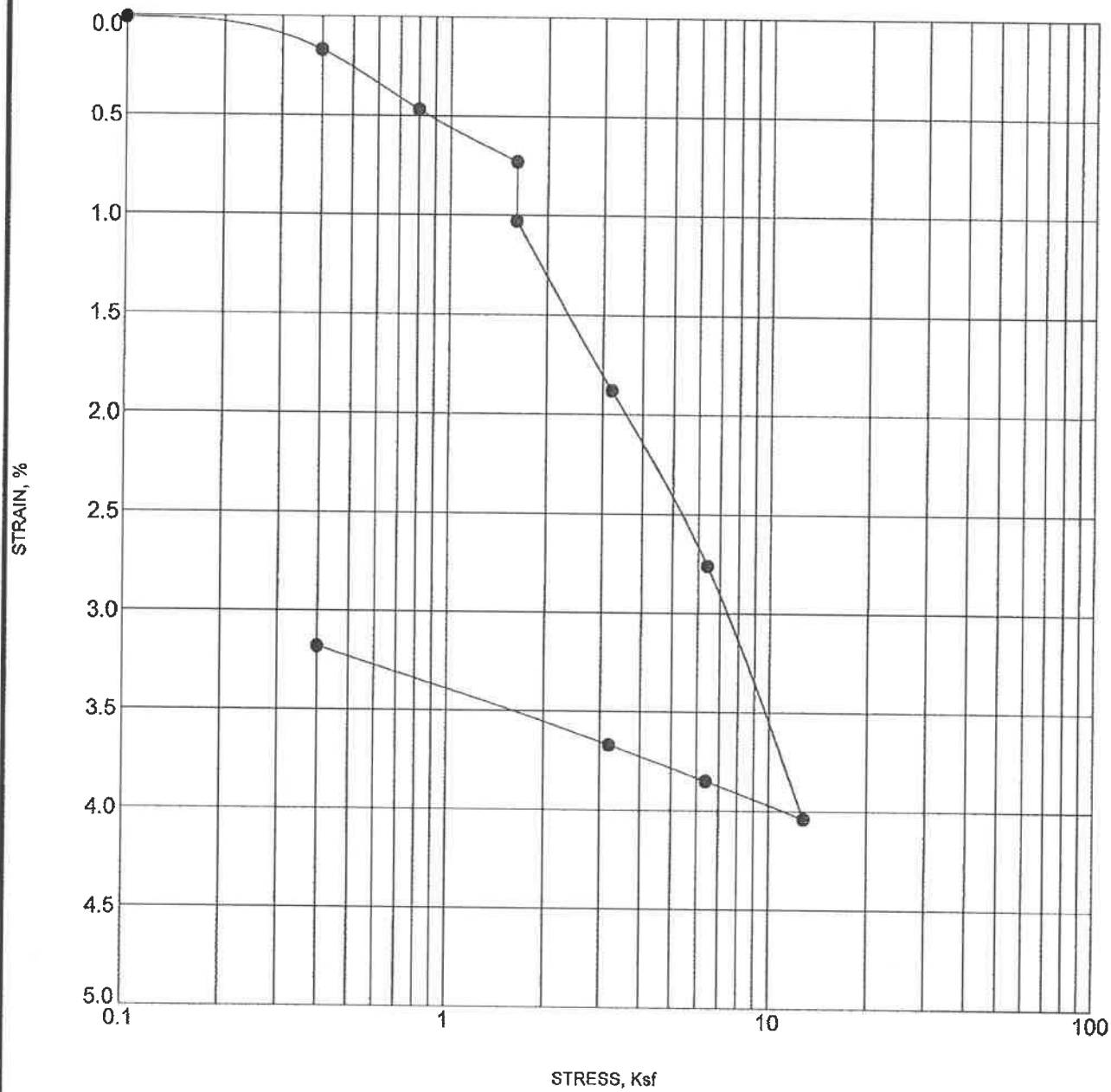

Specimen Identification			Classification	γ_d	MC%
●	B-4	10.0	**Sand, coarse grained.**	**119**	**9**

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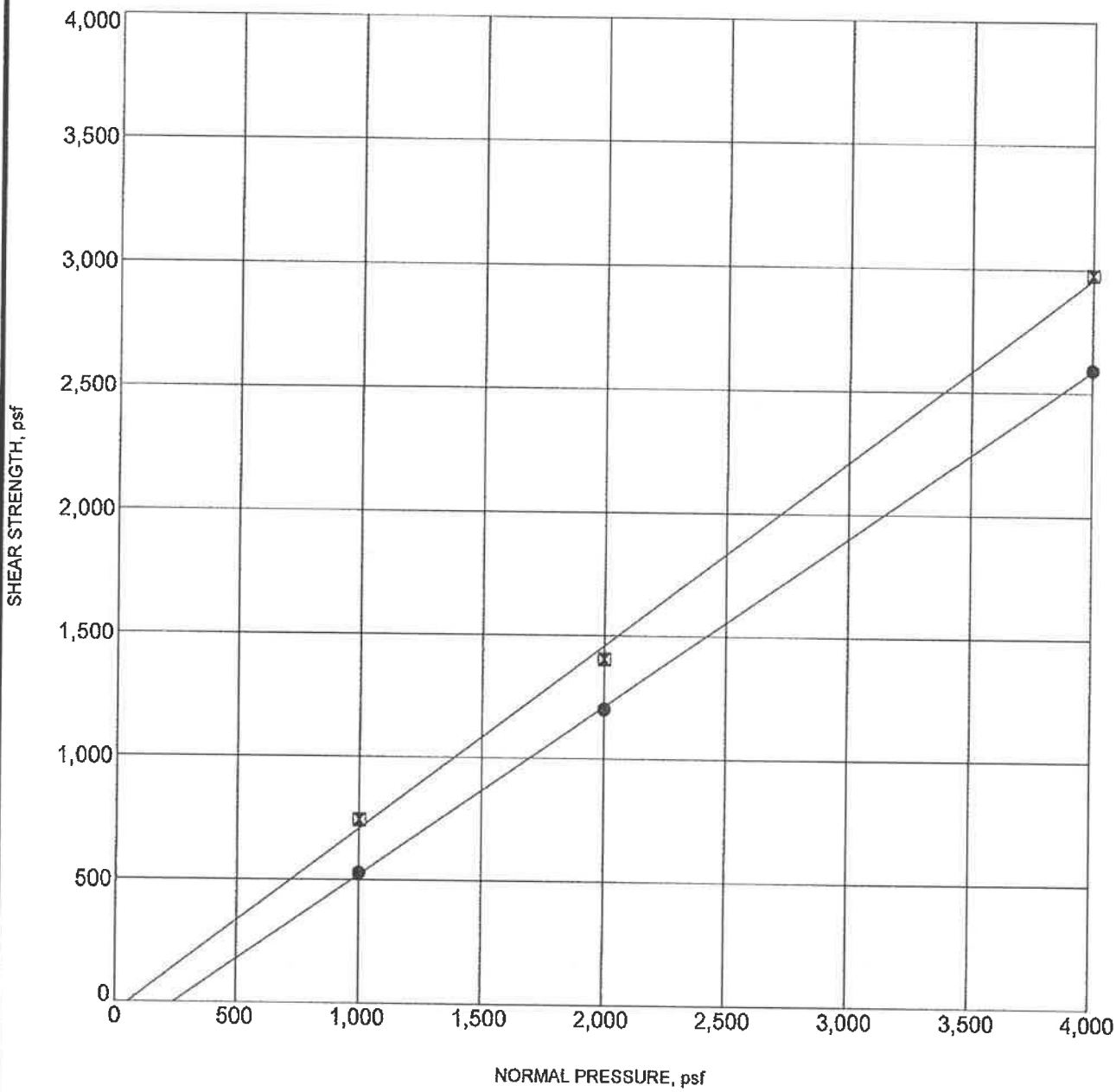

Specimen Identification			Classification	γ_d	MC%	c	ϕ
●	B-2	5'	**Sand,Undisturbed, Ultimate Stress**	**104**	**2.4**	**0**	**32**
⊠	B-2	5'	**Sand, Undisturbed, Peak Stress**	**104**	**2.4**	**0**	**36**

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DIRECT SHEAR TEST

Project Number: 17-6513

Project Name: Garden Grove Hotel

US DIRECT SHEAR 17-6513 HARBOR AND TRASK GARDEN GROVE.GPJ TGR GEOTECH.GDT 7/24/17

17-6510

APPENDIX D
LIQUEFACTION ANALYSIS

TGR GEOTECHNICAL
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SPT BASED LIQUEFACTION ANALYSIS REPORT

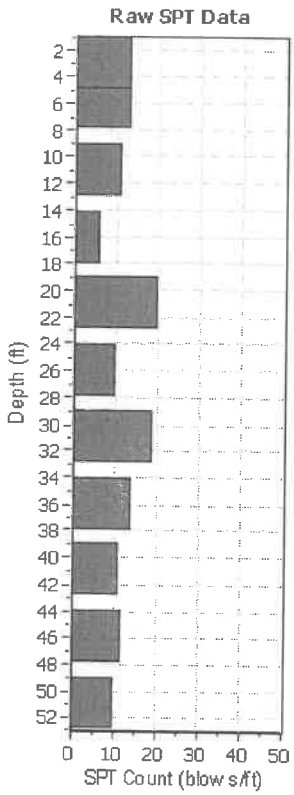
Project title : 17-6513 5-Story Hotel

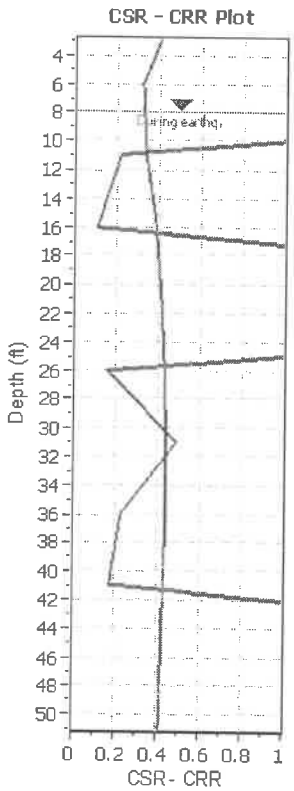
SPT Name: B-2

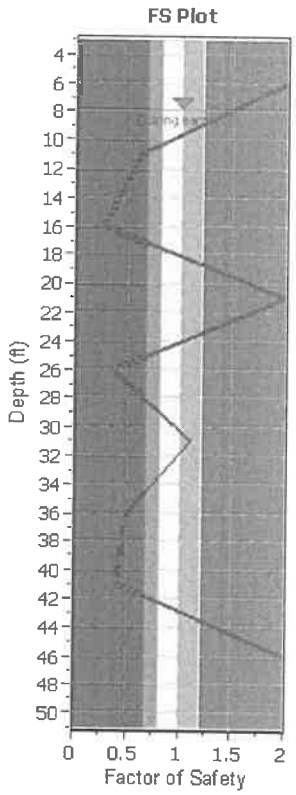
Location : 13650 S. Harbor Blvd, Garden Grove

