Appendix F

Water Resources Technical Report

PASEO MARINA
WATER RESOURCES TECHNICAL REPORT

City of Los Angeles
County of Los Angeles, California

Prepared For

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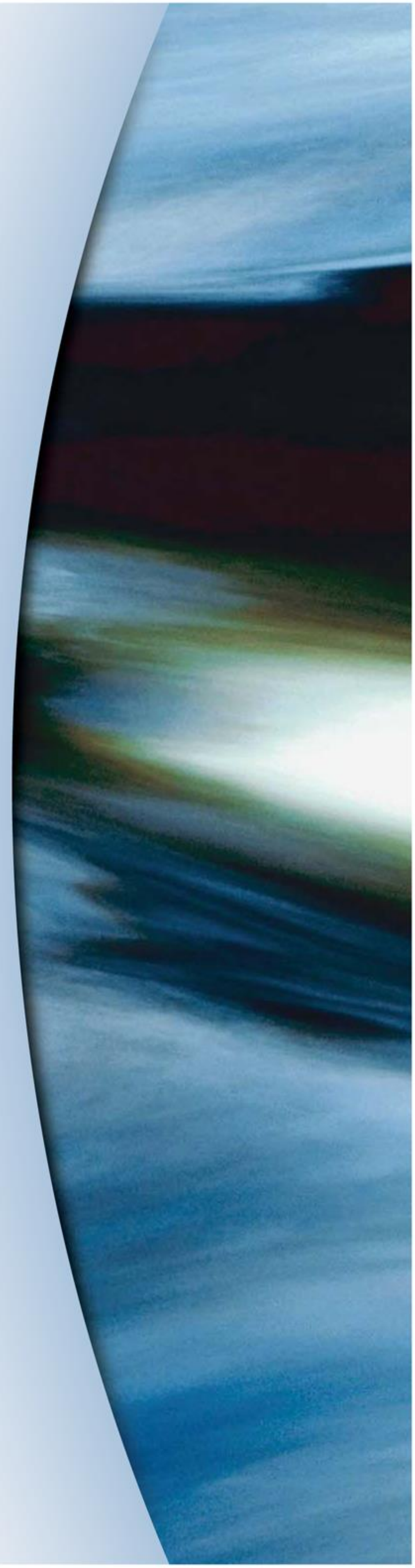

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1. INTRODUCTION

1.1. PROJECT DESCRIPTION

The Paseo Marina project ("Project") is a mixed-use development project on an approximately 6.05-acre site ("Project Site") located at the intersection of Maxella Avenue and Glencoe Avenue in the City of Los Angeles. The Project Site is bordered to the north by the Tierra del Rey Apartments and the Villa Velletri Townhouses, to the west by Gelsons and AMC and the Stella Apartments, to the east by Pavilions and to the south by Hotel MdR Marina del Rey – a Double Tree by Hilton.

The Project Site is currently occupied by several retail buildings and surface parking lots. The existing land uses cover a total 100,781 square feet (SF) including restaurant area (8,532 SF) and commercial area (92,249 SF). The retail buildings include a Barnes and Noble, a DSW Designer Shoe Warehouse, and various other restaurants and office uses. The site is relatively flat with grade sloping gently to the south and east.

The Project will entail the demolition and removal of all existing land uses. The proposed Project consist of three seven-stories buildings which will contain a total of 658 residential units. The residential units will include studio (97 units), one-bedroom (386 units) and two-bedroom (175 units) apartments. The Project's ground level will include 27,300 square feet of retail/commercial space including restaurants (13,650 SF) and general retail (13,650 SF). Two levels of above-grade retail parking will be provided as well as two levels of subterranean parking for residents.

1.2. SCOPE OF WORK

As part of the environmental impact report (EIR) for the Project, this report will describe the existing and proposed surface water hydrology, surface water quality, and groundwater at the Project Site and immediate surrounding areas, as well as an analysis of the Project's potential impacts on each of these water resources.

For the purpose of this report, the collective Project components (residential, retail and restaurants) will be analyzed and considered as one project.

2. REGULATORY FRAMEWORK

2.1. SURFACE WATER HYDROLOGY

County of Los Angeles Hydrology Manual

Per the City of Los Angeles (City)'s Special Order No. 007-1299, December 3, 1999, the City has adopted the Los Angeles County (County) Department of Public Works Hydrology Manual as its basis of design for storm drainage facilities. The Hydrology Manual requires that a storm drain conveyance system be designed for at least a 10-year storm event. Areas with sump conditions are required to have a storm drain conveyance system capable of conveying flow from a 50-year storm event. The County also limits the allowable discharge into existing storm drain facilities based on the MS4 Permit and is enforced on all new developments that discharge directly into the County's storm drain system. Any proposed drainage improvements of County owned storm drain facilities such as catch basins and storm drain lines requires the approval/review from the County Flood Control District department.

The Los Angeles County Department of Public Works Hydrology Manual (January 2006) establishes the Los Angeles County Department of Public Works' hydrologic design procedures based on historic rainfall and runoff data collected within the county. The hydrologic techniques in the manual apply for the design of local storm drains, retention and detention basins, pump stations, and major channel projects.

The proposed Project is required to utilize the 2006 Hydrology Manual and accompanying hydrologic tools including HydroCalc Calculator to calculate existing and proposed discharges and volumes from the Project.

Los Angeles Municipal Code

Any proposed drainage improvements within the street right-of-way or any other property owned by, to be owned by, or under the control of the City requires approval through the B-Permit process (Section 62.105, LAMC). Through the B-Permit process, storm drain installation plans which include any connections to the City's storm drain system from a property line to a catch basin or storm drain pipe, are subject to review and approval by the City of Los Angeles Department of Public Works, Bureau of Engineering.

2.2. SURFACE WATER QUALITY

Clean Water Act

Controlling pollution of the nation's receiving water bodies has been a major environmental concern for more than three decades. Growing public awareness of the impacts of water pollution in the United States culminated in the establishment of the federal Clean Water Act[1] (CWA) in 1972, which provided the regulatory framework for surface water quality protection.

The United States Congress amended the CWA in 1987 to specifically regulate discharges to waters of the United States from public storm drain systems and storm water flows from industrial facilities, including construction sites, and require such discharges be regulated through permits under the National Pollutant Discharge Elimination System (NPDES).[2] Rather than setting numeric effluent limitations for storm water and urban runoff, CWA regulation calls for the implementation of Best Management Practices (BMPs) to

[1] Also referred to as the Federal Water Pollution Control Act of 1972.
[2] CWA Section 402(p).

reduce or prevent the discharge of pollutants from these activities to the Maximum Extent Practicable (MEP) for urban runoff and meeting the Best Available Technology Economically achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) standards for construction storm water. Regulations and permits have been implemented at the federal, state, and local level to form a comprehensive regulatory framework to serve and protect the quality of the nation's surface water resources.

In addition to reducing pollution with the regulations described above, the CWA also seeks to maintain the integrity of clean waters of the United States – in other words, to keep clean waters clean and to prevent undue degradation of others. As part of the CWA, the Federal Anti-Degradation Policy [40 Code of Federal Regulations (CFR) Section 131.12] states that each state "shall develop and adopt a statewide anti-degradation policy and identify the methods for implementing such policy…" [40 CFR Section 131.12(a)]. Three levels of protection are defined by the federal regulations:

1. Existing uses must be protected in all of the Nation's receiving waters, prohibiting any degradation that would compromise those existing uses;
2. Where existing uses are better than those needed to support propagation of aquatic wildlife and water recreation, those uses shall be maintained, unless the state finds that degradation is "…necessary to accommodate important economic or social development" [40 CFR Section 131.12(a)(2)]. Degradation, however, is not allowed to fall below the existing use of the receiving water; and
3. States must prohibit the degradation of Outstanding National Resource Waters, such as waters of national and state parks, wildlife refuges, and waters of exceptional recreation or ecological significance.

Federal Anti-Degradation Policy

The Federal Anti-Degradation Policy (40 CFR 131.12) requires states to develop statewide anti-degradation policies and identify methods for implementing them. Pursuant to the CFR, state anti-degradation policies and implementation methods shall, at a minimum, protect and maintain (1) existing in-stream water uses; (2) existing water quality, where the quality of the waters exceeds levels necessary to support existing beneficial uses, unless the state finds that allowing lower water quality is necessary to accommodate economic and social development in the area; and (3) water quality in waters considered an outstanding national resource.

Porter-Cologne Water Quality Act

In the State of California, the State Water Resources Control Board (SWRCB) and local Regional Water Quality Control Boards (RWQCBs) have assumed the responsibility of implementing the United States Environmental Protection Agency's (USEPA) NPDES Program and other programs under the CWA such as the Impaired Waters Program and the Anti-Degradation Policy. The primary quality control law in California is the Porter-Cologne Water Quality Act (Water Code Sections 13000 et seq.). Under Porter-Cologne, the SWRCB issues joint federal NPDES Storm Water permits and state Waste Discharge Requirements (WDRs) to operators of municipal separate storm sewer systems (MS4s), industrial facilities, and construction sites to obtain coverage for the storm water discharges from these operations.

California Anti-Degradation Policy

The California Anti-Degradation Policy, otherwise known as the Statement of Policy with Respect to Maintaining High Quality Water in California was adopted by the SWRCB (State Board Resolution No. 68-16) in 1968. Unlike the Federal Anti-degradation, Policy, the California Anti-Degradation Policy applies to all waters of the State, not just surface waters. The policy states that whenever the existing quality of a water body is better than the quality established in individual Basin Plans, such high quality shall be maintained and discharges to that water body shall not unreasonably affect present or anticipated beneficial use of such water resource.

California Toxic Rule

In 2000, the EPA promulgated the California Toxic Rule, which establishes water quality criteria for certain toxic substances to be applied to waters in the State. The EPA promulgated this rule based on the EPA's determination that the numeric criteria are necessary in the State to protect human health and the environment. The California Toxic Rule establishes acute (i.e., short-term) and chronic (i.e., long-term) standards for bodies of water such as inland surface waters and enclosed bays and estuaries that are designated by the Los Angeles Regional Water Quality Control Board (LARWQCB) as having beneficial uses protective of aquatic life or human health.

Board Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties

As required by the California Water Code, the LARWQCB has adopted a plan entitled "Water Quality Control Plan, Los Angeles Region: Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties" (Basin Plan). Specifically, the Basin Plan designates beneficial uses for surface and groundwaters, sets narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's anti-degradation policy, and describes implementation programs to protect all waters in the Los Angeles Region. In addition, the Basin Plan incorporates (by reference) all applicable state and Regional Board plans and policies and other pertinent water quality policies and regulations. Those of other agencies are referenced in appropriate sections throughout the Basin Plan.

NPDES Permit Program

The NPDES permit program was first established under authority of the CWA to control the discharge of pollutants from any point source into the waters of the United States. As indicated above, in California, the NPDES stormwater permitting program is administered by the SWRCB through its nine RWQCBs.

The General Permit for Construction Activities

SWRCB Order No. 2009-0009-DWQ known as "General Permit" was adopted on September 2, 2009 and was amended by Order No 2012-0006-DWQ which became effective on July 17, 2012. This NPDES permit establishes a risk-based approach to stormwater control requirements for construction projects by identifying three project risk levels. The main objectives of the General Permit are to:

1. Reduce erosion
2. Minimize or eliminate sediment in stormwater discharges
3. Prevent materials used at a construction site from contacting stormwater
4. Implement a sampling and analysis program
5. Eliminate unauthorized non-stormwater discharges from construction sites
6. Implement appropriate measures to reduce potential impacts on waterways both during and after construction of projects
7. Establish maintenance commitments on post-construction pollution control measures

California mandates requirements for all construction activities disturbing more than one acre of land to develop and implement Stormwater Pollution Prevention Plans (SWPPP). The SWPPP documents the selection and implementation of BMPs for a specific construction project, charging Owners with stormwater quality management responsibilities. A construction site subject to the General Permit must prepare and implement a SWPPP that meets the requirements of the General Permit.

As part of the Project, preparation and implementation of a SWPPP will be required. In addition, the Project will be required to obtain a Waste Discharger Identification Number (WDID) through the State's Storm Water Multiple Application and Report Tracking System (S.M.A.R.T.S.).

Los Angeles County Municipal Storm Water System (MS4) Permit

As described above, USEPA regulations require that MS4 permittees implement a program to monitor and control pollutants being discharged to the municipal system from both industrial and commercial projects that contribute a substantial pollutant load to the MS4.

On December 13, 2001, the LARWQCB adopted Order No. 01-182 under the CWA and the Porter-Cologne Act. This Order is the NPDES Permit or MS4 permit for municipal stormwater and urban runoff discharges within Los Angeles County. The requirements of this Order (the "Permit") cover 84 cities and most of the unincorporated areas of Los Angeles County. Under the Permit, the LACFCD is designated as the Principal Permittee. The Permittees are the 84 Los Angeles County cities (including the City of Los Angeles) and unincorporated areas within Los Angeles County. Collectively, these are the "Co-Permittees". The Principal Permittee helps to facilitate activities necessary to comply with the requirements outlined in the Permit but is not responsible for ensuring compliance of any of the Permittees.

Since adoption of Order No. 01-182, the LARWQCB has seen adopted Order No. R4-2012-0175, as amended by State Water Board Order WQ 2015-0075 NPDES Permit No. CAS004001 on November 8, 2012. This current permit will expire on December 28, 2017.

The City of Los Angeles is a Permittee of the California Regional Water Quality Control Board, Los Angeles Region, and is therefore subject to the requirements set forth in Order No. R4-2012-0175, as amended by State Water Board Order WQ 2015-0075, NPDES Permit No. CAS004001.

Los Angeles Municipal Code

Section 64.70 of LAMC sets forth the City's Stormwater and Urban Runoff Pollution Control Ordinance. The ordinance prohibits the discharge of the following items into any storm drain systems:

- Any liquids, solids or gasses which by reason of their nature or quantity are flammable, reactive, explosive, corrosive, or radioactive, or by interaction with other materials could result in fire, explosion or injury.
- Any solid or viscous materials, which could cause obstruction to the flow or operation of the storm drain system.
- Any pollutant that injures or constitutes a hazard to human, animal, plant or fish life, or creates a public nuisance.
- Any noxious or malodorous liquid, gas, or solid in sufficient quantity, either singly or by interaction with other materials, which creates a public nuisance, hazard to life, or inhibits authorized entry of any person into the storm drain system.
- Any medical, infectious, toxic or hazardous material or waste.

Earthwork activities, including grading, are overseen by the Los Angeles Building Code, which is contained in Los Angeles Municipal Code (LAMC), Chapter IX, Article 1. Section 91.7013 contains regulations pertaining to erosion control and drainage devices and Section 91.7014 provide requirements for flood, mudflow protection and general construction requirements.

Standard Urban Stormwater Mitigation Plan (SUSMP)

Under the current Los Angeles County Municipal NPDES Permit, permittees are required to implement a development planning program to address storm water pollution. These programs require project applicants for certain types of projects to implement Standard Urban Stormwater Mitigation Plans (SUSMP) throughout the operational life of their projects. The purpose of SUSMP is to reduce the discharge of pollutants in storm water by outlining BMPs which must be incorporated into the design plans of new development and redevelopment.

The Project falls within the definition of "redevelopment" under the MS4 Storm Water Permit which requires compliance with the Low Impact Development (LID) requirements and SUSMP requirements.

Low Impact Development

LID is a stormwater strategy that is used to mitigate the impacts of runoff and stormwater pollution as close to its source as possible. Urban runoff discharged from municipal storm drain systems is one of the principal causes of water quality impacts in most urban areas. The stormwater may contain pollutants such as trash and debris, bacteria and viruses, oil and grease, sediments, nutrients, metals, and toxic chemicals that can negatively affect the ocean, rivers, plant and animal life, and public health.

LID encompasses a set of site design approaches and BMPs that are designed to address runoff and pollution at the source. These LID practices can effectively remove nutrients, bacteria, and metals, while reducing the volume and intensity of stormwater flows.

The Project is subject to compliance of Order No. R4-2012-0175, which became effective on November 8, 2012. The main purpose of this law is to ensure that development and redevelopment projects mitigate runoff in a manner that captures or treats rainwater at its source, while utilizing natural resources.

In accordance with Order No. R4-2012-0175, stormwater runoff shall be infiltrated, evapotranspired, captured and used, or treated through high removal efficiency BMPs, onsite, through stormwater management techniques that comply with provisions of the City of Los Angeles Development Best Management Practices Handbook (June 2011).

The City of Los Angeles also passed an LID Ordinance (#181899) on October 7, 2011 which provides mandates for LID BMPs within development and redevelopment projects.

The LARWQCB has a BMP Hierarchy in which the project must follow when selecting the type or types of BMPs to be constructed on site. The following is the BMP Hierarchy, per Order No. R4-2012-0175 as amended by Order WQ 2015-0075 NPDES NO. CAS004001:

1. On-site infiltration,
2. On-site bioretention and/or harvest and use,
3. On-site biofiltration, off-site ground water replenishment, and/or off-site retrofit

Hydromodification

In addition to the LID requirements listed in the Permit, the Permit also addresses requirements for Hydromodification as pertaining to the project. Per Part VI.D.7.c.iv of the Permit:

"Each Permittee shall require all New Development and Redevelopment projects located within natural drainage systems as described in Part VI.D.7.c.iv.(1)(a)(iii) to implement hydrologic control measures, to prevent accelerated downstream erosion and to protect stream habitat in natural drainage systems. The purpose of the hydrologic controls is to minimize changes in post-development hydrologic storm water runoff discharge rates, velocities, and duration. This shall be achieved by maintaining the project's pre-project stormwater runoff flow rates and durations."

However, per Part VI.D.7.c.iv.(1)(b)(iv) of the Permit, the project is exempt from such requirements as runoff from the site is discharged directly via storm drain to a receiving water that is not susceptible to hydromodification impacts. Ballona Creek and Marina del Rey harbor are categorized as not susceptible to hydromodification. Therefore, the project is not required to implement hydrologic control measures as mitigation for hydromodification impacts. In addition, implementation of the project will result in a reduction of peak flows and volumes as compared to existing conditions, thereby satisfying hydromodification requirements in addition to the receiving water exemption.

2.3. GROUNDWATER

California Groundwater Sustainability Act

On Sept. 16, 2014, California Governor Jerry Brown signed into law a three-bill legislative package, known as the Sustainable Groundwater Management Act of 2014 (SGMA). The SGMA provides a framework for sustainable management of groundwater supplies by local authorities, with a limited role for state intervention only if necessary to protect the resource.

The SGMA requires the formation of local groundwater sustainability agencies (GSAs) that must assess conditions in their local water basins and adopt locally-based management plans. The act provides substantial time – 20 years – for GSAs to implement plans and achieve long-term groundwater sustainability. It protects existing surface water and groundwater rights and does not impact current drought response measures.

The California Water Commission (CWC) requires a statewide prioritization of California's groundwater basins using the following eight criteria:

1. Overlying population;
2. Projected growth of overlying population;
3. Public supply wells;
4. Total wells;
5. Overlying irrigated acreage;
6. Reliance on groundwater as the primary source of water;
7. Impacts on the groundwater; including overdraft, subsidence, saline intrusion, and other water quality degradation; and
8. Any other information determined to be relevant by the Department.

The Project Site is located within a medium priority California Statewide Groundwater Elevation Monitoring groundwater basin. GSAs responsible for high-and medium-priority basins must adopt groundwater sustainability plans within five to seven years, depending on whether the basin is in critical overdraft. Agencies may adopt a single plan covering an entire basin or combine a number of plans created by multiple agencies. Preparation of groundwater sustainability plans is exempt from CEQA. Plans must include a physical description of the basin, including groundwater levels, groundwater quality, subsidence, information on groundwater-surface water interaction, data on historical and projected water demands and supplies, monitoring and management provisions, and a description of how the plan will affect other plans, including city and county general plans. Plans will be evaluated every five years.

Board Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties

As required by the California Water Code, the LARWQCB has adopted a plan entitled “Water Quality Control Plan, Los Angeles Region: Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties” (Basin Plan). Specifically, the Basin Plan designates beneficial uses for surface and groundwaters, sets narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's anti-degradation policy, and describes implementation programs to protect all waters in the Los Angeles Region. In addition, the Basin Plan incorporates (by reference) all applicable state and regional board plans and policies and other pertinent water quality policies and regulations. Those of other agencies are referenced in appropriate sections throughout the Basin Plan.

The Basin Plan is a resource for the LARWQCB and others who use water and/or discharge wastewater in the Los Angeles Region. Other agencies and organizations involved in environmental permitting and resource management activities also use the Basin Plan. Finally, the Basin Plan provides valuable information to the public about local water quality issues.

Safe Drinking Water Act (SDWA)

The federal Safe Drinking Water Act (SDWA), established in 1974, sets drinking water standards throughout the country and is administered by the USEPA. The drinking water standards established in the SDWA, as set forth in the CFR, are referred to as the National Primary Drinking Water Regulations (Primary Standards, Title 40, CFR Part 141) and the National Secondary Drinking Water Regulations (Second Standards, 40 CFR Part 143). California passed its own SDWA in 1986 that authorizes the State's Department of Health Services (DHS) to protect the public from contaminants in drinking water by establishing maximum contaminants levels, as set forth in the California Code of Regulations (CCR), Title 22, Division 4, Chapter 15, that are at least as stringent as those developed by the USEPA, as required by the federal SDWA.

Watermaster Service for the Santa Monica Basin

The Santa Monica Basin is an unadjudicated basin. The primary producer in the basin is the city of Santa Monica. The Groundwater management in the Santa Monica Basin has centered primarily on the cleanup of groundwater contaminated by MTBE, most notably in the Arcadia and Charnock subbasins. The cleanup operations are coordinated/overseen by the Los Angeles Regional Water Quality Control Board.

3. ENVIRONMENTAL SETTING

3.1. SURFACE WATER HYDROLOGY

3.1.1. Regional

The Project is located within the Ballona Creek Watershed in the County of Los Angeles and directly adjacent to the Marina Del Rey Watershed. The Ballona Creek Watershed covers approximately 130 square miles in the coastal plain of the Los Angeles Basin. Its boundaries are the Santa Monica Mountains to the north, the Harbor Freeway (110) to the east, and the Baldwin Hills to the south. Ballona Creek flows as an open channel for just under 10 miles from mid-Los Angeles (south of Hancock Park) through Culver City, reaching the Pacific Ocean at Playa del Rey (Marina del Rey Harbor). The Estuary portion (from Centinela Avenue to the outlet) is soft bottomed, while the remainder of the creek is lined in concrete. Ballona Creek is fed by a network of underground storm drains, which reaches north into Beverly Hills and West Hollywood. The average dry weather flow at the Watershed's terminus in Playa del Rey is 25 cubic feet per second (cfs). The average wet weather flow is ten times higher, or even more during large storms.

The northern portion of the Project discharges into the Marina del Rey Watershed. The watershed consists of the harbor water area, including the docks, back basins, Marina Beach, Oxford Retention Basin (Oxford Basin) and the land adjacent to the harbor back basins including portions of Los Angeles County unincorporated area parcels, streets, and other facilities. The Harbor consists of the Main Channel and eight back basins (A-H). The Project discharges into back basin "E" which has impairments to water quality due to poor circulation and tidal as explained in more detail in Section 3.2.

3.1.2. Local

Stormwater runoff is collected from the Project Site and conveyed through offsite storm drain facilities along the public streets surrounding the Project Site. Stormwater flows northwest to Maxella Avenue or south east and west to ribbon gutters within adjacent parking lots offsite that ultimately connect to a channel under Highway Route 90. The storm drain facilities along Maxella Avenue are owned and maintained by Los Angeles County Flood Control District (LACFCD). The storm drain along Maxella Avenue flows in a southwesterly direction and connects to the storm drain along Berkley Drive, which flows westerly and discharges into the Marina del Rey Harbor. The southeast and southwesterly flows ultimately discharge into Ballona Creek located to the southeast. Please refer to Appendix A for the existing storm drain map.

3.1.3. On Site

Under the existing conditions, the entire Paseo Marina project area is built out with high impervious conditions throughout each existing drainage area, and the predominant land use being surface parking lots and buildings. The topography of the site is relatively flat, with slopes varying from about 0.5% to approximately 1%. As mentioned, a portion of the site drains the Maxella Avenue and the remainder of the site drains to ribbon gutters within adjacent parking lots offsite to the south that ultimately connect to a channel under Highway Route 90. The site is fully developed with a few landscaped areas within the site. The highest elevation of the site is 23' near the Maxella Avenue/Glencoe Avenue intersection, while the lowest elevation of the site is 18' located at the southern corner of the site, north of the existing Pavilions building offsite. The site drains to various discharge points, including the western portion of the property, the eastern corner of the property, and the two south corners of the property. See Appendix A for existing drainage areas and discharge points.

The only existing underground drainage facilities within the property are an inlet and water quality structure (CDS/Contech manhole) at the northwest corner of the property, near the hotel driveway, which collects and conveys drainage from the northwest portion of the property. The drainage on the other portions of the property is conveyed offsite via surface gutters. There are no drainage issues associated with the project site.

The project site has been delineated into six Drainage Sub-Areas (DAs) served by various storm drains both on- and off-site (see Appendix A for exhibits). There is an existing Los Angeles County Department of Public Works (LACDPW) 45" RCP storm drain on Maxella Avenue (north side of roadway), which drains in a westerly direction from Glencoe Avenue toward Del Rey Avenue. This storm drain currently collects drainage from an onsite inlet, located at the northwest corner of the property. The 45" pipe ultimately drains to the northern portion of the Marina del Rey harbor at Basin E. DA's 1E and 1F drain in a westerly direction to catch basins and connect to the 45" pipe along Maxella Avenue.

There are also two existing 18" lines and one existing 24" line beyond the southern end of the property along Route 90. The 24" line is the farthest east of the offsite lines. Runoff from DA 1A flows offsite through a system of gutters and connect to the 24" line. DA's 1B and 1C drainage flows to the two 18" lines along Route 90. DA 1D flows southwest off site to a system of gutters ultimately to the 54" City drain offsite along Route 1/Pacific Coast Highway.

Table 1 below provides 10-year and 50-year storm frequency analysis for the Project Site's existing conditions. These two storm frequencies are required by Los Angeles County Public Works (10-year) and the City of Los Angles CEQA guideline requirements (50-year). Output calculations are provided in Appendix B.

Table 1 Existing Condition 10-year and 50-year Storm Event Hydrology

Existing Conditions10-year Storm Frequency				
Drainage Sub-Area	Acreage	Time of Concentration (min)	% Imperviousness	Q_{10} (cfs)
1A	1.42	8	96%	2.34
1B	2.23	11	96%	3.16
1C	0.86	8	96%	1.42
1D	0.31	6	96%	0.586
1E	0.97	9	96%	1.51
1F	0.26	5	96%	0.536
Total Site	**6.05**	--	**96%**	**9.55**
Existing Conditions 50-year Storm Frequency				
Drainage Sub-Area	Acreage	Time of Concentration (min)	% Imperviousness	Q_{50} (cfs)
1A	1.42	7	96%	3.50
1B	2.23	9	96%	4.88
1C	0.86	7	96%	2.12
1D	0.31	5	96%	0.90
1E	0.97	7	96%	2.39
1F	0.26	5	96%	0.75
Total Site	**6.05**	--	**96%**	**14.5**
Notes: See Appendix A for the existing hydrology exhibit and Appendix B for existing hydrology calculations.				

3.1.4. FEMA

The project is within Panel 1752 of 2350 (Map Number 06037C1752F, dated September 26, 2008) on Federal Emergency Management Agency's (FEMA's) Flood Insurance Rate Map (FIRM). Based on the FIRM, the project is within Zone X, which depicts areas determined to be outside of the 0.2% (500-year) annual chance floodplain. Therefore, the processing of a CLOMR/LOMR, through FEMA, will not be required for this project.

3.2. SURFACE WATER QUALITY

3.2.1. Regional

As described above, the Project is located within the Ballona Creek Watershed although the northern portion of the site discharges into the Marina del Rey Watershed. Ballona Creek is an impaired watershed and includes the cities of Beverly Hills, West Hollywood, portions of the cities of Los Angeles, Culver City, Inglewood and Santa Monica, unincorporated areas of Los Angeles County, and areas under the jurisdiction of Caltrans. The Ballona Creek Watershed is comprised of a highly urbanized area and includes 64% residential, 8% commercial, 4% industrial, and 17% open space. The Marina del Rey Watershed is also impaired and consists of runoff from portions of the cities of Culver City, Los Angeles, as well as portions of the unincorporated County of Los Angeles.

3.2.1.1. Beneficial Uses in Ballona Creek/Marina Del Rey Watersheds

The existing and potential beneficial uses for the waters within the Ballona Creek Watershed, where the majority of the surface water flows from the Project ultimately discharge are described below. Beneficial uses for waterbodies in the Ballona Creek Watershed are primarily identified for coastal waters that receive discharges from the storm drains.

Table 2 Beneficial Uses of Ballona Creek and Ballona Estuary

NAV - Navigation	MAR - Marine Habitat
MUN* - Municipal and Domestic Supply	WILD - Wildlife Habitat
REC1 - Water Contact Recreation	RARE - Rare, Threatened, or Endangered Species
REC2 - Non-Contact Water Recreation	MIGR - Migration or Aquatic Organisms
COMM - Commercial and Sport Fishing	SPWN - Spawning, Reproduction, and/or Early Development
WARM* - Warm Freshwater Habitat	SHELL - Shellfish Harvesting
EST - Estuarine Habitat	

Notes:
* Potential beneficial use
Source: Los Angeles Regional Water Quality Control Board Beneficial Use Table, found here: http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/Beneficial_Uses/ch2/Revised%20Beneficial%20Use%20Tables.pdf

The existing and potential beneficial uses for the waters within the harbor area of the Marina del Rey Watershed where surface water flows from the northwestern portion of the Project ultimately discharge are described below. Discharges to the Marina del Rey harbor are routed through a series of storm drain lines.

Table 3 Beneficial Uses of Marina del Rey Watershed

NAV - Navigation	**MAR** - Marine Habitat
COMM - Commercial and Sport Fishing	**WILD** - Wildlife Habitat
SHELL - Shellfish Harvesting	
Notes: Source: Los Angeles Regional Water Quality Control Board Beneficial Use Table, found here: http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/Beneficial_Uses/ch2/Revised%20Beneficial%20Use%20Tables.pdf	

3.2.1.2. Impairments and TMDL's in the Ballona Creek Watershed and Marina del Rey Harbor

CWA 303(d) List of Water Quality Limited Segments

Under Section 303(d) of the CWA, states are required to identify water bodies that do not meet their water quality standards. Biennially, the LARWQCB prepares a list of impaired waterbodies in the region, referred to as the 303(d) list. The 303(d) list outlines the impaired waterbody and the specific pollutant(s) for which it is impaired. All waterbodies on the 303(d) list are subject to the development of a Total Daily Maximum Load (TMDL).

Storm water runoff from the Project discharges to Ballona Creek Estuary and to Marina del Rey Harbor. According to the 2010 303(d) list of Limited Water Quality Segments published by the SWRCB, the Ballona Creek Estuary and Marina del Rey Harbor are listed as impaired by the constituents in the Table below.

Table 4 List of 303(d) Impairments

Water Body	303(d) Impairment
Ballona Creek Estuary	Cadmium, chlordane, coliform bacteria, copper, DDT, lead, PAHs, PCBs, shellfish harvesting advisory, silver and zinc
Marina del Rey Harbor	Chlordane, copper, fish consumption advisory, indicator bacteria, lead, PCBs and zinc
Notes: Source: 2010 Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report) – Statewide, found here: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml?wbid=CAB1152200020020108171136	

Total Maximum Daily Loads (TMDLs)

Ballona Creek Watershed

Once a water body has been listed as impaired on the 303(d) list, a TMDL for the constituent of concern (pollutant) must be developed for that water body. A TMDL is an estimate of the daily load of pollutants that a water body may receive from point sources, non-point sources, and natural background conditions (including an appropriate margin of safety), without exceeding its water quality standard. Those facilities and activities that are discharging into the water body, collectively, must not exceed the TMDL. In general terms, municipal, small MS4, and other dischargers within each watershed are collectively responsible for meeting the required reductions and other TMDL requirements by the assigned deadline.

The Los Angeles RWQCB has adopted wet-weather TMDLs in Ballona Creek Estuary for silver, zinc, shellfish harvesting advisory, sediment toxicity, PCBs, PAHs, lead, DDT, copper, coliform bacteria, chlordane and cadmium as explained in more detail below:

- **Ballona Creek, Estuary, and Sepulveda Channel Bacteria TMDL** - includes numeric limits and waste load allocations applicable to urban runoff for total coliform, fecal coliform, enterococcus, and E. coli. LARWQCB 2005). The TMDL effective date is April 27, 2007. A TMDL

Implementation Plan was due to the LARWQCB October 27, 2009, however an extension to this date was granted to the responsible agencies.

- **Ballona Creek Estuary Toxic Pollutants TMDL** - includes numeric targets and waste load allocations for the following constituents in sediment: cadmium, copper, lead, silver, zinc, chlordane, DDT, total PCBs and Total PAHs (LARWQCB 2005). The TMDL effective date is January 11, 2006; a TMDL Implementation Plan is due to the LARWQCB January 11, 2011.

The Ballona Creek Estuary Toxics TMDL Implementation Plan (Implementation Plan) defines the approaches that the cities of Los Angeles (lead agency), Culver City, Beverly Hills, Inglewood, West Hollywood, Santa Monica, and the California Department of Transportation (Caltrans), (the responsible jurisdictions), will take to comply with the requirements of the Ballona Creek Estuary Toxics TMDL (Toxics TMDL). Compliance with Waste Load Allocation (WLA) for toxic pollutants based on the BMPs described above are shown in Table 5.

Table 5 Ballona Creek Estuary Toxics TMDL and Compliance with WLA

Constituent	Baseline Load	Load Reduction	Post BMP Load	WLA (MS4 Permitees and Caltrans)	Percent Exceedance
Metals	**(kg/yr)**	**(kg/yr)**	**(kg/yr)**	**(kg/yr)**	**%**
Cadmium	4.53	0.48	4.05	8.11	0%
Copper	243.95	25.75	218.19	230.50	0%
Lead	184.87	19.52	165.35	316.70	0%
Silver	2.96	0.31	2.65	6.78	0%
Zinc	1,012.58	106.90	905.69	1,017.00	0%
Organics	**(g/yr)**	**(g/yr)**	**(g/yr)**	**(g/yr)**	**%**
Chlordane	17.32	1.83	15.50	3.39	357%
DDTs	52.53	5.55	46.99	10.71	339%
PCBs	13.43	1.42	12.01	154.00	0%
PAHs	973.43	102.76	870.67	27,300.00	0%
Source: http://www.lastormwater.org/wp-content/files_mf/bcestuarytoxicstmdlimplementationplan2011.pdf					

Marina del Rey Watershed

The Marina del Rey Watershed has one of the most aggressive TMDL schedules for both Toxics and Bacteria and often leads the way in TMDL implementation for the rest of Los Angeles County[3]. The Marina del Rey Watershed is subject to three TMDLs; the Santa Monica Bay Nearshore Debris TMDL (Debris TMDL), the Marina del Rey Harbor Mother's Beach and Back Basin Bacteria TMDL (Bacteria TMDL), and the Toxic Pollutants in Marina del Rey Harbor TMDL (Toxics TMDL).

[3] Marina del Rey Enhanced Watershed Management Program Plan (2016), found here: http://www.waterboards.ca.gov/losangeles/water_issues/programs/stormwater/municipal/watershed_management/marina_delrey/MdR_EWMP_Final_wAppendices4-26.pdf

The Marina del Rey Watershed specifically has wet-weather TMDLs for chlordane, copper, fish consumption advisory, indicator bacteria, lead, PCBs and zinc. The Toxics TMDL numeric targets include concentrations of toxic pollutants in the back basins of the harbor, i.e., Basins D, E and F (the Project discharges into Basin E). The WLA are for the maximum amount of each of these constituents that can be transported from the Marina del Rey Watershed to the Back Basins. A majority of these constituents are bound to sediment and transported as storm-borne sediment during wet weather runoff events. See Table 6 below for a summary of the Marina del Rey harbor numeric targets and WLAs.

Table 6 Marina del Rey Harbor TMDLs and WLAs

Metals	Numeric Target (mg/kg)	WLA (kg/yr)
Copper	34	2.06
Lead	46.7	2.83
Zinc	150	9.11
Organics	**Numeric Target (µg/kg)**	**TMDL (g/yr)**
Chlordane	0.5	0.03
Total PCBs	22.7	22.7

3.2.2. Local

Within the urban environment of the Project, stormwater runoff occurs during and shortly after rain events. The volume of runoff depends on the intensity and duration of the storm event and the imperviousness of the drainage area. Typical urban pollutants associated with stormwater runoff following rain events includes sediment, trash, bacteria, metals, nutrients and potentially organics and pesticides. The source of contaminants is wide ranging and includes all areas where rainfall occurs along with atmospheric deposition. Therefore, sources of contaminants within urban areas include roadways, building tops, parking lots, landscape areas and maintenance areas.

To reduce contaminant loads from entering the storm drain system, the City conducts routine street cleaning operations as well as periodic cleaning and maintenance of the catch basins to reduce stormwater pollution within the storm drain system.

3.2.3. On Site

Under the existing conditions, the entire Paseo Marina project area is built out with high impervious conditions throughout each existing drainage area, and the predominant land use being surface parking lots and buildings. As mentioned, the only existing underground drainage facilities within the property are an inlet and water quality structure (CDS/Contech manhole) at the northwest corner of the property, near the hotel driveway, which collects and conveys drainage from the northwest portion of the property. The drainage on the other portions of the property is conveyed offsite via surface gutters. There are no drainage issues associated with the project site. Anticipated pollutants consistent with parking lots, building areas and landscaping include total suspended solids (TSS), oil/grease, heavy metals, nutrients, pesticides and trash.

3.3. GROUNDWATER

3.3.1. Regional

The City of Los Angeles overlies the Los Angeles Coastal Plain Groundwater Basin (Basin) which consists of four major subbasins: Hollywood, Santa Monica, Central and West Coast. Replenishment of the Basin occurs primarily through percolation of rainfall throughout the watershed via permeable surfaces, spreading grounds, and groundwater migration from adjacent basins. Injection wells are also used to pump freshwater along specific seawater barriers to prevent the intrusion of salt water. Groundwater flow within the Basin generally flows in a south and southwesterly direction.

3.3.2. Local

The Project also resides within the Los Angeles Coastal Plain Groundwater Basin, specifically overlying the Santa Monica Groundwater Subbasin, which is located in the northwestern part of the Los Angeles Coastal Plain Groundwater Basin. The Santa Monica Subbasin is bounded on the north by impermeable rocks of the Santa Monica Mountains, the Newport-Inglewood fault to the east, the Pacific Ocean to the west, and the Ballona Escarpment to the south. Extensive faulting within the Santa Monica Subbasin further separates the Subbasin into five subbasins. These include the Arcadia, Olympic, Coastal, Charnock, and Crestal subbasins. The Santa Monica Subbasin is a natural groundwater basin that encompasses a surface area of approximately 50.2 square miles and is estimated to have a total storage capacity of approximately 1.1 million acre-feet. Replenishment of groundwater in the Santa Monica Basin is mainly by percolation of precipitation and surface runoff onto the subbasin from the Sana Monica Mountains.

3.3.3. On Site

Golder Associates, Inc. performed geotechnical analysis of the project site. Based on on-site explorations conducted, the Project Site is located on alluvial soils derived from the nearby Ballona Creek. The alluvial soils generally consist of approximately 17 to 20 feet of silt and clay. The silt and clay contained layers of lenses of sand and silty sand. Below the silt and clay is medium dense to dense sand. The sand layer was approximately 20 to 25 feet thick. Below the sand is another silt clay layer approximately 5 to 15 feet thick.

According to the groundwater level contour map prepared by the California Division of Mines and Geology (CDMG, 1998) and presented in the Seismic Hazard Zone Report for the Venice 7.5-minute Quadrangle, the historical high groundwater level at the Site is approximately 5 to 10 feet below ground surface. Geotechnical borings on the properties next to the Project Site encountered groundwater at a depth of approximately 17 feet below ground surface (bgs). The depth to groundwater can fluctuate with the time of year, however, the water table is likely controlled by the ocean located southwest of the Project Site. Based on the Project Site's soil investigation, infiltration rates range from 0.5-2 inches per hour.

In addition to the geotechnical analysis, an analysis was performed by Carlin Environmental Consulting, Inc. (CEC) regarding methane concentrations in the underlying soils (see Appendix D) The Los Angeles Municipal Code requires all buildings within a Methane Zone or Methane Buffer Zone to provide a methane mitigation system based on appropriate site design levels. As the Project is located within a Methane Buffer Zone, and results from the analysis included concentrations ranging from 15 parts per million (ppm) to 1,050 ppm, the Project site is considered a Level III. According to Table 1B – Mitigation Requirements for Methane Buffer Zone (see Appendix D), Level III site design levels do not require any specific design features other than following standard protocols during construction and operation of the Project.

4. SIGNIFICANCE THRESHOLD

4.1. SURFACE WATER HYDROLOGY

The City of Los Angeles CEQA Thresholds Guide states that a project would normally have a significant impact on surface water hydrology if it would:

- Cause flooding during the projected 50-year developed storm event, which would have the potential to harm people or damage property or sensitive biological resources;
- Substantially reduce or increase the amount of surface water in a water body; or
- Result in a permanent, adverse change to the movement of surface water sufficient to produce a substantial change in the current or direction of water flow.

4.2. SURFACE WATER QUALITY

The City of Los Angeles CEQA Thresholds Guide states that a project would normally have a significant impact on surface water quality if discharges associated with the project would create pollution, contamination or nuisance, as defined in Section 13050 of the California Water Code (CWC) or that cause regulatory standards to be violated, as defined in the applicable NPDES stormwater permit or Water Quality Control Plan for the receiving water body.

The City of Los Angeles CEQA Thresholds Guide and CWC include the following relevant definitions:

"Pollution" means an alteration of the quality of the waters of the state to a degree which unreasonably affects either of the following: 1) the waters for beneficial uses or 2) facilities which serve these beneficial uses. "Pollution" may include "Contamination".

"Contamination" means an impairment of the quality of the waters of the state by waste to a degree, which creates a hazard to the public health through poisoning or though the spread of disease. "Contamination" includes any equivalent effect resulting from the disposal of waste, whether or not waters of the state are affected.

"Nuisance" means anything which meets all of the following requirements: 1) is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property; 2) affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal; and 3) occurs during, or as a result of, the treatment or disposal of wastes.

4.3. GROUNDWATER

According to the City of Los Angeles CEQA Thresholds Guide, a project would normally have a significant impact on groundwater quality and groundwater level if it would:

- Affect the rate or change the direction of movement of existing contaminants;
- Expand the area affected by contaminants;
- Result in an increased level of groundwater contamination (including that from direct percolation, injection or salt water intrusion); or
- Cause regulatory water quality standards at an existing production well to be violated, as defined in the California Code of Regulations (CCR), Title 22, Division 4, and Chapter 15 and in the Safe Drinking Water Act.

- Change potable water levels sufficiently to:
  - Reduce the ability of a water utility to use the groundwater basin for public water supplies, conjunctive use purposes, storage of imported water, summer/ winter peaking, or to respond to emergencies and drought;
  - Reduce yields of adjacent wells or well fields (public or private); or
  - Adversely change the rate or direction of flow of groundwater; or
- Result in demonstrable and sustained reduction of groundwater recharge capacity.