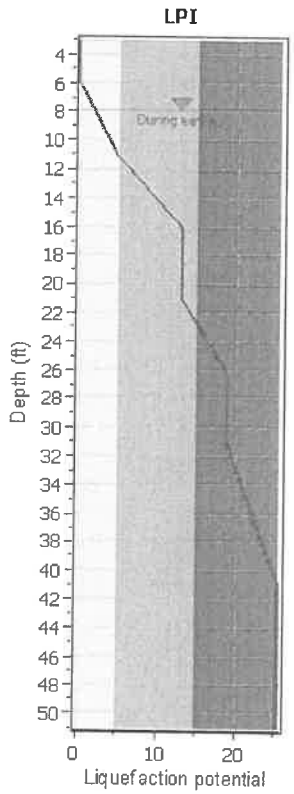
:: Input parameters and analysis properties ::

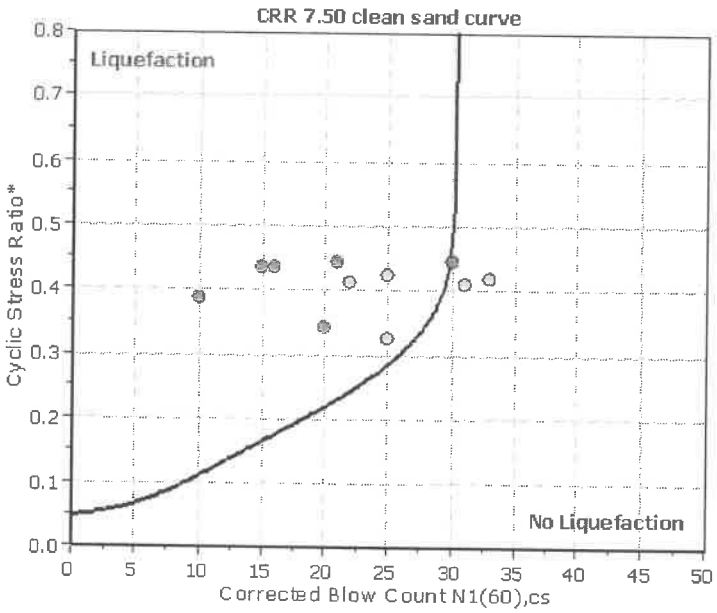
Analysis method:	NCEER 1998	G.W.T. (in-situ):	22.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	8.00 ft
Sampling method:	Sampler wo liners	Earthquake magnitude M_w:	6.60 ft
Borehole diameter:	200mm	Peak ground acceleration:	0.53 g
Rod length:	3.28 ft	Eq. external load:	0.10 tsf
Hammer energy ratio:	1.25		











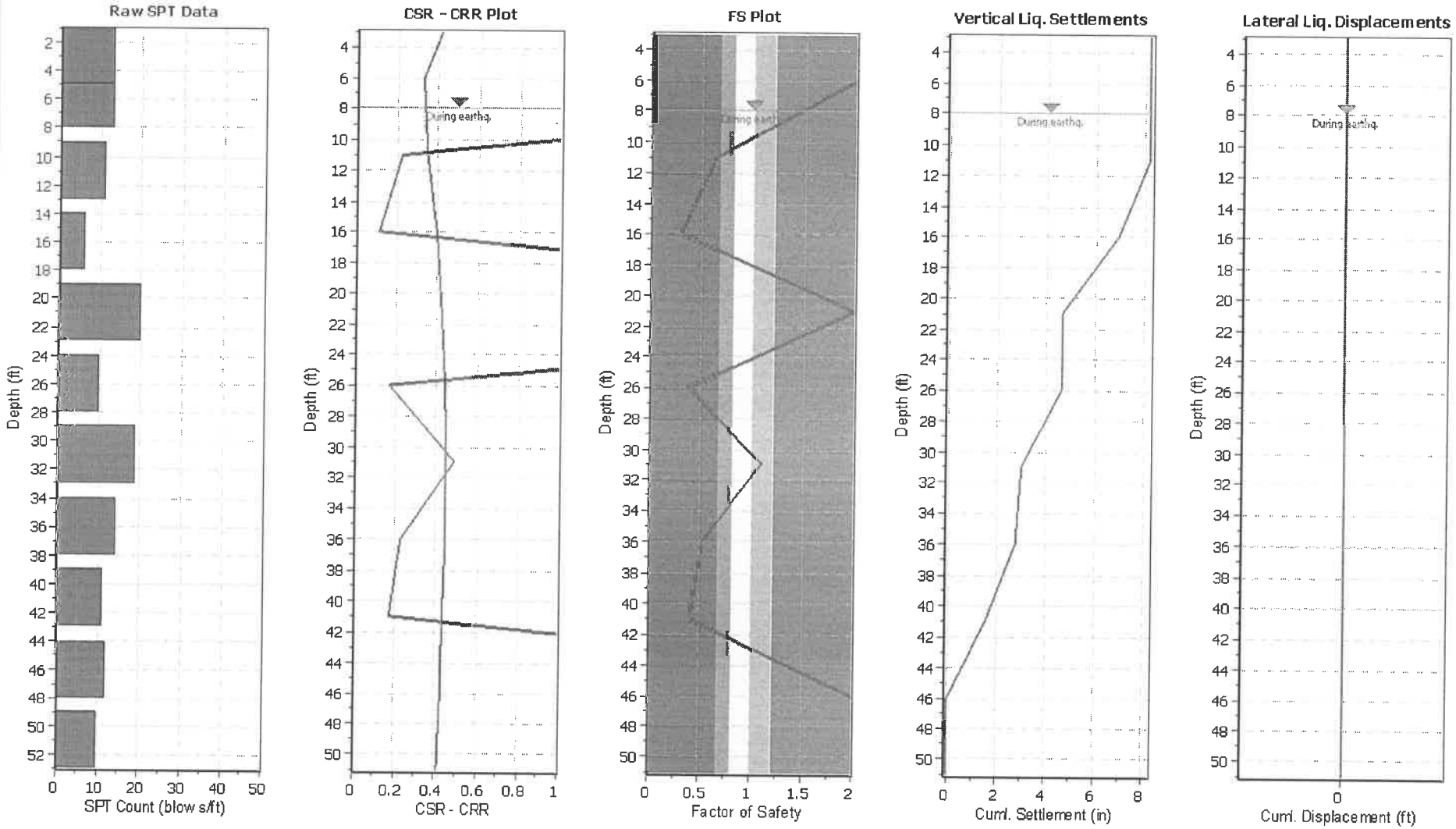
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



:: Field input data ::

Test Depth (ft)	SPT Field Value (blows)	Fines Content (%)	Unit Weight (pcf)	Infl. Thickness (ft)	Can Liquefy
3.00	13	14.00	102.00	5.00	Yes
6.00	13	3.60	106.00	5.00	Yes
11.00	11	3.60	101.00	5.00	Yes
16.00	6	3.60	101.00	5.00	Yes
21.00	20	5.50	101.00	5.00	Yes
26.00	10	5.70	101.00	5.00	Yes
31.00	19	5.70	101.00	5.00	Yes
36.00	14	6.40	101.00	5.00	Yes
41.00	11	6.40	101.00	5.00	Yes
46.00	12	51.40	101.00	5.00	No
51.00	10	76.80	101.00	5.00	No

Abbreviations

Depth: Depth at which test was performed (ft)
SPT Field Value: Number of blows per foot
Fines Content: Fines content at test depth (%)
Unit Weight: Unit weight at test depth (pcf)
Infl. Thickness: Thickness of the soil layer to be considered in settlements analysis (ft)
Can Liquefy: User defined switch for excluding/including test depth from the analysis procedure

:: Cyclic Resistance Ratio (CRR) calculation data ::

Depth (ft)	SPT Field Value	Unit Weight (pcf)	σ_v (tsf)	u_o (tsf)	σ'_{vo} (tsf)	C_N	C_E	C_B	C_R	C_S	$(N_1)_{60}$	Fines Content (%)	α	β	$(N_1)_{60cs}$	$CRR_{7.5}$
3.00	13	102.00	0.15	0.00	0.15	1.64	1.25	1.15	0.75	1.20	28	14.00	2.20	1.04	31	4.000
6.00	13	106.00	0.31	0.00	0.31	1.47	1.25	1.15	0.75	1.20	25	3.60	0.00	1.00	25	4.000
11.00	11	101.00	0.56	0.00	0.56	1.27	1.25	1.15	0.85	1.20	20	3.60	0.00	1.00	20	0.218
16.00	6	101.00	0.82	0.00	0.82	1.12	1.25	1.15	0.85	1.20	10	3.60	0.00	1.00	10	0.110
21.00	20	101.00	1.07	0.00	1.07	1.00	1.25	1.15	0.95	1.20	33	5.50	0.01	1.00	33	4.000
26.00	10	101.00	1.32	0.12	1.20	0.94	1.25	1.15	0.95	1.20	15	5.70	0.02	1.00	15	0.163
31.00	19	101.00	1.57	0.28	1.29	0.91	1.25	1.15	1.00	1.20	30	5.70	0.02	1.00	30	0.488
36.00	14	101.00	1.83	0.44	1.39	0.88	1.25	1.15	1.00	1.20	21	6.40	0.06	1.01	21	0.229
41.00	11	101.00	2.08	0.59	1.49	0.84	1.25	1.15	1.00	1.20	16	6.40	0.06	1.01	16	0.174
46.00	12	101.00	2.33	0.75	1.58	0.82	1.25	1.15	1.00	1.20	17	51.40	5.00	1.20	25	4.000
51.00	10	101.00	2.58	0.91	1.68	0.79	1.25	1.15	1.00	1.20	14	76.80	5.00	1.20	22	4.000

Abbreviations

σ_v: Total stress during SPT test (tsf)
u_o: Water pore pressure during SPT test (tsf)
σ'_{vo}: Effective overburden pressure during SPT test (tsf)
C_N: Overburden corretion factor
C_E: Energy correction factor
C_B: Borehole diameter correction factor
C_R: Rod length correction factor
C_S: Liner correction factor
$N_{1(60)}$: Corrected N_{SPT} to a 60% energy ratio
α, β: Clean sand equivalent clean sand formula coefficients
$N_{1(60)cs}$: Corected $N_{1(60)}$ value for fines content
$CRR_{7.5}$: Cyclic resistance ratio for M=7.5

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Depth (ft)	Unit Weight (pcf)	$\sigma_{v,eq}$ (tsf)	$u_{o,eq}$ (tsf)	$\sigma'_{vo,eq}$ (tsf)	r_d	α	CSR	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*	FS

:: Cyclic Stress Ratio calculation (CSR fully adjusted and normalized) ::

Depth (ft)	Unit Weight (pcf)	$\sigma_{v,eq}$ (tsf)	$u_{o,eq}$ (tsf)	$\sigma'_{vo,eq}$ (tsf)	r_d	α	CSR	MSF	$CSR_{eq,M=7.5}$	K_{sigma}	CSR^*	FS
3.00	102.00	0.15	0.00	0.25	0.99	1.00	0.567	1.39	0.409	1.00	0.409	2.000
6.00	106.00	0.31	0.00	0.41	0.99	1.00	0.449	1.39	0.324	1.00	0.324	2.000
11.00	101.00	0.56	0.09	0.57	0.98	1.00	0.475	1.39	0.343	1.00	0.343	0.635
16.00	101.00	0.82	0.25	0.67	0.97	1.00	0.538	1.39	0.388	1.00	0.388	0.282
21.00	101.00	1.07	0.41	0.76	0.95	1.00	0.579	1.39	0.418	1.00	0.418	2.000
26.00	101.00	1.32	0.56	0.86	0.94	1.00	0.605	1.39	0.436	1.00	0.436	0.375
31.00	101.00	1.57	0.72	0.96	0.92	1.00	0.617	1.39	0.445	1.00	0.445	1.098
36.00	101.00	1.83	0.87	1.05	0.88	1.00	0.616	1.39	0.444	1.00	0.444	0.517
41.00	101.00	2.08	1.03	1.15	0.84	1.00	0.603	1.39	0.435	1.00	0.435	0.401
46.00	101.00	2.33	1.19	1.25	0.79	1.00	0.580	1.39	0.419	0.98	0.425	2.000
51.00	101.00	2.58	1.34	1.34	0.74	1.00	0.553	1.39	0.399	0.97	0.412	2.000

Abbreviations

$\sigma_{v,eq}$:	Total overburden pressure at test point, during earthquake (tsf)
$u_{o,eq}$:	Water pressure at test point, during earthquake (tsf)
$\sigma'_{vo,eq}$:	Effective overburden pressure, during earthquake (tsf)
r_d :	Nonlinear shear mass factor
α:	Improvement factor due to stone columns
CSR :	Cyclic Stress Ratio (adjusted for improvement)
MSF :	Magnitude Scaling Factor
$CSR_{eq,M=7.5}$:	CSR adjusted for M=7.5
K_{sigma}:	Effective overburden stress factor
CSR^*:	CSR fully adjusted
FS:	Calculated factor of safety against soil liquefaction

:: Liquefaction potential according to Iwasaki ::

Depth (ft)	FS	F	wz	Thickness (ft)	I_L
3.00	2.000	0.00	9.54	3.00	0.00
6.00	2.000	0.00	9.09	3.00	0.00
11.00	0.635	0.36	8.32	5.00	4.62
16.00	0.282	0.72	7.56	5.00	8.27
21.00	2.000	0.00	6.80	5.00	0.00
26.00	0.375	0.63	6.04	5.00	5.75
31.00	1.098	0.00	5.28	5.00	0.00
36.00	0.517	0.48	4.51	5.00	3.32
41.00	0.401	0.60	3.75	5.00	3.43
46.00	2.000	0.00	2.99	5.00	0.00
51.00	2.000	0.00	2.23	5.00	0.00

Overall potential I_L : 25.40

I_L = 0.00 - No liquefaction
I_L between 0.00 and 5 - Liquefaction not probable
I_L between 5 and 15 - Liquefaction probable
I_L > 15 - Liquefaction certain

:: Vertical settlements estimation for dry sands ::

Depth (ft)	$(N_1)_{60}$	τ_{av}	p	G_{max} (tsf)	α	b	γ	ε_{15}	N_c	ε_{Nc} (%)	Δh (ft)	ΔS (in)
3.00	28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.000
6.00	25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.000

:: Vertical settlements estimation for dry sands ::

Depth (ft)	$(N_1)_{60}$	τ_{av}	p	G_{max} (tsf)	α	b	γ	ε_{15}	N_c	ε_{Nc} (%)	Δh (ft)	ΔS (in)

Cumulative settlemetns: 0.000

Abbreviations

τ_{av}: Average cyclic shear stress
p: Average stress
G_{max}: Maximum shear modulus (tsf)
α, b: Shear strain formula variables
γ: Average shear strain
ε_{15}: Volumetric strain after 15 cycles
N_c: Number of cycles
ε_{Nc}: Volumetric strain for number of cycles N_c (%)
Δh: Thickness of soil layer (in)
ΔS: Settlement of soil layer (in)

:: Vertical settlements estimation for saturated sands ::

Depth (ft)	D_{50} (in)	q_c/N	e_v (%)	Δh (ft)	s (in)
11.00	0.30	5.58	2.14	5.00	1.282
16.00	0.30	5.58	3.77	5.00	2.264
21.00	0.20	4.95	0.00	5.00	0.000
26.00	0.30	5.58	2.71	5.00	1.623
31.00	0.30	5.58	0.39	5.00	0.237
36.00	0.30	5.58	2.05	5.00	1.232
41.00	0.30	5.58	2.57	5.00	1.540
46.00	0.07	3.64	0.00	5.00	0.000
51.00	0.07	3.64	0.00	5.00	0.000

Cumulative settlements: 8.177

Abbreviations

D_{50}: Median grain size (in)
q_c/N: Ratio of cone resistance to SPT
e_v: Post liquefaction volumetric strain (%)
Δh: Thickness of soil layer to be considered (ft)
s: Estimated settlement (in)

:: Lateral displacements estimation for saturated sands ::

Depth (ft)	$(N_1)_{60}$	D_r (%)	γ_{max} (%)	d_z (ft)	LDI	LD (ft)
3.00	28	74.08	0.00	5.00	0.000	0.00
6.00	25	70.00	0.00	5.00	0.000	0.00
11.00	20	62.61	22.70	5.00	0.000	0.00
16.00	10	44.27	51.20	5.00	0.000	0.00
21.00	33	80.42	0.00	5.00	0.000	0.00
26.00	15	54.22	34.10	5.00	0.000	0.00
31.00	30	76.68	2.65	5.00	0.000	0.00
36.00	21	64.16	22.70	5.00	0.000	0.00
41.00	16	56.00	22.70	5.00	0.000	0.00
46.00	17	57.72	0.00	5.00	0.000	0.00
51.00	14	52.38	0.00	5.00	0.000	0.00

:: Lateral displacements estimation for saturated sands ::

Depth (ft)	$(N_1)_{60}$	D_r (%)	γ_{max} (%)	d_z (ft)	LDI	LD (ft)

Cumulative lateral displacements: 0.00

Abbreviations

D_r: Relative density (%)
γ_{max}: Maximum amplitude of cyclic shear strain (%)
d_z: Soil layer thickness (ft)
LDI: Lateral displacement index (ft)
LD: Actual estimated displacement (ft)

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Appendix D:

Hydrology Report

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11819 Goldring Road, Unit A, Arcadia, CA 91006
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Drainage Report
Hydrology Study / SUSMP / LID SIZING

CITY OF GARDEN GROVE

Building Address: 13650 Harbor Blvd.
Garden Grove, CA 92843

EGL Job No. 17-294-003

EGL ASSOCIATES, INC.
11819 Goldring Road, Unit A, Arcadia, CA 91006
Ph: 626-263-3588; Fax: 626-263-3599

Table of Contents

Section		*Page*
1.	**DRAINAGE CONCEPT**	3
2.	**GREEN DESIGN CONCEPT**	3
3.	**SUSMP AND LID SWQDv**	3
4.	**SUSMP AND LID MAINTENANCE**	**3**
5.	**CALCULATION**	4
6.	**CONCLUSION**	**6**

EXHIBIT

HYDROLOGY PLAN

1. Drainage Concept:

Existing drainage pattern is from East to West and drains to Harbor Blvd. Proposed drainage pattern will maintain the same as existing and proposed catch basins, pipes, infiltration basins will convey the water to the streets.

Therefore, drainage subareas of this property will be the **same** at pre and post development conditions.

At post development, the project site drains to catch basin and treated by catch basin filter as a pre- treatment, and low flows to the underground infiltration basin, and bypass flows discharge to the Harbor Blvd. via parkway drain.