5. METHODOLOGY

5.1. SURFACE WATER HYDROLOGY

In December 3, 1999, the City of Los Angeles issued Special Order No. 007-1299 which adopted the Los Angeles County Department of Public Works' Hydrology Manual to be used for studies within the City of Los Angeles. According to the County's 2006 Hydrology Manual, storm drains associated with the Project must carry flow from at least the 10-year frequency design storm. The 10-year storm event also corresponds with the design storm of the existing storm drain infrastructure receiving the flows from the Project.

The City's LA CEQA Thresholds Guide; however, has determined that a 50-year storm frequency analysis is required when determining flood hazards impacts and changes in the amount or movement of surface water. To analyze the Project's potential impacts under both thresholds, runoff for both 10- and 50-year frequency design storms was calculated for this report.

This study was prepared using HydroCalc 0.3.1-beta software in conformance with the County's Hydrology Manual (2006). The HydroCalc program uses the Modified Rational Method to calculate the required time of concentration and designed flowrates for 25- and 50-year storm events. The peak runoff for a drainage area is calculated using the formula Q= CIA, where

- Q= flowrate (cfs)
- C= runoff coefficient (unit less)
- I=rainfall intensity (in/hr)
- A= basin area (acres)

The HydroCalc calculator is supported by the County's online GIS system. This database is used to locate the Project Site's 50-year isohyet rainfall frequency as well as relevant soil type (please refer to Appendix B). The data collected is then used in the HydroCalc program to calculate peak stormwater runoff values.

5.2. SURFACE WATER QUALITY

5.2.1. Construction

Prior to the issuance of grading permits, the applicant is required by The City to provide of a Notice of Intent (NOI) and WDID Number issued from the SWRCB in accordance with the requirements of the General Permit to ensure the potential for soil erosion and construction impacts are minimized. In accordance with the updated General Permit (Order No 2012-0006-DWQ), the following Permit Registration Documents (PRD's) are required to be submitted to the SWRCB prior to commencement of construction activities:

- Notice of Intent (NOI);
- Risk Assessment (Standard or Site-Specific);
- Particle Size Analysis (if site-specific risk assessment is performed);
- Site Map;
- SWPPP;
- Annual Fee & Certification.

The updated General Permit uses a risk-based approach for controlling erosion and sediment discharges from construction sites, since the rates of erosion and sedimentation can vary from site to site depending on factors such as duration of construction activities, climate, topography, soil condition, and proximity to receiving water bodies. The updated General Permit identifies three levels of risk with differing requirements, designated as Risk Levels 1, 2 and 3, with Risk Level 1 having the fewest permit requirements and Risk Level 3 having the most-stringent requirements.

The Risk Assessment incorporates two risk factors for a project site: sediment risk (general amount of sediment potentially discharged from the site) and receiving water risk (the risk sediment discharges can pose to receiving waters). Based on the Risk Level a project falls under, different sets of regulatory requirements are applied to the site. The main difference between Risk Levels 1, 2, and 3 are the numeric effluent standards. In Risk Level 1, there are no numeric effluent standard requirements, as it is considered a Low sediment risk and Low receiving water risk. Instead, narrative effluent limits are prescribed. In Risk Level 2, Numeric Action Levels (NALs) of pH between 6.5-8.5 and turbidity below 250 NTU are prescribed in addition to the narrative effluent limitations found in Risk Level 1 requirements. Should the NAL be exceeded during a storm event, the discharger is required to immediately determine the source associated with the exceedance and to implement corrective actions if necessary to mitigate the exceedance. Risk Level 3 dischargers must comply with Risk Level 2 requirements for NALs in addition to more rigorous monitoring requirements such as receiving water monitoring and in some cases bioassessment, should NALs be exceeded.

5.2.2. Operation

The Project will meet the requirements of the LID Manual[4]. Post-construction stormwater runoff from new developments must be infiltrated, captured and reused, and/or treated through a high efficiency BMP onsite for the 85th percentile storm event or 0.75", whichever is greater. For the Project, the 85th percentile storm event is 1.1". The LID Manual prioritizes infiltration systems as the top priority BMP. The Project is proposing to implement an infiltration basin as the proposed means of stormwater management and compliance. The infiltration basin will include two 36" diameter CMP systems. The methodology will focus on the LID sizing of the proposed infiltration systems. The following steps are required for sizing infiltration systems.

Step 1: Calculate the Design Volume

Infiltration facilities shall be sized to capture and infiltrate the design capture volume (V_{design}) based on the runoff produced from a 1.1-inch (0.092 ft) storm event.

V_{design} (cu ft) = 0.092 (ft) x Catchment Area (sq ft)

Catchment Area = (Impervious Area x 0.9) + (Pervious Area x 0.1)

Step 2: Determine the Design Infiltration Rate

$K_{sat,\ design} = K_{sat,\ measured}/FS$

FS = Infiltration factor of Safety of 3

Step 3: Calculate BMP Surface Area

Determine the minimum infiltrating surface area necessary to infiltrate the design volume:

$A_{min} = (V_{design} \times 12\ in/ft) / (T \times K_{sat,\ design})$

Where:

A_{min} = Minimum infiltrating surface area (ft
T = Drawdown time (hours), 48 hours

Step 4: Calculate the Total Storage Volume*

Determine the storage volume of the infiltration unit to be filled with media for capturing the design capture volume.

[4] The Development Best Management Practices Handbook, Part B Planning Activities, 4th Edition; adopted by the City of Los Angeles, Board of Public Works on July 1, 2011 to reflect LID requirements that took effect on May 12, 2012.

$$V_{storage} = V_{design} / n$$

Where:

$V_{storage}$ = Minimum media storage of the infiltration facility (ft
n = void ratio (use 0.40 for gap graded gravel)

Step 5: Calculate the Media Storage Depth

Determine the depth of the infiltration unit to be filled with media for capturing the design capture volume. The depth shall not exceed 8 feet – except for dry well(s).

$$D_{media} = V_{storage} / A_{min}$$

5.3. GROUNDWATER

This report discusses the impact of the Project as it relates to the underlying groundwater conditions of the Los Angeles Coastal Plain Groundwater Basin. The significance of the Project as it relates to the condition of the underlying groundwater table included a review of the following existing considerations:

- Identification of the Los Angeles Coastal Plain Groundwater Basin as the underlying groundwater basin, and description of the level, quality, direction of flow, and existing uses for the groundwater
- Description of the location, existing uses, production capacity, quality and other pertinent data for spreading grounds and potable water wells in the vicinity (typically within a one-mile radius) and;

The analysis of the proposed Project impacts on groundwater conditions include a review of the following proposed considerations:

- Description of the rate, duration, location and quantity of extraction, dewatering, spreading, injection or other activities;
- The projected reduction in groundwater resources and any existing wells in the vicinity (typically within one-mile radius); and
- The projected change in local or regional groundwater flow patterns

In addition, short-term groundwater quality impacts could potentially occur during construction of the Project as a result of soil or shallow groundwater being exposed to construction activities, materials, wastes and spilled materials. These potential impacts are qualitatively assessed.

6. SIGNIFICANCE THRESHOLD

6.1. CONSTRUCTION

6.1.1. Surface Water Hydrology and Quality

Implementation of the Project would result in construction activities that includes demolition of the existing parking lots and buildings on-site and over-excavation of existing soils. It is anticipated that the Project would result in the excavation of approximately 220,000 cubic yards of soil that will be exported.

Construction activities have the potential to temporarily alter the existing drainage patterns of the Project site and also increase the permeability of a site based on increased pervious surface coverage during construction. Exposed pervious surfaces also have the potential for erosion, scour and increased sediment and associated pollutants discharging from the site during construction activities. The main pollutant of concern during construction is typically sediment and soil particles that discharge off-site due to wind, rain and construction patterns.

At this stage in the proposed Project, a detailed, site-specific Risk Assessment cannot be performed. However, based on the Project's location and known site conditions, a preliminary erosion calculation can be performed The Project is located in a low risk watershed and the predicted sediment loss is <15 tons/acre (14.51 tons/acre). However, as construction is predicted to last longer than 18 months, the Project will likely classify as a Risk Level 2. If a conservative Risk Level 2 assumption was made, certain monitoring requirements apply to the Project. See Table 7 below highlighting the various requirements for Risk Levels 1-3.

Table 7 Risk Level Requirements

Visual Inspection						Sample Collection	
Risk Level	Quarterly Non-Storm Water Discharge	Baseline	REAP	Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
1	X	X		X	X		
2	X	X	X	X	X	X	
3	X	X	X	X	X	X	X [1]

Notes
[1] When numeric effluent level (NEL) exceeded.
REAP (Rain Event Action Plan)

In the event exceedances of receiving water quality objectives are observed, measures must be taken and documented within the SWPPP to improve discharge water quality and runoff effluent. This may include but not limited to increasing the size of existing BMPs such as sediment traps, adding more BMPs to the drainage area such as erosion control stabilizers, additional filtering and/or a reduction in active grading area.

Construction Best Management Practices (BMPs)

In accordance with the existing and updated General Permit, a construction SWPPP must be prepared and implemented for the Project site, and revised as necessary, as administrative or physical conditions change. The SWPPP must be made available for review upon request, shall describe construction BMPs that address pollutant source reduction, and provide measures/controls necessary to mitigate potential pollutant sources. These measures/controls include, but are not limited to: erosion controls, sediment controls, tracking controls, non-storm water management, materials & waste management, and good housekeeping practices including the following:

- Erosion control BMPs, such as hydraulic mulch, soil binders, and geotextiles and mats, protect the soil surface by covering and/or binding the soil particles. Temporary earth dikes or drainage swales may also be employed to divert runoff away from exposed areas and into more suitable locations. If implemented correctly, erosion controls can effectively reduce the sediment loads entrained in storm water runoff from construction sites.
- Sediment controls are designed to intercept and filter out soil particles that have been detached and transported by the force of water. All storm drain inlets on the project site or within the project vicinity (i.e., along streets immediately adjacent to the project boundary) should be adequately protected with an impoundment (i.e., gravel bags) around the inlet and equipped with a sediment filter (i.e., fiber roll). Bags should also be placed around areas of soil disturbing activities, such as grading or clearing.
- Stabilize all construction entrance/exit points to reduce the tracking of sediments onto adjacent streets. Wind erosion controls should be employed in conjunction with tracking controls.
- Non-storm water management BMPs prohibit the discharge of materials other than storm water, as well as reduce the potential for pollutants from discharging at their source. Examples include avoiding paving and grinding operations during the rainy season (i.e., October 1 through April 30 each year) where feasible, and performing any vehicle equipment cleaning, fueling and maintenance in designated areas that are adequately protected and contained.
- Waste management consists of implementing procedural and structural BMPs for collecting, handling, storing and disposing of wastes generated by a construction project to prevent the release of waste materials into storm water discharges.

Prior to commencement of construction activities, the General Permit requires the Project SWPPP to be prepared in accordance with the site specific sediment risk analyses based on the grading plans, with erosion and sediment controls proposed for each phase of construction for the Project. The phases of construction will define the maximum amount of soil disturbed, the appropriate sized sediment basins and other control measures to accommodate all active soil disturbance areas and the appropriate monitoring and sampling plans. Major phases of the construction for the Project are described below.

Mass & Rough Grading

During mass and/or rough grading, a substantial amount of soil disturbing activities or earthwork will occur. As a consequence, soil loss potential will be at its highest risk level to exceed NALs/NELs specified in the General Permit. Therefore, an effective combination of erosion and sediment controls must be implemented during this phase of construction.

This region requires the use of sediment basins or sediment traps to control the amount of sediment discharged off-site during the rainy season. Sediment basins or sediment traps generally act as primary sediment control facilities at downstream locations that provide final polish of runoff prior to discharging off-site. Therefore, they are a major element in a project's erosion and sediment control design.

Utility and Road Installation

In addition to the erosion and sediment control BMP requirements for the grading phase, the utility and road installation phase will introduce materials to the Project site that may cause or contribute to exceedances of NALs specified in the General Permit. Materials include, but are not limited to hydrated lime, concrete, mortar, Portland cement treated base, and fly ash. For this reason, pH levels must be controlled at this stage through non-storm water management and waste and materials management BMPs. Stockpile management will also be important due to the trenching activities involved during utility installation. Should NALs/NELs be exceeded at any point in time, additional site management or good housekeeping BMPs shall be implemented and the source of pollution controlled.

Vertical Construction

Once utilities and roads are in place, sediment controls (such as sediment/desilting basins) found in the rough grade phase may no longer be applicable as previously designed, due to the installment of curb and gutter, catch basins, and storm drain infrastructure to convey runoff off-site per the post-construction condition. BMPs at this stage will thus be more focused on on-site sediment control BMPs and at discharge points (i.e., catch basin inlet protection). During vertical construction, a substantial amount of construction materials will be delivered to the site, and wastes generated from the site have the potential to negatively impact pH levels. Therefore, non-storm water management and waste and materials management BMPs will be employed regularly.

Final Stabilization and Landscaping

During final stabilization and landscaping, minimal construction will be taking place and the majority of the project site will be stabilized. The majority of activities will involve planting and landscaping lots and common areas. Sediment control at discharge locations and stockpile management will be of primary concern. Good housekeeping practices will continue in this phase of construction.

Through compliance with the General Permit including the preparation of a SWPPP, implementation of BMPs, and compliance with applicable City grading regulations, construction of the Project would not cause flooding, substantially increase or decrease the amount of surface water in a water body, or result in a permanent, adverse change to flow direction. The Project would also not result in discharges that would cause: (1) pollution that would impact the quality of waters of the State to a degree which negatively impacts beneficial uses of the waters; (2) contamination of the quality of the waters of the State by waste to a degree which creates a hazard to the public health through poisoning or through the spread of diseases; or (3) nuisance that would be injurious to health, affect an entire community or neighborhood or any considerable number of persons, and occurs during or as a result of the treatment or disposal of wastes.

Construction of the Project would not result in discharges that would cause regulatory impacts within the Ballona Creek or the Marina del Rey watersheds. Therefore, impacts to surface water hydrology and water quality during construction would be less than significant.

6.1.2. Groundwater Hydrology

Construction of the Project is not anticipated to impact any water supply wells. No water supply wells are located at or within one thousand feet of the Project and the Project will not include the construction of any water supply wells. In addition, recharge of groundwater will not be impacted. Rather, groundwater recharge will increase due to increased perviousness at the Project Site which allows for increased natural infiltration of stormwater. In addition, to meet water quality regulations, an infiltration BMP is proposed to infiltrate the 85^{th} percentile storm event volume which also augment groundwater recharge.

Construction of the Project will include excavation with average depths of 28 feet bgs. Groundwater was encountered at 17 feet bgs as mentioned in the geotechnical investigation by Golder and Associates. Based on these excavation depths, groundwater is anticipated to be encountered during construction of the subsurface parking garage. Therefore, temporary dewatering will be required of existing groundwater.

Dewatering activities must be done properly to avoid eroding the soil on the construction site and any significant impacts to existing groundwater hydrology. The Los Angeles Regional Water Quality Control Board (LARWQCB) passed the General NPDES Permit No CAG994004 on June 6, 2013 titled Waste Discharge Requirements for Discharges of Groundwater from Construction and Project Dewatering to Surface Waters in Coastal Watersheds of Los Angeles and Ventura Counties that will apply to the Project. The Project will acquire a dewatering permit from the LARWQCB and discharges will either go to the sewer (with separate authorization from City of Los Angeles Bureau of Sanitation) or to the storm drain system after water quality testing of the groundwater to ensure the quality of the water is sufficient to discharge to the adjacent storm drain system. The Project will comply with all Standard Provisions and with any additional conditions that are applicable under 40 CFR section 122.42 to ensure groundwater hydrology is protected. It is proposed that some of the dewatered groundwater will be reused for dust control which will keep a portion of the dewatered groundwater on site. The groundwater will be collected and monitored regularly to protect water quality as described in more detail below.

6.1.3. Groundwater Quality

As previously noted above, construction of the Project will include temporary dewatering practices during the construction of the subterranean parking structure due to the groundwater level of 17 feet bgs. To protect groundwater quality, the General NPDES Permit No CAG994004 (Order No. R4-2013-0095) covers discharges to surface waters of groundwater from dewatering operations. 40 CFR section 122.48 of the Permit requires that all NPDES permits specify requirements for recording and reporting water quality monitoring results. The Monitoring and Reporting Program establishes monitoring and reporting requirements to implement federal and State requirements. The LARWQCB evaluates the test results to determine if the water can be discharged under an NPDES dewatering permit, and if so, any treatment required to remove pollutants prior to discharge. As mentioned, the Project will acquire a dewatering permit from the LARWQCB and discharges will either go to the sewer (with separate authorization from City of Los Angeles Bureau of Sanitation) or to the storm drain system after water quality testing of the groundwater to ensure the quality of the water is sufficient to discharge to the adjacent storm drain system. All monitoring requirements and other provisions of the Permit will be followed.

As mentioned, an analysis of methane concentrations in the underlying soils was performed to determine any potential methane pollution that might impact the Project, specifically groundwater quality. If the Project site has a Level IV or Level V site design level, certain dewatering system design features and other methane mitigation must be included. As the Project is located within a Methane Buffer Zone, and results from the analysis included concentrations ranging from 15 ppm to 1,050 ppm, the Project site is considered a Level III. According to Table 1B – Mitigation Requirements for Methane Buffer Zone (see Appendix D), Level III site design levels do not require any specific methane mitigation design features other than following standard protocols during construction and operation. Therefore, standard dewatering protocols following NPDES Permit No CAG994004 will be followed.

During on-site grading and building activities, hazardous materials such as fuels, paints, solvents, and concrete additives could be used and require proper management and containment during construction activities. The presence of such materials provides an opportunity for hazardous materials to be released into groundwater. To protect groundwater resources, the Project will comply with all applicable federal, state and local requirements related to the handling, storage, application and disposal of hazardous waste which will reduce the potential for construction activities of the Project to release contaminants into groundwater that could affect existing contamination, mobilize or increase the level of groundwater contamination, or cause a violation of regulatory water quality standards at an existing production well.

Therefore, the Project would not result in a significant increase in groundwater contamination though hazardous materials releases and impacts on groundwater quality would be less than significant.

6.2. OPERATION

6.2.1. Surface Water Hydrology

Development of the Project would result in the addition of landscaped areas throughout the Project Site and would reduce the amount of impervious surfaces from 96 percent to 88 percent. This increase in pervious surfaces would result in a slight reduction in stormwater runoff. Table 8 below provides an analysis of the 10-year and 50-year frequency design storm events following construction of the Project. As this is still in the conceptual design stage of the Project, the hydrology analysis was run assuming one outlet point in the proposed condition discharging to Glencoe Avenue to evaluate the most conservative potential impact on the local storm drain system and may change during final design. Output calculations are provided in Appendix B.

Table 8 Proposed Condition 10-year and 50-year Storm Event Hydrology

10-year Storm Event			
Area	Acreage	% Imperviousness	Q_{10} (cfs)
Total Site	6.05	88	8.41
50-year Storm Event			
Area	Acreage	% Imperviousness	Q_{50} (cfs)
Total Site	6.05	88	13.9
Notes: Calculations included in Appendix B.			

Table 9 provides a comparison of the existing and proposed peak flows for the 10-year and 50-year storm events.

Table 9 Existing versus Proposed Condition for the 10-year and 50-year Storm Event Hydrology

10-year Storm Event		
Condition	% Imperviousness	Q_{10} (cfs)
Existing Total Site	96%	9.55
Proposed Total Site	88%	8.41
50-year Storm Event		
Condition	% Imperviousness	Q_{50} (cfs)
Existing Total Site	96%	14.5
Proposed Total Site	88%	13.9
Notes: Calculations included in Appendix B.		

Based on the above, operation of the Project would decrease the amount of peaks flows from the 10-year and 50-year storm events due to increase pervious surfaces as compared to the existing condition. However, under the proposed condition, all flows are anticipated to be discharged to either Glencoe Avenue, Maxella Avenue or split between the two streets. As described in more detail in Section 6.2.2, low flows will be routed to infiltration BMPs. To determine potential impacts to either of these streets, street capacity calculations for both Glencoe Avenue and Maxella Avenue were performed to determine if either street could handle the entire project high flows. The street capacity calculations for both Glencoe Avenue and Maxella Avenue resulted in the conclusion that both roadways can handle the proposed 10-year flows associated with the Project, along with street flows already in the roadways. In Maxella Avenue, the street capacity of 11 cfs is sufficient to handle the total flows from the site (8.4 cfs), along with existing street flows of 1.2 cfs. In Glencoe Avenue, the street capacity of 24 cfs is sufficient to handle the flows from the site (8.4 cfs), along with the existing street flows of 1.2 cfs. The street capacity calculations were submitted to staff at West Los Angeles District, Bureau of Engineering, Department of Public Works and they concluded it would be acceptable for the proposed project to discharge into either street (Glencoe or Maxella) based on the available street conveyance capacity. Under final design, it is anticipated that the project flows will be split between Maxella Avenue and Glencoe Avenue which would reduce the amount of flows draining to each street.

Based on the hydrology analysis, the Project would not result in on-site or off-site flooding, impact the capacity of the existing storm drain system or street conveyance system or worsen an existing condition flood condition. In addition, the Project would not substantially reduce or increase the amount of surface water in the local water body, or result in a permanent adverse change in the drainage pattern that would result in an incremental effect on the capacity of the storm existing storm drain system. Therefore, operation of the Project would result in less than significant impact on surface water hydrology.

6.2.2. Surface Water Quality

Stormwater runoff from the Project has the potential to discharge pollutants into the City and County storm drain system. Anticipated pollutants and typical source areas include the following:

Table 10 Potential Stormwater Pollutants and Sources

Pollutant	Source
Sediment (coarse and fine)	Parking lots, driveways, building rooftops, landscape areas, roads
Nutrients (dissolved and particulates)	Landscape areas, lawns
Pesticides	Landscape areas, lawns
Pathogens	Landscape areas, lawns, building rooftops, food serving areas
Trash/debris	Parking lots, driveways, roadways, parks
Oil/grease	Parking lots, driveways, roadways, food serving areas
Metals (dissolved and particulate)	Parking lots, driveways, roadways

To meet the local MS4 Permit and LID requirements consistent with the City's LID Ordinance and LID Development BMP Handbook (June 2011), stormwater management strategies will be implemented throughout the Project Site. Infiltration design features will be implemented to meet the local LID requirements.

Table 11 shows the water quality volume (V_m), as well as water quality flow rate (Q_{pm}), that are required to be infiltrated at the Project Site. All calculations are provided in Appendix C.

Table 11 Water Quality Volume and Flow Rate

Area	Acreage	% Imperviousness	V_m (cu-ft)	Q_{pm} (cfs)
Total Site	6.05	88	19,263	1.45
Notes: cu-ft – cubic feet cfs – cubic feet per second				

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

Based on the relatively high infiltration rates and the ability to meet minimum separation requirements between the bottom of the proposed infiltration BMP surface and groundwater levels, infiltration is considered feasible. A conservative design infiltration rate of 0.233 inch/hour is assumed for the preliminary BMP sizing. See Table 12 below and Appendix C for more details on the infiltration BMP calculations.

Table 12 Infiltration Basin Calculations

Area	Acreage	% Imp.	V_m (cu-ft)[1]	Design Infiltration Rate (in/hr)[2]	Min. Area Required (sq. ft.)[2]	Area Provided (sq. ft.)[3]	Storage capacity sufficient?
Total Site	6.05	88	19,263	0.223	10,414	10,586	Yes
Notes: [1] From Table 11 and Appendix C. [2] See Appendix C for design infiltration rate calculations and Appendix D for geotechnical report and infiltration results. [3] See Proposed Condition LID and Storm Drain exhibit in Appendix A							

As shown above, the proposed LID BMP design will provide enough area to infiltrate the 85th percentile storm event water quality volume at the Project Site. The proposed low flows will be routed to the infiltration BMP and high flows will be diverted to Maxella Avenue and to Glencoe Avenue. Based on the podium design of this Project, a combination of gravity flows, pumps and splitter boxes will likely be implemented to route flows to either the infiltration BMP or to the adjacent streets. As this is considered the conceptual design stage of the Project, changes to the BMP design may occur during final design. Please see Appendix C for more detailed calculations regarding the proposed BMP design.

As noted in the existing conditions description, the existing site does not have any structural or LID BMPs to treat or infiltrate stormwater. Therefore, implementation of the LID features proposed as part of the Project would result in a significant improvement in surface water quality runoff as compared to existing conditions. Implementation of the proposed BMP system will result in infiltration of the entire required treatment volume for the project site and the elimination of pollutant runoff up to the 85th percentile storm event.

Based on the proposed LID plan, operation of the Project would not result in discharges that would cause: (1) an incremental increase in pollution which would alter the quality of the waters of the State (Ballona Creek or Marina del Rey Harbor) to a degree which unreasonably affects beneficial uses of the waters; (2) an incremental increase of contamination of the quality of the waters of the State by waste to a degree which creates a hazard to the public health through poisoning or through the spread of diseases; or (3) an incremental increase in the nuisance that would injurious to health; affect an entire community or neighborhood, or any considerable numbers of persons; and occurs during or as a result of the treatment or disposal of wastes. Lastly, operation of the Project would not result in discharges that would cause regulatory standards to be violated in Ballona Creek or Marina del Rey harbor. Thus, operational impacts on surface water quality would be less than significant.

6.2.3. Groundwater Hydrology

Under the proposed conditions, region and local potable water levels and adjacent wells or well fields will not be impacted by the Project. The Project does not include any groundwater pumping and relies on the local water purveyor for water. In addition, the Project is not anticipated to adversely change the rate of direction of flow of groundwater. Infiltration of the 85th percentile storm event (1.1 inch) will not significantly change regional groundwater rates or flows. Implementation of the project would also result in a slight increase in pervious areas over the existing conditions. The increase in pervious areas coupled with the CMP infiltration basin system would improve the groundwater recharge capacity of the site over existing conditions. Based on the design of the infiltration system and depth to groundwater, the Project is providing a sufficient depth for pollutant removals prior to reaching the groundwater table.

In addition, infiltration of storm water via the CMP infiltration basin is not anticipated to cause the movement of existing contaminants. The Geotracker website (State Water Resources Control Board) indicates there are no significant sources of soil or groundwater pollution within the project area. Therefore, the proposed infiltration systems are designed to safely convey stormwater runoff into the sub-surface soil without the threat of contaminant mobilization.

Based on the design of the Project's proposed CMP infiltration system, discharging runoff into the soil at an appropriate depth away from the structures and groundwater table, impacts to groundwater are considered less than significant.

6.2.4. Groundwater Quality

In addition, infiltration of storm water via the CMP infiltration basin is not anticipated to cause the movement of existing contaminants. The Geotracker website (State Water Resources Control Board) indicates there are no significant sources of soil or groundwater pollution within the project area and local vicinity. In addition, an analysis of methane concentrations in the underlying soils was performed to determine any potential methane pollution that might impact the Project, specifically groundwater quality. As specific by the Los Angeles Municipal Code, if a project site has a Level IV or Level V site design level, certain methane mitigation design features must be included. As the Project is located within a Methane Buffer Zone, and results from the analysis included concentrations ranging from 15 ppm to 1,050 ppm, the Project site is considered a Level III. According to Table 1B – Mitigation Requirements for Methane Buffer Zone (see Appendix D), Level III site design levels do not require any specific methane mitigation design features other than following standard protocols during construction and operation. Therefore, the proposed infiltration systems are designed to safely convey stormwater runoff into the sub-surface soil without the threat of contaminant mobilization.

Based on the design of the Project's infiltration system, discharging runoff into the soil at an appropriate depth away from the structures and groundwater table, impacts to groundwater are considered less than significant.

6.3. CUMULATIVE IMPACTS

6.3.1. Surface Water Hydrology

The regional geographic context for the cumulative impact analysis on surface water hydrology is the Ballona Creek Watershed and the Marina del Rey Watershed. The Project will reduce flows to these watersheds due to increased perviousness as compared to the existing conditions. BMPs will be implemented during the construction phase of the Project to ensure against erosion or negative impacts to surface water hydrology. As there is sufficient capacity within Maxella Avenue and Glencoe Avenue to handle the proposed flows during the operational phase, there are no significant impacts to surface water hydrology anticipated.

6.3.2. Surface Water Quality

No significant impacts are anticipated regarding surface water quality during the construction or operational phases of the Project. Construction of the Project will not result in discharges that would cause regulatory water quality impacts within the Ballona Creek or the Marina del Rey watersheds. During operation of the Project, infiltration BMPs are proposed to infiltrate the 85th percentile storm event water quality volume that normally would have flowed untreated to Ballona Creek and Marina del Rey watersheds. Therefore, water quality will be improved as compared to existing conditions and no significant impacts to surface water quality are anticipated.

6.3.3. Groundwater Hydrology

Groundwater hydrology at the Project Site is not anticipated to be impacted. As mentioned, temporary dewatering will occur during the construction of the Project. A dewatering permit will be acquired from LARWQCB to ensure that groundwater hydrology is protected. Based on the design of the Project's proposed CMP infiltration system to satisfy water quality regulations, groundwater recharge will be augmented and not negatively impacted. Therefore, impacts to groundwater hydrology are considered less than significant.

6.3.4. Groundwater Quality

Groundwater quality at the Project Site is not anticipated to be impacted. The dewatering permit acquired from the LARWQCB will ensure that both groundwater hydrology and quality are protected during construction. The Geotracker website (State Water Resources Control Board) indicates there are no significant sources of soil or groundwater pollution within the project area and local vicinity. Therefore, the proposed infiltration systems are designed to safely convey stormwater runoff into the sub-surface soil without the threat of contaminant mobilization. Therefore, no significant impacts to groundwater quality are anticipated.

7. LEVEL OF SIGNIFICANCE

Based on the analysis contained in this report no significant impacts have been identified for surface water hydrology, surface water quality, or groundwater for this Project.

8. APPENDICES

Appendix A – Existing and Proposed Hydrology/Water Quality Exhibits

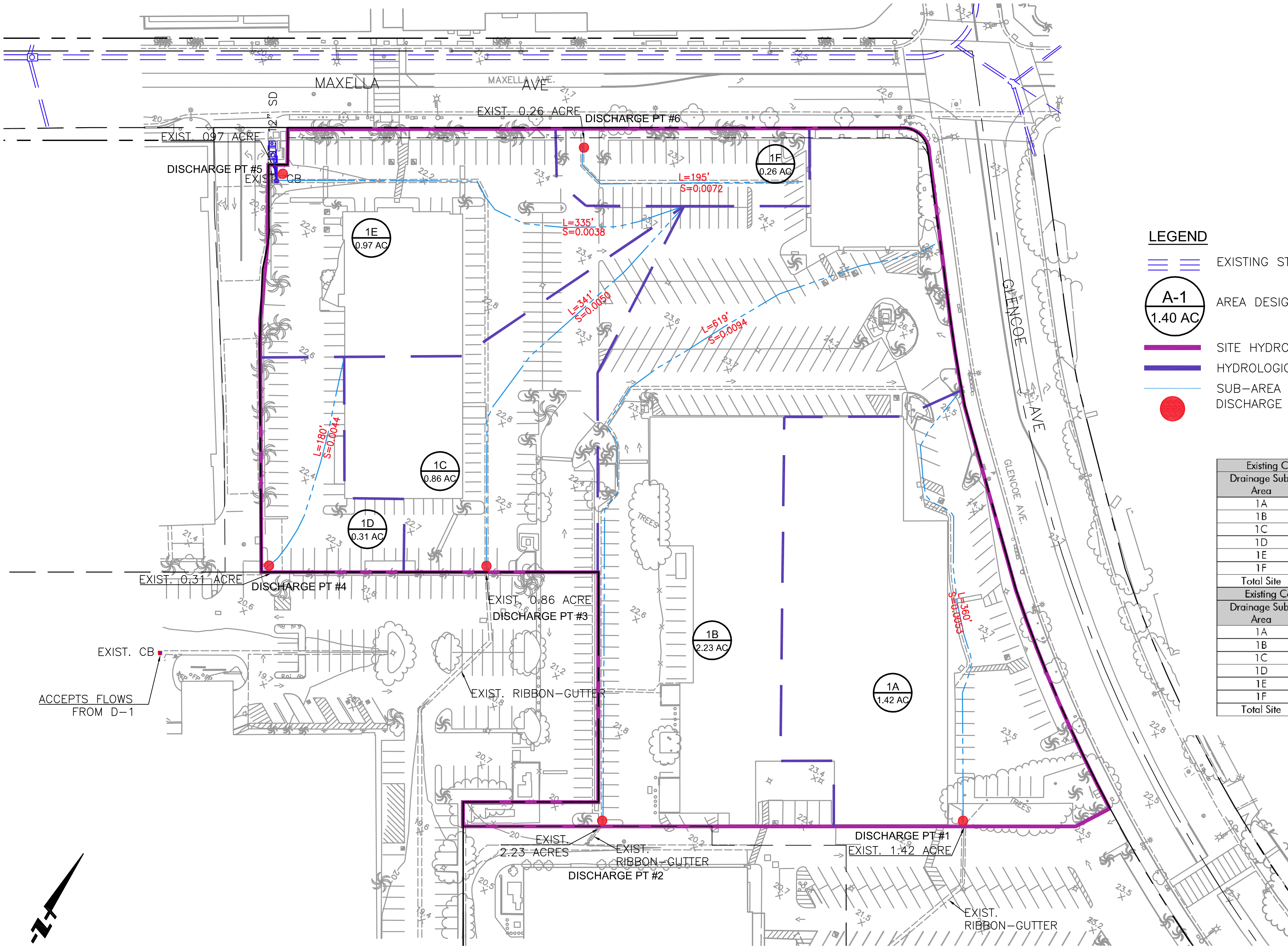
Appendix B – Hydrology Calculations

Appendix C – Water Quality Calculations

Appendix D – Geotechnical and Infiltration Findings

APPENDIX A

EXISTING AND PROPOSED HYDROLOGY/WATER QUALITY EXHIBITS



LEGEND

- EXISTING STORM DRAIN
- A-1 / 1.40 AC — AREA DESIGNATION / ACRES
- SITE HYDROLOGIC BOUNDARY
- HYDROLOGIC AREA SUB-BOUNDARY
- SUB-AREA FLOWPATH / DIRECTION OF FLOW
- DISCHARGE POINT (WHERE DRAINAGE LEAVES THE SITE)

Existing Conditions10-year Storm Frequency		
Drainage Sub-Area	Acreage	Q_{10} (cfs)
1A	1.42	2.34
1B	2.23	3.16
1C	0.86	1.42
1D	0.31	0.586
1E	0.97	1.51
1F	0.26	0.536
Total Site	6.05	9.55

Existing Conditions 50-year Storm Frequency		
Drainage Sub-Area	Acreage	Q_{50} (cfs)
1A	1.42	3.50
1B	2.23	4.88
1C	0.86	2.12
1D	0.31	0.90
1E	0.97	2.39
1F	0.26	0.75
Total Site	6.05	14.5

EXISTING CONDITION HYDROLOGY

SCALE: 1" = 80'

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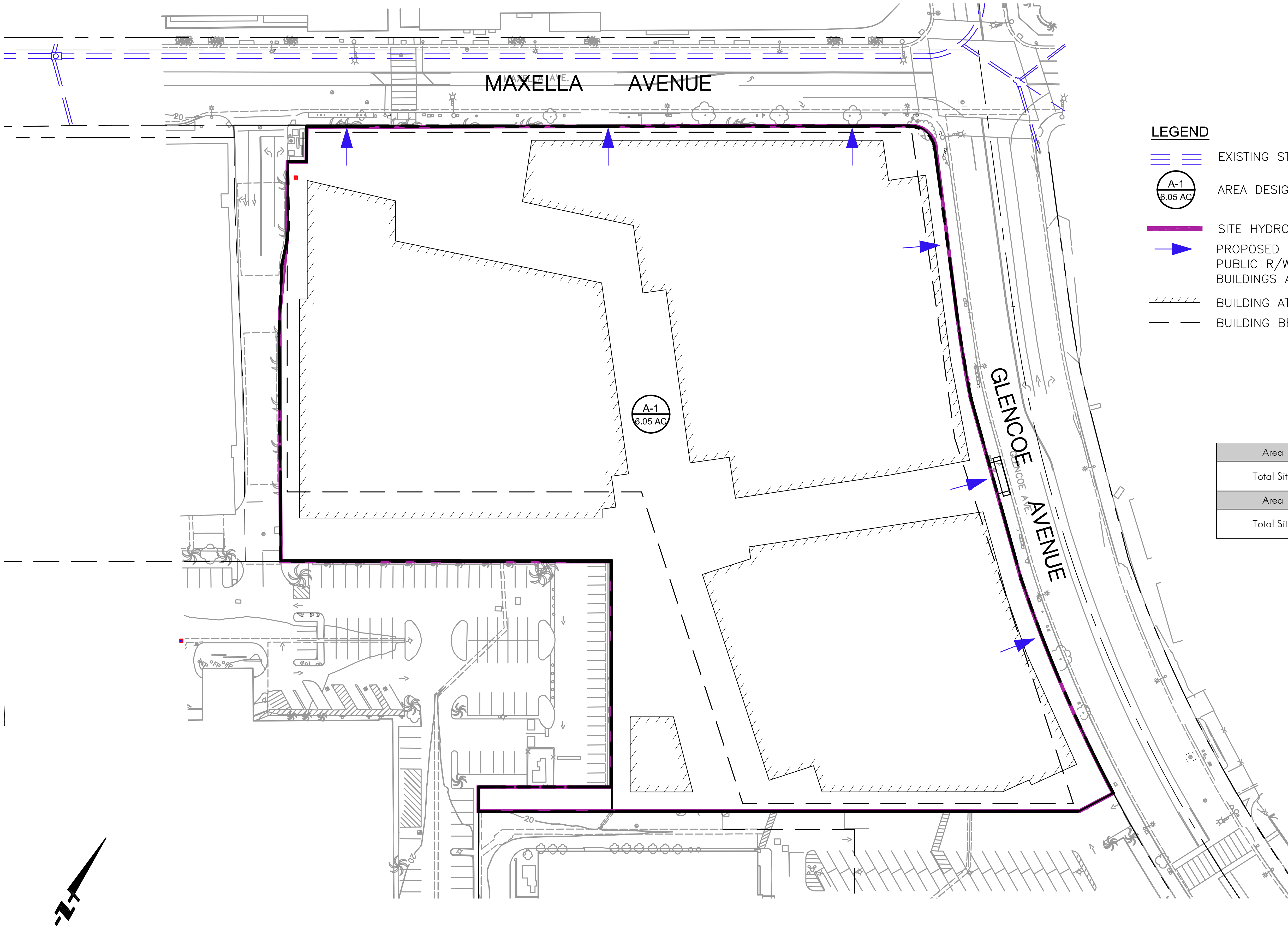

LEGEND

EXISTING STORM DRAIN

A-1 6.05 AC — AREA DESIGNATION / ACRES

SITE HYDROLOGIC BOUNDARY

PROPOSED FLOW DIRECTION FOR HIGH FLOWS TO PUBLIC R/W (REQUIRES INTERNAL PLUMBING WITHIN BUILDINGS AND PUMPS)

BUILDING AT GRADE

BUILDING BELOW GRADE

Area	Acreage	Q_{10} (cfs)
Total Site	6.05	8.41
Area	Acreage	Q_{50} (cfs)
Total Site	6.05	13.9

PROPOSED CONDITION HYDROLOGY

SCALE: 1" = 80'

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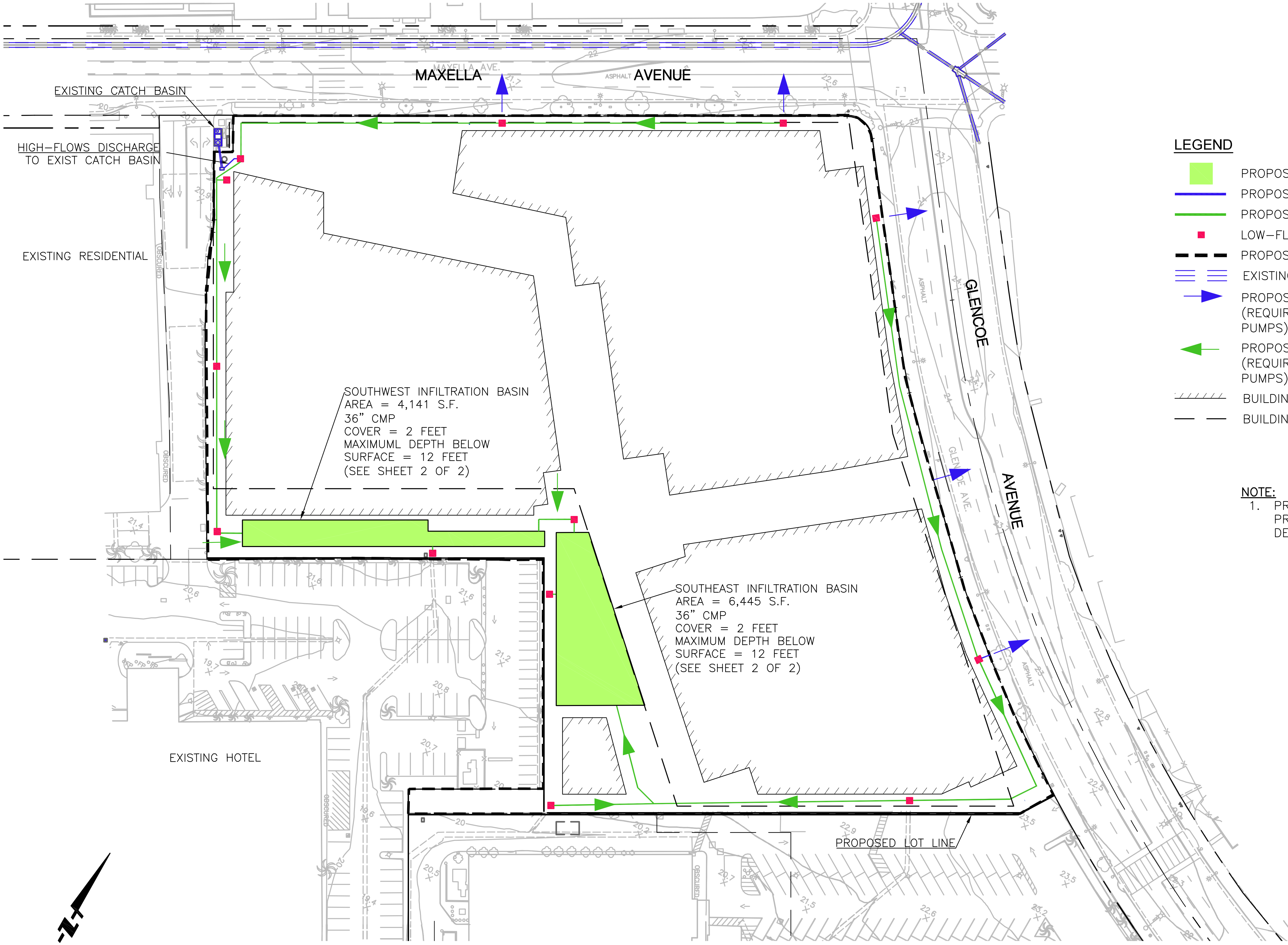

LEGEND

- PROPOSED BMP (INFILTRATION)
- PROPOSED STORM DRAIN
- PROPOSED LOW-FLOW STORM DRAIN – TO BMP
- LOW-FLOW DIVERSION SPLITTER BOX
- PROPOSED SITE / DRAINAGE AREA BOUNDARY
- EXISTING STORM DRAIN
- PROPOSED DIRECTION OF HIGH FLOWS TO PUBLIC R/W (REQUIRES INTERNAL PLUMBING WITHIN BUILDINGS AND PUMPS)
- PROPOSED DIRECTION OF LOW FLOWS TO LID BMP (REQUIRES INTERNAL PLUMBING WITHIN BUILDINGS AND PUMPS)
- BUILDING AT GRADE
- BUILDING BELOW GRADE

NOTE:

1. PROPOSED STORM DRAIN CONNECTIONS ARE PRELIMINARY. SIZE AND LOCATION WILL BE DETERMINED IN FINAL DESIGN.

PROPOSED CONDITION LID & LOW-FLOW STORM DRAIN - 1 OF 2

SCALE: 1" = 80'

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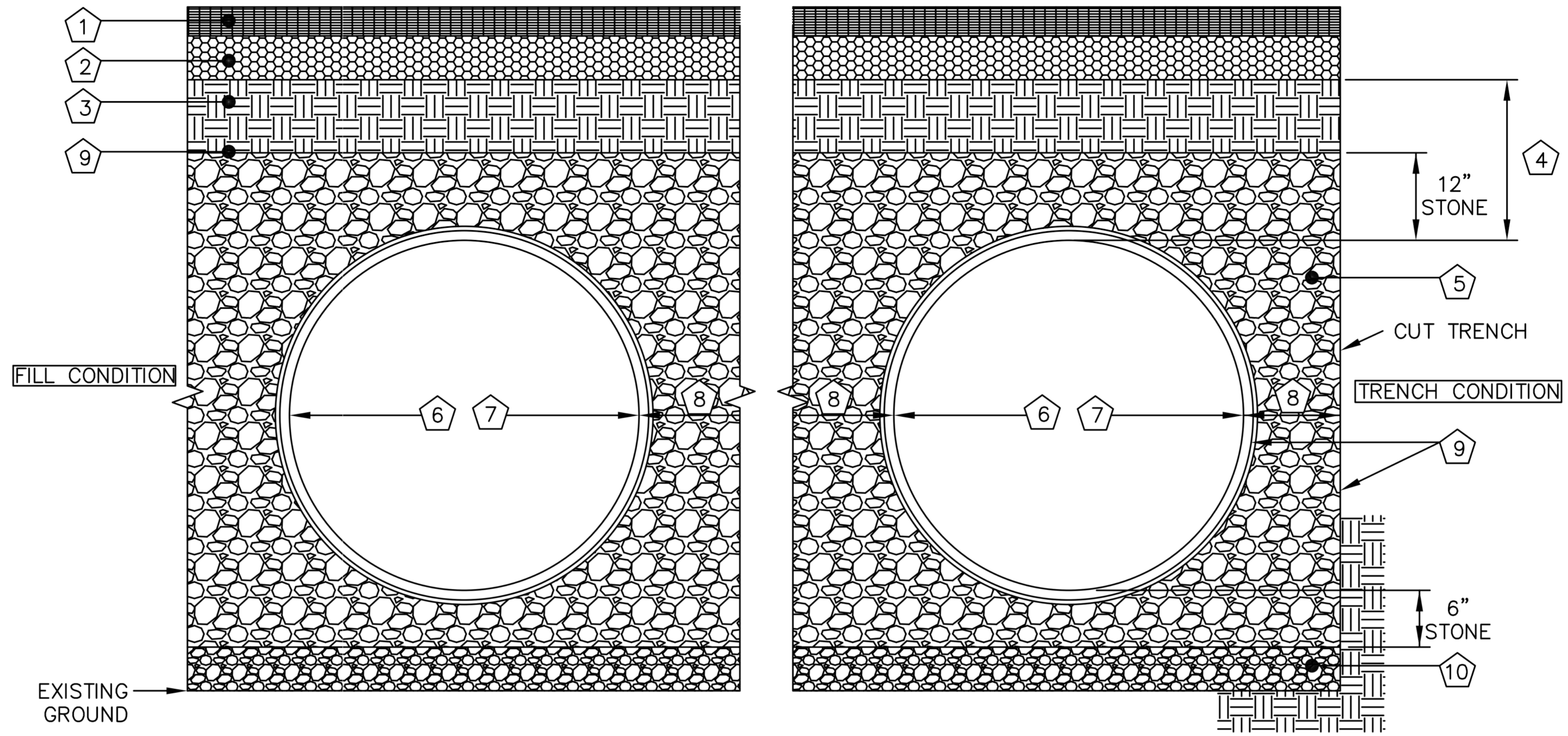

1. RIGID OR FLEXIBLE PAVEMENT
2. GRANULAR ROAD BASE
3. NORMAL ROADWAY EMBANKMENT FILL PLACED IN 8" LIFTS AND COMPACTED TO MIN. 90% STANDARD DENSITY PER AASHTO T-99.
4. 12" MIN. FOR DIAMETERS THROUGH 96" 18" MIN. FOR DIAMETERS FROM 102" AND UP MEASURED FROM TOP OF RIGID OR BOTT. OF FLEXIBLE PAVEMENT.
5. FREE DRAINING ANGULAR WASHED STONE 3/8" MIN. PARTICLE SIZE. COMPACT TO MIN. 90% STANDARD DENSITY PER AASHTO T-99.
6. 12"ø THRU 84"ø 2 2/3" X 1/2" CSP, GAGE PER AASHTO SECTION 12

H20/H25 LIVE LOAD

7. 54"ø THRU 144"ø 3" X 1" OR 5" X 1" CSP GAGE PER AASHTO SECTION 12
8. STANDARD SPACING IN TABLE, SPECIAL SPACING IS SUBJECT TO APPROVAL BY CONTECH.