Based on survey investigation, northerly & southerly boundary lines were blocked by existing CMU wall, and easterly neighbor of the property has its own drainage system with conc. gutter, thus, no offsite drainage contributes to property.

Proposed building shall be protected from the design storm and the stormwater will positive flow to the street without sump, ponding conditions.

Therefore, we conclude that this development will **not adversely impact** to drainage conditions to the downstream properties and existing drainage pattern to the downstream properties will **be maintained**.

2. Green Design Concept:

The low flow of roofdrain and paving area will be drained to an infiltration basin. Flogard filter will be proposed prior to discharging into an infiltration basin.

Bypass flow will discharge to the Street via parkway drain.

3. SUSMP and LID Volume:

Per pursuant to the Orange County 2012 MS4 Permit and City of Garden Grove Municipal Code, first 85th percentile rainfall shall be mitigated. In this case, all the first flush storm water on site will be filtered by catch basin filter and retained by the infiltration basin.

The storm runoff in infiltration basin will then infiltrate into ground, and bypass flow from catch basin will be discharged to the street through a parkway drain.

Stormwater Quality Design Volume Calculation needs to be performed per County of Orange LID manual, and its volume will be retained in infiltration basin.

4. SUSMP Maintenance:

See the separate project WQMP report for the detail of Inspection and maintenance.

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5. Calculation:

Per attached exhibits of hydrology plans, pre & post development conditions have been analyzed.

Q50 = C (I – Fm) A

Where, C: Runoff coefficient (=0.75 x Imp. + 0.15 = 0.75 x 0.9 + 0.15 = 0.83)

$I = a\ t^b$ (a:13.521, b:-0.566, t: 10.5 min for Area 1, 8.4 min for Area 2)

Fm = ap x Fp (ap: 0.1 pervious ratio, Fp=0.30 at soil type B)

Area A

Area = 0.80 ac

$Q = 0.83 \times \{(13.521 \times 10.5^{-0.566}) - (0.1 \times 0.3)\} \times 0.80 = 2.35$ cfs

$Qbmp = C\ I_{85th}\ A$ (where, I_{85th} = 0.77" per map attached)

= 0.83 x 0.77 x 0.8 = 0.51 cfs

V = C d A (where, d=storm depth, 0.77" per map attached)

= 0.83 x 0.77 x 0.8 x 43560/12 = 1856 cf

Area B

Area = 0.68 ac

$Q = 0.83 \times \{(13.521 \times 8.4^{-0.566}) - (0.1 \times 0.3)\} \times 0.68 = 2.27$ cfs

$Qbmp = C\ I_{85th}\ A$ (where, I_{85th} = 0.77" per map attached)

= 0.83 x 0.77 x 0.68 = 0.43 cfs

V = C d A (where, d=storm depth, 0.77" per map attached)

= 0.83 x 0.77 x 0.68 x 43560/12 = 1578 cf

Qbmp

Qbmp @Area A = 0.51 cfs

Use flogard plus catch basin filter, FGP-24F=1.5 cfs > 0.51 cfs o.k.

Qbmp @Area B = 0.43 cfs

Use flogard plus catch basin filter, FGP-24F=1.5 cfs > 0.43 cfs o.k.

Infiltration Basin Calculation

First 85TH percentile rainfall will be stored on-site before discharging to the street.

V@Area A = 1856 cf

STORMTECH MC-3500 will be used for infiltration basin,
and its volume capacity=184 cf/ea for chamber, 48.6 cf/ea for end cap

Use 10 chambers and 4 end caps = (10 x 184 cf) + (4 x 48.6) = 2034.4 cf >1856 cf o.k.

V@Area B = 1578 cf

STORMTECH MC-3500 will be used for infiltration basin,
and its volume capacity=184 cf/ea for chamber, 48.6 cf/ea for end cap

Use 8 chambers and 4 end caps = (8 x 184 cf) + (4 x 48.6) = 1666.4 cf >1578 cf o.k.

Percolation Rate Calculation

Per percolation report, infiltration rate, P=5.0 in/hr

Area of Infiltration @ Area A = 2 rows x [{(7.5' x 5ea) + (2' x 2ea)} x 7'] = 581 sf

Drawdown Time (T)=(V/A)/(P/12) = (1856/581)/(5.0/12) = 7.67 hr < 96.0 hr o.k.

Area of Infiltration @ Area B = 2 rows x [{(7.5' x 4ea) + (2' x 2ea)} x 7'] = 476 sf

Drawdown Time (T)=(V/A)/(P/12) = (1578/476)/(5.0/12) = 7.96 hr < 96.0 hr o.k.

Pipe Size Calculation

1. Area A

   A1 = 0.58 AC

   Q = 2.35 x (0.58/0.80) = 1.70 cfs

   Use 1-8" pvc sch. 40 @1.5%

   Q = 1.95 cfs > 1.70 cfs o.k.

   A1 + A2 = 0.58 + 0.22 = 0.80 AC

   Q = 2.35 x (0.80/0.80) = 2.35 cfs

   Use 2'-0" parkway drain

   Q = 2.90 cfs > 2.35 cfs o.k.

2. Area B

   A3 = 0.02 AC

   Q = 2.27x (0.02/0.68) = 0.07 cfs

   Use 1-4" PVC Pipe

   D = 0.33' S = 0.75%

   Q = 0.21 cfs > 0.07 cfs o.k.

A3 + A4 = 0.07 + 0.02 = 0.30 AC

Q = 2.27x (0.09/0.68) = 0.37 cfs

Use 1-6" PVC Pipe

D = 0.50' S = 0.75%

Q = 0.63 cfs > 0.30 cfs o.k.

A5 =0.02 AC

Q = 2.27x (0.02/0.68) = 0.07 cfs

Use 1-4" PVC Pipe

D = 0.33' S = 0.75%

Q = 0.21 cfs > 0.07 cfs o.k.

A5 + A6 = 0.02 + 0.04 = 0.06 AC

Q = 2.27x (0.06/0.68) = 0.20 cfs

Use 1-4" PVC Pipe

D = 0.33' S = 0.75%

Q = 0.21 cfs > 0.20 cfs o.k.

A3 THRU A7 = 0.68 AC

Q = 2.27 cfs

Use 2'-0" parkway drain, Q = 2.90 cfs > 2.27 cfs o.k.

6. CONCULSION:

a. Q50 at Area A = 2.35 cfs, Q50 at Area B = 2.27 cfs

b. V at Area A = 1856 cf, Area B = 1578 cf

c. Proposed Infiltration Basin

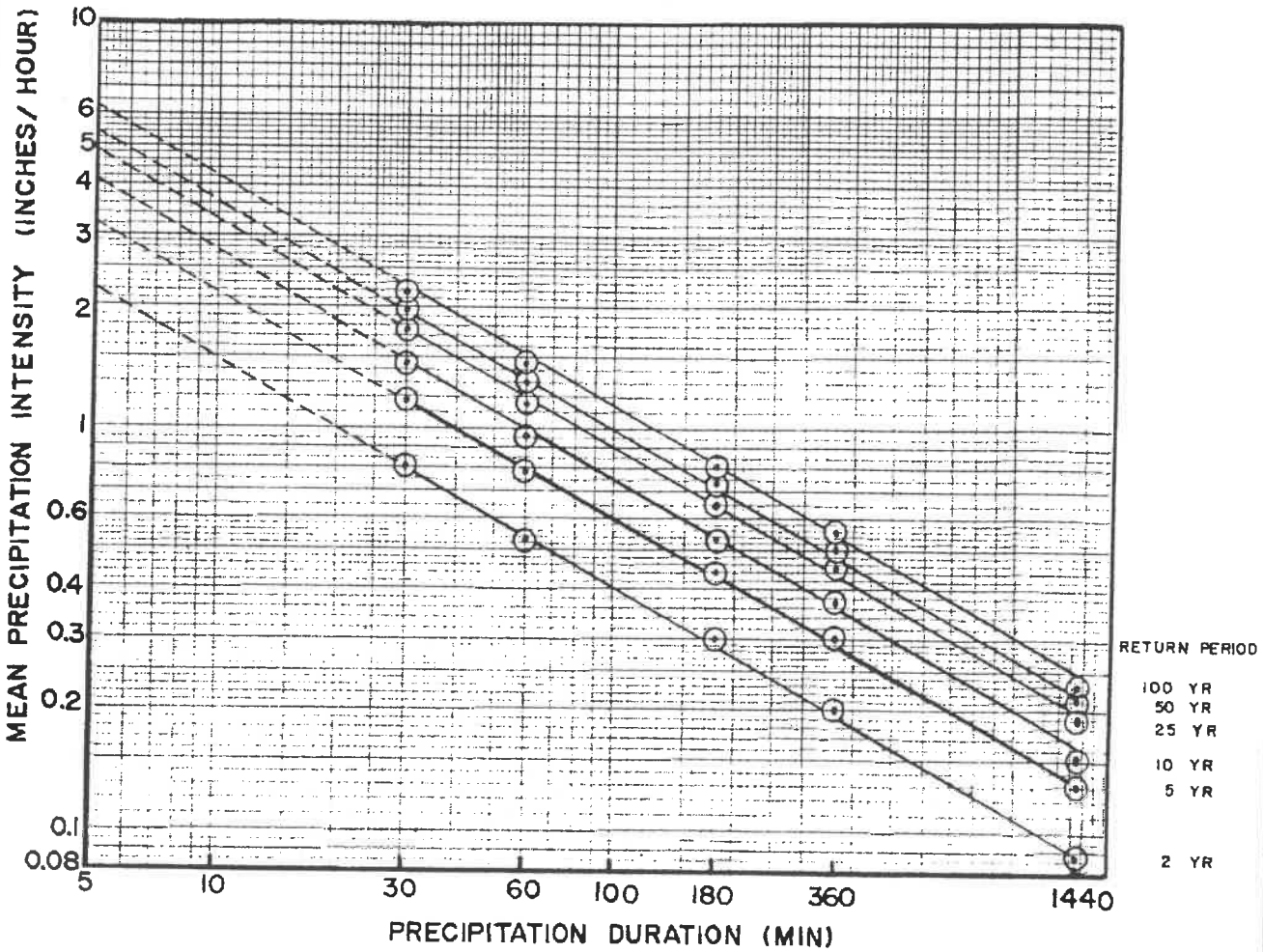
Area A : Use 10 chambers and 4 end caps
= (10 x 184 cf) + (4 x 48.6) = 2034.4 cf >1856 cf o.k.