SPACING CHART PER AISI AND NCSPA GUIDELINES	
DIAMETER	REQUIRED SPACING
UP TO 24"	12"
24" – 72"	1/2 PIPE DIA
72" AND UP	36"

9. CONTECH C-40 NON-WOVEN GEOTEXTILE REQUIRED, WRAPPING PIPE AND TRENCH.
10. RELATIVELY LOOSE GRANULAR BEDDING, ROUGHLY SHAPED TO FIT BOTTOM OF PIPE, 4" TO 6" IN DEPTH. (#57 OR #8 OR OTHER SUITABLE GRANULAR)

INFILTRATION BASIN (36" CMP) SECTION

PROPOSED CONDITION LID & LOW-FLOW STORM DRAIN - 2 OF 2

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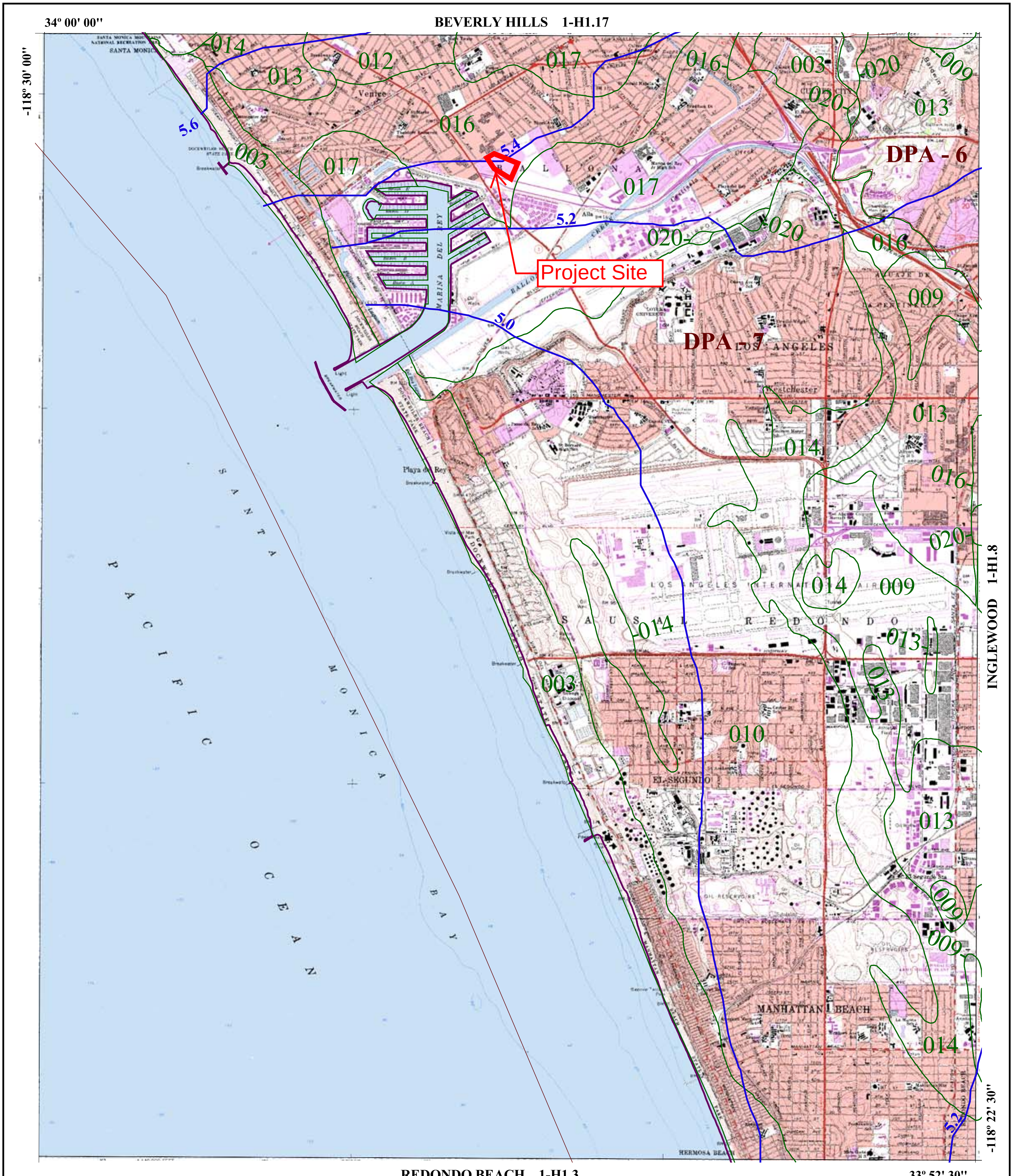
APPENDIX B

HYDROLOGY CALCULATIONS



016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA - 6 DEBRIS POTENTIAL AREA

N S E W

1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

V E N I C E

50-YEAR 24-HOUR ISOHYET

1-H1.7

LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works

Peak Flow Hydrologic Analysis

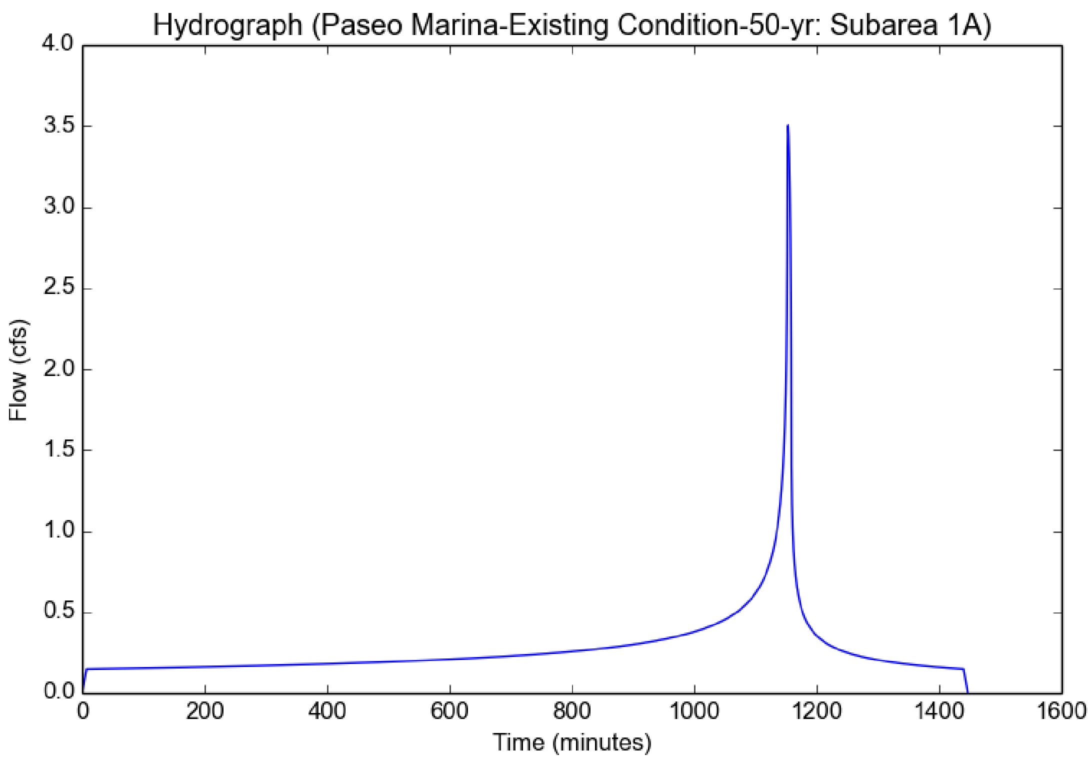
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition-50-yr - Subarea 1A.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition-50-yr
Subarea ID	Subarea 1A
Area (ac)	1.42
Flow Path Length (ft)	360.0
Flow Path Slope (vft/hft)	0.0053
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.4
Peak Intensity (in/hr)	2.7505
Undeveloped Runoff Coefficient (Cu)	0.8301
Developed Runoff Coefficient (Cd)	0.8972
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	3.5043
Burned Peak Flow Rate (cfs)	3.5043
24-Hr Clear Runoff Volume (ac-ft)	0.5523
24-Hr Clear Runoff Volume (cu-ft)	24057.6529



Peak Flow Hydrologic Analysis

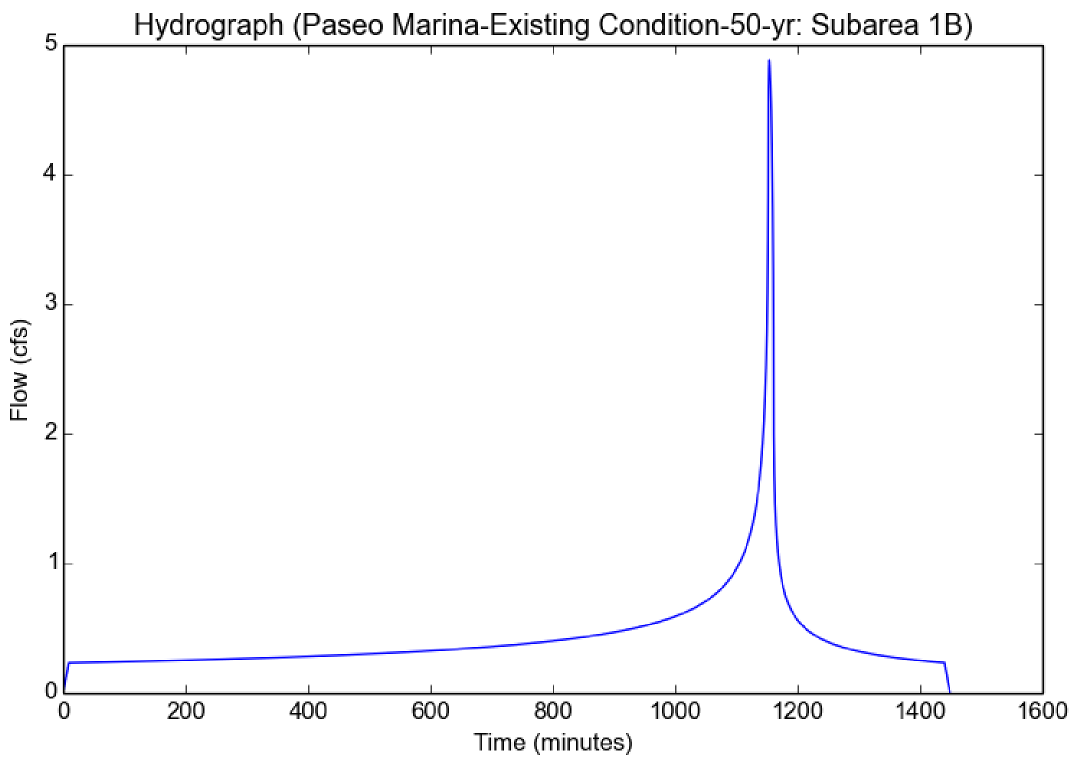
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition-50-yr - Subarea 1B.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition-50-yr
Subarea ID	Subarea 1B
Area (ac)	2.23
Flow Path Length (ft)	619.0
Flow Path Slope (vft/hft)	0.0094
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.4
Peak Intensity (in/hr)	2.4441
Undeveloped Runoff Coefficient (Cu)	0.8048
Developed Runoff Coefficient (Cd)	0.8962
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	4.8845
Burned Peak Flow Rate (cfs)	4.8845
24-Hr Clear Runoff Volume (ac-ft)	0.8673
24-Hr Clear Runoff Volume (cu-ft)	37780.0814



Peak Flow Hydrologic Analysis

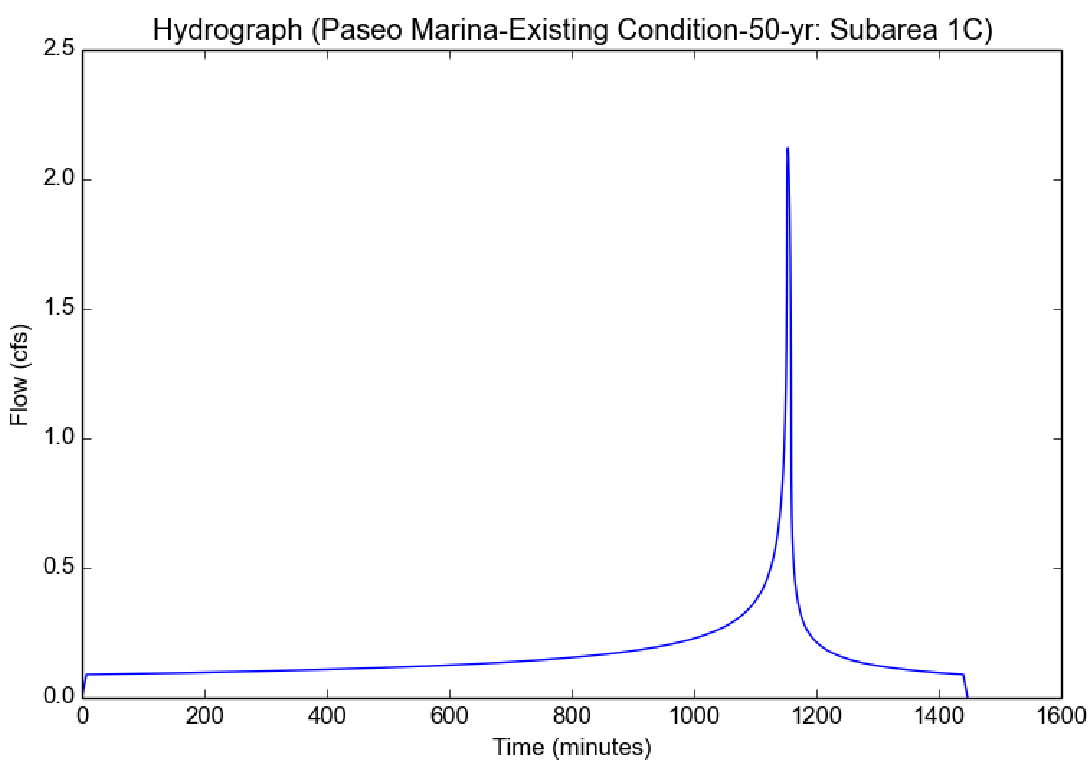
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition-50-yr - Subarea 1C.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition-50-yr
Subarea ID	Subarea 1C
Area (ac)	0.86
Flow Path Length (ft)	341.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.4
Peak Intensity (in/hr)	2.7505
Undeveloped Runoff Coefficient (Cu)	0.8301
Developed Runoff Coefficient (Cd)	0.8972
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	2.1223
Burned Peak Flow Rate (cfs)	2.1223
24-Hr Clear Runoff Volume (ac-ft)	0.3345
24-Hr Clear Runoff Volume (cu-ft)	14570.1278



Peak Flow Hydrologic Analysis

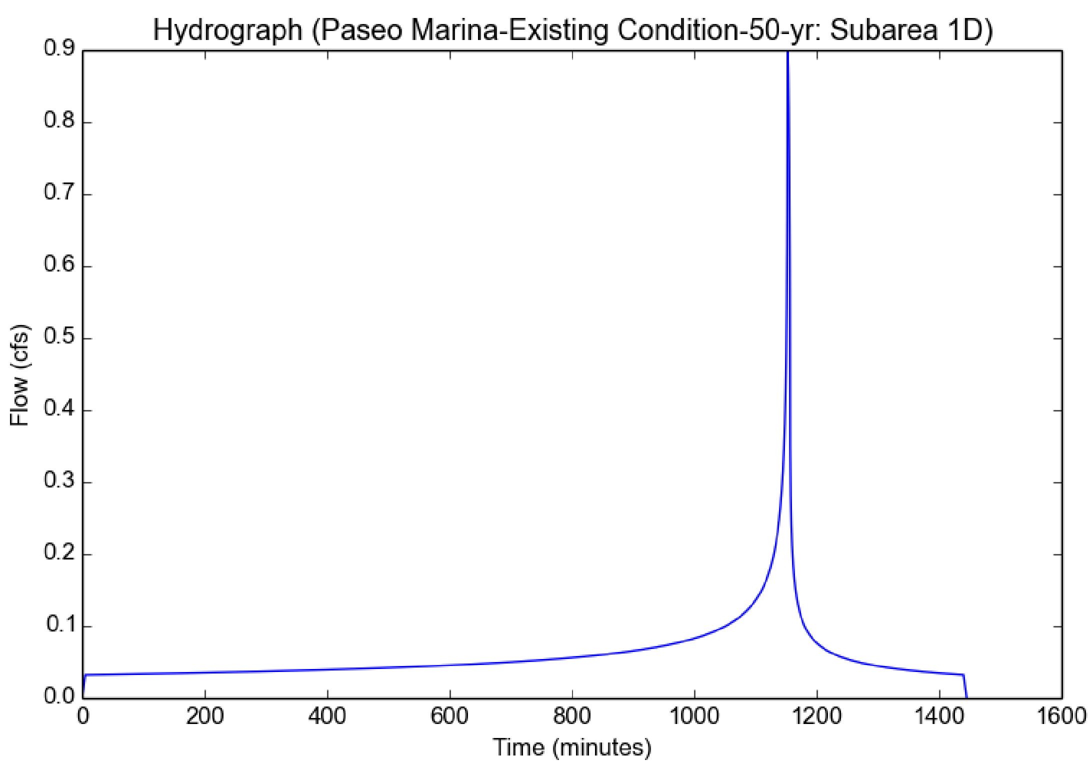
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition-50-yr - Subarea 1D.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition-50-yr
Subarea ID	Subarea 1D
Area (ac)	0.31
Flow Path Length (ft)	180.0
Flow Path Slope (vft/hft)	0.0044
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.4
Peak Intensity (in/hr)	3.2218
Undeveloped Runoff Coefficient (Cu)	0.8608
Developed Runoff Coefficient (Cd)	0.8984
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.8973
Burned Peak Flow Rate (cfs)	0.8973
24-Hr Clear Runoff Volume (ac-ft)	0.1206
24-Hr Clear Runoff Volume (cu-ft)	5252.1021



Peak Flow Hydrologic Analysis

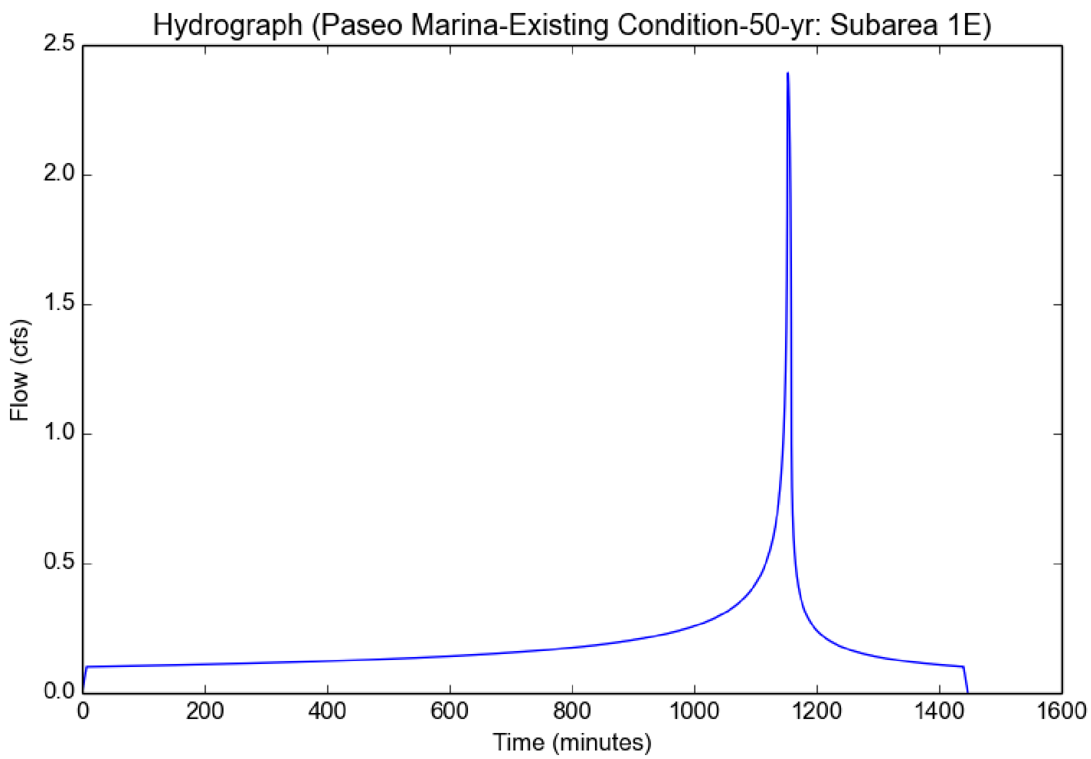
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition-50-yr - Subarea 1E.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition-50-yr
Subarea ID	Subarea 1E
Area (ac)	0.97
Flow Path Length (ft)	335.0
Flow Path Slope (vft/hft)	0.0038
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.4
Peak Intensity (in/hr)	2.7505
Undeveloped Runoff Coefficient (Cu)	0.8301
Developed Runoff Coefficient (Cd)	0.8972
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	2.3938
Burned Peak Flow Rate (cfs)	2.3938
24-Hr Clear Runoff Volume (ac-ft)	0.3773
24-Hr Clear Runoff Volume (cu-ft)	16433.7488



Peak Flow Hydrologic Analysis

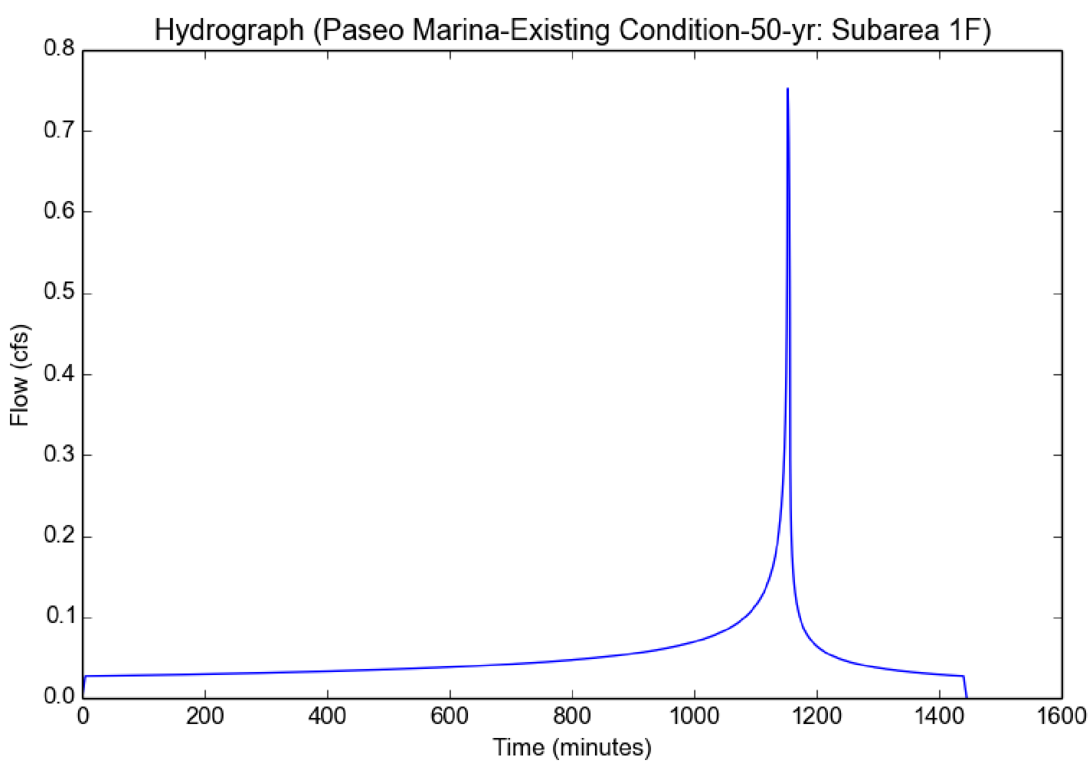
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition-50-yr - Subarea 1F.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition-50-yr
Subarea ID	Subarea 1F
Area (ac)	0.26
Flow Path Length (ft)	195.0
Flow Path Slope (vft/hft)	0.0072
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.4
Peak Intensity (in/hr)	3.2218
Undeveloped Runoff Coefficient (Cu)	0.8608
Developed Runoff Coefficient (Cd)	0.8984
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.7526
Burned Peak Flow Rate (cfs)	0.7526
24-Hr Clear Runoff Volume (ac-ft)	0.1011
24-Hr Clear Runoff Volume (cu-ft)	4404.9888



Peak Flow Hydrologic Analysis

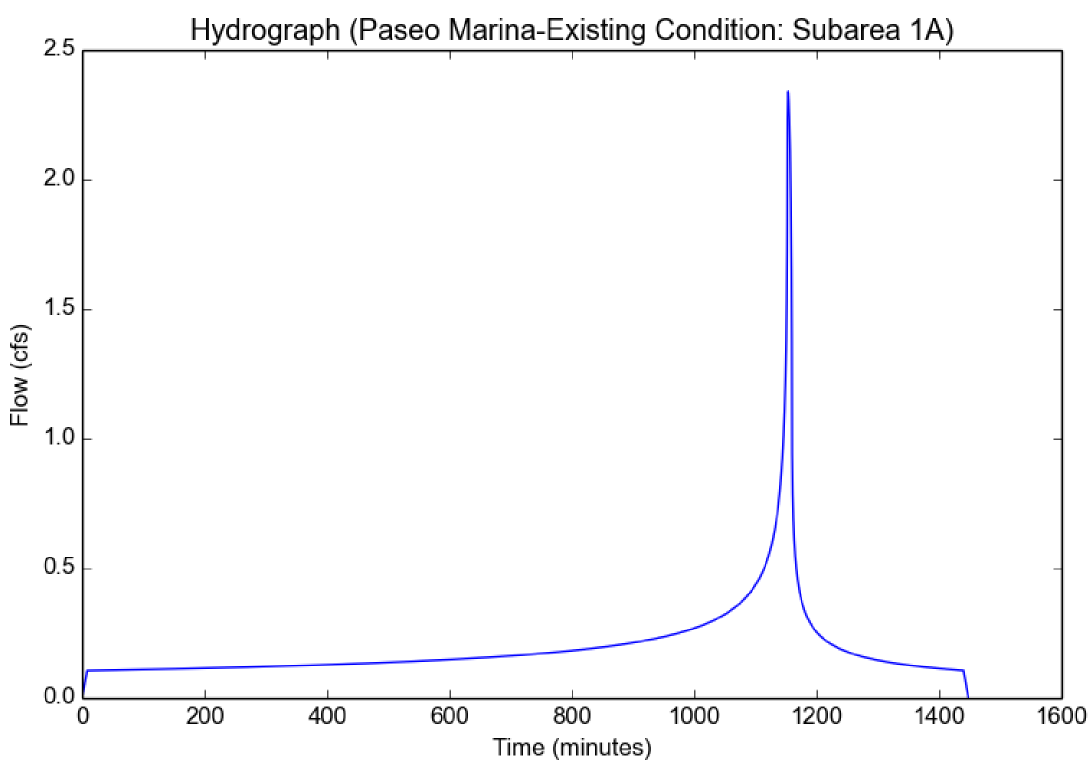
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition - Subarea 1A.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition
Subarea ID	Subarea 1A
Area (ac)	1.42
Flow Path Length (ft)	360.0
Flow Path Slope (vft/hft)	0.0053
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	3.8556
Peak Intensity (in/hr)	1.8444
Undeveloped Runoff Coefficient (Cu)	0.7326
Developed Runoff Coefficient (Cd)	0.8933
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	2.3396
Burned Peak Flow Rate (cfs)	2.3396
24-Hr Clear Runoff Volume (ac-ft)	0.3938
24-Hr Clear Runoff Volume (cu-ft)	17154.4249



Peak Flow Hydrologic Analysis

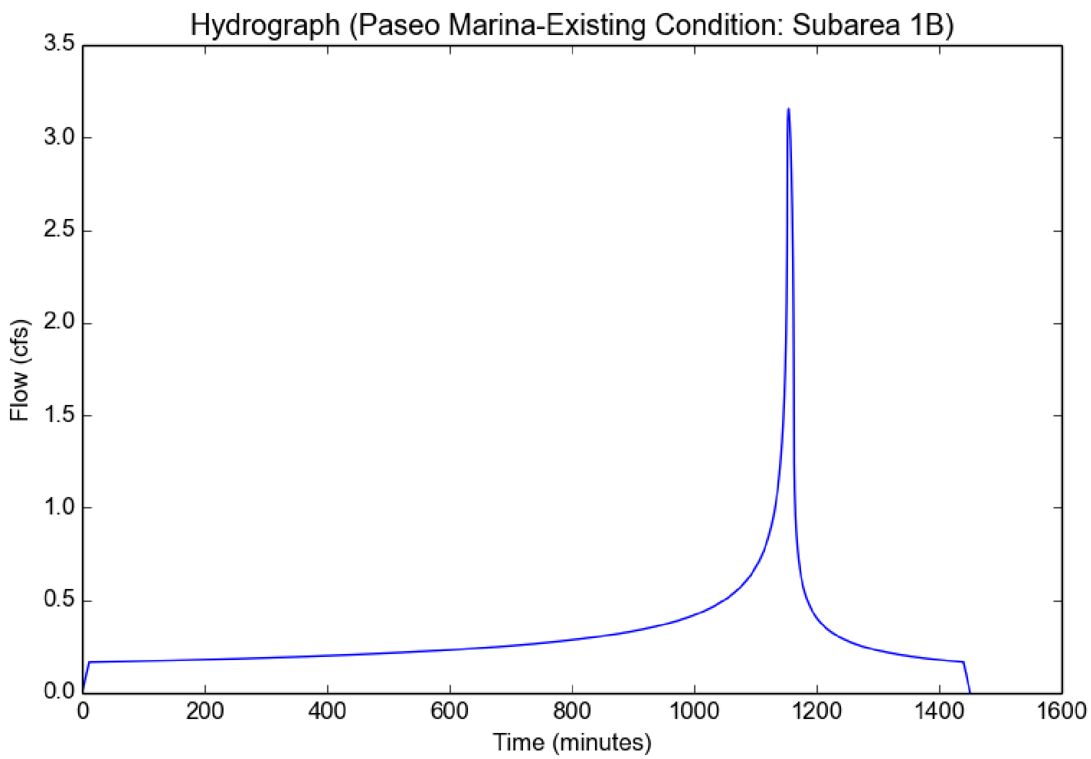
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition - Subarea 1B.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition
Subarea ID	Subarea 1B
Area (ac)	2.23
Flow Path Length (ft)	619.0
Flow Path Slope (vft/hft)	0.0094
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	3.8556
Peak Intensity (in/hr)	1.588
Undeveloped Runoff Coefficient (Cu)	0.6918
Developed Runoff Coefficient (Cd)	0.8917
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	3.1577
Burned Peak Flow Rate (cfs)	3.1577
24-Hr Clear Runoff Volume (ac-ft)	0.6184
24-Hr Clear Runoff Volume (cu-ft)	26938.9371



Peak Flow Hydrologic Analysis

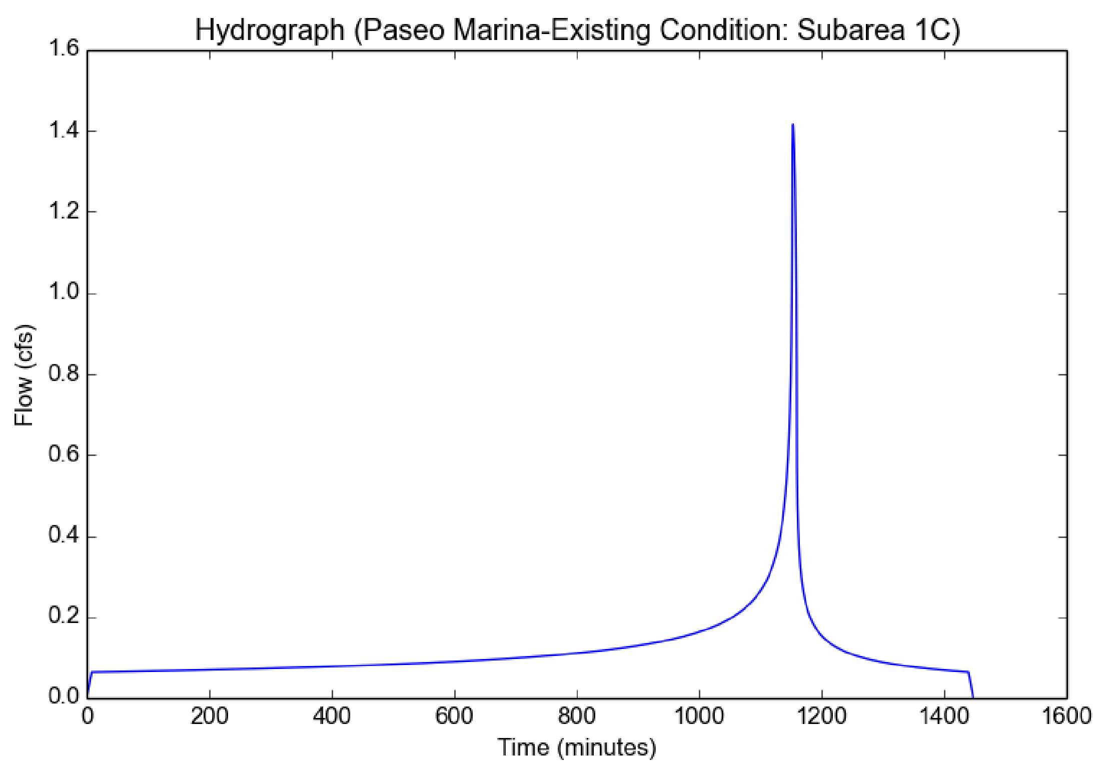
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition - Subarea 1C.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition
Subarea ID	Subarea 1C
Area (ac)	0.86
Flow Path Length (ft)	341.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	3.8556
Peak Intensity (in/hr)	1.8444
Undeveloped Runoff Coefficient (Cu)	0.7326
Developed Runoff Coefficient (Cd)	0.8933
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	1.417
Burned Peak Flow Rate (cfs)	1.417
24-Hr Clear Runoff Volume (ac-ft)	0.2385
24-Hr Clear Runoff Volume (cu-ft)	10389.2996



Peak Flow Hydrologic Analysis

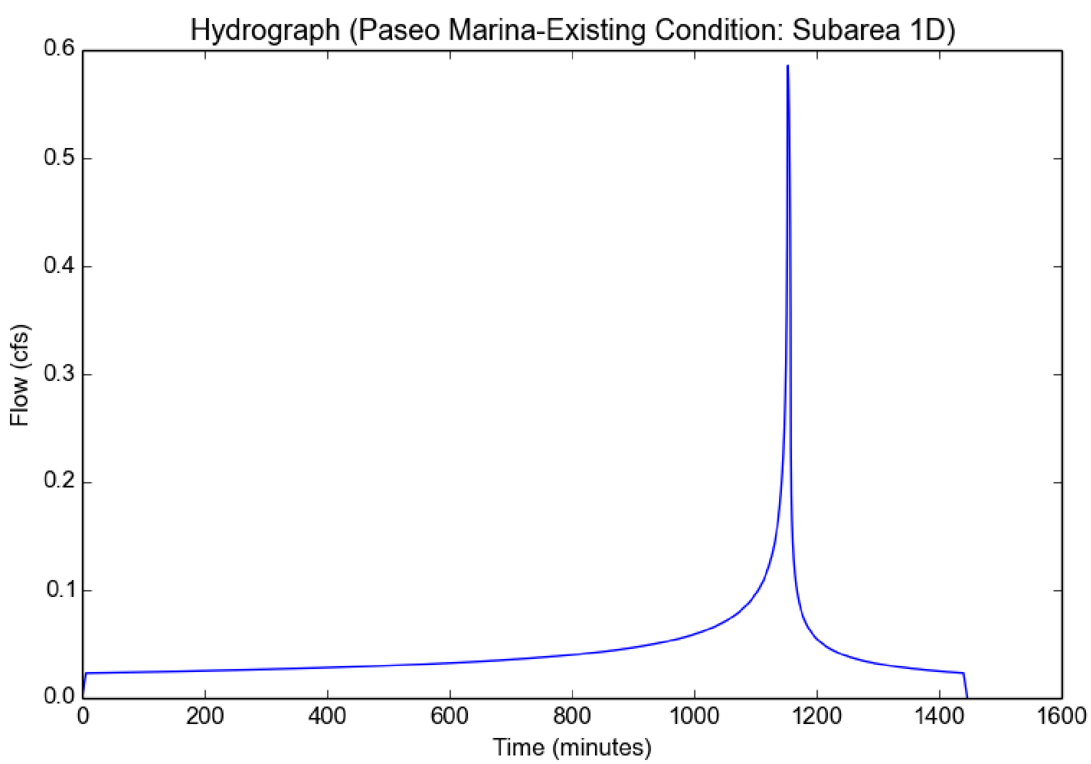
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition - Subarea 1D.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition
Subarea ID	Subarea 1D
Area (ac)	0.31
Flow Path Length (ft)	180.0
Flow Path Slope (vft/hft)	0.0044
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	3.8556
Peak Intensity (in/hr)	2.1114
Undeveloped Runoff Coefficient (Cu)	0.7692
Developed Runoff Coefficient (Cd)	0.8948
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	0.5857
Burned Peak Flow Rate (cfs)	0.5857
24-Hr Clear Runoff Volume (ac-ft)	0.086
24-Hr Clear Runoff Volume (cu-ft)	3745.0756