Area B : Use 8 chambers and 4 end caps
= (8 x 184 cf) + (4 x 48.6) = 1666.4 cf >1578 cf o.k.

Regression Equations: $I(t) = at^b$

(I= Intensity in inches/hour, t= duration in minutes)

Return Frequency (years)	a	b
2	5.702	-0.574
5	7.870	-0.562
10	10.209	-0.573
25	11.995	-0.566
50	13.521	-0.566
100	15.560	-0.573



ORANGE COUNTY

HYDROLOGY MANUAL

MEAN PRECIPITATION INTENSITIES FOR NONMOUNTAINOUS AREAS

Figure B-3

C.6.4. Estimation of Maximum Loss Rates for Pervious Areas, F_p

Table C.2 lists the maximum loss rates (inch/hour), F_p, for pervious area as a function of soil group.

TABLE C.2.
MAXIMUM EFFECTIVE PERVIOUS AREA LOSS RATES (inch/hour), F_p

SOIL GROUP:	A	B	C	D
F_p:	0.40	0.30	0.25	0.20

Table C.2 reflects the model calibration assuming an F_p of 0.30 in/hr. for all the considered catchments and storm return frequencies. This mean value of F_p of 0.30 in/hr. was assigned to Hydrologic Soil Group B due to the actual average soil conditions in the reconstitution study areas. The F_p values for Hydrologic Soil Groups A, C, and D, were assigned to account for the different soil types that may be found in Orange County.

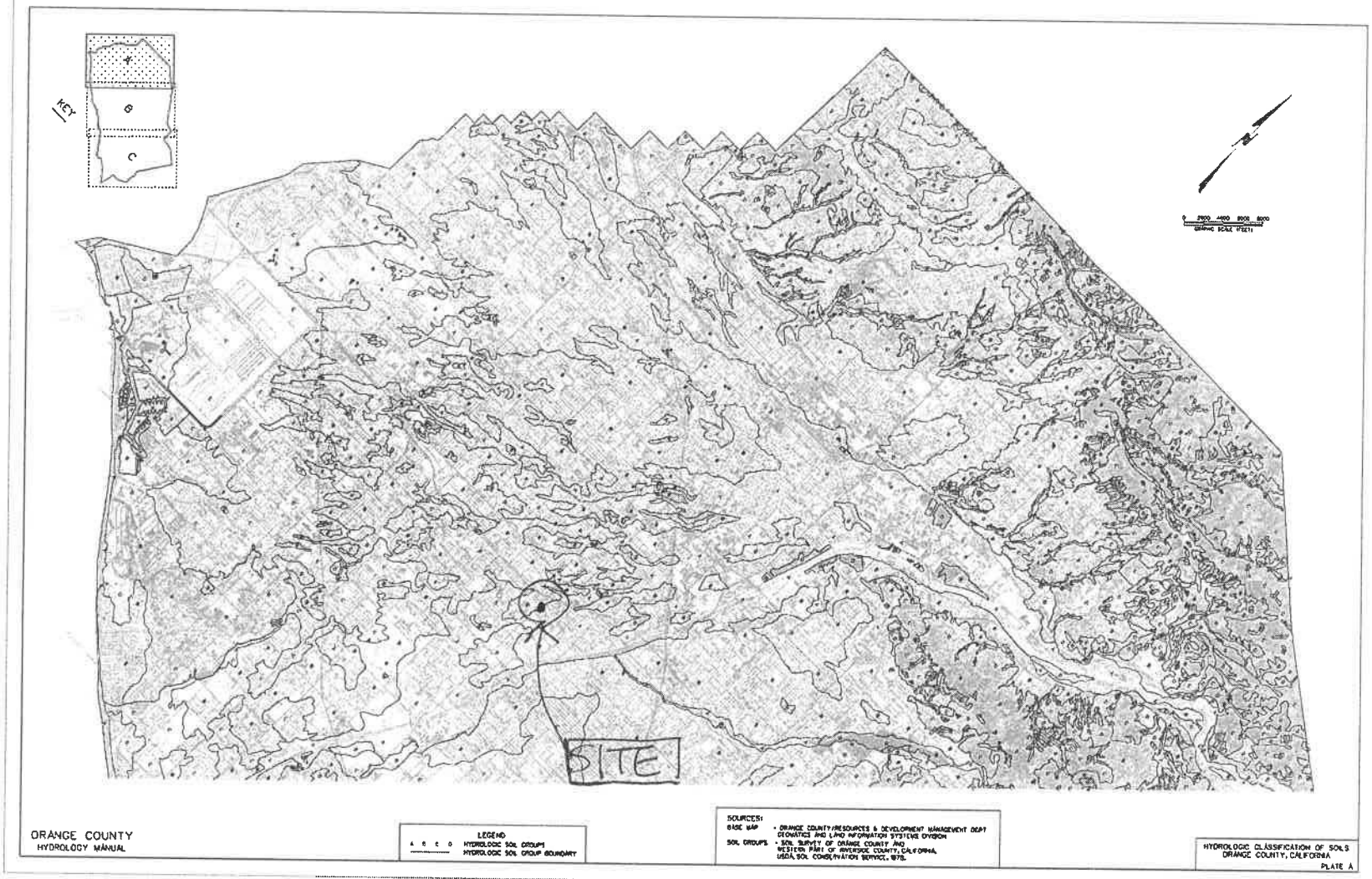
C.6.5. Estimation of Catchment Maximum Loss Rates, F_m

The maximum loss rate selected from Table C.2 applies to the pervious area fraction of the watershed. The loss rate assumed for an impervious surface is 0.0 inch/hour. The maximum loss rate, F_m, for a catchment is therefore given by

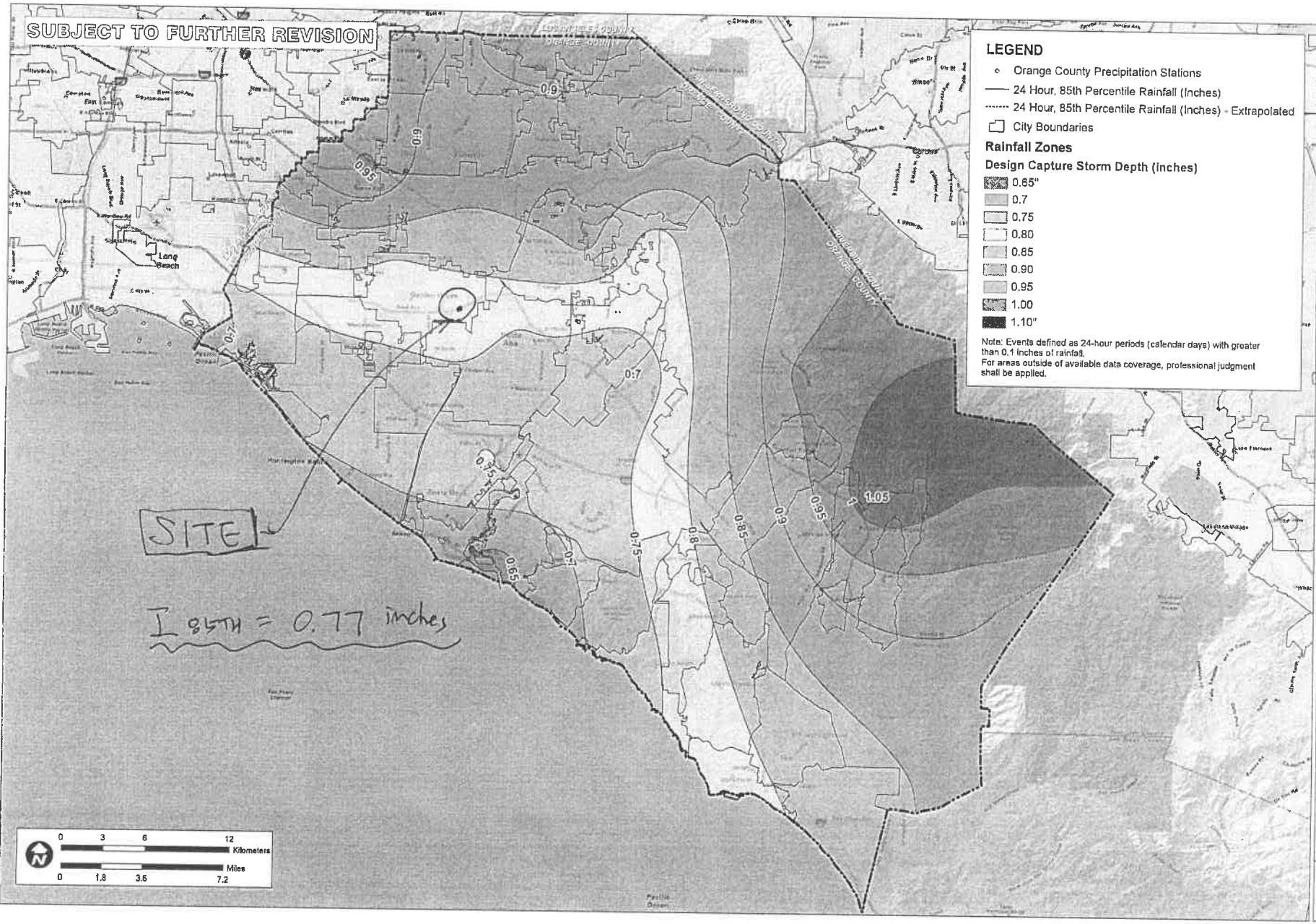
$$F_m = a_p F_p \qquad \text{(C.7)}$$

where a_p is the pervious area fraction and F_p is the maximum loss rate for the pervious area (Section C.6.4).

Should a catchment contain several F_m values, the composite F_m value is determined as a simple area average of the several F_m values.


KEY
A
B
C
SITE
ORANGE COUNTY
HYDROLOGY MANUAL
LEGEND
A B C D HYDROLOGIC SOIL GROUPS
HYDROLOGIC SOIL GROUP BOUNDARY
SOURCES:
BASE MAP - ORANGE COUNTY RESOURCES & DEVELOPMENT MANAGEMENT DEPT GEOMATICS AND LAND INFORMATION SYSTEMS DIVISION
SOIL GROUPS - SOIL SURVEY OF ORANGE COUNTY AND WESTERN PART OF RIVERSIDE COUNTY, CALIFORNIA, USDA SOIL CONSERVATION SERVICE, 1978.
HYDROLOGIC CLASSIFICATION OF SOILS
ORANGE COUNTY, CALIFORNIA
PLATE A

SOIL=B



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TITLE
RAINFALL ZONES

JOB
ORANGE COUNTY
TECHNICAL GUIDANCE
DOCUMENT

ORANGE CO. CA

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

PACE
Advanced Water Engineering

FIGURE
XVI-1

Cross Section for Circular Pipe - 1

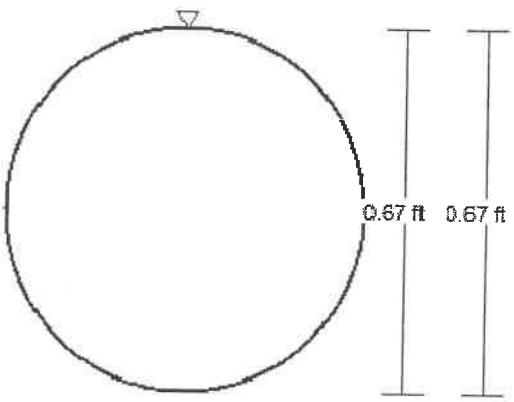
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.01500	ft/ft
Normal Depth	0.67	ft
Diameter	0.67	ft
Discharge	1.95	ft^3/s

Cross Section Image



V: 1
H: 1

Cross Section for Box Pipe - 1

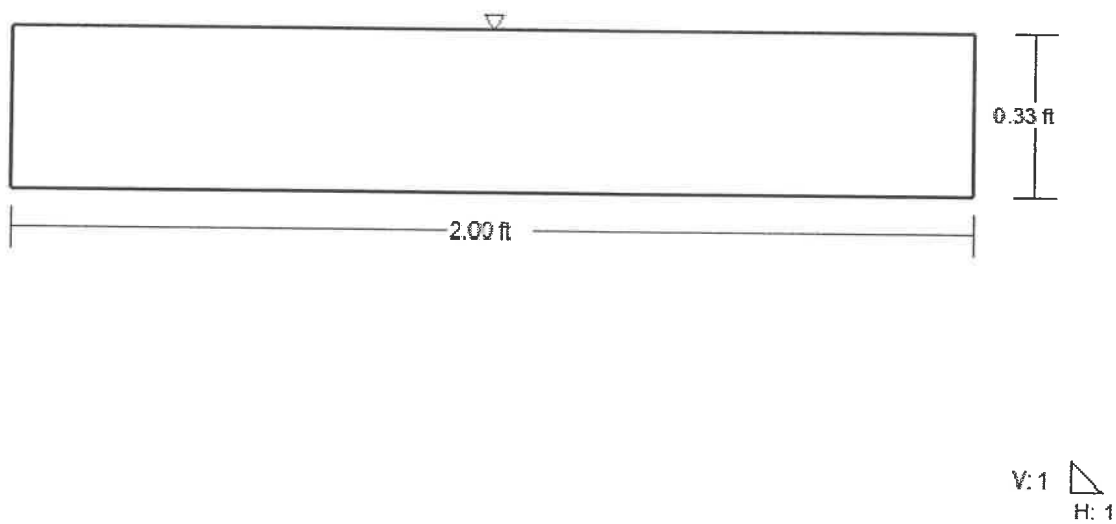
Project Description

Friction Method	Manning Formula
Solve For	Discharge

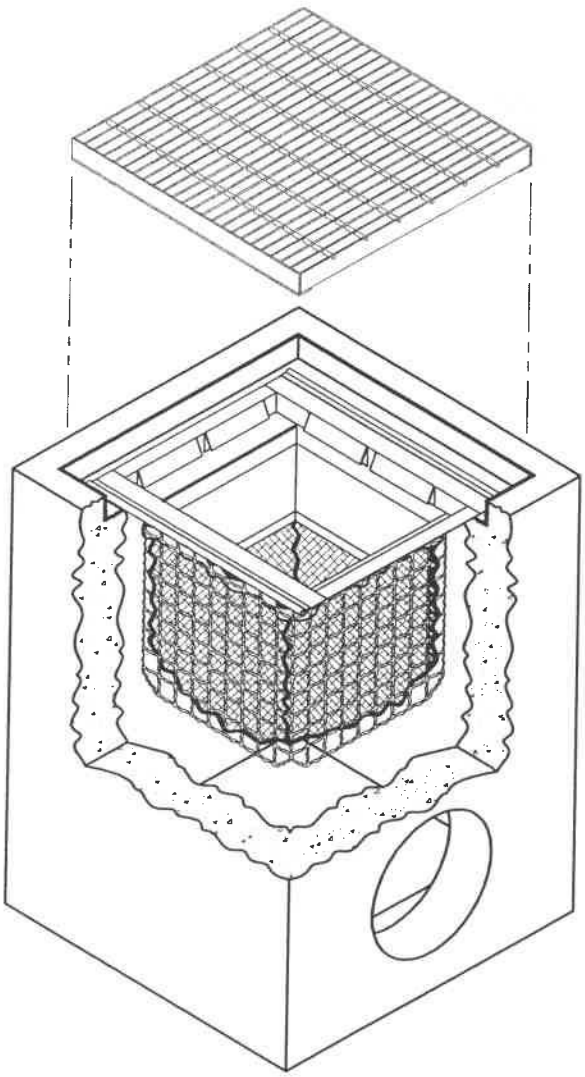
Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Normal Depth	0.33	ft
Height	0.33	ft
Bottom Width	2.00	ft
Discharge	2.90	ft^3/s

Cross Section Image

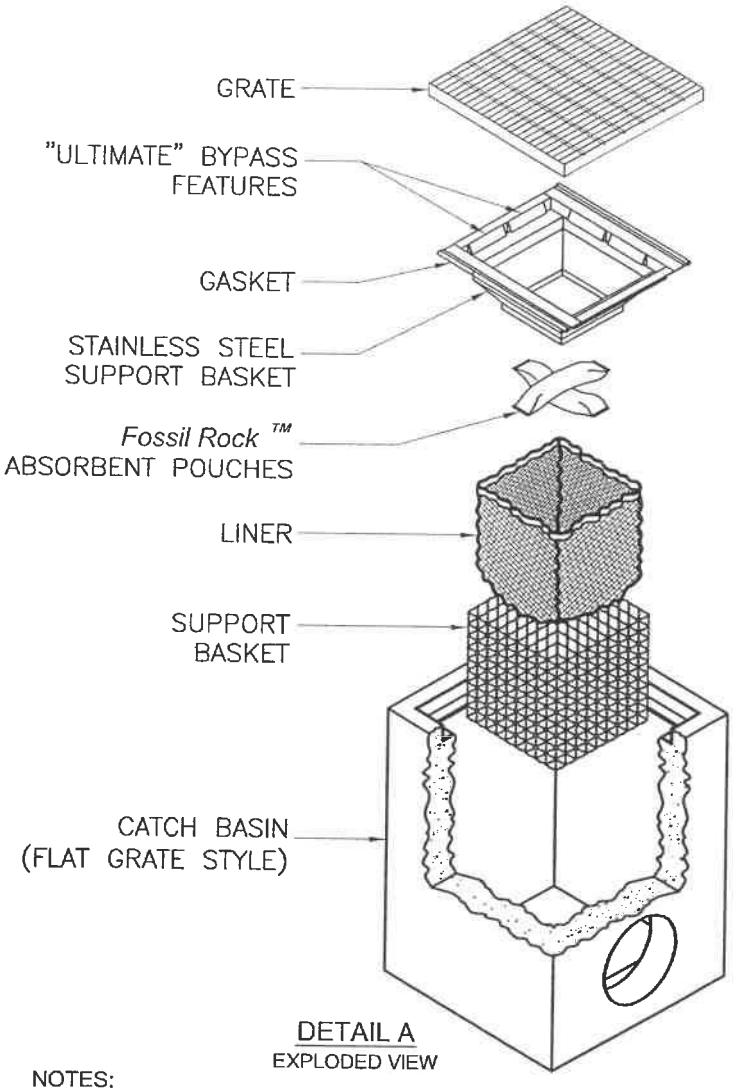


FGP-0001



FLOGARD+PLUS® FILTER
-INSTALLED INTO CATCH BASIN-

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



DETAIL A
EXPLODED VIEW

NOTES:

1. FloGard®+Plus (frame mount) high capacity catch basin inserts are available in most sizes and styles (see specifier chart, sheet 2 of 2). Refer to the FloGard®+Plus (wall mount) insert for devices to fit non-standard, or combination style catch basins.
2. Filter insert shall have both an "initial" filtering bypass and "ultimate" high flow bypass feature.
3. Filter support frame shall be constructed from stainless steel Type 304.
4. Allow a minimum of 2.0 feet, of clearance between the bottom of the grate and top of outlet pipe(s), or refer to the FloGard® insert for "shallow" installations.
5. Filter medium shall be *Fossil Rock* ™, installed and maintained in accordance with manufacturer specifications.
6. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.
7. Filtered flow rate includes a safety factor of two.