Peak Flow Hydrologic Analysis

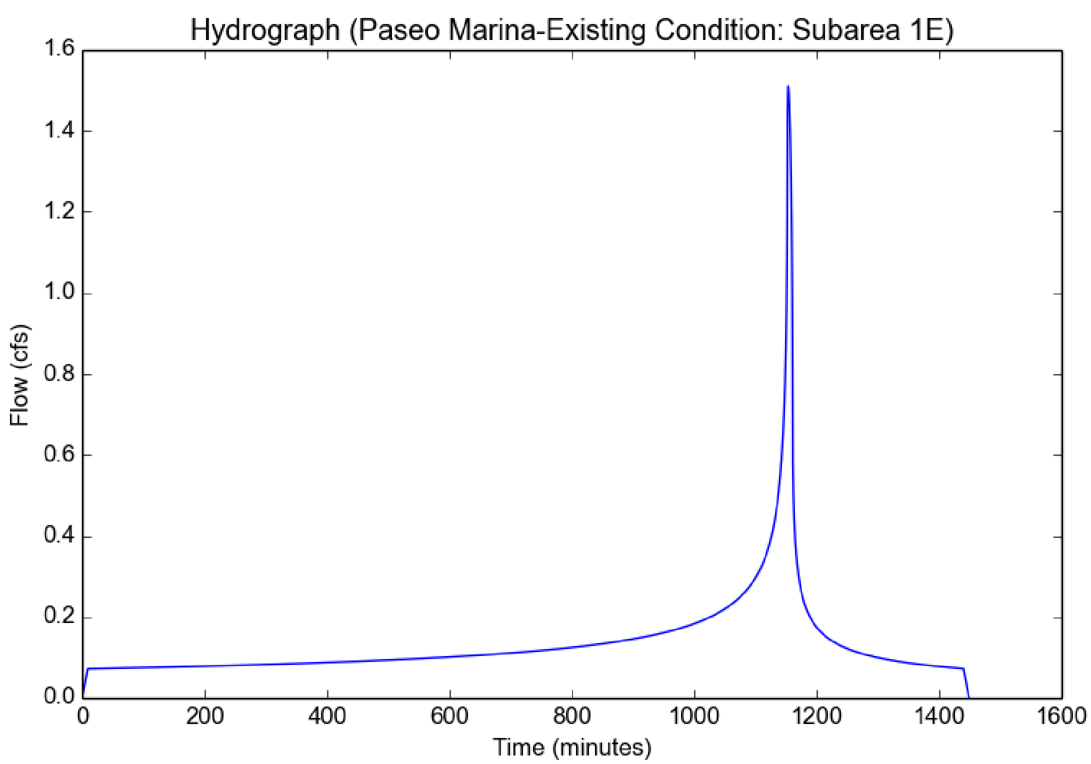
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition - Subarea 1E.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition
Subarea ID	Subarea 1E
Area (ac)	0.97
Flow Path Length (ft)	335.0
Flow Path Slope (vft/hft)	0.0038
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	3.8556
Peak Intensity (in/hr)	1.7451
Undeveloped Runoff Coefficient (Cu)	0.7168
Developed Runoff Coefficient (Cd)	0.8927
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	1.5111
Burned Peak Flow Rate (cfs)	1.5111
24-Hr Clear Runoff Volume (ac-ft)	0.269
24-Hr Clear Runoff Volume (cu-ft)	11718.0404



Peak Flow Hydrologic Analysis

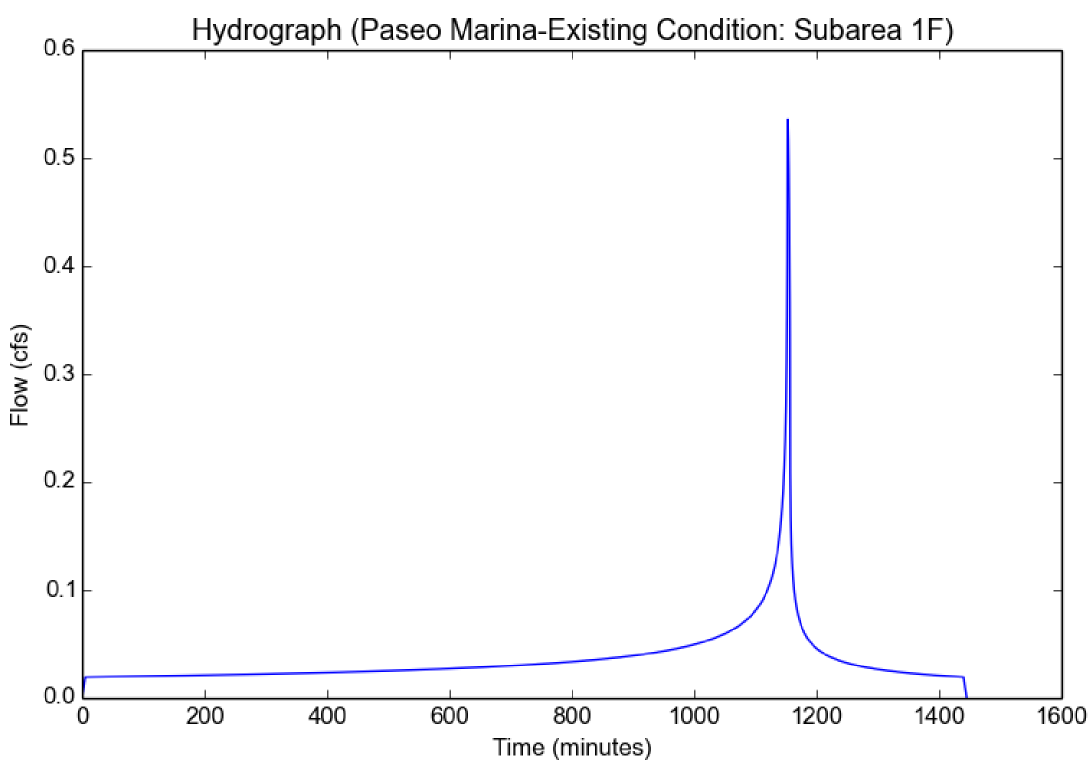
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Existing Condition - Subarea 1F.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Existing Condition
Subarea ID	Subarea 1F
Area (ac)	0.26
Flow Path Length (ft)	195.0
Flow Path Slope (vft/hft)	0.0072
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	3.8556
Peak Intensity (in/hr)	2.3004
Undeveloped Runoff Coefficient (Cu)	0.7894
Developed Runoff Coefficient (Cd)	0.8956
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.5356
Burned Peak Flow Rate (cfs)	0.5356
24-Hr Clear Runoff Volume (ac-ft)	0.0721
24-Hr Clear Runoff Volume (cu-ft)	3141.0611



Peak Flow Hydrologic Analysis

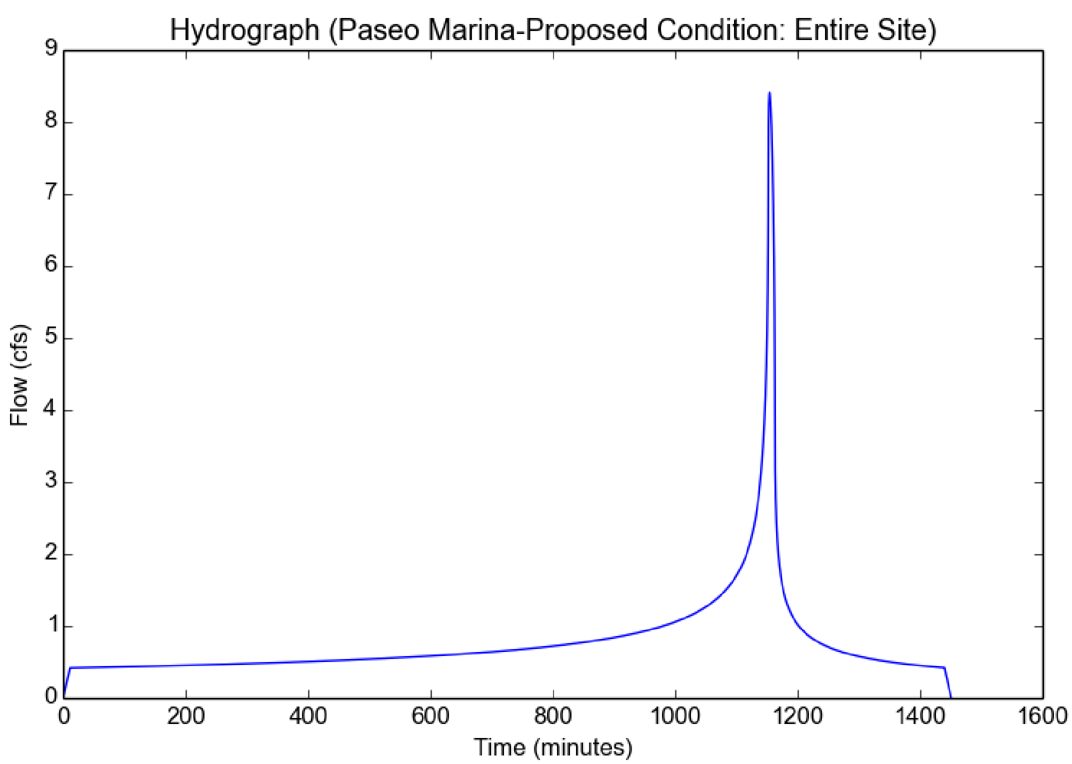
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Proposed Condition - Entire Site.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Proposed Condition
Subarea ID	Entire Site
Area (ac)	6.05
Flow Path Length (ft)	500.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.88
Soil Type	16
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	3.8556
Peak Intensity (in/hr)	1.588
Undeveloped Runoff Coefficient (Cu)	0.6918
Developed Runoff Coefficient (Cd)	0.875
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	8.4067
Burned Peak Flow Rate (cfs)	8.4067
24-Hr Clear Runoff Volume (ac-ft)	1.5634
24-Hr Clear Runoff Volume (cu-ft)	68101.1989



Peak Flow Hydrologic Analysis

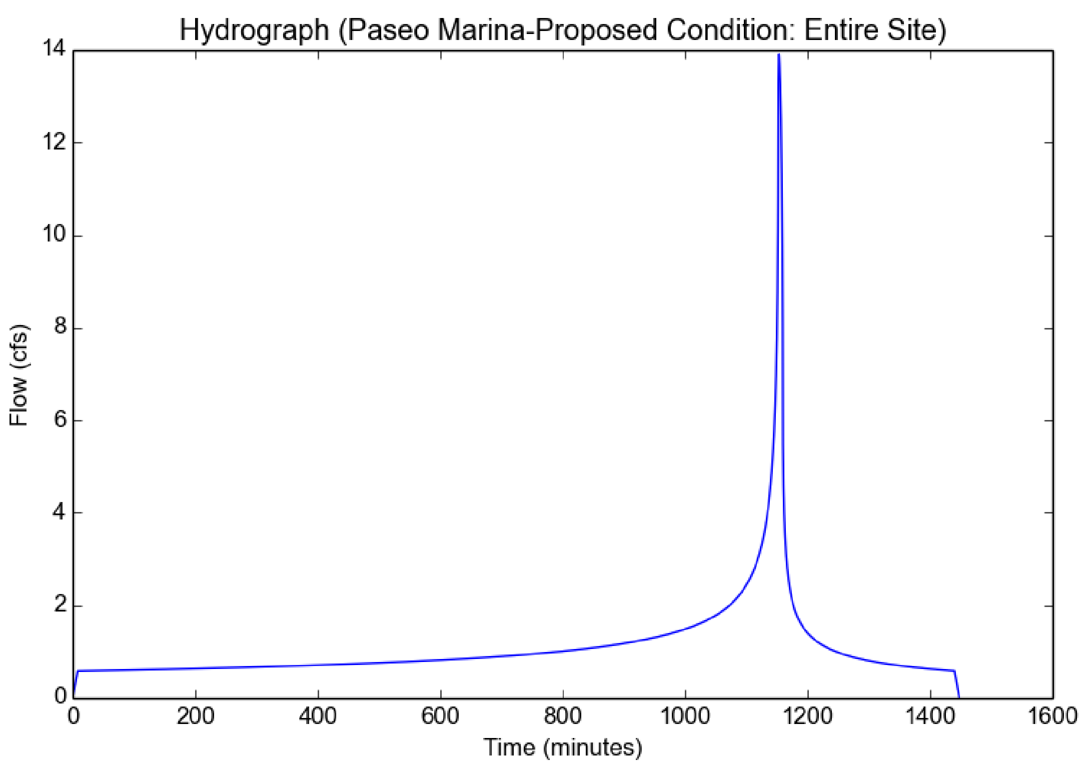
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Proposed Condition - Entire Site.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Paseo Marina-Proposed Condition
Subarea ID	Entire Site
Area (ac)	6.05
Flow Path Length (ft)	500.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	5.4
Percent Impervious	0.88
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.4
Peak Intensity (in/hr)	2.5832
Undeveloped Runoff Coefficient (Cu)	0.8172
Developed Runoff Coefficient (Cd)	0.8901
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	13.9103
Burned Peak Flow Rate (cfs)	13.9103
24-Hr Clear Runoff Volume (ac-ft)	2.1991
24-Hr Clear Runoff Volume (cu-ft)	95793.5626



APPENDIX C

WATER QUALITY CALCULATIONS

Peak Flow Hydrologic Analysis

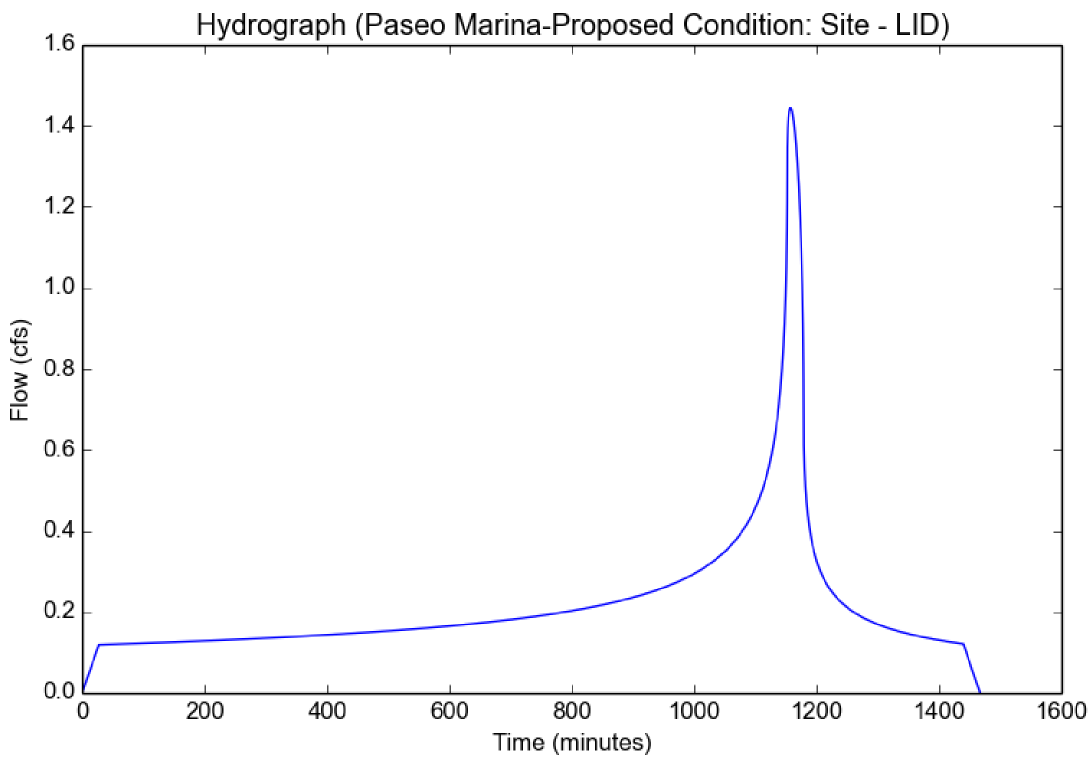
File location: C:/Users/Susan Williams/Desktop/Paseo Marina-Proposed Condition - Site - LID.pdf
Version: HydroCalc 1.0.2

Input Parameters

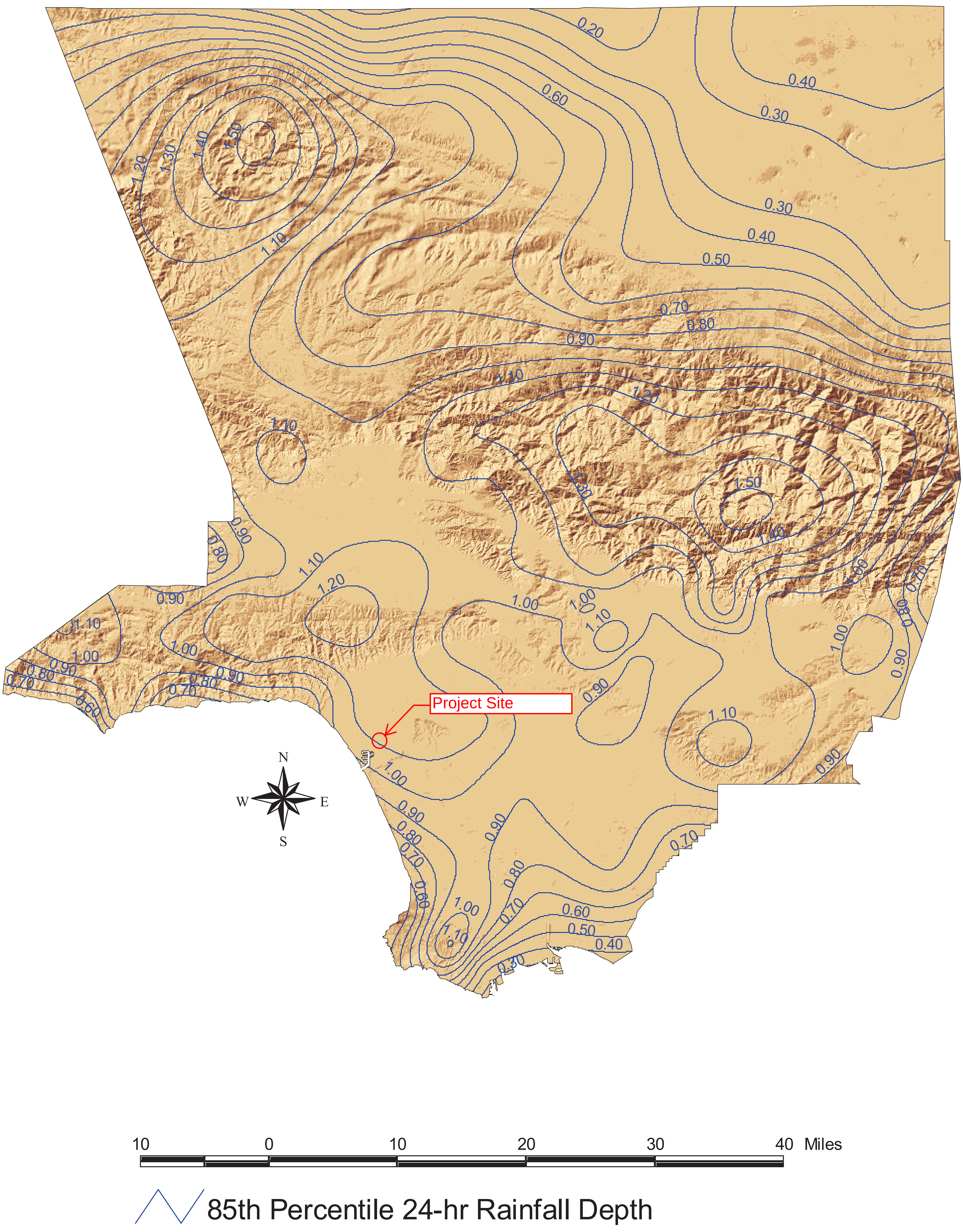
Project Name	Paseo Marina-Proposed Condition
Subarea ID	Site - LID
Area (ac)	6.05
Flow Path Length (ft)	500.0
Flow Path Slope (vft/hft)	0.005
85th Percentile Rainfall Depth (in)	1.1
Percent Impervious	0.88
Soil Type	16
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.1
Peak Intensity (in/hr)	0.2971
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.804
Time of Concentration (min)	27.0
Clear Peak Flow Rate (cfs)	1.445
Burned Peak Flow Rate (cfs)	1.445
24-Hr Clear Runoff Volume (ac-ft)	0.4422
24-Hr Clear Runoff Volume (cu-ft)	19262.4108



85th Percentile 24-hr Rainfall Isohyetal Map



Paseo Marina – LID-Infiltration BMP Design Calculations

References:

1. *Planning and Land Development Handbook for Low Impact Development (LID)* (May 9, 2016) City of Los Angeles Department of Public Works
2. *Analysis of 85th Percentile 24-hour Rainfall Depths Within the County of Los Angeles* (February 2004) Los Angeles County Department of Public Works – Water Resources Division – Hydrology Section

4.4.3 Calculating Size Requirements for Infiltration BMPs

The main challenge associated with infiltration BMPs is preventing system clogging and subsequent infiltration inhibition. In addition, infiltration BMPs must be designed to drain in a reasonable period of time so that storage capacity is available for subsequent storms and so that standing water does not result in vector risks or plant mortality. Infiltration BMPs should be designed according to the requirements listed in Table 4.2 and outlined in the text following.

Infiltration facilities must be sized to completely infiltrate the design capture volume within 48 hours. Steps for the simple sizing method are provided below.

Step 1: Calculate the Design Volume

Infiltration facilities shall be sized to capture and infiltrate the design capture volume (V_{design}) of water produced by the stormwater quality design storm event as determined in section 3.2.2

$$V_{design} \text{ (cu ft)} = \mathit{0.0625\ (ft)\ \ x\ Catchment\ Area\ (sq\ ft)}$$

or

$$V_{design} \text{ (cu ft)} = \mathit{depth\ of\ from\ 85^{th}\ percentile\ (ft)}_4\ \ \mathit{x\ Catchment\ Area\ (sq\ ft)}$$

Where:

Catchment Area = (Impervious Area x 0.9) + [(Pervious Area + Undeveloped Area) x 0.1]

For catchment areas given in acres, multiply the above equation by 43,560 sq. ft./acre.

<u>Proposed site:</u>

85th Percentile 24-hr Rainfall Depth = 1.1"

Total Area = 6.05 acres

Pervious area = 0.73 acre (12% pervious)

Impervious area = 6.05 – 0.73 = 5.32 acres

Catchment Area: (5.32 x 0.9) + (0.73 x 0.1) = 4.788 + 0.073 = 4.861 acres

<u>Volume (design) = 1.1/12 x 4.861 = 0.4456 ac-ft (= 19,410 cu. ft.)</u>

Step 2: Determine the Design Infiltration Rate

The infiltration rate will decline between maintenance cycles as the surface becomes clogged with particulates and debris. Monitoring of actual facility performance has shown that the full-scale infiltration rate is far lower than the rate measured by small-scale testing. It is important that adequate conservatism is incorporated in the sizing of facilities depending on a site's infiltration rate and expected surface loading. Where applicable, the measured infiltration rate discussed here is the infiltration rate of the underlying soils and not the infiltration rate of the filter media bed or engineered surface soils.Facility maintenance is required to maintain the infiltration rate for the life of the project. Infiltration rates used for design must be divided by the appropriate factors of safety.

$$K_{sat,design} = \mathrm{K}_{\mathrm{sat,measured}}/\mathrm{FS}$$

Where:

FS = Infiltration factor of safety, in accordance with Table 4.2

Measured infiltration rates shall be determined by in-ground, site specific infiltration tests or can be based on laboratory tests conducted on soil samples collected during the exploratory work for a site-specific geotechnical report.

Ksat, measured = 0.7 inch/hour (per Geotechnical Report), FS = 3 (Per Table 4.2)

<u>Ksat, design = 0.7/3 = 0.233 inches/hour</u>

Step 3: Calculate the BMP Surface Area

Determine the size of the required infiltrating surface by assuming the design capture volume will fill the available ponding depth plus the void spaces of the gravel fill (normally about 30 - 40% [5]) or amended soil (normally about 20 – 30%).

Determine the minimum infiltrating surface area necessary to infiltrate the design volume:

$$A_{min} = (V_{design} \times 12 \text{ in/ft}) / (T \times K_{sat,\ design})$$

Where:

A_{min} = Minimum infiltrating surface area (ft^2)

T = Drawdown time (hours), 48 hours

The calculated minimum BMP surface area only considers the surface area of the BMP where infiltration can occur. For dry wells, the calculated surface area is the total surface area of the well lying in soils with $K_{sat,measured}$ values > 0.3 in/hr. In other words, the portion of the dry well that extends through impermeable layers should not be considered part of the infiltrating area. For the hybrid bioretention/dry well BMP design, the calculated BMP surface area applies to the combined surface area of the bioretention facility and the infiltrating portion of the underlying dry well(s).

5 Terzaghi and Peck stated that in the densest possible arrangement of cohesionless spheres, the porosity is equivalent to 26%; in the loosest possible arrangement, the porosity is equal to 47% (Terzaghi K. and Peck R. Soil Mechanics in Engineering Practice. 2nd ed. New York: John Wiley and Sons; 1967).

For infiltration basins, the surface area should be calculated as the surface area at mid-ponding depth. For infiltration trenches, the surface area should be calculated at the bottom of the trench.

Note that A_{min} represents the minimum calculated surface area. It is up to the discretion of the developer if A_{min} will be exceeded to allow for less media storage.

Vdesign = 19,410 cu. ft. (calculated above)
T = 96 hours (Table 4.2)
Ksat,design = 0.233 in./hr. (calculated above)

Amin (96 hours drawdown time) = (19,410 x 12)/(96 x 0.233) = 10,414 sq. ft.

Step 4: Calculate the Total Storage Volume*

Determine the storage volume of the infiltration unit to be filled with media for capturing the design capture volume.

$$V_{storage} = V_{design} / n$$

Where:

$V_{storage}$ = Minimum media storage of the infiltration facility (ft^3)
n = void ratio (use 0.40 for gap graded gravel)

* Note: Dry wells with gravel fill may not store the entire design volume; additional storage unit(s) to capture the remaining design volume may be required upstream of the dry well.

Vdesign = 18,660 cu. ft. (calculated above)
n=0.40 (recommended void ratio for gap-graded gravel)

<u>Vstorage = 19,410 /0.4 = 48,525 cu. ft. (if use gravel-filled infiltration basin)</u>

Step 5: Calculate the Media Storage Depth

Determine the depth of the infiltration unit to be filled with media for capturing the design capture volume. The depth shall not exceed 8 feet – except for dry well(s).

$$D_{media} = V_{storage} / A_{min}$$

Where:

D_{media} = Minimum media storage depth of the infiltration facility (ft)

If D_{media} is calculated as greater than 8 feet, the design infiltration area (A_{design}) shall be increased and the depth of media shall be recalculated until it is less than 8 feet.

Many project developers may elect to increase the design infiltration area such that A_{design}>A_{min}. This is especially feasible where infiltration rates are relatively high (leading to a low A_{min} value). The depth of media (D_{media}) should be calculated using the actual design area in Step 5 above. For projects with designed infiltration areas significantly higher than A_{min}, it may be feasible to have no media storage (i.e. D_{media} = 0 ft). For this to apply, the following condition must be met:

$$A_{design} \geq (V_{design} \times 12\text{in/ft}) / (K_{sat,design} \times T)$$

Vstorage (design) =19,410 cu. ft. (if use gravel-filled infiltration trench, calculated above)
Amin = 10,414 sq. ft. (96-hour drawdown time, calculated above)

Dmedia = 19,410 /10,414 = 1.86 ft.

An infiltration trench should therefore be designed with a minimum of 10,414 sq. ft. of infiltrating surface area. At this minimum surface area, the gravel media depth should be at least 1.86 ft.

Table 4.2: Infiltration BMP Design Criteria

Design Parameter	Unit	Basins and Trenches	Galleries	Bioinfiltration	Permeable Pavement	Dry Well[d]	Hybrid Bioretention/ Dry Well
Design Capture Volume, $V_{capture}$	cubic feet	Volume of water produced by the stormwater quality design storm event as determined in section 3.2.2 0.0625 (ft) x Catchment Area (sq. ft.)[a] *or* *= depth of from 85th percentile (ft) x Catchment Area (sq ft)*					
Design Drawdown Time	hrs	At surface = 48 Below grade = up to 96					
Setbacks and Elevations	-	In accordance with the Infiltration Feasibility Criteria, Section 4.2 and current Stormwater Informational Bulletien.					
Pretreatment	-	Appropriate Treatment Control Measure shall be provided as pretreatment for all tributary surfaces.					
Hydraulic Conductivity, $K_{sat,measured}$	in/hr	Measured hydraulic conductivity at the location of the proposed BMP at the depth of the proposed infiltrating surface (or effective infiltration rate where multi directional infiltration is occurring).					
Factor of Safety, FS[b]	-	3					
Facility geometry	-	Basin: Bottom slope ≤ 3%; side slope ≤ 3:1 (H:V)	Flat bottom slope	Bottom slope ≤ 3%; side slope ≤ 3:1 (H:V)	Pavement slope ≤ 5%; If ≥ 2%, area shall be terraced	Typical 18 – 36 inch diameter; flat bottom slope	Bioretention: Bottom slope ≤ 3%; side slope ≤ 3:1 (H:V) Drywell: flat bottom
Ponding Depth	inch	18 (max)[c]	-	18 (max)[c]	-	-	18 (max)[c]
Media Depth	feet	2 (min) 8 (max)	-	2 (min) 8 (max)	2 (min) 8 (max)	-	2 (min) 8 (max)
Washed gravel media diameter	inch	1 – 3	-	-	1 - 2	3/8 – 1	3/8 - 1
Inlet erosion control	-	Energy dissipater to reduce velocity					
Overflow device	-	Required if system is on-line and does not have an upstream bypass structure. Shall be designed to handle the peak storm flow in accordance with the Building and Safety code and requirements					

a: Catchment area = (impervious area x 0.9) + [(pervious area + undeveloped area) x 0.1]

b: Listed FS values to be used only if soil infiltration / percolation test was performed and a detailed geotechnical report from a professional geotechnical engineer or engineering geologist is provided. A FS of 6 will be assigned if only a boring was done.

c: Ponding depth may vary for galleries (which have a storage depth) and may be different from one vendor to another.

d. City of Los Angeles does not require the reduction factor to be applied to measured percolation rate.

APPENDIX D

GEOTECHNICAL AND INFILTRATION FINDINGS

Percolation Test: PT-01

Pre-Soak (5 gallons)			Percolation Test (5 gallons)				
Elapsed Time (minutes)	Depth to Water Level (inches)	Water Level Height (inches)	Elapsed Time (minutes)	Depth to Water Level (inches)	Water Level Height (inches)	Percolation Rate (minutes/inch)	Infiltration Rate (inches/hour)
0	91.3	52.7	0	91.3	52.7	-	-
2	91.6	52.4	30	97.8	46.2	4.6	0.5
4	91.8	52.2	60	117.2	26.8	1.5	2.0
6	92.2	51.8	90	123.8	20.2	4.5	1.0
8	92.2	51.8	120	127.7	16.3	7.8	0.8
10	92.3	51.7	150	130.7	13.3	10.0	0.7
15	92.5	51.5					
20	92.8	51.2					
25	93.0	51.0					
30	93.0	51.0					
35	93.2	50.8					
40	93.4	50.6					
45	93.5	50.5					
50	93.5	50.5					
55	93.7	50.3					
60	93.7	50.3					
65	93.8	50.2					

REPORT

GEOTECHNICAL FEASIBILITY REPORT

Marina Marketplace Phase III
13450 W. Maxella Avenue, Marina del Rey, California

Submitted To: Sares-Regis Group
18802 Bardeen Avenue
Irvine, CA 92612

Submitted By: Golder Associates Inc.
3 Corporate Park, Suite 200
Irvine, CA 92606

January 16, 2015 (Revised March 16, 2017) **1403929**

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1.0 INTRODUCTION

This report presents the results of the geotechnical feasibility study performed by Golder Associates Inc. (Golder) for the Marina Marketplace Phase III project to be located at 13450 West Maxella Avenue in Marina del Rey, California (the Site). The Site location is shown on Figure 1. This report presents a project description, a summary of Golder's limited geotechnical field investigation, and preliminary geotechnical engineering recommendations for the proposed development. Prior to final design of the project, it will be necessary to perform a design-level geotechnical study for the Site, which will include final geotechnical design recommendations for the project.

1.1 Existing Site Conditions

The Site has a net area of approximately 6 acres and is located at the intersection of Maxella Avenue and Glencoe Avenue in the Marina del Rey area of the City of Los Angeles, California, as shown on Figure 2. The Site is bordered to the north by the Tierra del Rey Apartments and the Villa Velletri Townhouses, to the west by the Marina Marketplace (Gelsons and AMC) and the Stella Apartments, to the east by the Marina Marketplace Phase I (Pavilions) and to the south by Hotel MdR Marina del Rey – a DoubleTree by Hilton. The Site is currently occupied by several retail buildings and at-grade paved parking lots. The existing ground surface at the Site is relatively flat and gently slopes down toward the south and east.

1.2 Proposed Development

The proposed project consists of the re-entitlement of the Site to construct approximately 660 apartment units and approximately 25,000 square feet of retail space. The project currently consists of a multistory residential development with up to seven levels above ground and 1.5 to 2 levels below ground. We have assumed that the total depth of the excavation will be approximately 18 to 20 feet below current grade. The project may also include a stormwater infiltration system.

1.3 Previous Investigations

Golder reviewed available geotechnical information for nearby structures at the City of Los Angeles Building Department. Several reports were available, including a geotechnical report performed at the Site for an expansion of the existing retail. These reports included both geotechnical borings and cone penetration test data.

1.4 Objective and Scope of Work

The objective of Golder's current study was to provide preliminary geotechnical recommendations for the preliminary design of the proposed residential development. In particular, the objective was to identify geologic conditions at the Site that could make the project uneconomic. Golder's scope of work included performing a data review, limited field exploration, and geologic characterization of the Site and providing preliminary geotechnical engineering design recommendations. The results of Golder's study are provided in the following sections of this report.

2.0 LIMITED GEOTECHNICAL EXPLORATION

2.1 Utility Clearance and Data Review

Golder performed a visual reconnaissance of the Site on September 22, 2014 to mark out cone penetration test (CPT) locations. Underground Service Alert of Southern California (Dig Alert) was notified by Golder of the proposed CPT locations as required by law. Golder did not contract the services of any utility location company during this phase of the project.

A drilling permit was obtained from the County of Los Angeles Public Health Department because subsurface exploration depths penetrated the groundwater table. A copy of the drilling permit is included in Appendix A.

Geologic and geotechnical data available for the region and Site were gathered from the following sources:

- "State of California Seismic Hazard Zones Map, Venice Quadrangle," prepared by the State of California Department of Conservation, Division of Mines and Geology, dated March 25, 1999.
- Geotechnical Investigation, Proposed Building Expansion, Existing Vons Store, 4365 Glencoe Avenue, Los Angeles, California.
- Additional Explorations, Proposed Hardscapes and Pavement Improvements, Phase 2 Villa Marina Market Place, 13455 Maxella Avenue, Marina del Rey, California.
- Geotechnical Feasibility Letter, Proposed Villa Marina, 13400 – 13490 W. Maxella Avenue, Los Angeles, California.

2.2 Limited Field Investigation

The purpose of the limited geotechnical field investigation was to evaluate the subsurface conditions within the proposed project Site in order to evaluate the engineering characteristics of the underlying soils for feasibility-level purposes. The limited geotechnical investigation consisted of advancing six CPT soundings (CPT-1 through CPT-6) and one soil boring (PT-01).

2.2.1 Cone Penetration Test (CPT) Soundings

CPT soundings were advanced by Kehoe Testing and Engineering of Huntington Beach, California on September 25, 2014. The CPT's were advanced using a 30-ton thrust capacity truck-mounted CPT rig. Data was collected in accordance with ASTM D5778 using a standard 15 square centimeter electronic cone system. Tip resistance and sleeve friction data were recorded continuously at approximately 2.5 centimeter depth intervals.

The upper 5 feet of each CPT location were hand augered to confirm the absence of utilities. A total of six CPT soundings were advanced at the locations shown on Figure 2. The planned investigation included advancing five (5) CPTs to a depth of 50 feet below the existing ground surface (bgs) and one CPT to a depth of 75 feet bgs. The actual depths of CPT soundings ranged from 26 to 60 feet bgs. Four of the CPT soundings (CPT-2, CPT-4, CPT-5, and CPT-6) hit refusal before the planned termination depth. The CPT data graphs are presented in Appendix B.

All CPT soundings were backfilled with bentonite pellets and the upper 6 inches were capped with cold-patch asphalt mix.

2.2.2 Soil Test Boring

One soil test boring was drilled on December 17, 2014 using a truck mounted hollow stem auger drill rig provided by Martini Drilling Corporation of Huntington Beach, California. The boring was drilled to an approximate depth of 12 feet bgs. The boring was drilled in the location of the proposed stormwater infiltration basin. Figure 2 shows the location of the test boring.

The soil cuttings from the boring were visually logged in the field by a Golder engineer. In addition, two standard penetration test (SPT) soil samples were collected from depths of 6 ft bgs and 12 ft bgs.

The log for the soil boring is presented in Appendix C. The log (Record of Borehole) describes the earth materials encountered and the samples obtained. The log also shows the boring number, drilling date, and the name of the Golder engineer that logged the boring. The soils were described in general accordance with ASTM D2488. The boundaries between different soil types shown on the log are approximate because the actual transition between soil layers may be gradual.

2.2.3 Previous Investigations

Geotechnical Professionals, Inc. performed a geotechnical investigation for a proposed Vons store expansion adjacent to and southwest of the Site in 2005. The investigation included two geotechnical borings drilled to depths of 26.5 and 51 feet bgs and two CPTs advanced to depths of 36 and 50 feet bgs. Group Delta Consultants, Inc. performed a geotechnical investigation for a proposed Villa Marina development. The investigation included two geotechnical borings drilled to depths of 41 and 58.8 feet bgs and two CPTs advanced to depths of 42 and 55 feet bgs. Copies of the boring logs from the previous investigation are included in Appendix D.

3.0 GEOLOGIC CONDITIONS

3.1 Site Subsurface Conditions

The Site is located on alluvial soils derived from the nearby Ballona Creek. The alluvial soils are vertically and horizontally discontinuous as a result of periods of alluvial deposition.

Golder's geotechnical exploration confirmed that the area within the Site is underlain by alluvial soils to the depths explored. From an interpretation of the CPT data, the alluvial soils generally consist of approximately 17 to 20 feet of silt and clay. The silt and clay contained layers/lenses of sand and silty sand. Below the silt and clay lies a medium dense to dense sand layer. This sand layer, where penetrated, was approximately 20 to 25 feet thick. Below the sand is another silt and clay layer approximately 5 to 15 feet thick. The interpretation of the CPT data is consistent with the borings drilled on the adjacent sites.

3.2 Groundwater

According to the groundwater level contour map prepared by the California Division of Mines and Geology (CDMG, 1998) and presented in the Seismic Hazard Zone Report for the Venice 7.5-Minute Quadrangle, the historical high groundwater level at the Site is approximately 6 feet bgs. Geotechnical borings on the properties adjacent to the Site encountered groundwater at a depth of approximately 17 feet bgs. The depth to groundwater can fluctuate with the time of year; however, the water table is likely controlled by the ocean located approximately 1,000 feet to the southwest of the Site. The depth of the groundwater table should be determined during final design.

The City of Los Angeles typically requires that infiltration basins are located a minimum of 10 feet above the current groundwater table. We understand that for this project the City of Los Angeles will allow the infiltration basin to be located a minimum of 5 feet above the current groundwater table. A percolation test was performed in the area of the proposed basin at a depth of 12 feet bgs. The results of the percolation testing are presented in Section 3.3.

3.3 Percolation Testing

The percolation testing was performed in soil test boring PT-01 in accordance with the County of Los Angeles Department of Public Works guidelines as outlined in the Low Impact Development (LID) Manual. After the test boring was drilled, the augers were removed from the borehole and approximately two inches of No. 3 coarse grained sand was placed at the bottom of the hole. A 2-inch diameter, 10-foot long slotted PVC pipe was then placed into the center of the borehole. Six feet of No.3 coarse grained sand was used to fill the annular space between the PVC pipe and the borehole walls. Five gallons of water was poured into the PVC pipe and the borehole was allowed to pre-soak for several hours.

The percolation test was performed in the borehole on the same day the boring was drilled and pre-soaked (i.e., December 17, 2014). The percolation test was performed by pouring 5 gallons of clear water into the

PVC pipe installed in the borehole and then measuring the rate at which the water level in the borehole dropped. The water level in the borehole was measured using an electronic water level indicator.

Measurements of the water levels in the borehole were taken in 30 minute intervals over a period of 2.5 hours. The percolation rate (in minutes per inch) in the borehole was then calculated for each increment of time. The infiltration rate (in inches per hour) was calculated from the percolation test data using the following equation:

$$I_t = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

where:

I_t = infiltration rate computed from test results (inches/hour)
ΔH = change in height of water in borehole during time interval (inches)
r = borehole radius (inches)
Δt = time interval over which calculation is being performed (minutes)
H_{avg} = average height of water in borehole during time interval (inches)

Appendix E contains the percolation test data (time intervals, measured water levels, and heights of water in the borehole) and results. Based on the percolation test data, the percolation rate is 7.8 minutes per inch and the calculated infiltration rate is 0.8 inches per hour. It is noted that the use of these values in stormwater infiltration design will require the use of appropriate factors of safety to account for subsurface variability, long-term performance, and other factors.

3.4 Potential Geologic Hazards

3.4.1 Surface Fault

The Site is not located in an Alquist-Priolo Earthquake Fault Zone (*Los Angeles General Plan Safety Element, Exhibit A, Alquist-Priolo Special Study Zones & Fault Rupture Study Areas, page 47, November 1996)*. The closest known active faults to the Site are the Santa Monica fault located approximately 4 miles to the north and the Newport-Inglewood fault located approximately 4 miles to the east. Accordingly, surface fault rupture is not a significant hazard at the Site.

3.4.2 Faults within 20 Miles of the Site

Faults are zones of weakness in the earth's crust. Faults that accommodate horizontal movement are referred to as strike-slip faults. Vertical movements occur on reverse and normal faults. Oblique faults accommodate both horizontal and vertical movements. Faults that have moved within the last 11,000 years are considered active.

Major active strike-slip faults and reverse faults are located within 20 miles of the Site. Table 1 lists the known active faults within 20 miles of the Site. The faults closest to the Site are the Santa Monica fault, the Newport-Inglewood fault, and the Palos Verdes fault, which are all located within 5 miles of the Site. These three faults are shown on Figure 3 and discussed further below.

For faults located at distances greater than 20 miles from the Site, the seismic ground motions at the Site resulting from earthquakes on these distant faults are expected to be small (i.e., less than 0.1 g). In addition, Section 3.5.2 confirms that the ground motion hazard at the Site is controlled by the faults located closest to the Site (i.e., less than 10 miles from the Site).

Table 1. Holocene-Active Faults with Surface Rupture within 20 Miles of the Site

Fault Name[1]	Distance to Site (miles)[2]	Fault Type[1]	Last Historical Event (year)	Maximum Magnitude (M)[1,3]	Median Deterministic PGA (g)
Santa Monica	4	R	---	6.6	0.29
Newport- Inglewood – north Los Angeles Basin section	4.3	RLSS	1920 (M 4.9)	6.9	0.30
Palos Verdes – Santa Monica Basin section	4.5	RLSS	---	7.1	0.31
Hollywood	6.8	R/LLSS	---	6.5	0.19
Redondo Canyon	16.5	R	---	6.4	0.08
Raymond	17.2	LLSS	---	6.8	0.10
Newport- Inglewood – south Los Angeles Basin section	18	RLSS	1812; 1933 (M 6.3)	7.0	0.11

Notes:

1) Data from U.S. Geological Survey Fault and Fold Database (Petersen et al., 2008)
2) As measured using Google Earth™ from the Site (located at 33.9863, -118.4402)
3) Evaluated from values in Petersen et al (2008) using earthquake scaling relationships presented in Stirling et al. (2013)

3.4.2.1 Santa Monica Fault

The Santa Monica fault is an ENE-trending reverse-oblique fault located along the southern flank of the Santa Monica Mountains. It extends offshore of Santa Monica to the west to Malibu and to the east it extends to the intersection with the West Beverly Hills Lineament (the northern extent of the Newport-Inglewood Fault). Attenuation equations indicate that the Santa Monica fault is capable of generating a median peak horizontal ground acceleration (PGA) of 0.29 g at the Site.

3.4.2.2 Newport-Inglewood Fault System

The Newport-Inglewood fault is right lateral strike slip fault. The Newport-Inglewood fault zone is a part of the fault system that extends from Beverly Hills to San Diego. South of Newport Beach the fault is located offshore. North of Newport Beach the fault is divided into two segments: the North Los Angeles Basin segment and the South Los Angeles Basin segment. The Los Angeles River forms an approximate boundary between these two segments. Attenuation equations indicate that the Newport-Inglewood fault is capable of generating a median PGA of 0.30 g at the Site.

3.4.2.3 Palos Verdes Fault System

The Palos Verdes fault is a right lateral strike-slip fault. The Palos Verdes fault zone is part of a fault system that extends from Santa Monica Bay to San Diego Bay. The fault is located offshore over most of its length. A small onshore segment is located east of San Pedro and Palos Verdes. Attenuation equations indicate that the Palos Verdes fault is capable of generating a median PGA of 0.31 g at the Site.

3.4.3 Historical Seismicity

Instrumental and reported historic records from the late 1900s through January 2015 reveal that at least 162 earthquakes of magnitude **M** ≥ 4.0 having epicenters located within about 62 miles (100 km) of the Site have occurred in this timeframe. Earthquake magnitudes and epicenter locations were taken from catalogs maintained by the U.S. Geological Survey National Earthquake Information Center (http://neic.usgs.gov/). Twenty-two (22) earthquakes of **M** ≥ 5.0 have been recorded from the late 19th Century through January 2011, and 3 of these earthquakes were of **M** ≥ 6.0. Most of the recorded earthquakes have occurred at distances of more than about 20 miles (32 km) from the Site.

The largest earthquakes near the Site are the 1933 **M** 6.3 Long Beach Earthquake, the 1971 **M** 6.6 Sylmar Earthquake, and the 1994 **M** 6.7 Northridge Earthquake. The shortest distance from the Site to the zone of energy release for these earthquakes is estimated to be 4, 18, and 22 miles, respectively. Using strong motion recordings located throughout the Los Angeles basin, Stewart et al. (1994) estimate the PGA at the Site during the Northridge Earthquake was between 0.2 and 0.3 g.

3.4.4 Landslides

The Site is relatively flat and located in Marina del Rey near the coast. The Site and surrounding areas are fully developed and generally characterized by gently sloping topography that would not be susceptible to landslides. There are no known landslides near the Site, nor is the Site in the path of any known or potential landslides. Furthermore, the Site is not mapped as an Earthquake-Induced Landslide Area as designated by the CDMG (1998), nor is the Site mapped as a landslide area by the City of Los Angeles.[1,2]

3.4.5 Tsunamis, Seiches, and Flooding

Tsunamis are very large waves in the ocean caused by seismic events, landslides, or volcanic eruptions. The Site is located less than one mile from the marina at an elevation of approximately 24 feet above mean

[1] Los Angeles General Plan Safety Element, Exhibit C, Landslide Inventory & Hillside Areas, page 51 (November 1996).
[2] City of Los Angeles Department of City Planning, ZIMAS, Parcel Profile Report for 13450 Maxella http://zimas.lacity.org/, accessed March 14, 2017.

sea level. The Site is not located in a Tsunami Inundation Zone as mapped by the California Geological Survey (2009). On this basis, the tsunami hazards are not significant at the Site.

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures or land-locked bodies of water are located immediately up gradient from the Site. Therefore, the risk of flooding from a seiche is considered to be remote.

The Site is not located within a flood influence area of the City of Los Angeles Seismic Safety Element (1996) or a FEMA flood hazard zone.

3.4.6 Subsidence

SoCal Gas operates a natural gas storage field below Playa del Rey south of the Site. The storage field was originally an oil field that produced in the 1930s. Oil production lasted approximately 10 years. In 1942, the United States government began using the field for natural gas storage. In 1955, a predecessor of SoCal Gas purchased the field and SoCal Gas has been operating it since 1955. The natural gas storage area is not located below the Site. Natural gas is injected and withdrawn from 54 active wells operated by SoCal Gas.

Removal of oil and gas from geologic formations can cause surface subsidence. Because the oil extraction stopped 72 years ago, Golder expects that subsidence from oil extraction is substantially complete. SoCal Gas has been monitoring subsidence from the operation of the gas field since 2009. The monitoring has indicated that minor subsidence may occur with the operation of the field. However, the potential damage to surface structures from subsidence is low.

Subsidence can also occur when groundwater is withdrawn from unconsolidated aquifers. There is no indication that groundwater withdrawal is currently taking place in the area surrounding the Site. Therefore, the potential for subsidence is low.

3.5 Other Seismic Considerations

3.5.1 Ground Shaking

As with all of Southern California, the Site would be subject to potential strong ground motions if a moderate to strong earthquake were to occur on a local or regional fault. Design of the proposed structures in accordance with the provisions of the California Building Code will mitigate the potential effects of strong ground shaking.

The bases for the 2016 California Building Code (CBC) seismic design are 5%-damped spectral accelerations for 0.2 seconds (S_S) and 1 second (S_1) at a rock site (Site Class B). These 5%-damped spectral accelerations are established for a risk-adjusted Maximum Considered Earthquake (MCE_R). Typically, the MCE_R spectral accelerations have a mean return period of 2,475 years (i.e., 2% probability of being exceeded in 50 years). At some locations, the 2,475-year ground motions are capped by deterministic ground motions. The values for S_S and S_1 were evaluated using the US Seismic Design Maps application (http://earthquake.usgs.gov/designmaps/us/application.php) provided by the United States Geological Survey (USGS). Site coefficients (F_a and F_v) were used to scale the spectral accelerations as a function of Site Class to develop a site-specific, 5%-damped acceleration response spectrum. Table 2 provides the recommended 2016 CBC seismic design parameters for the Site based on the results of Golder's geotechnical exploration and on Section 1613 of the 2016 CBC.

Table 2. 2016 California Building Code (CBC) Seismic Design Parameters

2016 CBC Seismic Design Parameter	**Value**
Site Class	D
5%-damped, 0.2-sec spectral acceleration (S_S)	1.672 g
5%-damped, 1-sec spectral acceleration (S_1)	0.658 g
Site Class D, 5%-damped , maximum considered earthquake geometric mean (MCE_G) peak ground acceleration (PGA_M)	0.63 g
Site Coefficient, F_a	1.0
Site Coefficient, F_v	1.5
Site Coefficient, F_{pga}	1.0

3.5.2 Liquefaction Potential and Seismic Settlement

The Site is located within an area mapped as a Liquefaction Hazard Zone by the CDMG (1998). The 2016 CBC requires that liquefaction potential evaluations for soil Site Class D through F be developed based on either a site-specific study taking into account soil amplification effects or using mapped peak ground accelerations (PGA) adjusted for site effects (F_{PGA}), PGA_M. The mapped PGA values represent maximum considered earthquake geometric mean (MCE_G) peak ground accelerations, rather than risk-targeted values. F_{PGA} and PGA values were evaluated using tools provided by the USGS. The PGA_M at the Site (0.63 g) was evaluated from the 2008 model for the United States developed by the USGS. Deaggregation of the seismic hazard indicates that the PGA is associated with an **M** 6.8 earthquake located approximately 9 km from the Site.

Liquefaction potential at the Site was assessed using procedures presented by Youd et al. (2001) for CPT data. The results of the liquefaction analysis are included in Appendix F. The evaluation indicated that liquefaction is likely to occur at the Site in thin layers/lenses generally below 20 feet bgs. The liquefiable layers above 26 to 27 feet bgs (depending on the thickness of mat foundation) will be removed during the basement excavation. The liquefaction-induced settlement was calculated using the procedure proposed by Idriss and Boulanger (2008). The total estimated liquefaction settlement is one-half of an inch or less. A differential settlement equal to one-half of the total settlement should be expected. The significance of the estimated seismic settlement is discussed in Section 4.1.2.

4.0 GEOTECHNICAL DESIGN RECOMMENDATIONS

4.1 Preliminary Foundation Design

4.1.1 Uplift Pressures

The proposed building includes two levels below grade. We have assumed that base of the excavation is approximately 20 feet bgs. This is approximately 3 feet below the current groundwater level. As a result, the foundation will be subjected to hydrostatic uplift pressures. The historic high groundwater table at the Site is approximately 6 feet bgs. The hydrostatic uplift pressures should be calculated based on the historic high groundwater table of 6 feet bgs.

4.1.2 Mat Foundations

Golder recommends that mat foundations bearing on the native soils be designed for a preliminary static allowable net bearing pressure of 4,500 psf. This bearing pressure assumes the mat will be founded on the medium dense to dense sand layer located approximately 20 feet bgs. The recommended bearing value is for equivalent gross loads and may be increased by one-third for wind, seismic, or other transient loading conditions.

The net bearing pressure does not include the weight of the mat foundation. However, the weight of soil excavated to construct the mat will be much greater than the weight of the mat.

The recommended allowable bearing pressure given above is based on a total settlement of one inch or less. A differential settlement equal to one-half of the total settlement can be expected. The City of Los Angeles limits the total allowable settlement (including seismic settlement) to 4 inches and the total allowable differential settlement (including seismic settlement) to 2 inches. The total and differential settlements of the mat foundation (including seismic) are less that the limits prescribed by the City of Los Angeles, so impacts regarding seismic settlement would be less than significant.

4.1.3 Modulus of Subgrade Reaction

The modulus of subgrade reaction, commonly required for the design of mat foundations, is not an intrinsic property of the soil since it also depends on the dimensions and stiffness of the mat and the applied stress level. The coefficient of subgrade reaction, k_1, for a 1-foot diameter plate may be taken as 2,000 kcf for design purposes. The coefficient of subgrade reaction for the mat foundation, k, can then be calculated using the equation:

$$k = k_1 \left(\frac{B+1}{2B}\right)^2$$

where B is the effective diameter of the mat's reaction area in feet. B may be estimated using the following equation:

$$B = \frac{4h}{\pi}\sqrt[3]{\frac{E}{E_S}}$$

where E and E_S are the elastic moduli of the concrete and soil, respectively, and h is the thickness of the mat in feet. Golder recommends that an E_S of 1,000 kips per square foot (ksf) be used to evaluate the modulus of subgrade reaction for the mat foundation.

Waterproofing on the base and sides of the mat foundation is recommended.

4.1.3.1 Lateral Resistance

A mat foundation located below grade may derive lateral load resistance from passive resistance along the vertical sides of the mat, friction acting on the base of the mat, or a combination of the two. An allowable passive resistance of 230 psf per foot of depth up to a maximum of 4,000 psf may be used for design. Golder recommends that the upper 1 foot of soil cover be neglected in the passive resistance calculations. An ultimate friction factor of 0.50 between the base of the mat foundation and the native soils can be used for sliding resistance using the dead load forces. Friction and passive resistance may be combined without reduction.

4.2 Walls

4.2.1 Basement Walls

The basement walls can be designed for an earth pressure represented by an equivalent fluid weight of 60 pounds per cubic foot (pcf). Walls below the groundwater table can be designed for a total earth and water pressure represented by an equivalent fluid weight of 90 pcf. The basement walls should be backfilled with granular soils. The fine fraction of the soil should have a liquid limit of 25 or less and a plasticity index of 12 or less. The soil should be uniformly graded with no greater than 30 percent of the particles passing the No. 200 sieve and no particles greater than 6 inches in dimension.

Under earthquake loading, basement retaining walls will be subjected to an additional lateral force equal to $14H^2$ pounds per linear foot of wall, where H is the height of the wall in units of feet. This force should be applied at a point located 0.6H above the base of the wall and it acts in addition to the static lateral pressures discussed above.

Waterproofing of basement walls is recommended to prevent moisture intrusion and water seepage through the walls due to the shallow groundwater table. In addition, a drainage layer should be placed against the wall above the groundwater table. The drainage layer may consist of a geosynthetic drain placed against the basement wall.

4.2.2 Retaining Walls

Active earth pressures may be used for deign of retaining walls that are free to rotate at least 0.1 percent of the wall height. The active earth pressures can be computed using an equivalent fluid weight of 35 pcf. Retaining walls restrained against rotation should be designed for the higher at-rest earth pressure conditions. For design purposes, the at-rest earth pressure exerted on retaining walls can be taken as that exerted by an equivalent fluid weight of 60 pcf. These recommended values do not include compaction-, truck-, or building-induced wall pressures or water pressures (see below). Additional loads on retaining walls may be imposed by surcharges. Golder should be contacted when development plans are finalized for review of wall, backfill, and surcharge conditions on a case-by-case basis.

Care must be taken during compaction operations not to overstress the retaining wall. Heavy construction equipment should be kept at least 3 feet away from the wall while the backfill soils are being placed. Hand-operated compaction equipment should be used to compact the backfill soils within the 3-foot-wide zone adjacent to the walls. Soil at the toes of retaining walls should be in place and compacted prior to backfilling behind the walls.

Under earthquake loading, retaining walls will be subjected to an additional lateral force equal to $14H^2$ pounds per linear foot of wall, where H is the height of the wall in units of feet. This force should be applied at a point located 0.6H above the base of the wall and it acts in addition to the static lateral pressures discussed above.

The recommended lateral earth pressures provided herein assume that adequate drainage is provided behind the walls to prevent the buildup of hydrostatic pressures. Walls should be provided with backdrains to prevent the buildup of hydrostatic pressure behind the walls. Backdrains could consist of a 2-foot wide zone of Caltrans Class 2 permeable material located immediately behind the wall and extending to within 1 foot of the ground surface. A perforated pipe could be installed at the base of the backdrain and sloped to discharge to a suitable collection point. Alternatively, commercially available synthetic drainage layers could be used for drainage of the wall backfill. The synthetic manufacturer’s recommendations should be followed in the installation of synthetic drainage layers or backdrains.

4.3 Soil Corrosivity

Geotechnical Professionals, Inc. tested one soil sample for corrosion. Based on Caltrans guidelines for structural elements (Caltrans, 2012), the Site soils are corrosive. A corrosive environment is defined by either a chloride content greater than 500 ppm, a sulfate content greater than 1,000 ppm, or a pH less than 5.5. The test indicated the soils had a higher chloride content and sulfate content than the Caltrans defined minimums. Similar corrosive soils should be expected at the Site. Corrosivity testing of on-Site soils should be performed during final design. Type V cement should be used for concrete in contact with the existing on-Site corrosive soils.

Golder recommends that the concrete mix design be reviewed by a qualified corrosion engineer to evaluate the general corrosion potential at the Site. Buried metallic structures and elements are recommended to have corrosion protection designed by a qualified corrosion engineer.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Existence of Unsuitable Soils

Geotechnical Professionals, Inc. performed an expansion index test on one bulk soil sample. The expansion index value was 31. According to the 1997 Uniform Building Code, an expansion index of less than 50 indicates the soil has a low expansion potential. The on-Site soils should be tested for expansion during final design.

Because of the low expansion potential, Golder does not recommend that expansion pressures on the basement walls be included in the wall design.

5.2 Excavations

Golder assumes that the depth of the excavation will be approximately 18 to 20 feet bgs. The borings performed at the Site were advanced using a track-mounted hollow stem auger drill rig. Drilling was completed with low effort through the existing native alluvium. Therefore, conventional earth moving equipment (i.e., scrapers, dozers, excavators) will be capable of performing a portion of the excavations required for the development. All surface water should be diverted away from excavations.

Basement excavations should be sloped no steeper than 1.5H:1V (horizontal:vertical).

5.3 Shoring

If the basement excavations cannot be sloped, shoring can be used to support the sides of the excavations. Cantilever and tied-back shoring systems should be designed to resist lateral earth pressures calculated as an equivalent fluid weighing 35 pcf. A vertical surcharge load of 250 psf should be applied to the ground surface immediately behind the shoring system to represent construction and street traffic.

An allowable passive earth pressure of 230 psf per foot of depth below the bottom of the excavation should be used for design of the shoring system. The allowable passive pressure can be assumed to act over two times the concreted pile diameter or the pile spacing, whichever is less. For piles spaced closer than three diameters, a reduction in the allowable passive earth pressure may be necessary. Golder recommends that the upper 1 foot below the bottom of the excavation be neglected in the passive resistance calculations. The passive pressure should not exceed 4,000 psf.

The basement excavation is likely to extend into the groundwater table. Groundwater control during construction should be anticipated. In the silt and clay soils, groundwater control may be achieved through the use of sumps and local pumps. Dewatering wells may be required to locally lower the groundwater table in the sand layer. Because the soil below a depth of 17 feet is primarily sand with little fines, the influence zone around a dewatering well will be relatively narrow and the depth of dewatering will be less than 5 feet. As a result, the potential for dewatering induced settlement impacting adjacent structures is considered low.

Movement of shoring walls is a function of many factors including the soil and groundwater conditions, changes in groundwater level, the depth and shape of the excavation, type and stiffness of the wall and its supports, methods of construction of the wall and adjacent facilities, surcharge loads, and the duration of wall exposure among others (Clough and O'Rourke, 1990). Typical horizontal wall movements in these types of soils available in the literature tend to average about 0.2% of the wall height (Clough and O'Rourke, 1990) for walls with good workmanship. The range of possible horizontal wall movements is approximately 0.5 inches to 2.5 inches. Typical vertical movements behind the wall in these types of soils available in the literature tend to average about 0.15% of the wall height (Clough and O'Rourke, 1990) for walls with good workmanship. Movements are largest immediately behind the wall. The movements are typically minimal at a distance beyond the wall equal to the depth of the excavation.

6.0 LIMITATIONS

This report has been prepared for the proposed development at the 13450 West Maxella Avenue in Marina del Rey, California. The findings, conclusions, and recommendations presented in this report were prepared in a manner consistent with that level of care and skill ordinarily exercised by other members of the geotechnical engineering profession currently practicing under similar conditions subject to the time limits and financial, physical, and other constraints applicable to the scope of work. No warranty, expressed or implied, is made. Appendix G contains further information regarding the proper use and interpretation of this geotechnical report.

The Owner has the responsibility to see that all parties to the project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. This report contains information that may be useful in the preparation of contract specifications and contractor cost estimates. However, this report is not written as a specification document and may not contain sufficient information for this use without proper modification.

7.0 CLOSING

The preliminary geotechnical recommendations contained herein are based on Golder's current understanding of the proposed project. If changes are made to the proposed project, then it will be necessary for Golder to review this report and make changes accordingly.

Golder appreciates the opportunity to perform this study. If there are any questions regarding this report, please contact the undersigned.

GOLDER ASSOCIATES INC.

Jason Cox, PE
Project Engineer

Ryan Hillman, PE
Senior Engineer

8.0 REFERENCES

California Department of Transportation (Caltrans), 2012, Corrosion Guidelines Version 2.0. Sacramento, California.

California Division of Mines and Geology (CDMG), 1998, Seismic Hazard Zone Report for the Venice 7.5 – Minute Quadrangle, Los Angeles County, California.

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Clough, G.W., O'Rourke, T.D., 1990, Construction Induced Movements of Insitu Walls, in *Design and Performance of Earth Retaining Structures,* P.C. Lambe and L.A. Hanson, eds., Geotechnical Special Publication No. 25, ASCE, June.

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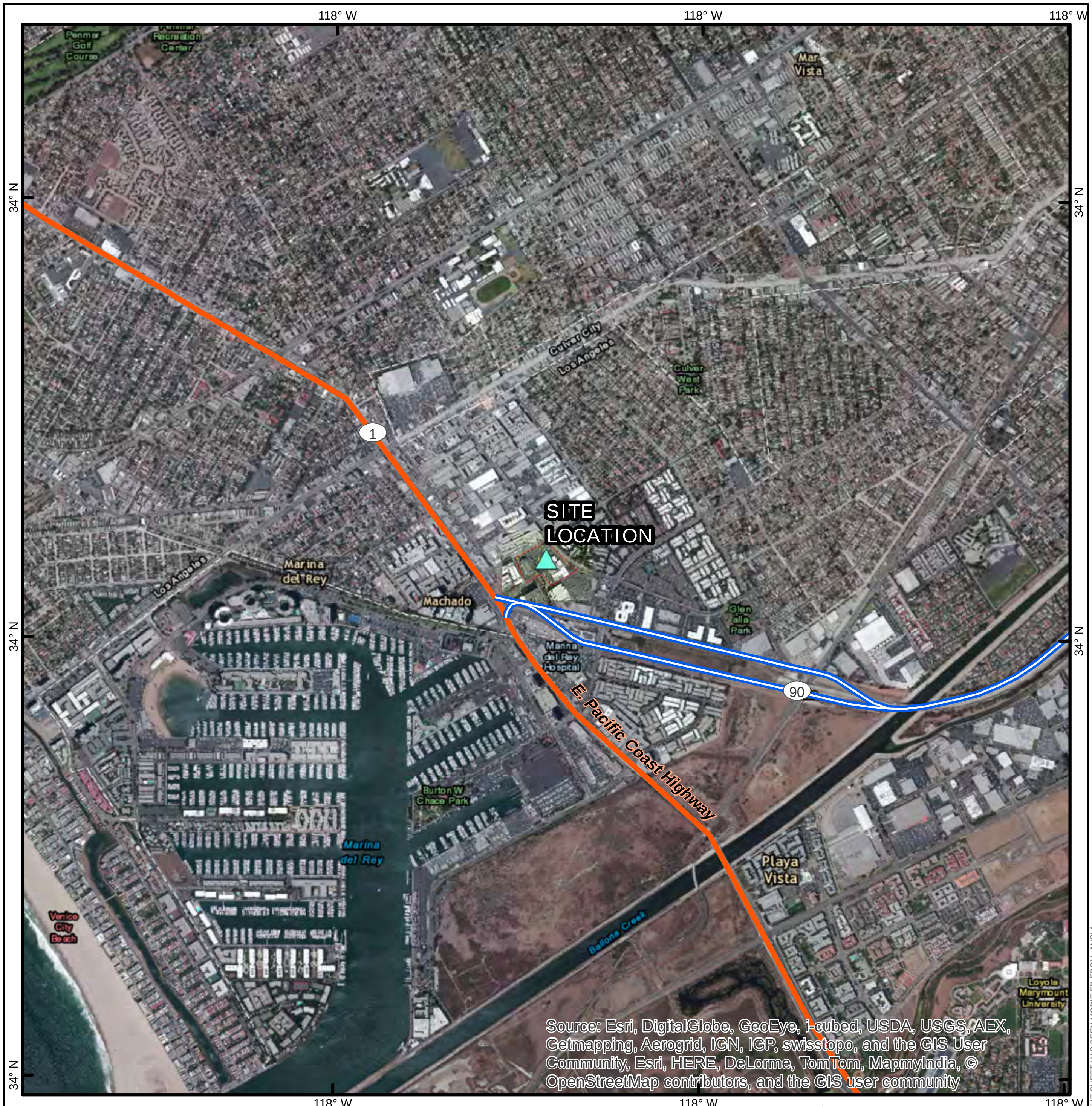
FIGURES



N

2,000 1,000 0 2,000

1 " = 2,000 ' FEET

CLIENT
RELATED CALIFORNIA
IRVINE, CALIFORNIA

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-09-11
PREPARED	KJK
DESIGN	AA
REVIEW	AA
APPROVED	AH

PROJECT
MARINA MARKETPLACE - PHASE III
MARINA DEL REY, CALIFORNIA

TITLE
SITE LOCATION MAP

PROJECT No.	CONTROL	Rev.	FIGURE
1403929			1

Path: M:\Projects\RelatedCalifornia\MarinaMarketplace\99_PROJECTS\1403929_MarinaMarketPlace-PhaseIII\02_PRODUCTION\1400329PHIII-01.mxd

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1 in

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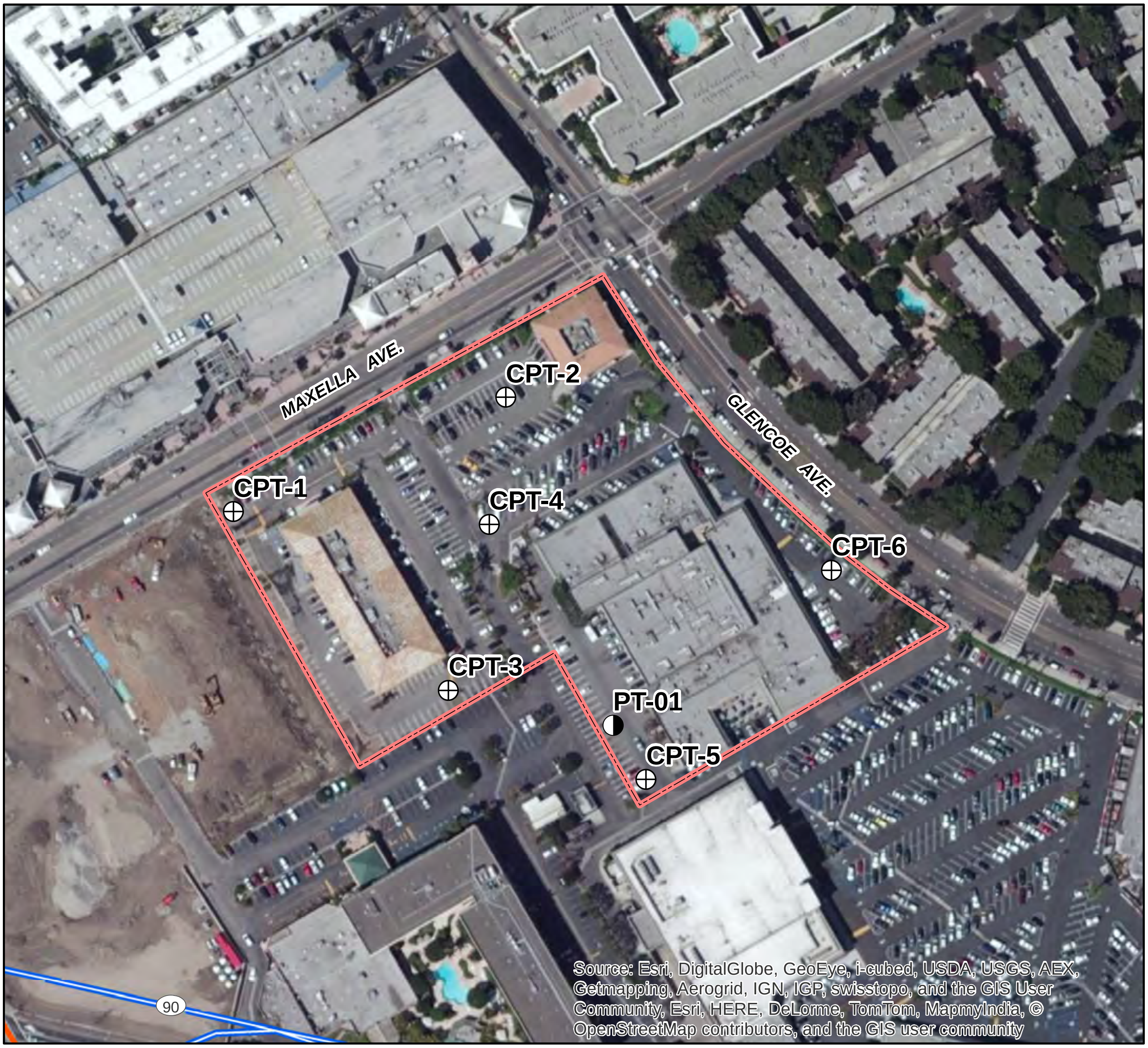

LEGEND

APPROXIMATE LIMITS OF PROJECT

CPT-6 DESIGNATION AND APPROXIMATE LOCATION OF CPT ADVANCED SEPTEMBER 25, 2014

PT-01 PERCOLATION TEST PERFORMED DECEMBER 17, 2014

N

180 90 0 180

1 " = 180 ' FEET

CLIENT
RELATED CALIFORNIA
IRVINE, CALIFORNIA

CONSULTANT

YYYY-MM-DD	2015-01-19
PREPARED	KJK
DESIGN	AA
REVIEW	AA
APPROVED	AH

PROJECT
MARINA MARKETPLACE - PHASE III
MARINA DEL REY, CALIFORNIA

TITLE
BORING LOCATION MAP

PROJECT No.	CONTROL	Rev.	FIGURE
1403929			2

Path: M:\Projects\RelatedCalifornia\MarinaMarketplace\99_PROJECTS\1403929_MarinaMarketPlace-PhaseIII\02_PRODUCTION\1400329PHIII-02.mxd

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0 1 in

CLIENT
RELATED CALIFORNIA
IRVINE, CALIFORNIA

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-09-11
PREPARED	KJK
DESIGN	AA
REVIEW	AA
APPROVED	AH

PROJECT
MARINA MARKETPLACE - PHASE III
MARINA DEL REY, CALIFORNIA

TITLE
FAULT MAP

PROJECT No.	CONTROL	Rev.	FIGURE
1403929			3

APPENDIX A

COUNTY OF LOS ANGELES PUBLIC HEALTH DEPARTMENT PERMIT

ENVIRONMENTAL HEALTH

Drinking Water Program

COUNTY OF LOS ANGELES
Public Health

5050 Commerce Drive, Baldwin Park, CA 91706
Telephone: (626) 430-5420 • Facsimile: (626) 813-3013 • Email: waterquality@ph.lacounty.gov
http://publichealth.lacounty.gov/eh/ep/dw/dw_main.htm

Well Permit Approval

TO BE COMPLETED BY APPLICANT:

WORK SITE ADDRESS	CITY	ZIP	EMAIL ADDRESS FOR WELL PERMIT APPROVAL
13450 Maxella Ave	Marina del Rey	90262	[redacted]

NOTICE:

- WORK PLAN APPROVALS ARE VALID FOR 180 DAYS. 30 DAY EXTENSIONS OF WORK PLAN APPROVALS ARE CONSIDERED ON AN INDIVIDUAL (CASE-BY-CASE) BASIS AND MAY BE SUBJECT TO ADDITIONAL PLAN REVIEW FEES (HOURLY RATE AS APPLICABLE).
- WORK PLAN MODIFICATIONS MAY BE REQUIRED IF WELL AND GEOLOGIC CONDITIONS ENCOUNTERED AT THE SITE INSPECTION ARE FOUND TO DIFFER FROM THE SCOPE OF WORK PRESENTED TO THE DEPARTMENT OF PUBLIC HEALTH—DRINKING WATER PROGRAM.
- THIS WELL PERMIT APPROVAL IS LIMITED TO COMPLIANCE WITH THE CALIFORNIA WELL STANDARDS AND THE LOS ANGELES COUNTY CODE AND DOES NOT GRANT ANY RIGHTS TO CONSTRUCT, RENOVATE, OR DECOMMISSION ANY WELL. THE APPLICANT IS RESPONSIBLE FOR SECURING ALL OTHER NECESSARY PERMITS SUCH AS WATER RIGHTS, PROPERTY RIGHTS, COASTAL COMMISSION APPROVALS, USE COVENANTS, ENCROACHMENT PERMISSIONS, UTILITY LINE SETBACKS, CITY/COUNTY PUBLIC WORKS RIGHTS OF WAY, ETC.
- ALL FIELD WORK MUST BE CONDUCTED UNDER THE DIRECT SUPERVISION OF A PROFESSIONAL GEOLOGIST LICENSED IN THE STATE OF CALIFORNIA.
- THIS PERMIT IS NOT COMPLETE UNTIL ALL OF THE FOLLOWING REQUIREMENTS ARE SIGNED BY THE DEPUTY HEALTH OFFICER. WORK SHALL NOT BE INITIATED WITHOUT A WORK PLAN APPROVAL STAMPED BY THE DEPARTMENT OF PUBLIC HEALTH—DRINKING WATER PROGRAM.
- **NOTIFY THE DRINKING WATER PROGRAM BY EMAIL 3 BUSINESS DAYS BEFORE WORK IS SCHEDULED TO BEGIN.**

Juan Rodriguez 626-430-5386 or [redacted]

TO BE COMPLETED BY DEPARTMENT OF PUBLIC HEALTH—DRINKING WATER PROGRAM:

☐ WORK PLAN INCOMPLETE; SUBMIT THE FOLLOWING:	☑ WORK PLAN APPROVED	DATE: 9/16/14
	Los Angeles County Drinking Water stamp REGISTERED ENVIRONMENTAL HEALTH SPECIALIST · COUNTY OF LOS ANGELES · CALIFORNIA R.E.H.S. NO. 6330 Juan Rodriguez	ADDITIONAL APPROVAL CONDITIONS: On 9/11/14 $780.00 was paid for Permit #893507 to advance 6 soil borings into groundwater at above site.

☐ ANNULAR SEAL FINAL INSPECTION REQUIRED | ☐ WELL COMPLETION LOG REQUIRED

DATE ACCEPTED:	REHS signature	DATE ACCEPTED:	REHS signature

☐ WATER QUALITY—BACTERIOLOGICAL STANDARDS REQUIRED | ☐ WATER QUALITY—CHEMICAL STANDARDS REQUIRED

DATE ACCEPTED:	REHS signature	DATE ACCEPTED:	REHS signature

☐ WATER SUPPLY YIELD REQUIRED | ☐ OTHER REQUIREMENT

DATE ACCEPTED:	REHS signature	DATE ACCEPTED:	REHS signature

APPENDIX B
CONE PENETRATION TEST RESULTS

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

13450 Maxella Avenue
Marina Del Rey, CA
September 25, 2014

Prepared for:

Mr. Tony Augello
Golder Associates Inc.
230 Commerce, Ste 200
Irvine, CA 92602
Office (714) 508-4400 / Fax (714) 508-4401

Prepared by:

KEHOE TESTING & ENGINEERING
5415 Industrial Drive
Huntington Beach, CA 92649-1518
Office (714) 901-7270 / Fax (714) 901-7289
www.kehoetesting.com

TABLE OF CONTENTS

SUMMARY

OF

CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the project located at 13450 Maxella Avenue in Marina Del Rey, California. The work was performed by Kehoe Testing & Engineering (KTE) on September 25, 2014. The scope of work was performed as directed by Golder Associates Inc. personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at six locations to determine the soil lithology. Groundwater measurements and hole collapse depths provided in **TABLE 2.1** are for information only. The readings indicate the apparent depth to which the hole is open and the apparent water level (if encountered) in the CPT probe hole at the time of measurement upon completion of the CPT. KTE does not warrant the accuracy of the measurements and the reported water levels may not represent the true or stabilized groundwater levels.

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-1	50	Groundwater @ 17.0 ft
CPT-2	26	Refusal, groundwater @ 17.0 ft
CPT-3	50	Refusal, groundwater @ 17.0 ft
CPT-4	60	Refusal, hole open to 1.0 ft (dry)
CPT-5	26	Refusal, hole open to 19.0 ft (dry)
CPT-6	33	Refusal, groundwater @ 17.5 ft

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by **KTE** using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone and recorded the following parameters at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed

The above parameters were recorded and viewed in real time using a laptop computer. Data is stored at the KTE office for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. These plots were generated using the CPeT-IT program. Penetration depths are referenced to ground surface. The soil classification on the CPT plots is derived from the attached CPT Classification Chart (Robertson) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used along with cone resistance to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

Tables of basic CPT output from the interpretation program CPeT-IT are provided for CPT data averaged over one foot intervals in the Appendix. Spreadsheet files of the averaged basic CPT output and averaged estimated geotechnical parameters are also included for use in further geotechnical analysis. We recommend a geotechnical engineer review the assumed input parameters and the calculated output from the CPeT-IT program. A summary of the equations used for the tabulated parameters is provided in the Appendix.

It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgement and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING

Richard W. Koester, Jr.
General Manager

09/29/14-kk-5210

APPENDIX

Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

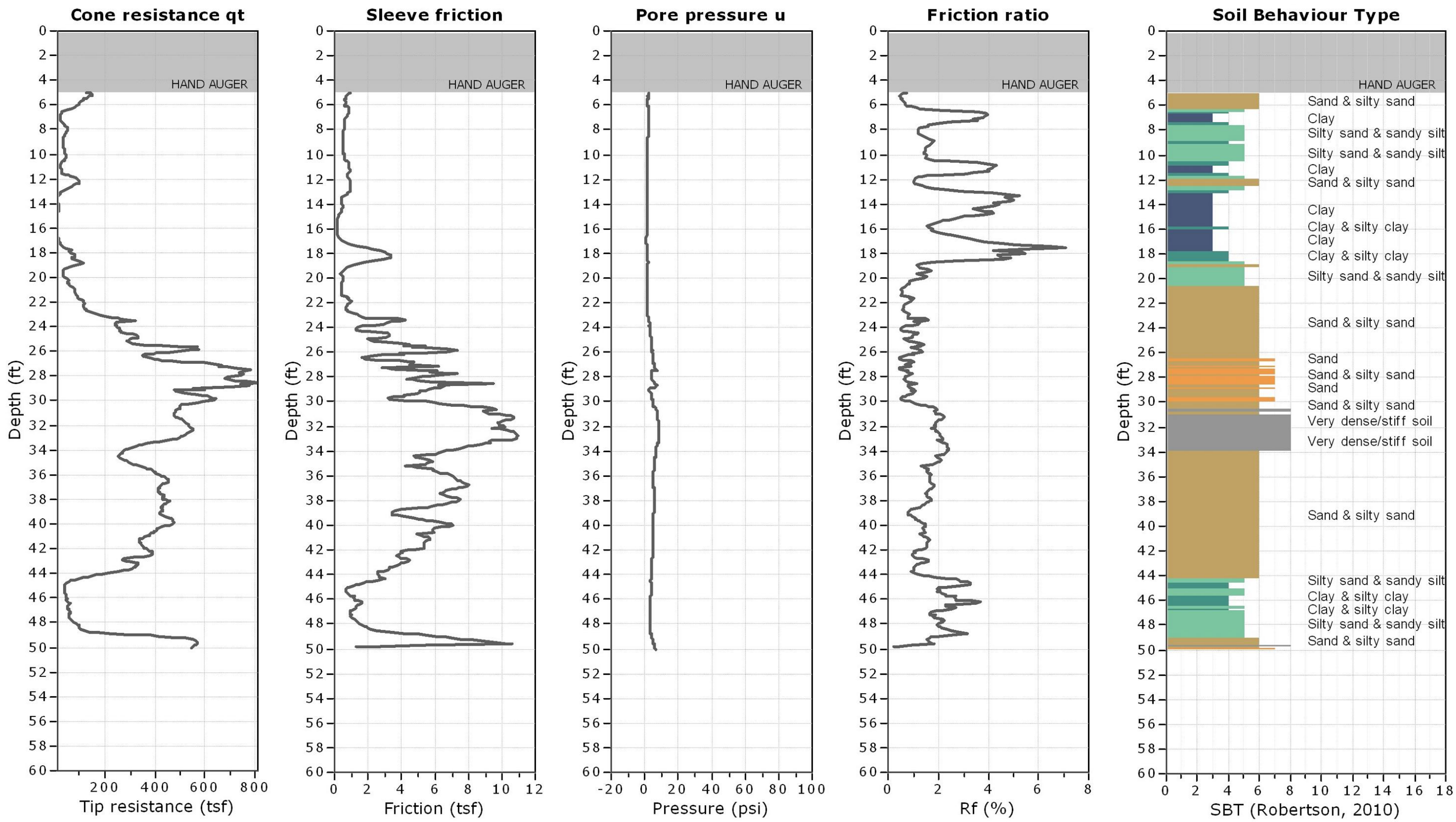
CPT: CPT-1

Project: **Golder Associates, Inc.**

Location: **13450 Maxella Ave. Marina Del Rey, CA**

Total depth: 50.02 ft, Date: 9/25/2014

Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

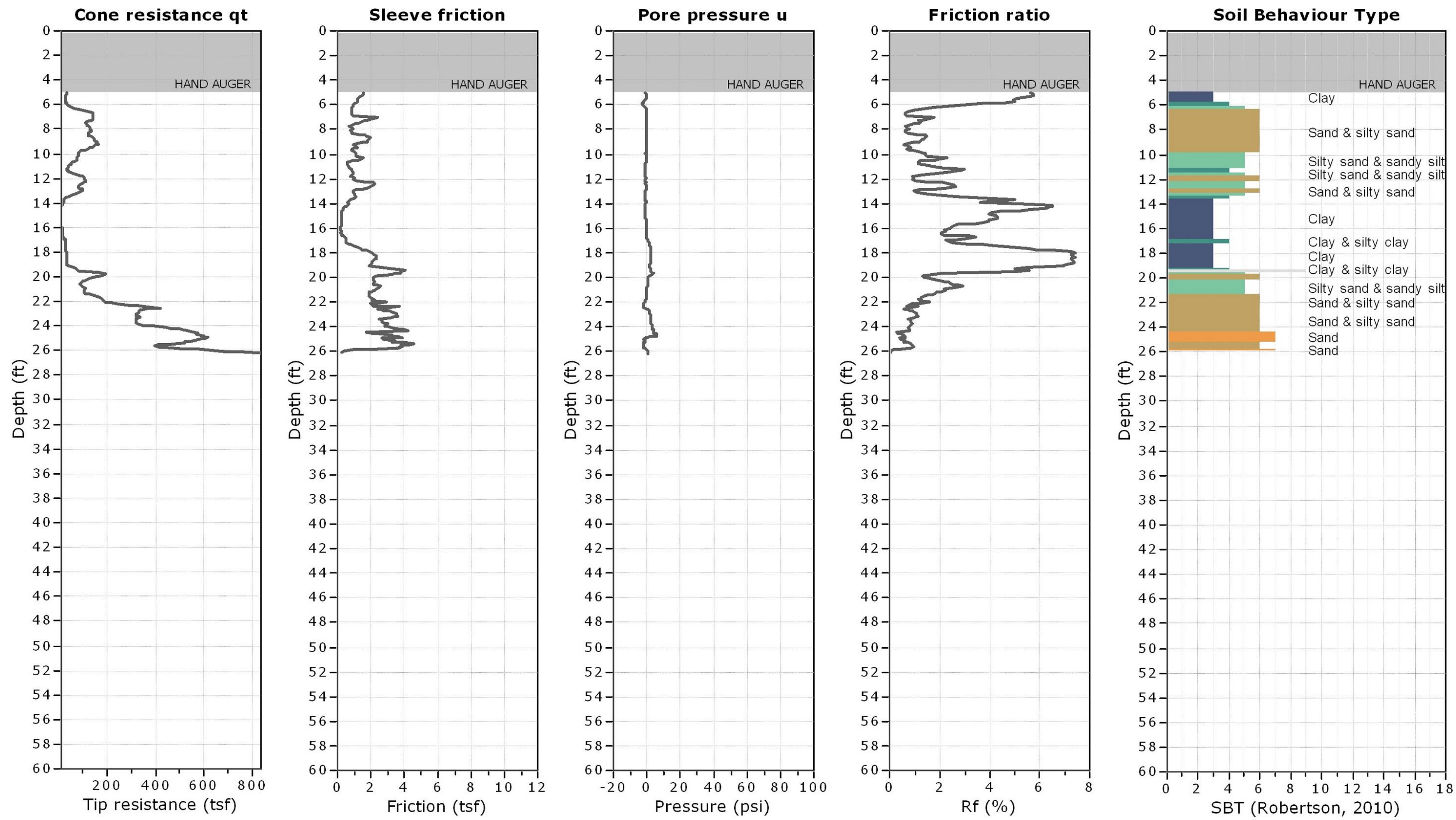
CPT: CPT-2

Total depth: 26.18 ft, Date: 9/25/2014

Cone Type: Vertek

Project: Golder Associates, Inc.