TITLE

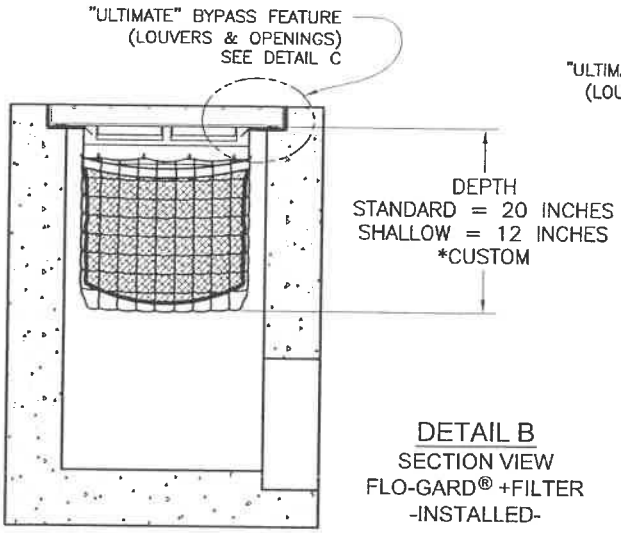
FloGard®+PLUS
CATCH BASIN FILTER INSERT
(Frame Mount)
FLAT GRATED INLET

KriStar Enterprises, Inc.
P.O. Box 6419, Santa Rosa, CA 95406
Ph: 800.579.8819, Fax: 707.524.8186, www.kristar.com

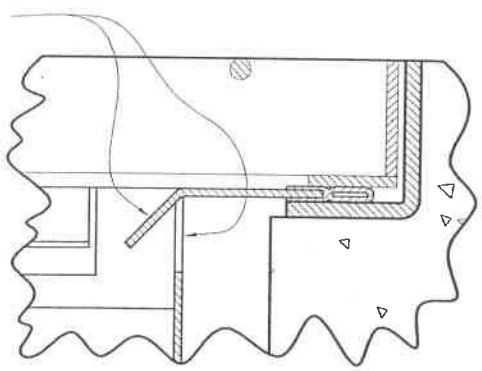
DRAWING NO.	REV	ECO	DATE	
FGP-0001	A	0001	JPR 09/01/06	SHEET 1 OF 2

FGP-0001

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



DETAIL B
SECTION VIEW
FLO-GARD® +FILTER
-INSTALLED-



DETAIL C
"ULTIMATE"
BYPASS FEATURES

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

SPECIFIER CHART

MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data in these columes is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-	
	INLET ID Inside Dimension (inch x inch)	GRATE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-12F	12 X 12	12 X 14	2.8	0.3	0.4	FGP-12F8	.15	.25
FGP-1530F	15 X 30	15 X 35	6.9	2.3	1.6	FGP-1530F8	1.3	.9
FGP-16F	16 X 16	16 X 19	4.7	0.8	0.7	FGP-16F8	.45	.4
FGP-1624F	16 X 24	16 X 26	5.0	1.5	1.2	FGP-1624F8	.85	.7
FGP-18F	18 X 18	18 X 20	4.7	0.8	0.7	FGP-18F8	.45	.4
FGP-1820F	16 X 19	18 X 21	5.9	2.1	1.4	FGP-1820F8	1.2	.8
FGP-1824F	16 X 22	18 X 24	5.0	1.5	1.2	FGP-1824F8	.85	.7
FGP-1836F	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836F8	1.3	.9
FGP-2024F	18 X 22	20 X 24	5.9	1.2	1.0	FGP-2024F8	.7	.55
FGP-21F	22 X 22	22 X 24	6.1	2.2	1.5	FGP-21F8	1.25	.85
FGP-2142F	21 X 40	24 X 40	9.1	4.3	2.4	FGP-2142F8	2.45	1.35
FGP-2148F	19 X 46	22 X 48	9.8	4.7	2.6	FGP-2148F8	2.7	1.5
FGP-24F	24 X 24	24 X 27	6.1	2.2	1.5	FGP-24F8	1.25	.85
FGP-2430F	24 X 30	26 X 30	7.0	2.8	1.8	FGP-2430F8	1.6	1.05
FGP-2436F	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436F8	1.95	1.15
FGP-2448F	24 X 48	26 X 48	9.3	4.4	2.4	FGP-2448F8	2.5	1.35
FGP-28F	28 X 28	32 X 32	6.3	2.2	1.5	FGP-28F8	1.25	.85
FGP-2440F	24 X 36	28 X 40	8.3	4.2	2.3	FGP-2440F8	2.4	1.3
FGP-30F	30 X 30	30 X 34	8.1	3.6	2.0	FGP-30F8	2.05	1.15
FGP-36F	36 X 36	36 X 40	9.1	4.6	2.4	FGP-36F8	2.65	1.35
FGP-3648F	36 X 48	40 X 48	11.5	6.8	3.2	FGP-3648F8	3.9	1.85
FGP-48F	48 X 48	48 X 54	13.2	9.5	3.9	FGP-48F8	5.45	2.25
FGP-SD24F	24 X 24	28 X 28	6.1	2.2	1.5	FGP-SD24F8	1.25	.85
FGP-1836FGO	18 X 36	20 X 40	6.9	2.3	1.6	FGP-1836F8GO	1.3	.9
FGP-2436FGO	20 X 36	24 X 40	8.0	3.4	2.0	FGP-2436F8GO	1.95	1.15
FGP-48FGO	18 X 48	20 X 54	6.3	2.2	1.5	FGP-48F8GO	1.25	.85

TITLE

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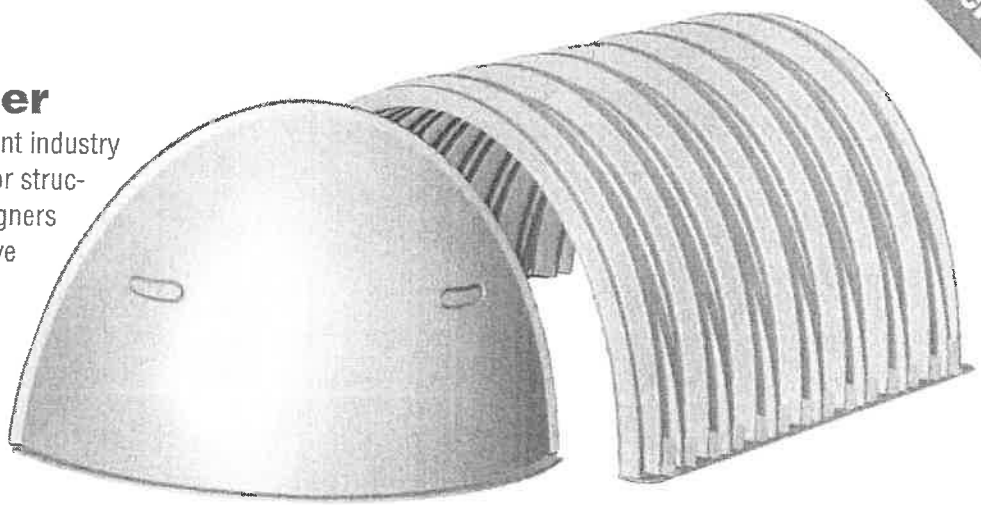
StormTech®

Detention • Retention • Water Quality

MC-3500 Chamber

StormTech MC-3500 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.



StormTech MC-3500 Chamber (not to scale)

Nominal Chamber Specifications

Size (L x W x H)	90" (2286 mm) x 77" (1956 mm) x 45" (1143 mm)
Chamber Storage	109.9 ft³ (3.11 m³)
Min. Installed Storage*	178.9 ft³ (5.06 m³)
Weight	134 lbs (60.8 kg)

* This assumes a minimum of 12" (305 mm) of stone above, 9" (229 mm) of stone below chambers, 9" (229 mm) row spacing, and 40% stone porosity.

StormTech MC-3500 End Cap (not to scale)

Nominal End Cap Specifications

Size (L x W x H)	26.5" (673 mm) x 71" (1803 mm) x 45.1" (1145 mm)
End Cap Storage	15.6 ft³ (0.44 m³)
Min. Installed Storage*	46.9 ft³ (1.33 m³)
Weight	43 lbs (19.5 kg)

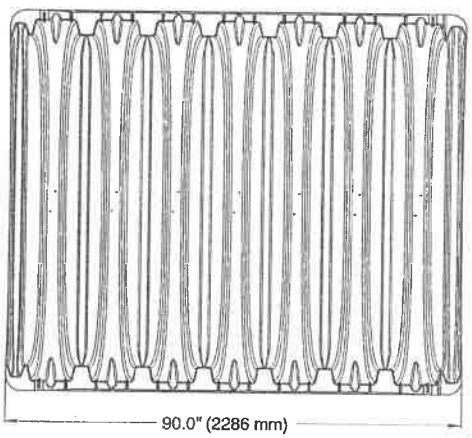
*This assumes a minimum of 12" (305 mm) of stone above, 9" (229 mm) of stone below, 9" (229 mm) row spacing, 6" (152 mm) of stone perimeter, and 40% stone porosity.