Location: 13450 Maxella Ave. Marina Del Rey, CA



Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

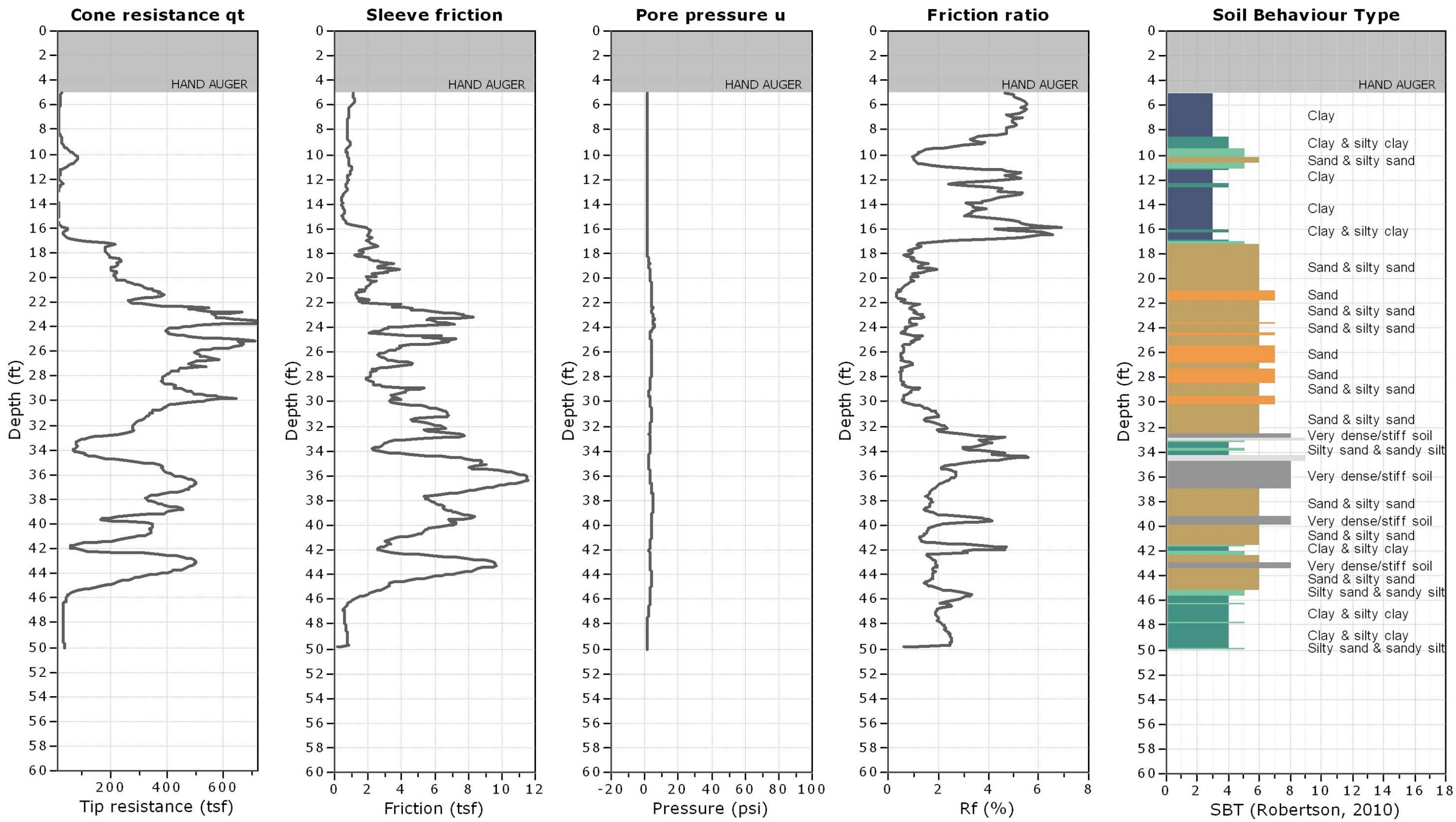
CPT: CPT-3

Project: **Golder Associates, Inc.**

Location: **13450 Maxella Ave. Marina Del Rey, CA**

Total depth: 50.06 ft, Date: 9/25/2014

Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

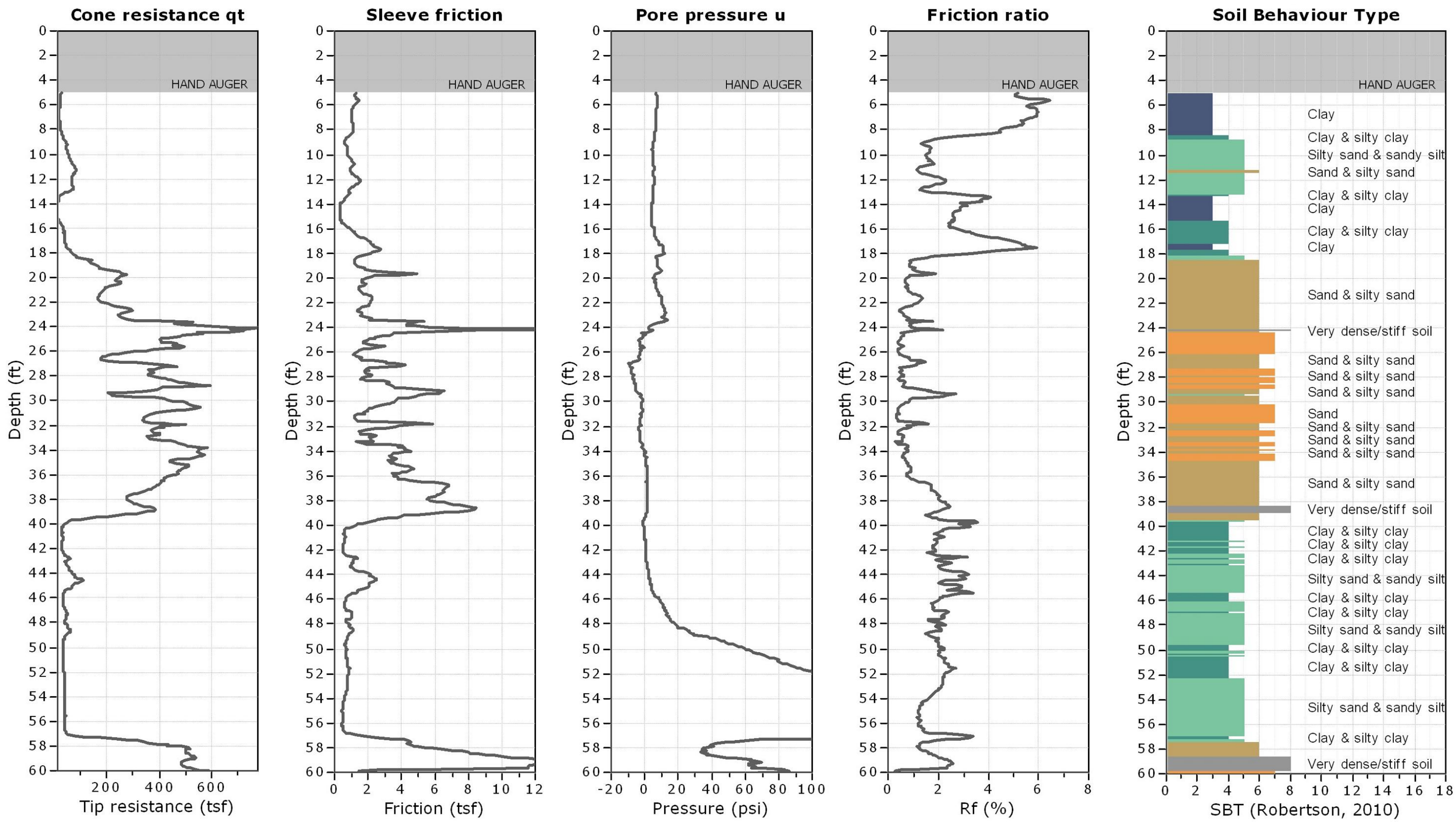
CPT: CPT-4

Project: Golder Associates, Inc.

Total depth: 60.03 ft, Date: 9/25/2014

Location: 13450 Maxella Ave. Marina Del Rey, CA

Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

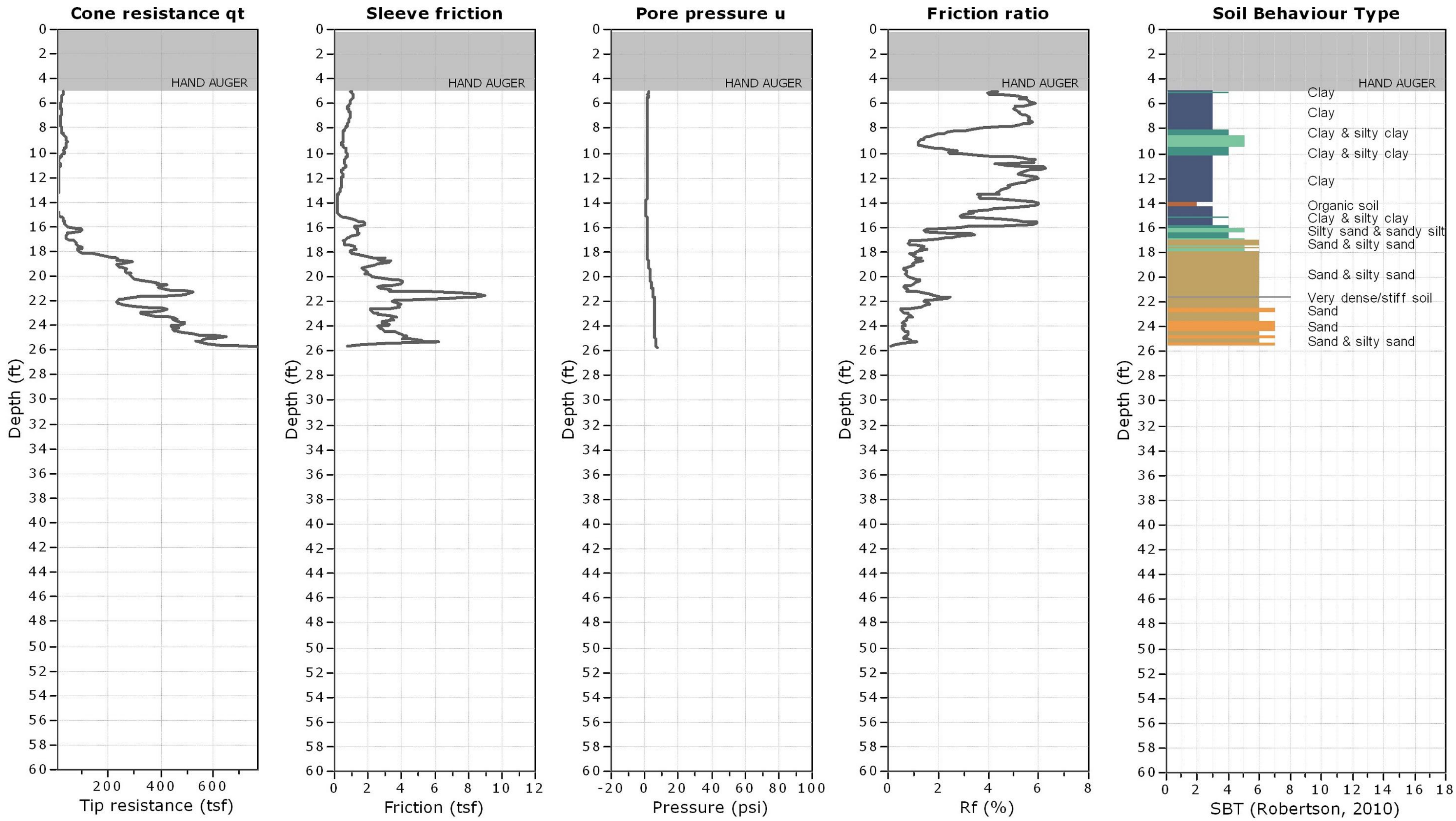
CPT: CPT-5

Total depth: 25.72 ft, Date: 9/25/2014

Cone Type: Vertek

Project: Golder Associates, Inc.

Location: 13450 Maxella Ave. Marina Del Rey, CA



Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

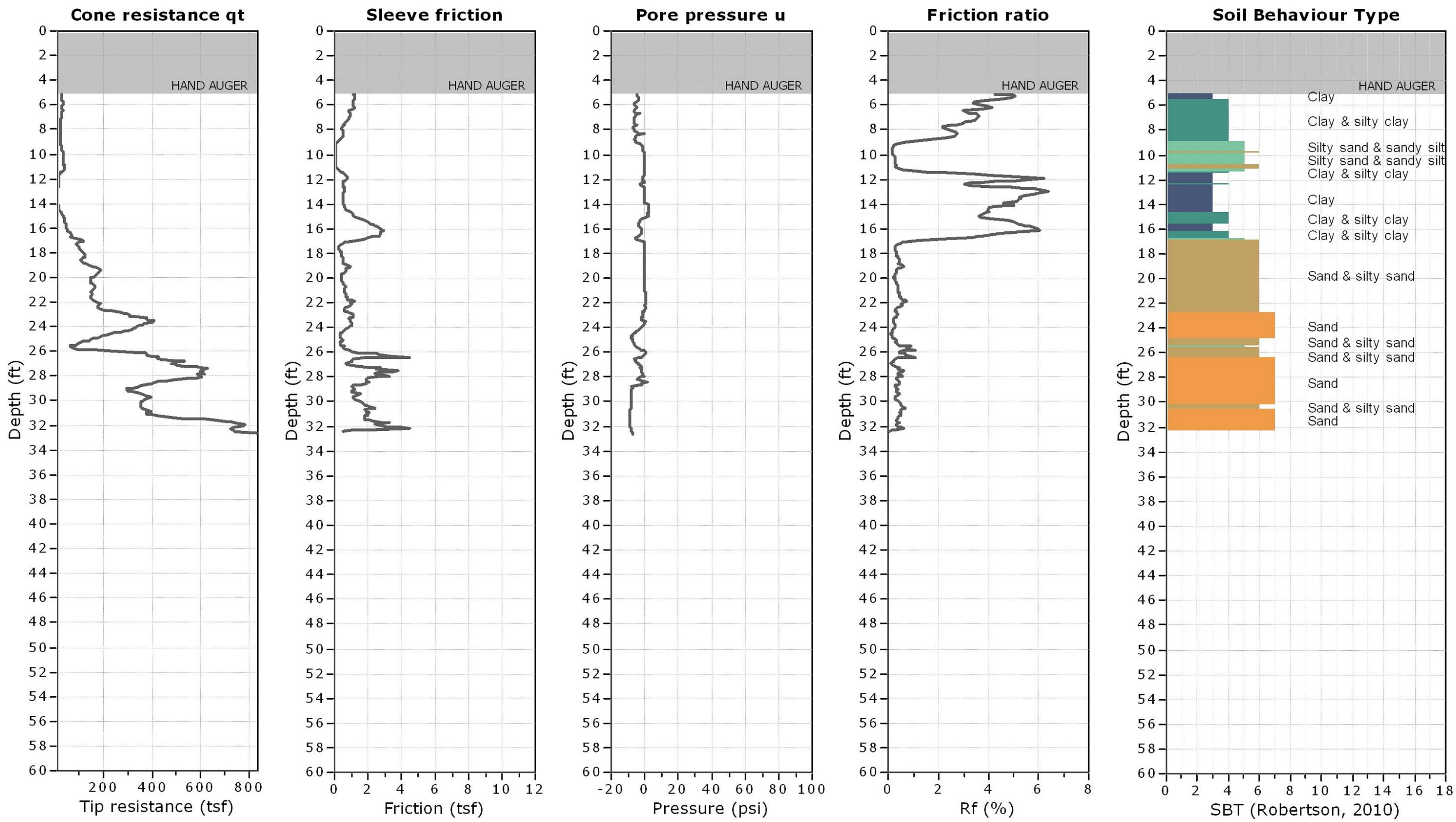
CPT: CPT-6

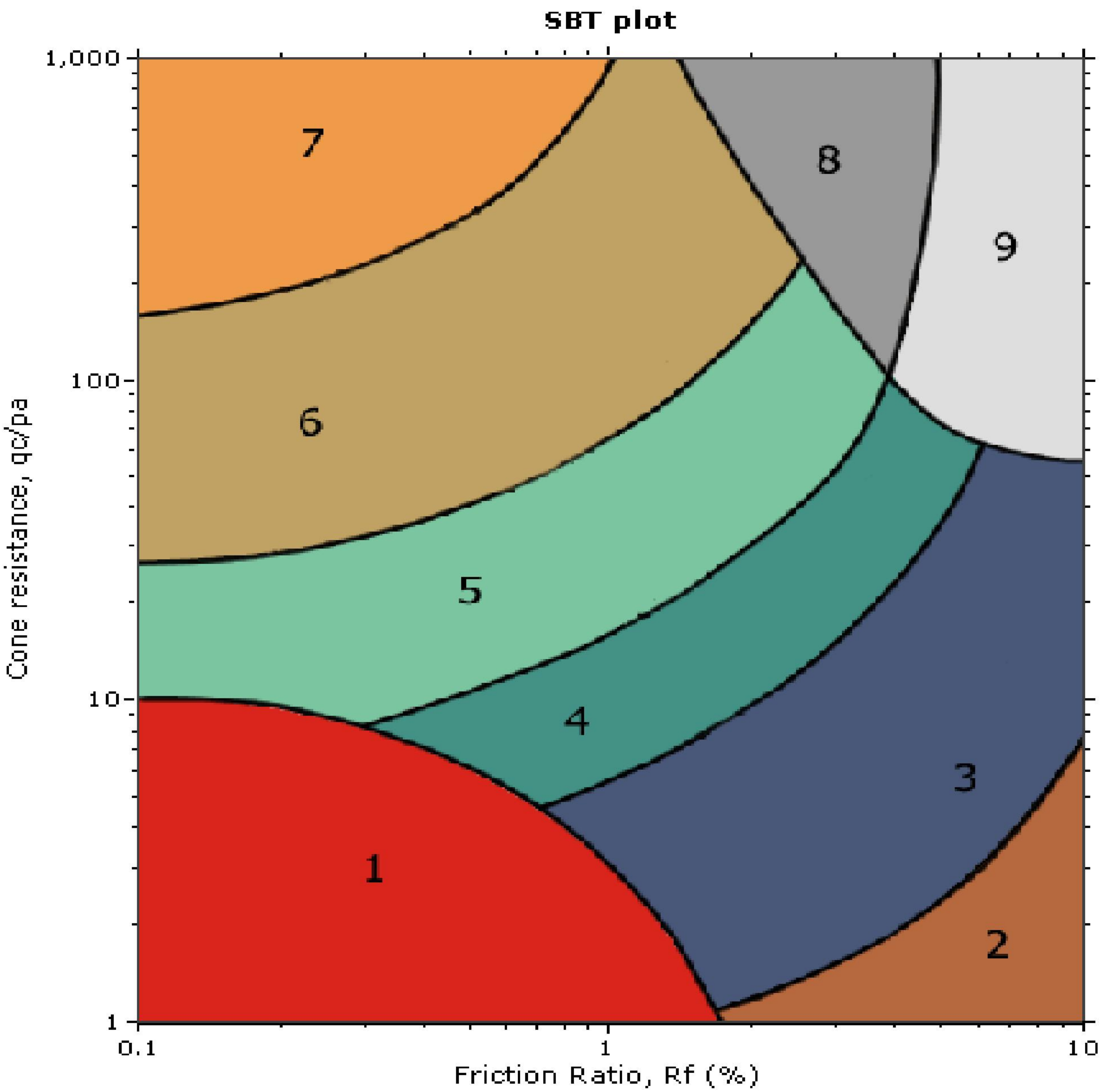
Project: Golder Associates, Inc.

Location: 13450 Maxella Ave. Marina Del Rey, CA

Total depth: 32.60 ft, Date: 9/25/2014

Cone Type: Vertek





SBT legend

1. Sensitive fine grained	4. Clayey silt to silty clay	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

	CPT-1	In situ data										Basic output data								
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn
1	24.4	0.87	1.01	-0.13	24.4124	3.5638	4	2.75296	117.0452	0.05852	0	0.0585	416.14	3.5723	0.003	8	0.6816	7.1937	2.1699	165.5739
2	17.7	0.74	0.82	-0.04	17.71	4.1784	3	2.90435	115.0782	0.11606	0	0.1161	151.59	4.206	0.0034	9	0.7654	5.4283	2.3861	90.26102
3	12.6	0.29	1.15	0.17	12.6141	2.299	4	2.86896	107.3962	0.16976	0	0.1698	73.305	2.3304	0.0067	5	0.7697	4.0895	2.3909	48.09612
4	30.6	0.62	1.55	0.54	30.619	2.0249	4	2.52272	115.1189	0.22732	0	0.2273	133.7	2.04	0.0037	5	0.6909	2.8937	2.1779	83.11451
5	122.7	0.93	2.2	1.15	122.727	0.7578	6	1.78457	121.4718	0.28806	0	0.2881	425.05	0.7596	0.0013	6	0.4682	1.839	1.586	212.7942
6	87.1	0.6	1.96	1.47	87.124	0.6887	6	1.8803	117.4295	0.34677	0	0.3468	250.24	0.6914	0.0016	6	0.5085	1.7635	1.6848	144.6266
7	17.4	0.69	2.35	1.58	17.4288	3.959	3	2.89496	114.5272	0.40403	0	0.404	42.137	4.0529	0.0099	4	0.8729	2.3173	2.6353	37.28515
8	46.6	0.57	2.08	1.73	46.6255	1.2225	5	2.24563	115.5293	0.4618	0	0.4618	99.965	1.2347	0.0032	5	0.6577	1.7251	2.0638	75.26382
9	27.9	0.49	1.88	1.81	27.923	1.7548	4	2.51806	113.1723	0.51838	0	0.5184	52.865	1.788	0.0049	5	0.766	1.7273	2.3405	44.73709
10	39.1	0.58	1.8	1.95	39.122	1.4825	5	2.35646	115.2286	0.576	0	0.576	66.92	1.5047	0.0034	5	0.7209	1.5502	2.2147	56.47294
11	18.2	0.76	1.72	2.02	18.2211	4.171	3	2.89431	115.3427	0.63367	0	0.6337	27.755	4.3213	0.007	3	0.9315	1.6122	2.7591	26.79636
12	83.3	0.9	1.64	2.1	83.3201	1.0802	6	2.01197	120.2874	0.69381	0	0.6938	119.09	1.0892	0.0014	6	0.618	1.298	1.9298	101.3573
13	28.6	0.9	1.39	2.17	28.617	3.145	4	2.6652	117.6808	0.75265	0	0.7527	37.021	3.2299	0.0036	4	0.8705	1.3452	2.5844	35.42348
14	10.3	0.46	1.39	2.32	10.317	4.4587	3	3.10631	110.2816	0.80779	0	0.8078	11.772	4.8374	0.0105	3	1	1.3099	3.0633	11.77182
15	7.8	0.25	1.31	2.45	7.81603	3.1986	3	3.12146	105.1429	0.86037	0	0.8604	8.0845	3.5942	0.0136	3	1	1.2298	3.1174	8.08454
16	8.5	0.15	1.31	2.56	8.51603	1.7614	3	2.9537	101.6144	0.91117	0	0.9112	8.3462	1.9724	0.0124	3	1	1.1613	2.9648	8.34623
17	14.5	0.53	1.11	2.83	14.5136	3.6518	3	2.93582	112.1505	0.96725	0	0.9673	14.005	3.9125	0.0059	3	1	1.0939	2.947	14.00502
18	57.4	3.15	1.86	3.13	57.4228	5.4856	4	2.61732	128.5459	1.03152	0.0312	1.0003	56.373	5.586	0.0018	4	0.8932	1.0514	2.614	56.03606
19	90.3	0.99	1.7	3.14	90.3208	1.0961	6	1.9887	121.1815	1.09211	0.0624	1.0297	86.654	1.1095	0.0007	6	0.6569	1.018	1.9901	85.849
20	39.5	0.5	1.55	3.09	39.519	1.2652	5	2.31289	114.1673	1.1492	0.0936	1.0556	36.349	1.3031	0.0005	5	0.7876	1.0019	2.3301	36.33058
21	75	0.4	1.72	3.14	75.0211	0.5332	6	1.87586	114.0979	1.20625	0.1248	1.0815	68.256	0.5419	-1E-05	6	0.6214	0.9865	1.8906	68.82178
22	111.7	0.91	1.8	3.75	111.722	0.8145	6	1.83603	121.0836	1.26679	0.156	1.1108	99.439	0.8239	-2E-04	6	0.6085	0.9709	1.8531	101.3481
23	169.7	1.6	1.96	4.28	169.724	0.9427	6	1.7396	126.2326	1.3299	0.1872	1.1427	147.36	0.9502	-3E-04	6	0.574	0.9568	1.7584	152.2732
24	247.5	1.34	2.86	4.25	247.535	0.5413	6	1.45639	125.8555	1.39283	0.2184	1.1744	209.58	0.5444	-5E-05	6	0.4679	0.9524	1.4759	221.5443
25	300.8	1.8	4.01	4.36	300.849	0.5983	6	1.42355	128.4906	1.45708	0.2496	1.2075	247.95	0.6012	0.0001	6	0.4579	0.9413	1.4454	266.349
26	475.7	5.91	4.22	3.26	475.752	1.2422	6	1.54754	137.28	1.52572	0.2808	1.2449	380.93	1.2462	5E-05	6	0.5066	0.9209	1.5687	412.748
27	614.9	4.53	5.85	2.46	614.972	0.7366	7	1.29618	136.9875	1.59421	0.312	1.2822	478.38	0.7385	0.0002	7	0.4123	0.9239	1.3168	535.5511
28	729.7	5.21	4.31	2.83	729.753	0.7139	7	1.24554	137.28	1.66285	0.3432	1.3197	551.73	0.7156	-5E-05	7	0.3949	0.9165	1.2665	630.626
29	551.6	5.61	1.39	3.51	551.617	1.017	6	1.43985	137.28	1.73149	0.3744	1.3571	405.19	1.0202	-5E-04	6	0.4739	0.8888	1.4692	461.8756
30	637.7	5.48	4.59	3.54	637.756	0.8593	6	1.34459	137.28	1.80013	0.4056	1.3945	456.04	0.8617	-1E-04	6	0.4394	0.8858	1.3741	532.3667
31	476.3	9.74	7.68	4.25	476.394	2.0445	8	1.73479	137.28	1.86877	0.4368	1.432	331.38	2.0526	0.0002	6	0.594	0.8355	1.7752	374.69
32	536.1	10.11	8.37	4.28	536.202	1.8855	8	1.67983	137.28	1.93741	0.468	1.4694	363.59	1.8923	0.0003	6	0.5751	0.8279	1.7209	418.0325
33	493.8	10.86	8.23	4.38	493.901	2.1988	8	1.75552	137.28	2.00605	0.4992	1.5069	326.44	2.2078	0.0002	8	0.6079	0.8066	1.8024	374.9717
34	280.5	6.61	6.76	4.34	280.583	2.3558	6	1.90526	137.28	2.07469	0.5304	1.5443	180.35	2.3734	-2E-04	5	0.6746	0.7749	1.9728	203.9558
35	295.7	5.51	5.73	4.38	295.77	1.8629	6	1.80787	136.6352	2.14301	0.5616	1.5814	185.67	1.8765	-5E-04	6	0.6402	0.7732	1.8778	214.5569
36	411.4	7.03	5	4.49	411.461	1.7086	6	1.69849	137.28	2.21165	0.5928	1.6189	252.8	1.7178	-6E-04	6	0.5977	0.7756	1.7615	299.9767
37	420.1	7.4	5.49	4.55	420.167	1.7612	6	1.70512	137.28	2.28029	0.624	1.6563	252.3	1.7708	-6E-04	6	0.6031	0.7632	1.7712	301.4079
38	437.8	7.41	5.97	4.55	437.873	1.6923	6	1.68107	137.28	2.34893	0.6552	1.6937	257.14	1.7014	-5E-04	6	0.5966	0.7553	1.7493	310.8825
39	426.4	3.42	5.73	4.59	426.47	0.8019	6	1.4182	134.0381	2.41595	0.6864	1.7296	245.18	0.8065	-7E-04	6	0.4991	0.7825	1.489	313.6017
40	467.8	7.02	5.38	4.66	467.866	1.5004	6	1.62144	137.28	2.48459	0.7176	1.767	263.38	1.5084	-7E-04	6	0.5789	0.7432	1.6939	326.8555
41	368	5.66	5.27	4.66	368.065	1.5378	6	1.68572	137.28	2.55323	0.7488	1.8044	202.56	1.5485	-0.001	6	0.6104	0.7219	1.7719	249.3873
42	361	3.66	4.95	4.66	361.061	1.0137	6	1.54295	134.1283	2.62029	0.78	1.8403	194.77	1.0211	-0.001	6	0.559	0.7339	1.6325	248.6091
43	269.8	4.06	4.29	4.65	269.853	1.5045	6	1.756	134.177	2.68738	0.8112	1.8762	142.4	1.5197	-0.002	6	0.6491	0.6895	1.8644	174.1005
44	196	2.66	3.92	4.54	196.048	1.3568	6	1.80956	130.3037	2.75253	0.8424	1.9101	101.19	1.3761	-0.003	6	0.6789	0.6697	1.9383	122.3316
45	38.4	0.85	3.83	4.31	38.4469	2.2108	5	2.46874	117.9828	2.81152	0.8736	1.9379	18.388	2.3853	-0.017	4	0.9775	0.5535	2.7185	18.64111
46	45.1	1.2	3.44	4.18	45.1421	2.6583	4	2.46782	120.8975	2.87197	0.9048	1.9672	21.488	2.8389	-0.016	4	0.9754	0.5461	2.7095	21.81774
47	53.8	0.83	3.22	4.12	53.8394	1.5416	5	2.25657	118.6298	2.93129	0.936	1.9953	25.514	1.6304	-0.014	5	0.8927	0.5677	2.4874	27.3108
48	78.3	1.56	3.27	4.17	78.34	1.9913	5	2.2067	124.1617	2.99337	0.9672	2.0262	37.187	2.0704	-0.01	5	0.8654	0.57	2.4135	40.58576
49	336.6	6.29	4.19	4.16	336.651	1.8684	6	1.77771	137.28	3.06201	0.9984	2.0636	161.65	1.8856	-0.002	6	0.67	0.6392	1.8961	201.5162
50	549.8	0	6.41	4.08	549.878	0	0	0	769.6	3.44681	1.0296	2.4172	226.06	0	-0.001	0	1	0.4377	0	0

	CPT-2	In situ data										Basic output data								
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn
1	23.5	1.1	-2.39	-2.7	23.4708	4.6867	3	2.84372	118.6656	0.05933	0	0.0593	394.58	4.6986	-0.007	9	0.7144	7.8311	2.2573	173.2681
2	20.8	0.83	10.44	-2.98	20.9278	3.966	3	2.83405	116.3252	0.1175	0	0.1175	177.12	3.9884	0.0361	9	0.7465	5.1582	2.3362	101.4483
3	17.5	0.83	-1.77	-8.85	17.4783	4.7487	3	2.94426	115.8859	0.17544	0	0.1754	98.627	4.7969	-0.007	4	0.8095	4.2826	2.5007	70.03134
4	25.3	1.05	-0.11	-8.17	25.2987	4.1504	3	2.78436	118.5082	0.23469	0	0.2347	106.79	4.1893	-3E-04	4	0.7852	3.2624	2.4282	77.27794
5	27.5	1.57	-1.17	-9.4	27.4857	5.7121	3	2.85175	121.6539	0.29552	0	0.2955	92.008	5.7742	-0.003	9	0.8335	2.8954	2.5458	74.40288
6	30.7	0.99	-2.59	-10.36	30.6683	3.2281	4	2.64966	118.5471	0.35479	0	0.3548	85.44	3.2659	-0.006	5	0.7768	2.3367	2.3897	66.94458
7	136.3	2.16	-0.21	-5.8	136.297	1.5848	6	1.96622	127.8935	0.41874	0	0.4187	324.49	1.5897	-1E-04	6	0.5624	1.6842	1.8189	216.2844
8	126.7	0.91	0.06	-10.2	126.701	0.7182	6	1.75935	121.3905	0.47943	0	0.4794	263.27	0.721	3E-05	6	0.4935	1.4779	1.6308	176.3022
9	151.1	1.77	-0.46	-9.73	151.094	1.1715	6	1.84141	126.6879	0.54278	0	0.5428	277.37	1.1757	-2E-04	6	0.5368	1.431	1.7359	203.603
10	78	1.12	-0.71	-9.84	77.9913	1.4361	5	2.11295	121.7263	0.60364	0	0.6036	128.2	1.4473	-7E-04	6	0.6411	1.4331	2.0018	104.8117
11	38.7	0.67	-0.93	-9.66	38.6886	1.7318	5	2.40076	116.2569	0.66177	0	0.6618	57.462	1.7619	-0.002	5	0.7541	1.4247	2.2911	51.20007
12	102.1	1.02	-0.75	-11.53	102.091	0.9991	6	1.92206	121.6987	0.72262	0	0.7226	140.28	1.0062	-5E-04	6	0.5897	1.2522	1.852	119.9604
13	94.7	0.99	-0.83	-14.29	94.6898	1.0455	6	1.95984	121.2967	0.78327	0	0.7833	119.89	1.0542	-6E-04	6	0.6123	1.2022	1.9036	106.6944
14	14.6	0.66	-1.01	-12.96	14.5876	4.5244	3	2.99152	113.768	0.84015	0	0.8402	16.363	4.8009	-0.005	3	1	1.2594	2.9505	16.36309
15	5.5	0.24	-0.7	-11.59	5.49143	4.3704	3	3.32426	103.9832	0.89214	0	0.8921	5.1553	5.2182	-0.011	3	1	1.186	3.3703	5.15532
16	8.7	0.21	-0.22	-12.6	8.69731	2.4145	3	3.01626	104.1277	0.94421	0	0.9442	8.2112	2.7086	-0.002	3	1	1.1206	3.0435	8.21122
17	22.5	0.51	0.75	-11.14	22.5092	2.2657	4	2.65898	112.9394	1.00068	0	1.0007	21.494	2.3712	0.0025	4	0.9141	1.0523	2.6688	21.39116
18	27.4	2.02	2.37	-11.63	27.429	7.3645	3	2.92995	123.4929	1.06242	0.0312	1.0312	25.568	7.6612	0.0053	3	1	1.0261	2.9464	25.56825
19	27.5	1.91	1.25	-11.75	27.5153	6.9416	3	2.91075	123.0909	1.12397	0.0624	1.0616	24.861	7.2372	0.0011	3	1	0.9967	2.9374	24.86068
20	153.9	2.12	0.57	-11.3	153.907	1.3775	6	1.88575	128.0531	1.188	0.0936	1.0944	139.55	1.3882	-3E-04	6	0.6244	0.9792	1.8969	141.3249
21	93.4	2.27	-0.22	-11.17	93.3973	2.4305	5	2.21391	127.3351	1.25166	0.1248	1.1269	81.772	2.4635	-0.002	5	0.7554	0.9536	2.2365	83.04098
22	187.7	2.8	-1.71	-11.39	187.679	1.4919	6	1.85301	130.5726	1.31695	0.156	1.161	160.53	1.5025	-0.002	6	0.6188	0.9442	1.8739	166.3025
23	313.6	3.18	2	-12.31	313.624	1.014	6	1.58094	132.7561	1.38333	0.1872	1.1961	261.04	1.0184	-1E-04	6	0.5166	0.9386	1.6012	276.9812
24	388.7	2.77	3.44	-10.89	388.742	0.7126	6	1.40347	132.2698	1.44946	0.2184	1.2311	314.6	0.7152	8E-05	6	0.4513	0.934	1.4251	341.852
25	609.4	2.54	-1.93	-10.77	609.376	0.4168	7	1.09959	132.7319	1.51583	0.2496	1.2662	480.06	0.4179	-6E-04	7	0.3359	0.9415	1.1182	540.8561
26	648.2	0	0.81	-11.1	648.21	0	0	0	769.6	1.90063	0.2808	1.6198	399	0	-3E-04	0	1	0.6532	0	0

	CPT-3	In situ data										Basic output data								
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn
1	16.1	0.42	1.01	0.06	16.1124	2.6067	4	2.81227	110.7033	0.05535	0	0.0554	290.09	2.6157	0.0045	5	0.6774	7.3784	2.1681	111.9683
2	31.8	1.08	1.79	-0.31	31.8219	3.3939	4	2.65183	119.2738	0.11499	0	0.115	275.74	3.4062	0.0041	8	0.6933	4.6586	2.1969	139.5979
3	10.8	0.37	1.46	-0.58	10.8179	3.4203	3	3.02163	108.8042	0.16939	0	0.1694	62.863	3.4747	0.0099	4	0.8216	4.5049	2.5278	45.33559
4	14.6	0.39	1.58	-0.86	14.6193	2.6677	4	2.85251	109.9239	0.22435	0	0.2244	64.162	2.7093	0.0079	5	0.791	3.4105	2.4463	46.39848
5	24.8	1.13	1.79	-0.83	24.8219	4.5524	3	2.81718	118.999	0.28385	0	0.2839	86.447	4.6051	0.0053	4	0.8141	2.9189	2.4969	67.69068
6	18.4	1.01	1.79	-0.69	18.4219	5.4826	3	2.96765	117.4503	0.34258	0	0.3426	52.774	5.5865	0.0071	3	0.8831	2.7071	2.6697	46.25452
7	16.5	0.85	1.68	-0.56	16.5206	5.1451	3	2.98542	115.9226	0.40054	0	0.4005	40.246	5.2729	0.0075	3	0.9053	2.4096	2.7206	36.70911
8	16	0.76	1.41	-0.46	16.0173	4.7449	3	2.97313	115.0283	0.45805	0	0.4581	33.968	4.8846	0.0065	3	0.9174	2.1556	2.7423	31.69796
9	25.4	0.95	1.38	-0.44	25.4169	3.7377	4	2.75301	117.7872	0.51695	0	0.517	48.167	3.8153	0.004	4	0.8535	1.8429	2.57	43.36867
10	66.9	0.81	1.46	-0.37	66.9179	1.2104	5	2.11735	118.9818	0.57644	0	0.5764	115.09	1.221	0.0016	6	0.6364	1.4719	1.993	92.28385
11	42.6	1.01	1.3	-0.22	42.6159	2.37	5	2.45383	119.4958	0.63619	0	0.6362	65.987	2.4059	0.0022	5	0.7702	1.4797	2.3364	58.7049
12	14.5	0.78	1.46	-0.18	14.5179	5.3727	3	3.04046	114.9786	0.69367	0	0.6937	19.929	5.6423	0.0076	3	1	1.5253	2.9322	19.92848
13	15.1	0.69	1.27	-0.13	15.1155	4.5648	3	2.98194	114.1799	0.75076	0	0.7508	19.134	4.8034	0.0064	3	0.9904	1.4048	2.9001	19.07075
14	14.6	0.47	1.22	-0.01	14.6149	3.2159	3	2.90021	111.2884	0.80641	0	0.8064	17.123	3.4037	0.0064	3	0.9715	1.302	2.8436	16.99162
15	14.5	0.44	1.3	-0.02	14.5159	3.0312	3	2.88737	110.7892	0.8618	0	0.8618	15.844	3.2225	0.0069	3	0.9784	1.2223	2.8546	15.77344
16	35.3	1.9	1.33	0.19	35.3163	5.38	3	2.75583	123.6612	0.92363	0	0.9236	37.236	5.5244	0.0028	3	0.9351	1.1355	2.7334	36.90915
17	84.3	1.89	1.56	0.32	84.3191	2.2415	5	2.21971	125.7452	0.98651	0	0.9865	84.472	2.268	0.0014	5	0.7391	1.0532	2.2111	82.94203
18	182	1.72	1.86	0.89	182.023	0.9449	6	1.71835	126.9324	1.04997	0.0312	1.0188	177.64	0.9504	0.0006	6	0.5517	1.0211	1.7154	174.6468
19	221.9	2.87	2.69	1.07	221.933	1.2932	6	1.75839	131.1621	1.11555	0.0624	1.0532	209.67	1.2997	0.0006	6	0.5706	1.0027	1.7607	209.2504
20	210.3	1.83	3.19	1.24	210.339	0.87	6	1.64839	127.7387	1.17942	0.0936	1.0858	192.63	0.8749	0.0007	6	0.5323	0.9863	1.6561	194.9714
21	347.9	1.38	4.15	1.3	347.951	0.3966	7	1.25616	126.9012	1.24287	0.1248	1.1181	310.09	0.398	0.0005	7	0.385	0.979	1.2654	320.7876
22	262	1.79	4.09	1.45	262.05	0.6831	6	1.50665	128.1131	1.30693	0.156	1.1509	226.55	0.6865	0.0005	6	0.4845	0.9601	1.5224	236.5867
23	557.3	8.06	4.82	2.57	557.359	1.4461	6	1.57005	137.28	1.37557	0.1872	1.1884	467.85	1.4497	0.0003	6	0.5097	0.9425	1.5839	495.2601
24	462	3.26	5.48	3.44	462.067	0.7055	6	1.3529	133.883	1.44251	0.2184	1.2241	376.29	0.7077	0.0004	6	0.4306	0.9392	1.3717	408.8507
25	625.8	6.47	4	3.21	625.849	1.0338	6	1.41814	137.28	1.51115	0.2496	1.2616	494.9	1.0363	6E-05	6	0.4573	0.9227	1.4371	544.46
26	502.6	3.04	4.24	4.08	502.652	0.6048	7	1.27769	133.5771	1.57794	0.2808	1.2971	386.29	0.6067	5E-05	7	0.4075	0.9204	1.3023	435.8408
27	476.8	4.54	4.03	4.17	476.849	0.9521	6	1.45014	136.3832	1.64613	0.312	1.3341	356.19	0.9554	-5E-05	6	0.4769	0.8954	1.4798	402.1106
28	383.4	2	3.44	3.38	383.442	0.5216	7	1.30698	129.8532	1.71106	0.3432	1.3679	279.07	0.5239	-3E-04	6	0.4265	0.8963	1.3433	323.3505
29	434.2	4.86	2.94	3.31	434.236	1.1192	6	1.53109	136.6533	1.77938	0.3744	1.405	307.8	1.1238	-4E-04	6	0.5145	0.8643	1.5699	353.2247
30	533.7	3.05	3.02	3.85	533.737	0.5714	7	1.24221	133.7475	1.84626	0.4056	1.4407	369.2	0.5734	-4E-04	7	0.4052	0.8824	1.2786	443.5859
31	342.7	6.75	4.08	3.55	342.75	1.9694	6	1.79274	137.28	1.9149	0.4368	1.4781	230.59	1.9804	-4E-04	6	0.6232	0.8119	1.8461	261.5391
32	279.6	6.42	2.91	3.64	279.636	2.2958	6	1.89672	137.28	1.98354	0.468	1.5155	183.2	2.3123	-9E-04	6	0.6686	0.7865	1.9606	206.3672
33	123	5.3	2.93	3.61	123.036	4.3077	9	2.32612	134.2116	2.05064	0.4992	1.5514	77.982	4.3807	-0.002	4	0.8471	0.7231	2.424	82.68138
34	66.1	2.71	2.85	3.66	66.1349	4.0977	4	2.4821	127.7896	2.11454	0.5304	1.5841	40.413	4.233	-0.005	4	0.9208	0.6896	2.6136	41.72546
35	303.4	8.76	2.31	3.68	303.428	2.887	8	1.96189	137.28	2.18318	0.5616	1.6216	185.77	2.9079	-0.001	8	0.7026	0.7409	2.0365	210.9254
36	420.9	11.39	3.02	3.76	420.937	2.7059	8	1.8675	137.28	2.25182	0.5928	1.659	252.37	2.7204	-9E-04	8	0.6655	0.7413	1.9347	293.3348
37	482.8	9.05	4.16	3.92	482.851	1.8743	6	1.69877	137.28	2.32046	0.624	1.6965	283.25	1.8833	-7E-04	6	0.6023	0.7525	1.7639	341.7607
38	320.1	5.71	4.89	4	320.16	1.7835	6	1.77287	137.0893	2.389	0.6552	1.7338	183.28	1.7969	-1E-03	6	0.6397	0.7291	1.8575	218.9746
39	404.3	7.25	4.66	4.11	404.357	1.793	6	1.72033	137.28	2.45764	0.6864	1.7712	226.9	1.8039	-9E-04	6	0.6193	0.7268	1.7995	276.0656
40	349.5	6.93	4.52	4.25	349.555	1.9825	6	1.79064	137.28	2.52628	0.7176	1.8087	191.87	1.997	-0.001	6	0.6518	0.7051	1.8801	231.2447
41	294.8	3.79	3.75	4.38	294.846	1.2854	6	1.67835	133.8895	2.59323	0.7488	1.8444	158.45	1.2968	-0.002	6	0.6148	0.7106	1.7783	196.2763
42	55.7	2.64	2.77	4.5	55.7339	4.7368	4	2.57872	127.1808	2.65682	0.78	1.8768	28.28	4.9739	-0.011	3	0.9992	0.564	2.7834	28.29301
43	500.8	9.55	3.26	4.59	500.84	1.9068	8	1.69784	137.28	2.72546	0.8112	1.9143	260.21	1.9172	-0.001	6	0.6192	0.6928	1.7813	326.1167
44	379.3	6.68	4.24	4.67	379.352	1.7609	6	1.72815	137.28	2.7941	0.8424	1.9517	192.94	1.774	-0.001	6	0.6389	0.6763	1.8283	240.6746
45	173.6	3.15	3.53	4.68	173.643	1.8141	6	1.93936	131.2448	2.85972	0.8736	1.9861	85.988	1.8444	-0.004	5	0.7387	0.628	2.086	101.3667
46	41.2	1.18	2.94	4.77	41.236	2.8616	4	2.51845	120.5538	2.92	0.9048	2.0152	19.014	3.0797	-0.018	4	1	0.5251	2.7783	19.01351
47	29.2	0.57	2.38	4.78	29.2291	1.9501	4	2.52902	114.3904	2.97719	0.936	2.0412	12.861	2.1713	-0.029	4	1	0.5184	2.8278	12.86107
48	30	0.64	1.79	4.82	30.0219	2.1318	4	2.54308	115.3032	3.03485	0.9672	2.0677	13.052	2.3715	-0.031	4	1	0.5118	2.8438	13.05208
49	30.4	0.76	1.48	4.89	30.4181	2.4985	4	2.5812	116.5926	3.09314	0.9984	2.0947	13.045	2.7813	-0.033	3	1	0.5051	2.8834	13.04456
50	34.1	0	1.58	4.93	34.1193	0	0	0	769.6	3.47794	1.0296	2.4483	12.515	0	-0.03	0	1	0.4322	0	0

	CPT-4	In situ data										Basic output data								
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn
1	21.7	0.78	9.96	0.07	21.8219	3.5744	4	2.79124	115.9726	0.05799	0	0.058	375.33	3.5839	0.033	8	0.6901	7.4185	2.1917	152.5881
2	13.1	0.52	9.23	0.03	13.213	3.9355	3	2.98796	111.7821	0.11388	0	0.1139	115.03	3.9697	0.0507	4	0.7839	5.7397	2.4346	71.05538
3	17.2	0.66	7.42	-0.13	17.2908	3.8171	3	2.88773	114.1826	0.17097	0	0.171	100.13	3.8552	0.0312	4	0.7874	4.2005	2.438	67.96335
4	28.9	0.99	13.2	-0.2	29.0616	3.4066	4	2.68262	118.4158	0.23018	0	0.2302	125.26	3.4338	0.033	5	0.749	3.1346	2.3345	85.41289
5	29.9	1.34	5.29	-0.42	29.9648	4.4719	3	2.7515	120.7055	0.29053	0	0.2905	102.14	4.5157	0.0128	4	0.7961	2.7982	2.4487	78.47404
6	21	1.2	7.59	-0.38	21.0929	5.6891	3	2.93452	119.0418	0.35005	0	0.3501	59.257	5.7851	0.0264	3	0.8755	2.6339	2.6489	51.63511
7	17.7	1.02	6.63	-0.23	17.7812	5.7364	3	2.99218	117.436	0.40877	0	0.4088	42.499	5.8714	0.0275	3	0.9114	2.3794	2.7355	39.06501
8	24.8	1.09	6.54	-0.12	24.8801	4.381	3	2.80534	118.741	0.46814	0	0.4681	52.147	4.465	0.0193	4	0.8614	2.0186	2.5967	46.57192
9	42.6	0.61	5.36	-0.1	42.6656	1.4297	5	2.31679	115.8091	0.52604	0	0.526	80.107	1.4476	0.0092	5	0.6968	1.6273	2.1579	64.80911
10	51.8	0.79	4.91	0	51.8601	1.5233	5	2.26609	118.1771	0.58513	0	0.5851	87.63	1.5407	0.0069	5	0.6914	1.5062	2.1362	72.98907
11	76.8	1.01	5.42	0.12	76.8663	1.314	5	2.09285	120.9345	0.6456	0	0.6456	118.06	1.3251	0.0051	6	0.6403	1.3721	1.9944	98.83829
12	65.7	1.47	5.65	0.21	65.7692	2.2351	5	2.29638	123.3003	0.70725	0	0.7073	91.993	2.2594	0.0063	5	0.7262	1.3398	2.212	82.38404
13	56.9	0.89	4.97	0.23	56.9608	1.5625	5	2.24117	119.278	0.76689	0	0.7669	73.275	1.5838	0.0064	5	0.7141	1.2584	2.1729	66.83282
14	12.4	0.37	4.59	0.29	12.4562	2.9704	3	2.93624	109.1481	0.82146	0	0.8215	14.163	3.1801	0.0284	3	0.9897	1.2847	2.8895	14.12661
15	13.2	0.34	4.01	0.36	13.2491	2.5662	3	2.87795	108.6799	0.8758	0	0.8758	14.128	2.7479	0.0233	4	0.9786	1.2033	2.8535	14.07084
16	34.7	0.94	5.57	0.43	34.7682	2.7036	4	2.55822	118.4739	0.93504	0	0.935	36.184	2.7783	0.0119	4	0.8619	1.1125	2.5398	35.57089
17	41.1	2.02	7.19	0.47	41.188	4.9043	4	2.68026	124.4845	0.99728	0	0.9973	40.3	5.026	0.0129	4	0.9178	1.0558	2.6788	40.10454
18	54.3	2.28	11.34	0.53	54.4388	4.1882	4	2.54673	126.0507	1.06031	0.0312	1.0291	51.869	4.2714	0.0147	4	0.8708	1.0245	2.5516	51.68282
19	163	1.35	7.76	0.62	163.095	0.8277	6	1.71422	124.8923	1.12275	0.0624	1.0604	152.75	0.8335	0.0031	6	0.555	0.9988	1.7188	152.8973
20	244.2	1.83	5.83	0.49	244.271	0.7492	6	1.55653	128.1034	1.1868	0.0936	1.0932	222.36	0.7528	0.0013	6	0.4978	0.9839	1.5646	226.0338
21	190.1	1.5	7.37	-0.31	190.19	0.7887	6	1.65061	126.0381	1.24982	0.1248	1.125	167.94	0.7939	0.0022	6	0.5376	0.9676	1.6652	172.7733
22	177.9	2.15	10.15	-0.57	178.024	1.2077	6	1.80077	128.511	1.31408	0.156	1.1581	152.59	1.2167	0.0033	6	0.5988	0.9474	1.8216	158.2171
23	248.7	1.61	11.62	-0.46	248.842	0.647	6	1.50655	127.2115	1.37768	0.1872	1.1905	207.87	0.6506	0.0026	6	0.4886	0.944	1.5283	220.784
24	645.6	7.2	2.59	-0.14	645.632	1.1152	6	1.44041	137.28	1.44632	0.2184	1.2279	524.61	1.1177	-5E-05	6	0.4629	0.9334	1.4562	568.2734
25	399.6	2	-3.37	0.26	399.559	0.5006	7	1.2817	129.9536	1.5113	0.2496	1.2617	315.48	0.5025	-0.001	7	0.4072	0.9309	1.3059	350.1757
26	315.8	1.33	-2.49	0.38	315.77	0.4212	7	1.30518	126.3945	1.5745	0.2808	1.2937	242.87	0.4233	-0.001	6	0.4203	0.919	1.3364	272.8815
27	347.4	4.11	-8.92	0.99	347.291	1.1835	6	1.60687	134.8819	1.64194	0.312	1.3299	259.9	1.1891	-0.003	6	0.5385	0.8842	1.6421	288.824
28	369.3	1.88	-6.75	1.46	369.217	0.5092	7	1.31106	129.3082	1.70659	0.3432	1.3634	269.56	0.5116	-0.002	6	0.4279	0.8972	1.3476	311.6255
29	403.5	4.77	-5.73	2.15	403.43	1.1824	6	1.56879	136.337	1.77476	0.3744	1.4004	286.82	1.1876	-0.002	6	0.5292	0.8622	1.6088	327.2808
30	451.9	3.67	-1.84	2.99	451.877	0.8122	6	1.40744	134.6955	1.84211	0.4056	1.4365	313.28	0.8155	-0.001	6	0.4696	0.8663	1.448	368.4397
31	384.4	1.5	-2.31	3.65	384.372	0.3903	7	1.219	127.7541	1.90599	0.4368	1.4692	260.32	0.3922	-0.002	7	0.4016	0.8765	1.2653	316.8261
32	473.5	3.91	-3.94	3.58	473.452	0.8259	6	1.40133	135.2727	1.97362	0.468	1.5056	313.14	0.8293	-0.002	6	0.4726	0.8465	1.4474	377.1648
33	342.4	1.97	-3.36	3.33	342.359	0.5754	6	1.37188	129.4662	2.03836	0.4992	1.5392	221.11	0.5789	-0.002	6	0.4676	0.8393	1.4298	269.9377
34	550.6	4.55	0.07	3.36	550.601	0.8264	6	1.36427	136.7501	2.10673	0.5304	1.5763	347.96	0.8295	-1E-03	6	0.4627	0.8316	1.4124	431.0709
35	438.7	3.46	0.51	3.86	438.706	0.7887	6	1.40498	134.1922	2.17383	0.5616	1.6122	270.76	0.7926	-0.001	6	0.4838	0.8157	1.4634	336.5146
36	461	3.6	1.61	4.05	461.02	0.7809	6	1.38856	134.6034	2.24113	0.5928	1.6483	278.33	0.7847	-0.001	6	0.4799	0.8084	1.4487	350.4978
37	380.7	6.63	1.44	4.13	380.718	1.7415	6	1.72323	137.28	2.30977	0.624	1.6858	224.47	1.7521	-0.001	6	0.6139	0.7513	1.7959	268.6915
38	278.2	5.72	1.63	4.22	278.22	2.0559	6	1.8582	136.7597	2.37815	0.6552	1.723	160.1	2.0737	-0.002	6	0.6735	0.7201	1.9476	187.7259
39	354.6	6.39	1.18	4.3	354.614	1.802	6	1.75226	137.28	2.44679	0.6864	1.7604	200.05	1.8145	-0.002	6	0.6326	0.7247	1.8357	241.191
40	39.6	1.26	-0.64	4.35	39.5922	3.1825	4	2.56246	120.9346	2.50726	0.7176	1.7897	20.722	3.3976	-0.021	4	0.9921	0.5937	2.7743	20.80792
41	30.4	0.66	0.25	4.06	30.4031	2.1708	4	2.54356	115.5591	2.56504	0.7488	1.8162	15.327	2.3709	-0.026	4	0.9974	0.5834	2.7857	15.34919
42	28.8	0.54	0.66	3.89	28.8081	1.8745	4	2.52388	113.9594	2.62202	0.78	1.842	14.216	2.0622	-0.028	4	0.9959	0.5757	2.7783	14.24834
43	43.6	1.09	1.24	3.91	43.6152	2.4991	5	2.46127	120.1101	2.68207	0.8112	1.8709	21.879	2.6629	-0.018	4	0.9612	0.5782	2.6839	22.36893
44	69.1	2.22	2.6	3.96	69.1318	3.2113	5	2.39164	126.4383	2.74529	0.8424	1.9029	34.887	3.3441	-0.01	4	0.9253	0.581	2.5854	36.45073
45	63.8	2	4.4	4.04	63.8539	3.1322	5	2.4079	125.481	2.80803	0.8736	1.9344	31.558	3.2762	-0.009	4	0.9376	0.568	2.6138	32.76868
46	32.1	0.67	8.82	4.11	32.208	2.0802	4	2.51242	115.8098	2.86594	0.9048	1.9611	14.962	2.2834	-0.009	4	1	0.5395	2.7855	14.96175
47	41.7	1.01	12.82	4.17	41.8569	2.413	5	2.46484	119.452	2.92566	0.936	1.9897	19.567	2.5943	-3E-04	4	0.98	0.5386	2.7188	19.81524
48	38.1	0.92	18.16	4.22	38.3223	2.4007	4	2.49265	118.5539	2.98494	0.9672	2.0177	17.513	2.6035	0.0096	4	0.998	0.5251	2.7623	17.53638
49	45.2	0.79	38.26	4.31	45.6683	1.7299	5	2.34365	117.867	3.04387	0.9984	2.0455	20.838	1.8534	0.0412	4	0.9381	0.5388	2.6011	21.706
50	32.2	0.74	60.04	4.38	32.9349	2.2469	4	2.52545	116.5913	3.10217	1.0296	2.0726	14.394	2.4805	0.1104	4	1	0.5105	2.8198	14.39409
51	33.5	0.76	79.37	4.41	34.4715	2.2047	4	2.50483	116.8977	3.16062	1.0608	2.0998	14.911	2.4273	0.1486	4	1	0.5039	2.8018	14.91124
52	34.4	0.82	122.69	4.48	35.9017	2.284	4	2.50072	117.5528	3.21939	1.092	2.1274	15.363	2.509	0.2369	4	1	0.4974	2.7995	15.36262
53	36.1	0.82	132.74	4.54	37.7247	2.1736	5	2.47046	117.6736	3.27823	1.1232	2.155	15.984	2.3805	0.2449	4	1	0.491	2.7723	15.98424
54	34.7	0.62	152.71	4.62	36.5692	1.6954	5	2.4147	115.552	3.33601	1.1544	2.1816	15.233	1.8656	0.2961	4	0.9933	0.4874	2.7284	15.30754
55	36.1	0.47	208.93	4.69	38.6573	1.2158	5	2.31094	113.6608	3.39284	1.1856	2.2072	15.977	1.3328	0.393	4	0.9541	0.4959	2.6228	16.52578
56	36	0.49	261.04	4.77	39.1951	1.2502	5	2.31286	113.9994	3.44984	1.2168	2.233	16.007	1.3708	0.4918	4	0.9577	0.4891	2.6292	16.52164
57	44	1.4	224.23	4.83	46.7446	2.995	4	2.49152	122.1105	3.51089	1.248	2.2629	19.106	3.2382	0.3446	4	1	0.4676	2.7902	19.10551
58	443.5	5.58	26.27	4.93	443.822	1.2573	6	1.56807	137.28	3.57953	1.2792	2.3003	191.38	1.2675	0.0014	6	0.6034	0.6259	1.6917	260.4042
59	538.1	12.81	63.29	4.96	538.875	2.3772	8	1.76908	137.28	3.64817	1.3104	2.3378	228.95	2.3934	0.0061	8	0.6791	0.5837	1.8858	295.2701
60	575.4	0	73.28	4.98	576.297	0	0	0	769.6	4.03297	1.3416	2.6914	212.63	0	0.0069	0	1	0.3932	0	0

	CPT-5	In situ data										Basic output data								
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn
1	15	0.37	0.41	-0.5	15.005	2.4658	4	2.82364	109.6022	0.0548	0	0.0548	272.81	2.4749	0.002	5	0.6774	7.4288	2.1687	104.9632
2	15.3	0.77	1.42	-0.33	15.3174	5.027	3	3.00408	115.015	0.11231	0	0.1123	135.39	5.0641	0.0067	9	0.7947	5.945	2.4638	85.43042
3	14.4	0.24	1.55	0.11	14.419	1.6645	4	2.7445	106.3377	0.16548	0	0.1655	86.136	1.6838	0.0078	5	0.7256	3.8431	2.2749	51.76902
4	22.6	0.65	1.72	1.34	22.6211	2.8734	4	2.71969	114.7263	0.22284	0	0.2228	100.51	2.902	0.0055	5	0.7528	3.2307	2.3462	68.38821
5	22.5	0.99	2.04	1.45	22.525	4.3951	3	2.83871	117.7944	0.28174	0	0.2817	78.95	4.4508	0.0066	4	0.8191	2.9563	2.5104	62.14566
6	16	0.94	1.95	1.36	16.0239	5.8663	3	3.03259	116.5846	0.34003	0	0.34	46.125	5.9934	0.009	3	0.9041	2.7907	2.725	41.36573
7	16.7	0.93	1.88	1.42	16.723	5.5612	3	3.00338	116.6105	0.39834	0	0.3983	40.982	5.6969	0.0083	3	0.9117	2.4367	2.7375	37.59374
8	17.9	0.66	1.63	1.47	17.92	3.6831	3	2.86592	114.2698	0.45547	0	0.4555	38.344	3.7791	0.0067	4	0.8766	2.0936	2.6384	34.55629
9	38.3	0.49	1.47	1.58	38.318	1.2788	5	2.32654	113.9442	0.51244	0	0.5124	73.775	1.2961	0.0028	5	0.6963	1.6567	2.1583	59.19214
10	29.6	0.72	1.47	1.71	29.618	2.431	4	2.58282	116.132	0.57051	0	0.5705	50.915	2.4787	0.0036	5	0.8026	1.6418	2.4298	45.07088
11	13.6	0.68	1.39	1.79	13.617	4.9938	3	3.04172	113.8185	0.62742	0	0.6274	20.703	5.235	0.0077	3	0.9849	1.6732	2.9007	20.54012
12	7.7	0.46	1.39	1.88	7.71701	5.9609	3	3.28301	109.5734	0.6822	0	0.6822	10.312	6.5389	0.0142	3	1	1.551	3.1904	10.31188
13	7.3	0.32	1.39	1.99	7.31701	4.3734	3	3.22189	106.7882	0.7356	0	0.7356	8.947	4.8622	0.0152	3	1	1.4384	3.1588	8.94702
14	3.2	0.19	0.98	1.97	3.212	5.9153	3	3.59091	100.9658	0.78608	0	0.7861	3.0861	7.8321	0.0291	2	1	1.3461	3.6541	3.08609
15	8.6	0.25	1.08	2.05	8.61322	2.9025	3	3.06302	105.3797	0.83877	0	0.8388	9.2689	3.2157	0.01	3	1	1.2615	3.0411	9.26886
16	39.6	1.06	1.72	2.22	39.6211	2.6754	4	2.51216	119.6717	0.89861	0	0.8986	43.092	2.7374	0.0032	4	0.838	1.1468	2.4817	41.96624
17	42.5	0.64	1.55	2.81	42.519	1.5052	5	2.33132	116.152	0.95668	0	0.9567	43.444	1.5399	0.0027	5	0.7784	1.0816	2.318	42.48483
18	79	0.89	1.72	2.77	79.0211	1.1263	6	2.04128	120.0764	1.01672	0.0312	0.9855	79.15	1.141	0.0012	6	0.6712	1.0489	2.033	77.32217
19	253.6	2.39	2.39	2.3	253.629	0.9423	6	1.61707	130.1486	1.0818	0.0624	1.0194	247.74	0.9464	0.0004	6	0.5132	1.0193	1.6141	243.2874
20	286.4	2.23	3.19	2.21	286.439	0.7785	6	1.52031	129.9383	1.14676	0.0936	1.0532	270.89	0.7817	0.0005	6	0.4797	1.0023	1.5221	270.2313
21	387.4	3.06	4.76	1.78	387.458	0.7898	6	1.43881	132.9903	1.21326	0.1248	1.0885	354.85	0.7922	0.0006	6	0.4517	0.9873	1.4442	360.4002
22	236.4	3.25	5.72	1.08	236.47	1.3744	6	1.76084	132.2267	1.27937	0.156	1.1234	209.36	1.3819	0.0011	6	0.5789	0.9659	1.7738	214.7049
23	324.2	2.53	6.17	1.29	324.276	0.7802	6	1.48476	131.1644	1.34496	0.1872	1.1578	278.93	0.7835	0.0008	6	0.4762	0.9581	1.4997	292.3938
24	448.9	2.69	6.05	1.47	448.974	0.5991	7	1.30559	132.4067	1.41116	0.2184	1.1928	375.23	0.601	0.0005	7	0.4099	0.9521	1.3214	402.7169
25	607.6	3.5	6.36	0.86	607.678	0.576	7	1.21099	135.0709	1.47869	0.2496	1.2291	493.21	0.5774	0.0003	7	0.3757	0.9453	1.227	541.5573

	CPT-6	In situ data									Basic output data									
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn
1	44.9	0.15	-0.12	-0.37	44.8985	0.3341	6	1.9868	105.6691	0.05283	0	0.0528	848.8	0.3345	-2E-04	6	0.42	3.5209	1.4947	149.2249
2	12.8	0.11	0	-0.06	12.8	0.8594	4	2.65169	100.3388	0.103	0	0.103	123.27	0.8664	0	5	0.6481	4.5253	2.0859	54.30285
3	22	0.18	-0.14	0.26	21.9983	0.8183	5	2.43211	105.263	0.15564	0	0.1556	140.34	0.8241	-5E-04	6	0.6195	3.2784	1.9946	67.6765
4	12.8	0.09	-0.16	0.5	12.798	0.7032	4	2.61502	98.87015	0.20507	0	0.2051	61.408	0.7147	-9E-04	5	0.6927	3.1162	2.1833	37.08753
5	26.3	0.96	-4.35	0.65	26.2468	3.6576	4	2.73629	117.9422	0.26404	0	0.264	98.404	3.6948	-0.012	4	0.7783	2.9459	2.4062	72.33839
6	30.4	1.11	-5.94	0.48	30.3273	3.6601	4	2.6892	119.3569	0.32372	0	0.3237	92.684	3.6996	-0.014	4	0.7827	2.5269	2.4093	71.65368
7	25.4	0.91	-5.98	0.42	25.3268	3.593	4	2.74305	117.4638	0.38245	0	0.3825	65.222	3.6481	-0.017	4	0.8159	2.2939	2.4886	54.07821
8	19.6	0.46	-6.7	0.36	19.518	2.3568	4	2.7191	111.8366	0.43837	0	0.4384	43.524	2.411	-0.025	4	0.8177	2.0555	2.4862	37.06385
9	21.4	0.13	-4.64	0.28	21.3432	0.6091	5	2.387	102.8082	0.48977	0	0.4898	42.578	0.6234	-0.016	5	0.7065	1.7232	2.1885	33.96199
10	30.7	0.06	-0.59	0.15	30.6928	0.1955	6	2.07154	98.03684	0.53879	0	0.5388	55.966	0.199	-0.001	6	0.6028	1.502	1.9103	42.804
11	37.9	0.11	-0.47	0.11	37.8943	0.2903	6	2.03399	102.986	0.59029	0	0.5903	63.196	0.2949	-9E-04	6	0.6014	1.4205	1.8999	50.08085
12	12.2	0.74	-1.03	0.01	12.1874	6.0719	3	3.13285	114.1667	0.64737	0	0.6474	17.826	6.4125	-0.006	3	1	1.6345	3.0054	17.82603
13	8.7	0.55	-0.3	-0.12	8.69633	6.3245	3	3.25785	111.1723	0.70296	0	0.703	11.371	6.8807	-0.003	3	1	1.5052	3.1721	11.3711
14	11	0.53	1.29	-0.14	11.0158	4.8113	3	3.10378	111.4779	0.75869	0	0.7587	13.519	5.1672	0.0091	3	1	1.3946	3.0346	13.51941
15	31.6	1.13	1.99	-0.25	31.6244	3.5732	4	2.66867	119.5897	0.81849	0	0.8185	37.637	3.6681	0.0047	4	0.8839	1.2548	2.6119	36.53231
16	46.2	2.76	-2.21	-0.37	46.173	5.9775	3	2.70842	127.047	0.88201	0	0.882	51.35	6.0939	-0.004	3	0.9098	1.1801	2.6722	50.51339
17	116	0.98	-2.1	-0.55	115.974	0.845	6	1.83322	121.717	0.94287	0	0.9429	122	0.8519	-0.001	6	0.5863	1.0699	1.8154	116.3182
18	115.4	0.4	-0.35	-0.67	115.396	0.3466	6	1.62142	115.1481	1.00045	0.0312	0.9693	118.03	0.3497	-5E-04	6	0.5091	1.0457	1.6094	113.0504
19	134.3	0.82	-0.35	-0.71	134.296	0.6106	6	1.69669	120.7705	1.06083	0.0624	0.9984	133.44	0.6155	-7E-04	6	0.5413	1.0319	1.6905	129.9378
20	152.8	0.37	-0.4	-1.23	152.795	0.2422	6	1.44296	115.2624	1.11846	0.0936	1.0249	148	0.2439	-8E-04	6	0.4477	1.0144	1.4416	145.4105
21	154.3	0.65	0.01	-1.36	154.3	0.4213	6	1.55542	119.4092	1.17817	0.1248	1.0534	145.36	0.4245	-8E-04	6	0.4938	1.0022	1.5592	145.0343
22	173.5	0.95	0.75	-1.53	173.509	0.5475	6	1.57927	122.4721	1.2394	0.156	1.0834	159.01	0.5515	-6E-04	6	0.5061	0.9881	1.5878	160.8742
23	300.8	0.98	-0.82	-1.15	300.79	0.3258	7	1.25301	124.0415	1.30142	0.1872	1.1142	268.79	0.3272	-8E-04	7	0.3837	0.9804	1.2626	277.4842
24	332.1	0.8	-2.45	-0.82	332.07	0.2409	7	1.14436	122.7978	1.36282	0.2184	1.1444	288.97	0.2419	-0.001	7	0.3449	0.9733	1.1568	304.2058
25	150.7	0.51	-7.37	-0.78	150.61	0.3386	6	1.51516	117.5753	1.42161	0.2496	1.172	127.29	0.3419	-0.005	6	0.4922	0.9509	1.5398	134.0764
26	274.6	1.24	0.82	-0.43	274.61	0.4516	6	1.37108	125.5412	1.48438	0.2808	1.2036	226.93	0.454	-8E-04	6	0.4379	0.9452	1.3933	243.9691
27	475.7	0.62	-3.21	0.1	475.661	0.1304	7	0.88327	121.8093	1.54528	0.312	1.2333	384.43	0.1308	-0.001	7	0.2514	0.9622	0.9006	431.1481
28	599.3	2.69	-2.13	0.11	599.274	0.4489	7	1.12896	133.111	1.61184	0.3432	1.2686	471.1	0.4501	-8E-04	7	0.3474	0.9389	1.1482	530.3303
29	305.6	1.21	-8.02	-0.37	305.502	0.3961	7	1.29918	125.622	1.67465	0.3744	1.3003	233.67	0.3983	-0.003	6	0.4189	0.9173	1.3319	263.3944
30	360.6	1.59	-8.25	-0.35	360.499	0.4411	7	1.27534	128.0241	1.73866	0.4056	1.3331	269.12	0.4432	-0.003	7	0.4117	0.9093	1.309	308.2975
31	373.6	2.01	-8.6	-0.54	373.495	0.5382	7	1.32468	129.8256	1.80358	0.4368	1.3668	271.95	0.5408	-0.003	6	0.4334	0.895	1.3616	314.394
32	776.8	2.69	-9.45	-0.72	776.684	0.3463	7	0.97057	133.7434	1.87045	0.468	1.4025	552.47	0.3472	-0.001	7	0.2954	0.9202	0.995	673.7941

Presented below is a list of formulas used for the estimation of various soil properties. The formulas are presented in SI unit system and assume that all components are expressed in the same units.

:: Unit Weight, g (kN/m³) ::

$$g = g_w \cdot \left(0.27 \cdot \log(R_f) + 0.36 \cdot \log(\frac{q_t}{p_a}) + 1.236\right)$$

where g_w = water unit weight

:: Permeability, k (m/s) ::

$I_c < 3.27$ and $I_c > 1.00$ then $k = 10^{0.952-3.04 \cdot I_c}$

$I_c \leq 4.00$ and $I_c > 3.27$ then $k = 10^{-4.52-1.37 \cdot I_c}$

:: N_{SPT} (blows per 30 cm) ::

$$N_{60} = \left(\frac{q_c}{P_a}\right) \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

$$N_{1(60)} = Q_{tn} \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

:: Young's Modulus, Es (MPa) ::

$$(q_t - \sigma_v) \cdot 0.015 \cdot 10^{0.55 \cdot I_c + 1.68}$$

(applicable only to $I_c < I_{c\_cutoff}$)

:: Relative Density, Dr (%) ::

$$100 \cdot \sqrt{\frac{Q_{tn}}{k_{DR}}}$$

(applicable only to SBT_n: 5, 6, 7 and 8 or $I_c < I_{c\_cutoff}$)

:: State Parameter, ψ ::

$$\psi = 0.56 - 0.33 \cdot \log(Q_{tn,cs})$$

:: Peak drained friction angle, φ (°) ::

$$\varphi = 17.60 + 11 \cdot \log(Q_{tn})$$

(applicable only to SBT_n: 5, 6, 7 and 8)

:: 1-D constrained modulus, M (MPa) ::

If $I_c > 2.20$

$\alpha = 14$ for $Q_{tn} > 14$

$\alpha = Q_{tn}$ for $Q_{tn} \leq 14$

$M_{CPT} = \alpha \cdot (q_t - \sigma_v)$

If $I_c \leq 2.20$

$M_{CPT} = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$

:: Small strain shear Modulus, Go (MPa) ::

$$G_0 = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$$

:: Shear Wave Velocity, Vs (m/s) ::

$$V_s = \left(\frac{G_0}{\rho}\right)^{0.50}$$

:: Undrained peak shear strength, Su (kPa) ::

$N_{kt} = 10.50 + 7 \cdot \log(F_r)$ or user defined

$$S_u = \frac{(q_t - \sigma_v)}{N_{kt}}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Remolded undrained shear strength, Su(rem) (kPa) ::

$S_{u(rem)} = f_s$ (applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Overconsolidation Ratio, OCR ::

$$k_{OCR} = \left[\frac{Q_{tn}^{0.20}}{0.25 \cdot (10.50 \cdot + 7 \cdot \log(F_r))}\right]^{1.25}$$ or user defined

$OCR = k_{OCR} \cdot Q_{tn}$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: In situ Stress Ratio, Ko ::

$$K_O = (1 - \sin\varphi') \cdot OCR^{\sin\varphi'}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Soil Sensitivity, S_t ::

$$S_t = \frac{N_S}{F_r}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Effective Stress Friction Angle, φ' (°) ::

$$\varphi' = 29.5° \cdot B_q^{0.121} \cdot \left(0.256 + 0.336 \cdot B_q + \log Q_t\right)$$

(applicable for $0.10 < B_q < 1.00$)

References

- Robertson, P.K., Cabal K.L., Guide to Cone Penetration Testing for Geotechnical Engineering, Gregg Drilling & Testing, Inc., 5th Edition, November 2012
- Robertson, P.K., Interpretation of Cone Penetration Tests - a unified approach., Can. Geotech. J. 46(11): 1337–1355 (2009)

APPENDIX C

LOG OF SOIL BORING

REPORT OF BOREHOLE: PT-01

Golder Associates

CLIENT: Jones Lang Lasalle IP Inc (JLL)
PROJECT: Marina Marketplace Phase III Geotechnical Evaluation
LOCATION: 13400 Glencoe Avenue #240
PROJECT NO.: 140-3929

DRIVE WEIGHT: 140 lbs.
DROP DISTANCE: 30 inches
N: E:
ELEVATION: DATUM: GS
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

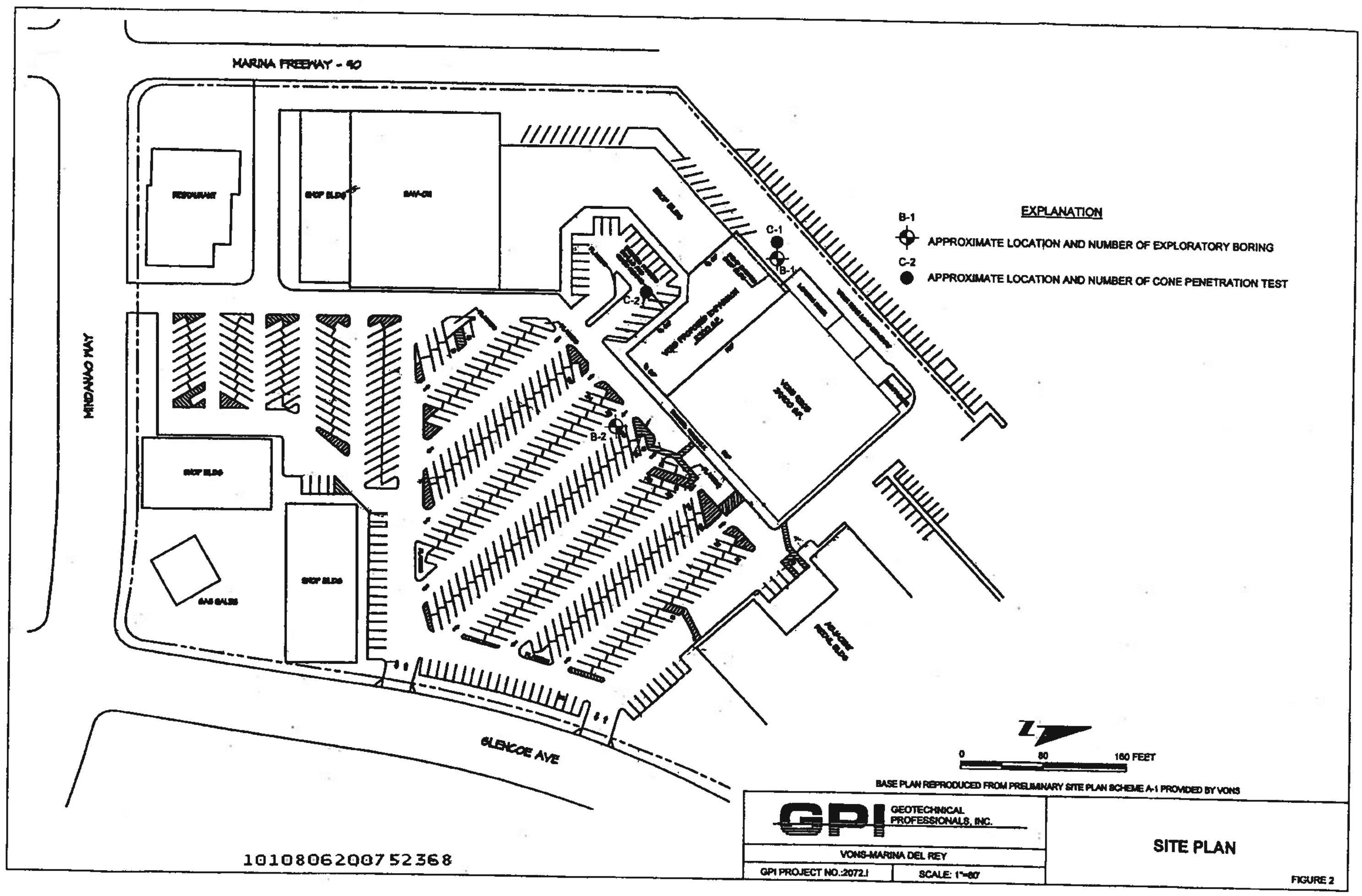
SHEET: 1 OF 1
DRILLER: Martini Drilling Corp.
DRILL RIG: CME 75
LOGGED: LG DATE: 12/17/14
CHECKED: AJA DATE: 1/7/15

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	RECOVERY (ft)	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hand Auger			0							3-inch asphalt pavement			
				0.5					SM	FILL: (SM), SILTY SAND, fine to medium grained, dark brown, non-cohesive, trace of clay, moist			
				0.7					CL	(CL), silty CLAY, medium plasticity, dark brown, cohesive, w~PL			
			2										
			4										
Hollow Stem Auger			6		S-1		1.5			-brown, some fine sand			
			8										
			10		S-2		1.5						
			12										
				13.5						Bottom of borehole at 12.0 feet. No groundwater encountered. Drilled borehole, sampled, and installed well. Performed percolation test, backfilled with coarse and patched with asphalt.			

Report of borehole must be read in conjunction with accompanying notes and abbreviations

APPENDIX D

PREVIOUS GEOTECHNICAL INVESTIGATIONS



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APPENDIX B

EXPLORATORY BORINGS

The subsurface conditions at the site were investigated by drilling and sampling three exploratory borings. The boring locations are shown on the Site Plan, Figure 2. The borings were advanced to depths of 26 and 51 feet below the existing site grades.

The borings were drilled using truck-mounted hollow-stem auger equipment. Relatively undisturbed samples were obtained using a brass-ring lined sampler (ASTM D3550), driven into the soil by a 140-pound hammer dropping 30 inches. The number of blows needed to drive the sampler 12 inches into the soil was recorded as the penetration resistance. Due to the use of a "free-fall" hammer (rather than a hammer attached to a rope), the blow-counts recorded with the drive (D) sampler are approximately equal to the Standard Penetration Test blow-count (N60).

The field explorations for the investigation were performed under the continuous technical supervision of GPI's representative, who visually inspected the site, maintained detailed logs of the borings, classified the soils encountered, and obtained relatively undisturbed samples for examination and laboratory testing. The soils encountered in the borings were classified in the field and through further examination in the laboratory in accordance with the Unified Soils Classification System. Detailed logs of the borings are presented in Figures B-1 to B-2 in this appendix.

When drilling below the groundwater depth, a head of water above the groundwater depth was maintained by the driller to help mitigate against any heaving or instability of the soils at the sampling depth due to excess hydrostatic pressure.

The borings were laid out in the field by measuring from existing site features. Existing ground surface elevations at the site were determined by USGS topographic map and should be considered very approximate. All borings were backfilled with bentonite chips above the groundwater depth where the hole did not cave.

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
				0	3 inches AC over 3 inches AB	
			B		Fill: **SILTY CLAY (CL)** dark brown/black, moist, very stiff, trace organics	15
17.6	111	18	D	5	@ 5 feet, mixed fill with SILTY SAND (SM), brown, moist, fine to medium grained sand, with shell fragments	
						10
14.7	116	21	D		Natural?: **SILTY CLAY (CL)** brown, moist, very stiff, with sand, slightly porous	
14.8	108	12	D	10	**SANDY CLAY (CL)/SANDY SILT (ML)** brown, very moist, stiff, fine to coarse grained sand	
						5
				15	**SILTY SAND (SM)** brown, wet, medium dense	
14.3		12	S			
					SAND (SP) brown, wet, medium dense, fine to coarse grained, with gravel	0
				20		
16.2		30	S			
						-5
6.0		39	S	25		
						-10
12.3		65	D	30	-becomes dense	
						-15
26.1		9	S		**CLAY (CL)** dark grey, moist, stiff	
					@ 34 feet, with fine sand, slightly porous	
				35		
						-20
			D			

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

DATE DRILLED: 11-2-05
EQUIPMENT USED: 8" Hollow Stem Auger
GROUNDWATER LEVEL (ft): Water at 16'6"

GPI

PROJECT NO.: 2072.I
VONS-MARINA DEL REY

LOG OF BORING NO. B-1

FIGURE B-1

	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
					40	**CLAYEY SAND (SC)** dark grey, very moist, medium dense, fine to coarse grained sand, porous	
	23.0		10	S			-25
	22.4	99	46	D	45	**CLAY (CL)** dark grey, moist, hard	
							-30
	39.1		9	D	50	@ 50 feet, stiff @ 51 feet, clayey sand, fine grained sand, slightly porous Total Depth 51 feet	

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

DATE DRILLED:
11-2-05
EQUIPMENT USED:
8" Hollow Stem Auger
GROUNDWATER LEVEL (ft):
Water at 16'6"

GPI

PROJECT NO.: 2072.I
VONS-MARINA DEL REY

LOG OF BORING NO. B-1

FIGURE B-1

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	MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
					0	3 inches AC over 3 inches AB	
				B		Fill: **CLAYEY SILT (ML)** dark brown, moist, very stiff, organic	15
						SILTY CLAY (CL) brown, moist, very stiff, with shale fragments	
	14.9	115	18	D	5		
							10
	20.1	106	12	D		Natural?: **SILTY SAND (SM)/SANDY SILT (ML)** brown, moist, medium dense, fine grained sand, porous	
	16.4	112	12	D	10	@ 10 feet, with angular gravel	
							5
	23.2		4	S	15	**SANDY CLAY (CL)** brown, very moist, soft to firm, fine to medium grained sand, porous	
							0
	23.2	100	22	D	20		
			35	S		**SAND (SP)** light brown, wet,medium dense, fine to medium grained @ 22 feet, with gravel	-5
	17.4		38	S	25		
						Total Depth 26 ½ feet	

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

DATE DRILLED:
11-2-05

EQUIPMENT USED:
8" Hollow Stem Auger

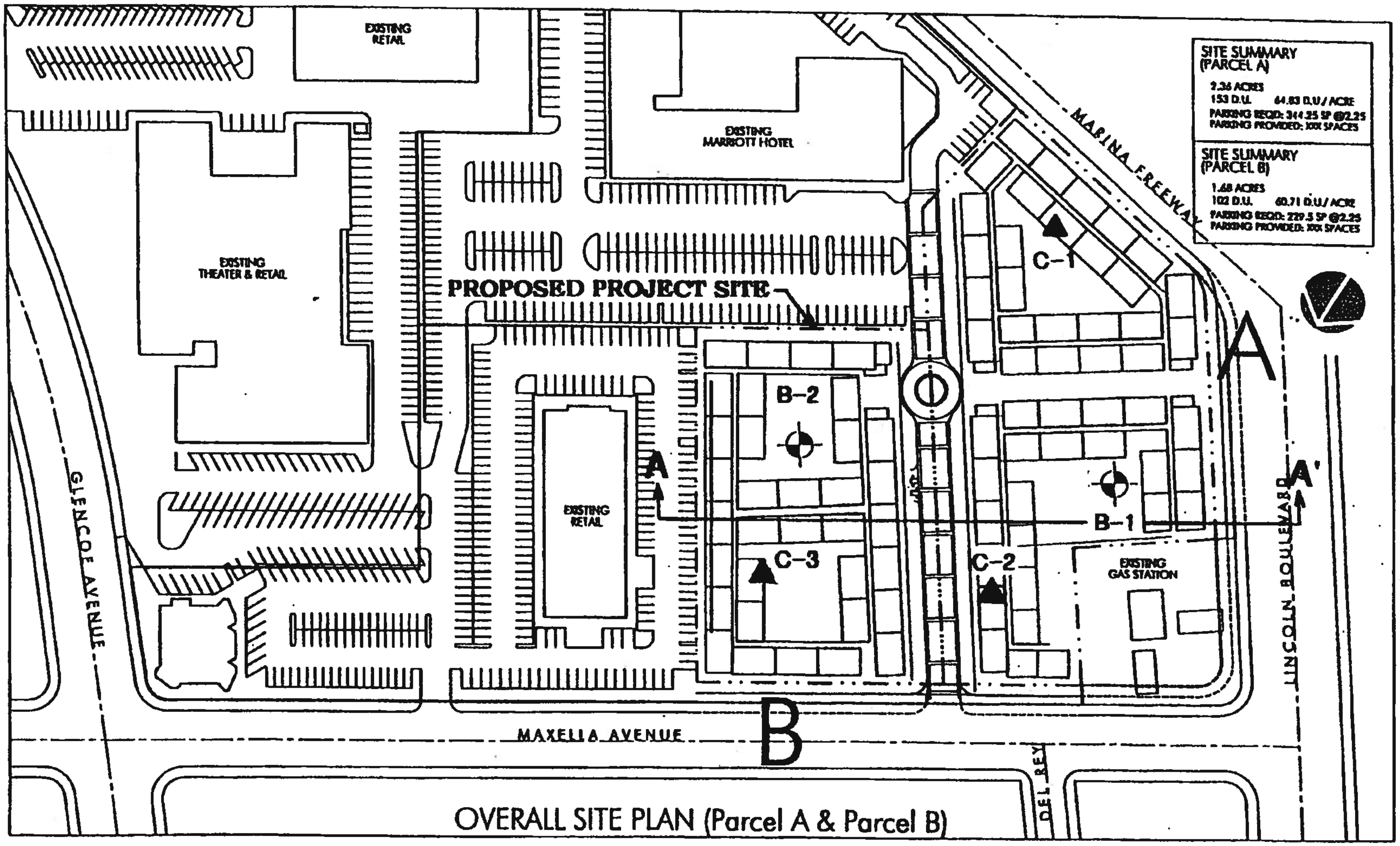
GROUNDWATER LEVEL (ft):
Water at 16'6"

GPI

PROJECT NO.: 2072.I
VONS-MARINA DEL REY

LOG OF BORING NO. B-2

FIGURE B-2



VILLA MARINA

MARINA DEL REY - CALIFORNIA

SCHEME

LEGEND

- BORING LOCATION
- CPT LOCATION

Reference: Drawing provided by, NGA, dated 5/13/03

DATE: 05/27/03	DRAWN BY: T Ybarra	GROUP DELTA CONSULTANTS, INC. 2291 W. 205th Street Suite 105 Torrance, CA 90501	BORING LOCATIONS	PROJECT NUMBER: L-453
REVISED:	APPROVED BY: T Armstrong		The Olson Company - Villa Marina Marina Del Rey, California	SCALE: AS SHOWN
REVISED:				FIGURE NUMBER: 2

GROUP DELTA CONSULTANTS

Geotechnical Engineering

Geology

HydroGeology

Earthquake Engineering

Materials Testing & Inspection

Forensic Services

APPENDIX A
FIELD EXPLORATION

The subsurface conditions at the proposed improvement site were investigated on May 15 and May 19, 2003 by drilling two mud rotary wash borings and three Cone Penetration Test (CPT) soundings at the locations shown on Figure 2. The borings were advanced to a depth of about 41 and 59 feet. The CPT soundings were performed to depths between approximately 9 feet to 65 feet. Subsurface materials were visually classified and logged by our field engineer in accordance with the Unified Soil Classification System (USCS). Boring logs are presented in Figures A-1 and A-2. A key to the boring logs is presented in Figure A-0. CPT soundings are presented in Figures A-3 through A-5.