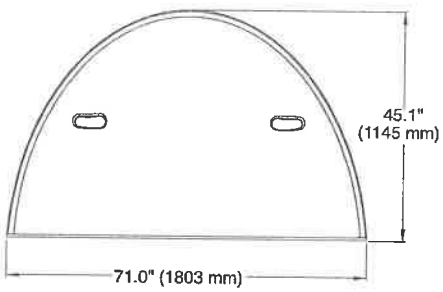
Shipping

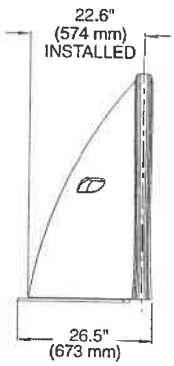
15 chambers/pallet

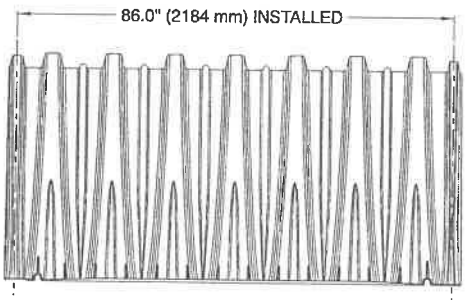
16 end caps/pallet

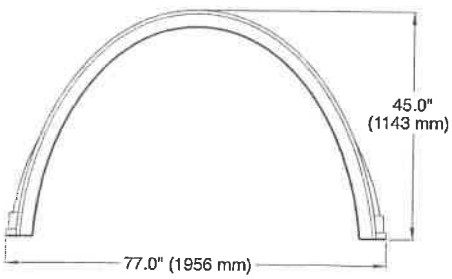
7 pallets/truck











Storage Volume Per Chamber/End Cap ft³ (m³)

	Bare Unit Storage	Chamber/End Cap and Stone Volume — Stone Foundation Depth in. (mm)			
	ft³ (m³)	9 (229)	12 (305)	15 (381)	18 (457)
MC-3500 Chamber	109.9 (3.11)	178.9 (5.06)	184.0 (5.21)	189.2 (5.36)	194.3 (5.5)
MC-3500 End Cap	15.64 (0.44)	46.9 (1.33)	48.6 (1.38)	50.3 (1.43)	52.0 (1.47)

NOTE: Assumes 9" (229 mm) row spacing, 40% stone porosity 12" (305 mm) stone above and includes the bare chamber/end cap volume. End Cap volume assumes 6" (152 mm) stone perimeter.

Volume of Excavation Per Chamber/End Cap in yd³ (m³)

	Stone Foundation Depth in. (mm)			
	9 (229)	12 (305)	15 (381)	18 (457)
MC-3500	12.4 (9.5)	12.8 (9.8)	13.3 (10.2)	13.8 (10.5)
End Cap	4.1 (3.1)	4.3 (3.3)	4.4 (3.4)	4.6 (3.5)

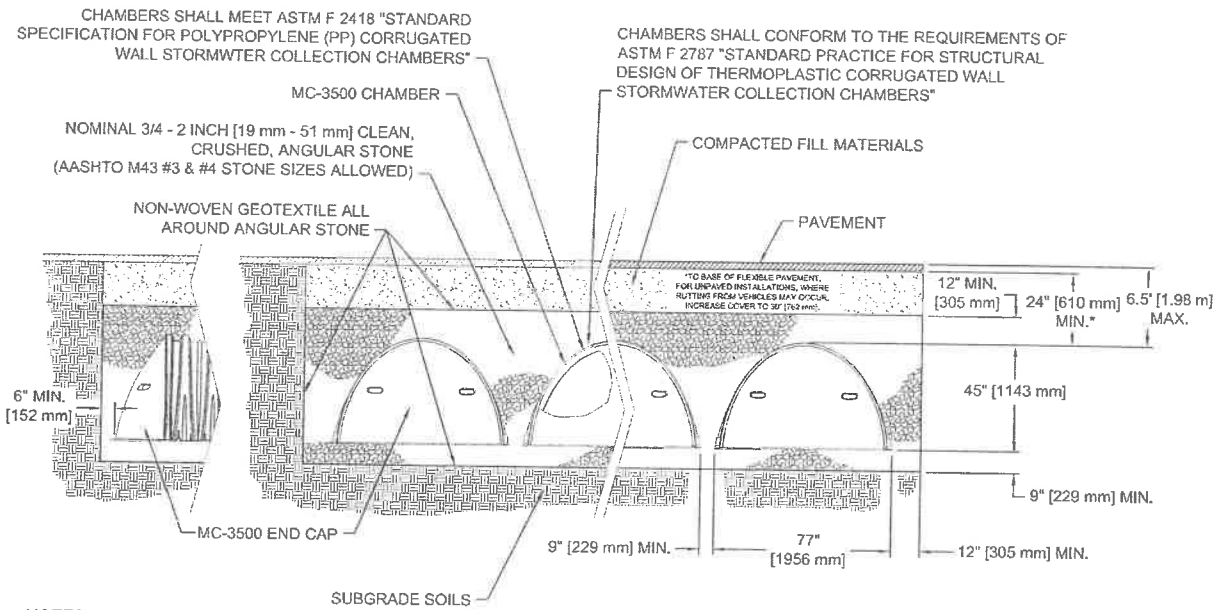
NOTE: Assumes 9" (229 mm) of separation between chamber rows and 24" (610 mm) of cover. The volume of excavation will vary as the depth of cover increases.

Amount of Stone Per Chamber

ENGLISH tons (yd³)	Stone Foundation Depth			
	9 in.	12 in.	15 in.	18 in.
MC-3500	9.1 (6.4)	9.7 (6.9)	10.4 (7.3)	11.1 (7.8)
End Cap	4.1 (2.9)	4.3 (3.1)	4.6 (3.2)	4.8 (3.4)
METRIC kg (m³)	229 mm	305 mm	381 mm	457 mm
MC-3500	8220 (4.9)	8831 (5.3)	9443 (5.6)	10054 (6.0)
End Cap	3729 (2.2)	3933 (2.3)	4136 (2.5)	4339 (2.6)

NOTE: Assumes 12" (305 mm) of stone above, and 9" (229 mm) between chambers/end caps.

General Cross Section



NOTES:

1. THIS CROSS SECTION PROVIDES GENERAL INFORMATION FOR THE MC-3500 CHAMBER. STORMTECH MC-3500 CHAMBERS MUST BE DESIGNED AND INSTALLED IN ACCORDANCE WITH THE MC-3500 DESIGN MANUAL AND MC-3500 CONSTRUCTION GUIDE.
2. PROPERLY INSTALLED MC-3500 CHAMBERS PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR EARTH AND LIVE LOADS WITH CONSIDERATION FOR IMPACT AND MULTIPLE PRESENCES.
3. PERIMETER STONE MUST ALWAYS BE BROUGHT UP EVENLY WITH BACKFILL OF BED. PERIMETER STONE MUST EXTEND HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH STRAIGHT OR SLOPED SIDEWALLS.

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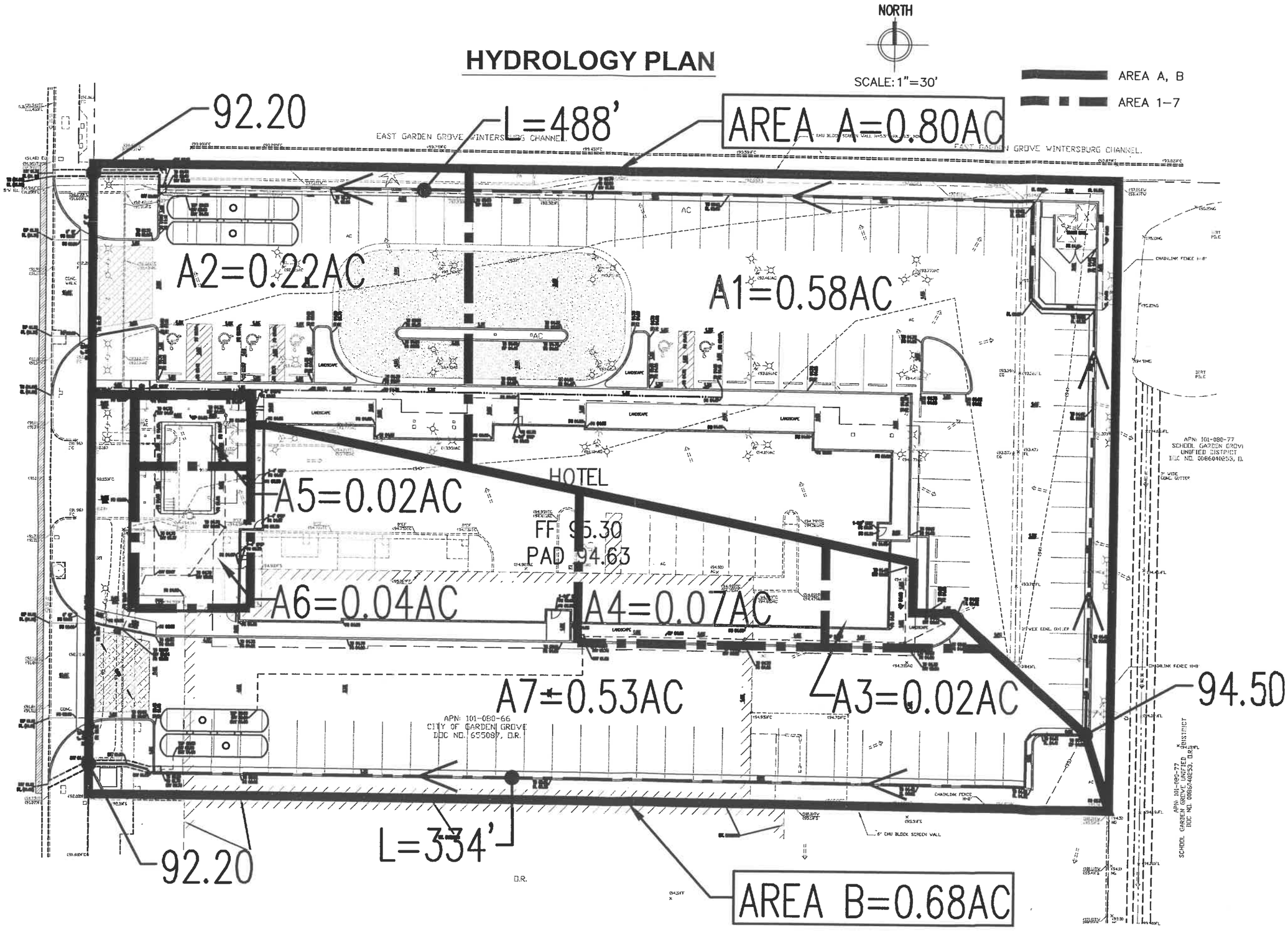
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