Relatively undisturbed drive samples and large samples of the materials encountered in the borings were obtained at the depth intervals noted on the boring logs. The drive samples were obtained with a 3-inch O.D. slit-barrel sampler lined with 1-inch metal rings. The samples were sealed to prevent moisture loss and returned to our laboratory for additional visual examination and laboratory testing. The sampler was driven into the soil using a 300-pound hammer falling a distance of 18 inches. The number of blows required to drive the sampler 12 inches is recorded on the boring logs. In addition, Standard Penetration Tests (SPT) were also conducted in accordance with ASTM D 1586, using a standard 2-inch outside diameter, 1.375-inch inside diameter, split-spoon sampler. The SPT sampler was driven into the soil using a 140-pound hammer free-falling 30 inches. The N-value blowcounts are shown directly on the boring logs.

Results of moisture content and dry density tests and pocket penetrometer tests are shown on the boring logs. Additional laboratory tests performed are indicated on the boring logs in the column labeled "Other Tests". The following abbreviations are used to identify these tests:

DS	Direct Shear
WA	Percent Passing No. 200 Sieve (-200 wash)
CN	Consolidation

The following are attached and complete this appendix:

Figure A-0	Key to Log of Borings
Figures A-1 and A-2	Log of Borings
Figures A-3 through A-5	CPT Sounding

LOG OF TEST BORING	PROJECT NAME: The Olson Company - Lincoln/Maxella		PROJECT NUMBER: L-453	BORING: LEGEND
SITE LOCATION: Marina Del Rey, CA		START: 5/19/03	FINISH: 5/19/03	SHEET NO.: 1 of 1
DRILLING COMPANY: A&W Drilling	DRILLING METHOD: Rotary Wash		LOGGED BY: N. Nghiem	CHECKED BY: T. Armstrong
DRILLING EQUIPMENT: Mayhew 1000	BORING DIA. (in): 6	TOTAL DEPTH (ft): 32	GROUND ELEV (ft):	DEPTH/ELEV. GROUND WATER (ft): ▼
SAMPLING METHOD: SPT: Hammer: 140 lbs., Drop 30 in., Ring 300 lbs., Drop 18 in.		NOTES:		

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TEST	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
									GRAB, CAL, SPT - Refers to the sampling method as described below
5									GRAB - Refers to collecting sample by method of placing disturbed soil cuttings into a plastic bag
10									CAL (CALIFORNIA MODIFIED) - A 3.0" o.d. split tube sampler lined with 2.42" i.d. metal sample rings generally driven into the soil by a free falling hammer
15									SPT (STANDARD PENETRATION TEST) - A 2.0" o.d. split spoon sampler with a 1.375" i.d. generally driven into the soil with a 140# hammer free falling a height of 30"
20									ABBREVIATIONS FOR OTHER TESTS:
25									
30									

AL = Atterberg Limits
CN = Consolidation
CO = Corrosivity
CP = Laboratory Compaction
DS = Direct Shear
LL = Liquid Limit
GS = Grain Size Analyses
PP = Pocket Pen
RV = R-Value
WA = Wash on #200 Sieve
EI = Expansion Index

GDC_LOG_BORING_4C L453.GPJ GDC_WLOG.GDT 6/18/03

GROUP DELTA

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-0

10109052006364 92

LOG OF TEST BORING

PROJECT NAME	PROJECT NUMBER	BORING
The Olson Company - Lincoln/Maxella	L-453	B-1

SITE LOCATION	START	FINISH	SHEET NO.
Marina Del Rey, CA	5/19/03	5/19/03	1 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
A&W Drilling	Rotary Wash	N. Nghiem	T. Armstrong

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/ELEV. GROUND WATER (ft)
Mayhew 1000	6	41	15	▼ 17.00 / -2.0

SAMPLING METHOD	NOTES
SPT: Hammer: 140 lbs., Drop 30 in., Ring 300 lbs., Drop 18 in.	

DEPTH (ft)	ELEVATION (ft)	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TEST	DESCRIPTION AND CLASSIFICATION
							3" of Asphalt.
							3" of Gravel.
							FILL: Silty Sand (SM/SC), dark gray, interbedded with brown silty sand, with clay.
							Silty Sand (SM), medium dense, black, with organics, with some coarse gravel up to 2".
5	10	1	22	118	14.9		
		2	13	112	15.1		Medium dense, brown, w/some gravel.
							NATIVE: Lean Sandy CLAY (CL), medium stiff, brown, moist, fine to medium grained sand, with some gravel.
10	5						
		3	9	114	14.6	CN	
15	0						Stiff.
		4	14				SAND (SP), loose to medium dense, brown, fine to coarse grained. ▼
							Gravelly SAND (SP), very dense, brown, fine to coarse grained, poorly grade.
20	-5	5	50		11.7		
25	-10	6	65				Very dense.
30	-15	7	57		25.2		Very dense.
							Clayey SAND (SC), very dense, olive, fine to coarse grained sand.

GDC_LOG_BORING_4C L453.GPJ GDC_WLOG.GDT 6/16/03

GROUP DELTA

GROUP DELTA CONSULTANTS, INC.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-1 a

LOG OF TEST BORING

PROJECT NAME	PROJECT NUMBER	BORING
The Olson Company - Lincoln/Maxella	L-453	B-1

SITE LOCATION	START	FINISH	SHEET NO.
Marina Del Rey, CA	5/19/03	5/19/03	2 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
A&W Drilling	Rotary Wash	N. Nghiem	T. Armstrong

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/ELEV. GROUND WATER (ft)
Mayhew 1000	6	41	15	▼ 17.00 / -2.0

SAMPLING METHOD	NOTES
SPT: Hammer: 140 lbs., Drop 30 in., Ring 300 lbs., Drop 18 in.	

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TEST	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
35	-20		8	73	109	19.1			Very dense.
									SAND (SP), very dense, brown to olive, fine to medium grained, poorly graded.
40	-25		9	96/6"					Becomes very dense, olive brown, fine to coarse grained, poorly graded.
									Bottom of Boring B-1 @ 41 feet. Boring backfilled with soil cuttings, grout & capped with asphalt.
45	-30								
50	-35								
55	-40								
60	-45								

GDC_LOG_BORING_4C L453.GPJ GDC_WLOG.GDT 6/16/03

GROUP DELTA CONSULTANTS, INC.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-1 b

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LOG OF TEST BORING

PROJECT NAME: The Olson Company - Lincoln/Maxella			PROJECT NUMBER: L-453	BORING: B-2	
SITE LOCATION: Marina Del Rey, CA	START: 5/19/03		FINISH: 5/19/03	SHEET NO.: 1 of 2	
DRILLING COMPANY: A&W Drilling	DRILLING METHOD: Rotary Wash		LOGGED BY: N. Nghiem	CHECKED BY: T. Armstrong	
DRILLING EQUIPMENT: Mayhew 1000	BORING DIA. (in): 6	TOTAL DEPTH (ft): 58.8	GROUND ELEV (ft): 15	DEPTH/ELEV. GROUND WATER (ft): 17.00 / -2.0	
SAMPLING METHOD: SPT: Hammer: 140 lbs., Drop 30 in., Ring 300 lbs., Drop 18 in.	NOTES:				

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TEST	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
									3" of Asphalt.
									3" of Gravel.
									FILL: Silty SAND (SM), dense, black, fine to medium grained, with some fine gravel.
		Ring	1	21	118	13.4			
5	10								Sandy CLAY (CL), dense, dark gray, fine to medium grained.
		Ring	2	21	119	15.4	DS		
									NATIVE: Sandy SILT (ML), brown, fine to medium grained.
10	5	SPT	3	8		20.9			Loose to firm.
15	0	Ring	4	17	120	16.9	DS		Medium dense.
									Gravelly.
20	-5	SPT	5	35					Gravelly SAND (SP), dense, brown, fine to coarse grained, poorly graded.
25	-10	SPT	6	80					Very dense.
30	-15	SPT	7	76					

GDC_LOG_BORING_4C L453.GPJ GDC_WLOG.GDT 6/18/03

GROUP DELTA CONSULTANTS, INC.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-2 a

LOG OF TEST BORING

PROJECT NAME	PROJECT NUMBER	BORING
The Olson Company - Lincoln/Maxella	L-453	B-2

SITE LOCATION	START	FINISH	SHEET NO.
Marina Del Rey, CA	5/19/03	5/19/03	2 of 2

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
A&W Drilling	Rotary Wash	N. Nghiem	T. Armstrong

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/ELEV. GROUND WATER (ft)
Mayhew 1000	6	58.8	15	▼ 17.00 / -2.0

SAMPLING METHOD	NOTES
SPT: Hammer: 140 lbs., Drop 30 in., Ring 300 lbs., Drop 18 in.	

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TEST	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
35	-20		8	84/6"					Grades to fine to medium grain.
									Clayey SILT and fine to medium Sandy SILT (ML), stiff, gray.
40	-25		9	17	98	28.3	CN		Clayey SAND (SC), dense, olive gray, fine to medium grained, sand with clay lense.
									SAND (SP), very dense, gray, fine to medium grained, poorly graded.
45	-30		10	50/6"					
50	-35		NSR	49					Medium dense to dense.
			11	55					
55	-40								@ 54 feet: Interbedding of Fat Clayey Silt, gray
			12	82/3"					Very dense, gray.
60	-45								Bottom of Boring B-2 @ 58.8 feet. Groundwater encountered @ 17 feet. Boring backfilled with soil cuttings and capped with asphalt.

GROUP DELTA CONSULTANTS, INC.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-2 b

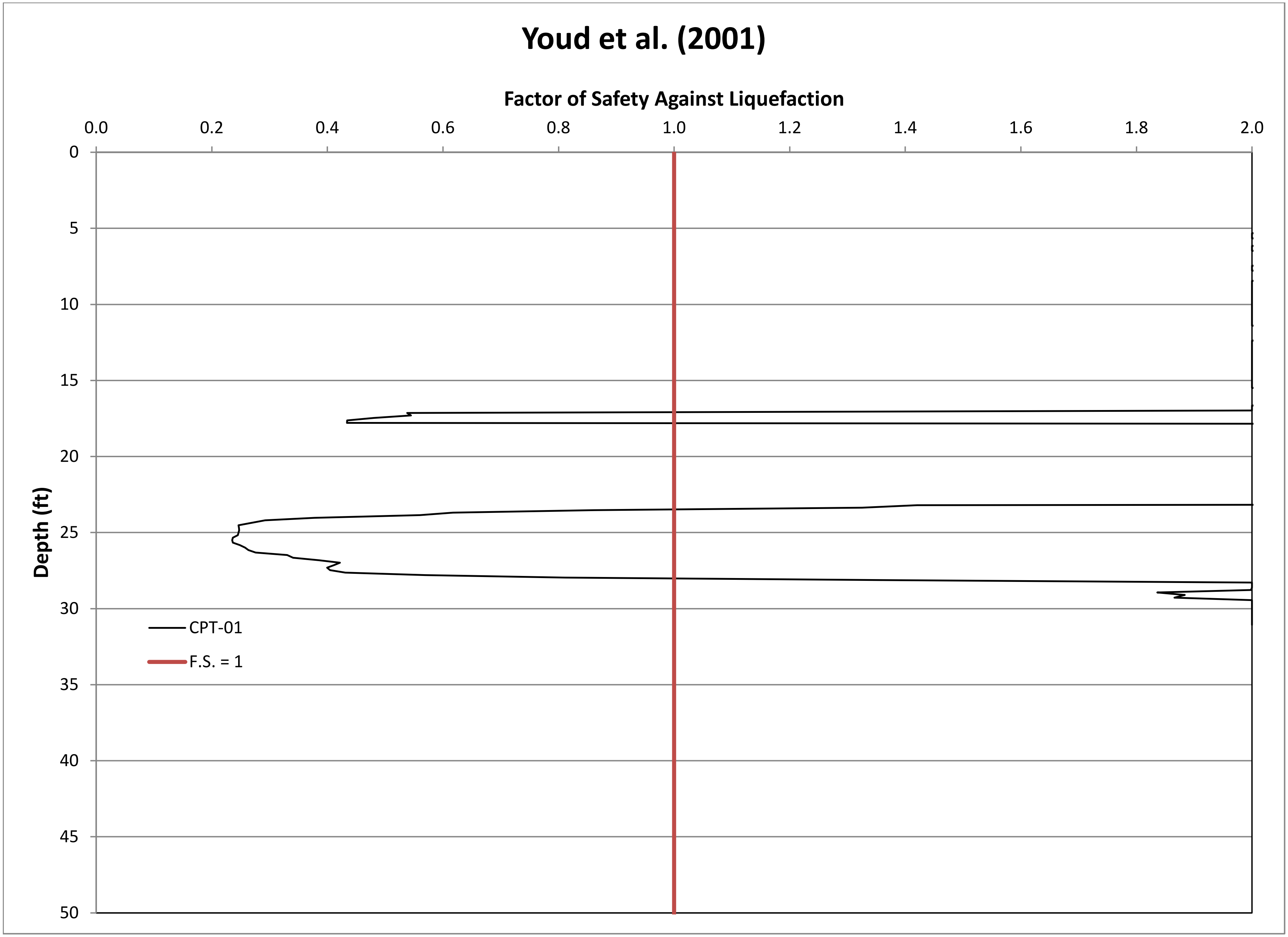
APPENDIX E

PERCOLATION TEST RESULTS

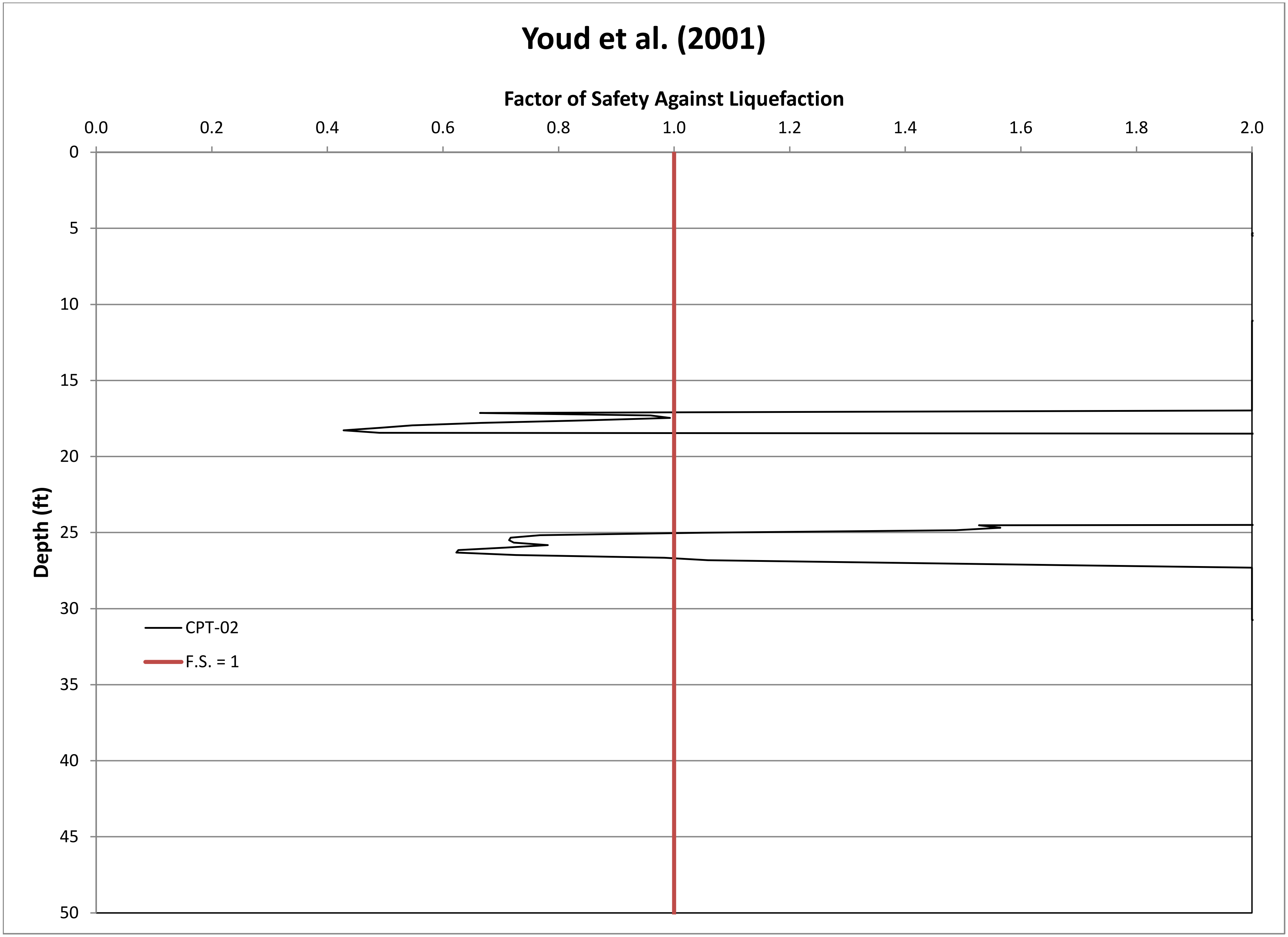
Percolation Test: PT-01

Pre-Soak (5 gallons)			Percolation Test (5 gallons)				
Elapsed Time (minutes)	Depth to Water Level (inches)	Water Level Height (inches)	Elapsed Time (minutes)	Depth to Water Level (inches)	Water Level Height (inches)	Percolation Rate (minutes/inch)	Infiltration Rate (inches/hour)
0	91.3	52.7	0	91.3	52.7	-	-
2	91.6	52.4	30	97.8	46.2	4.6	0.5
4	91.8	52.2	60	117.2	26.8	1.5	2.0
6	92.2	51.8	90	123.8	20.2	4.5	1.0
8	92.2	51.8	120	127.7	16.3	7.8	0.8
10	92.3	51.7	150	130.7	13.3	10.0	0.7
15	92.5	51.5					
20	92.8	51.2					
25	93.0	51.0					
30	93.0	51.0					
35	93.2	50.8					
40	93.4	50.6					
45	93.5	50.5					
50	93.5	50.5					
55	93.7	50.3					
60	93.7	50.3					
65	93.8	50.2					

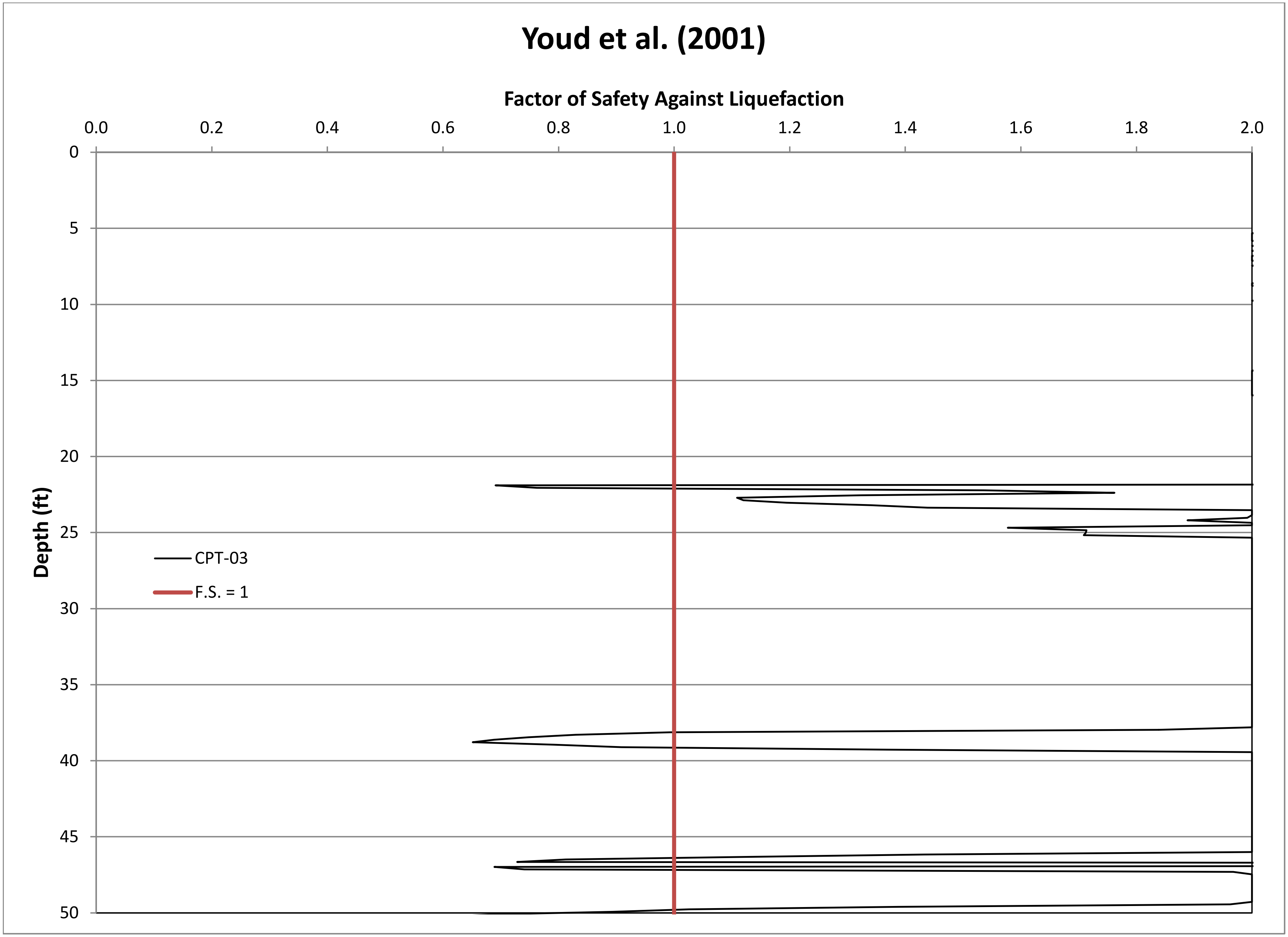
APPENDIX F
RESULTS OF LIQUEFACTION EVALUATION



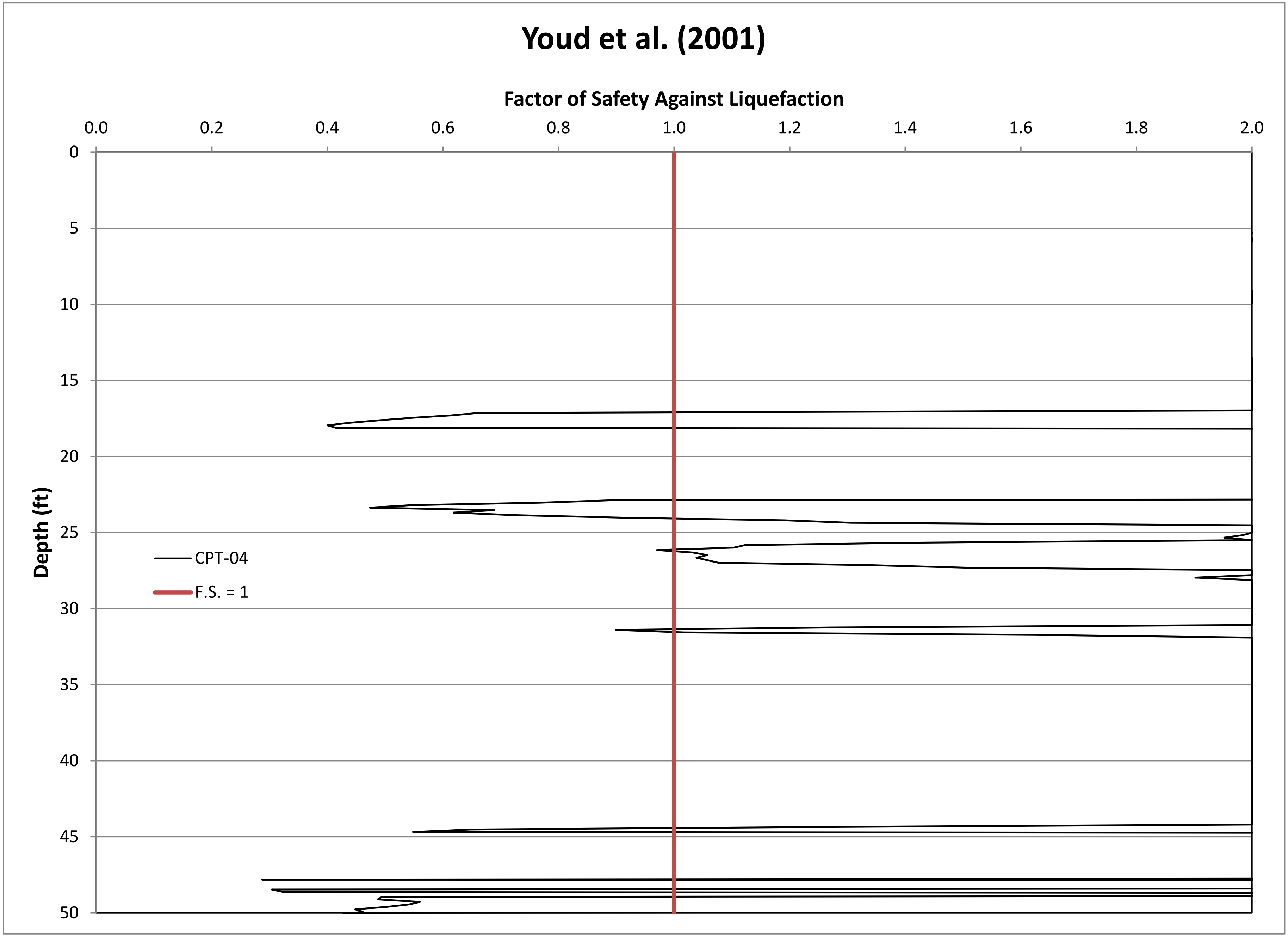
Youd et al. (2001)
Factor of Safety Against Liquefaction
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
CPT-01
F.S. = 1



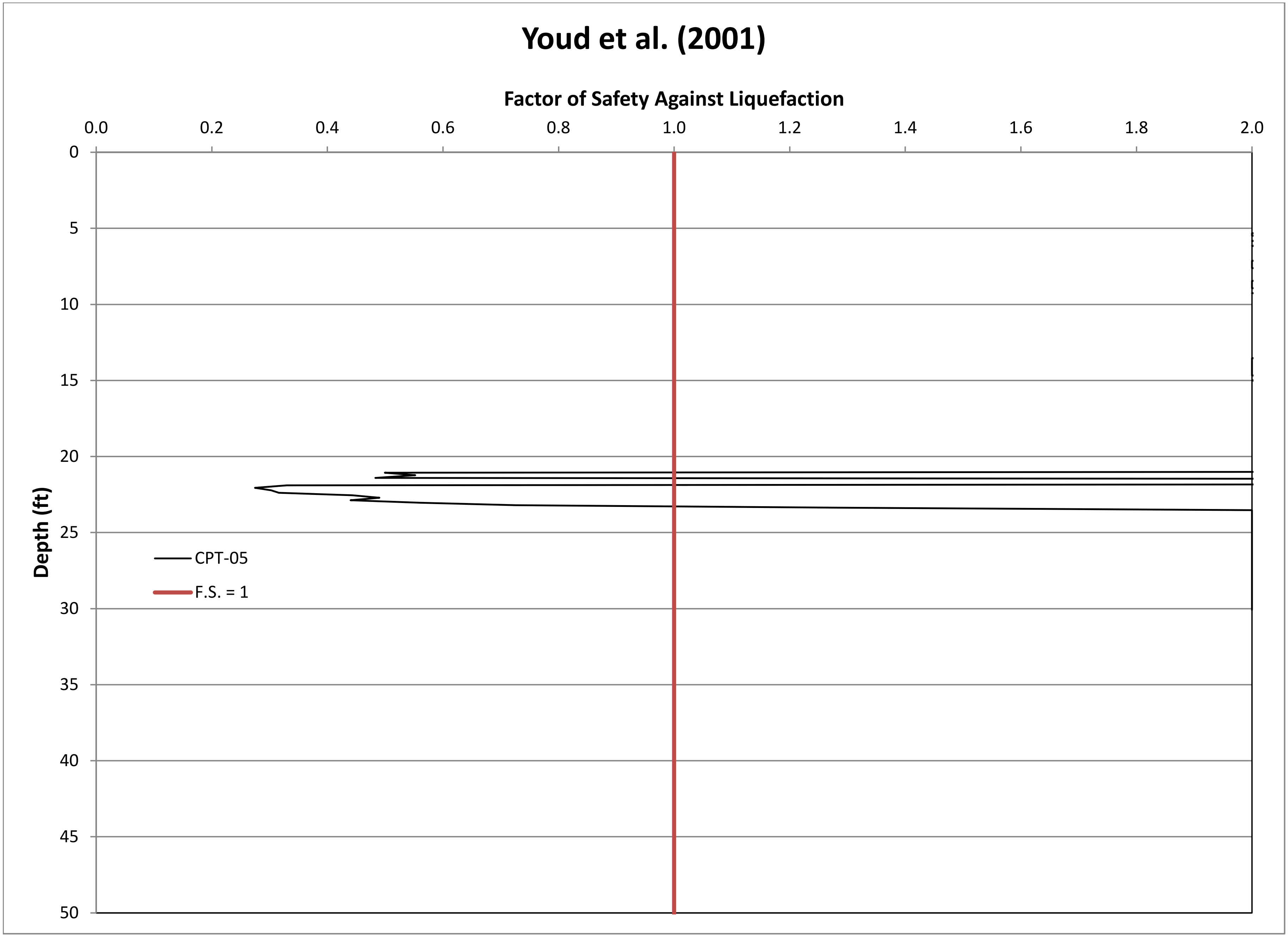
Youd et al. (2001)
Factor of Safety Against Liquefaction
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
0
5
10
15
20
25
30
35
40
45
50
Depth (ft)
CPT-02
F.S. = 1

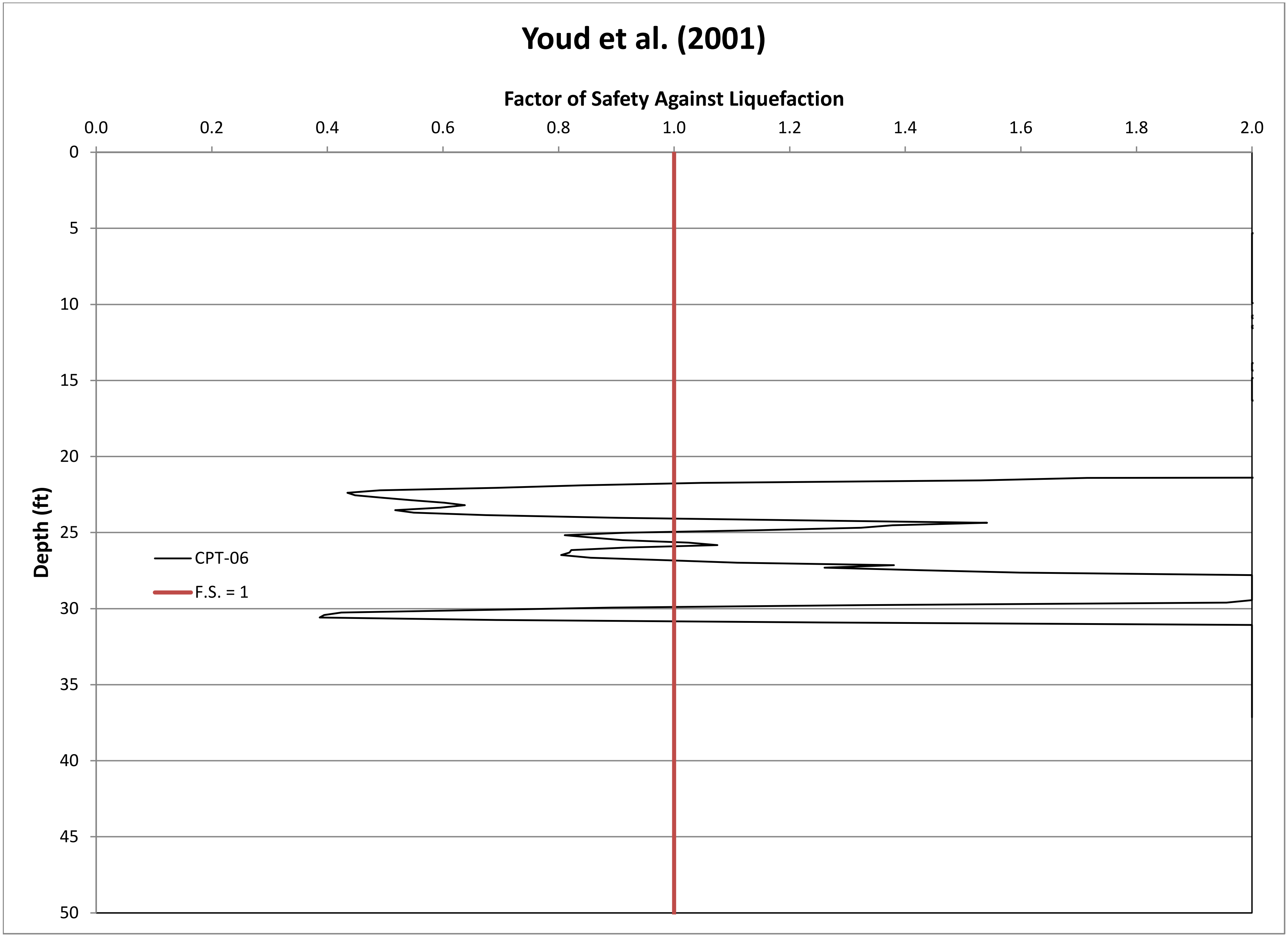


Youd et al. (2001)
Factor of Safety Against Liquefaction
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
CPT-03
F.S. = 1



Youd et al. (2001)
Factor of Safety Against Liquefaction
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
CPT-04
F.S. = 1


Youd et al. (2001)
Factor of Safety Against Liquefaction
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
CPT-05
F.S. = 1



Youd et al. (2001)
Factor of Safety Against Liquefaction
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
CPT-06
F.S. = 1

APPENDIX G

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT
(by ASFE)

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.
The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. *No one except you* should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you -* should apply the report for any purpose or project except the one originally contemplated.

A Geotechnical Engineering Report Is Based on a Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, Project-specific factors when establishing the scope of a study. Typical factors include the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, *do not rely on a geotechnical engineering report that was:*

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, always inform your geotechnical engineer of project changes-even minor ones-and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations*. Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an *opinion* about subsurface conditions throughout the site. Actual sub-surface conditions may differ - sometimes significantly - from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions

A Report's Recommendations Are *Not* Final

Do not over-rely on the construction recommendations included in your report. Those *recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability* for the report's recommendations if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject To Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A brand conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce such risks, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a geoenvironmental study differ significantly from those used to perform a geotechnical study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations: e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures*. If you have not yet obtained your own geoenviromental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Rely on Your Geotechnical Engineer for Additional Assistance

Membership in ASFE exposes geotechnical engineers to a wide army of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE

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email: info@asde.org www.asfe.org

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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Carlin Environmental Consulting, Inc.

Assessment > Remediation > Mitigation Design

February 13, 2017

Prepared for:
Sares-Regis Group
18825 Bardeen Ave.
Irvine, CA 92612

Attn: Tom Guiteras
(Transmitted via email to tguiteras@sare-regis.com)

Subject: **Methane Investigation Report – Report on Methane Investigation conducted at 13400 Maxella Ave. Marina Del Rey, California.**

Introduction:
Carlin Environmental Consulting, Inc. (CEC) is pleased to prepare this report regarding the methane investigation conducted at 13400 Maxella Avenue in the City of Marina Del Ray, Los Angeles County, California, 90292, hereafter referred to as the Site. The property identified for this investigation consists of two parcels (APN: 4212-004-015 and 4212-004-021). A previous Phase I Environmental Site Assessment Report conducted by California Environmental and published in September 2016 was reviewed by CEC for relevant information regarding this methane investigation.

The Site consists of approximately 6.81 acres combined over two parcels located at the intersection of Maxella Ave and Glencoe Ave. Currently, the Site is occupied with three commercial use buildings, and one building contains multiple tenants. The remainder of the site is covered with asphalt for parking, sidewalks, or landscaping planters.

Methane Probe Installations and Sampling:
On February 3rd, 2017, CEC personnel installed 11 soil vapor probes to depths of approximately 5 feet below ground surface throughout the Site (Figure 1). Borings were hand augured. Probes were placed according to the LADBS Site Testing Standards for Methane (Figure 2).

Soil gas measurements were taken from an RKI Instruments Eagle Series multi-gas detector. This instrument was utilized to determine the methane concentrations from the probes. The rental company, Geotechnical Services of Tustin, California, which is certified by the manufacturer of the instrument to conduct calibration, calibrated it prior to the days of usage. The instrument was calibrated by the rental company to 25,000 ppm and thus has a +/- accuracy range of 250 ppm. Soil gas measurements were taken on February 8th and 9th.

The field instrument was connected to the probe and allowed to measure methane concentrations continuously as vapor was extracted from the probe. It has been CEC's experience over the last 10+ years that field instrument readings provide equal or better accuracy than laboratory results when measuring methane concentrations. Thus, we recommend no laboratory analysis.

The recorded readings are presented on Table 1 were the highest readings shown by the instrument on each probe. That is some of the values reached a steady state that was slightly lower than the peak value. Nevertheless, we consider the values shown, as indicating that methane in this area of the site needs to be address at the appropriate level.

Investigation Results:
This section provides the results of each of the 11 probes. Each probe was tested twice with at least 24 hours in between. Probe #4 was disturbed and removed between installations and first testing, thus no readings are available.

Table 1 – Methane Probe Readings

Methane Probe Readings (ppm)										
	#1	#2	#3	#5	#6	#7	#8	#9	#10	#11
First Reading 2-8-17	1000	630	15	10	80	460*	440*	n/a*	220*	20
Second Reading 2-9-17	700	1050	40	110	15	300*	230*	290*	380*	120

*Immediate water in tube and unable to acquire reading or immediate water with initial recording.

Conclusions and Recommendations:
The Site is located in a Methane Buffer Zone, as designated by the LADBS. Based on the LADBS Standard Plan for Methane Hazard Mitigation, the Site would be categorized as a Level III Site Design as a result of the highest methane readings being between 1,001 and 5,000 ppm (high of 1,050 ppm) and Design Methane Pressure (inches of water column) ≤ 2".

Under these qualifications, the Site would require, under LADBS Methane Code, no methane mitigation requirements. See the attached Table 1B – Mitigation Requirements for Methane Buffer Zone from Sheet 4 of the LADBS Standard Plan for Methane Hazard Mitigation.

Attachments

Figure 1 – Probe Map
Figure 2 – Soil Gas Probe Set Up
Table 1 – Methane Probe Results
Figure 3 – Table 1B from LADBS Methane Code
Figure 4 – LADBS Form 1 – Certificate of Compliance for Methane Test Data

We appreciate the opportunity to be of service. Please contact us if there are any further questions or comments.

Sincerely,
Carlin Environmental Consulting, Inc.

Gary Carlin
President
Senior Environmental Scientist

Don Terres
P.G. #4349, C.E.G. #1362

CERTIFIED ENGINEERING GEOLOGIST
DONALD A. TERRES
No. CEG 1362
Exp. 1-31-19
STATE OF CALIFORNIA

Justin Allen
Staff Environmental Scientist

Carlin Environmental Consulting, Inc.
Assessment > Remediation > Mitigation Design

Paseo Marina Probe Location Map

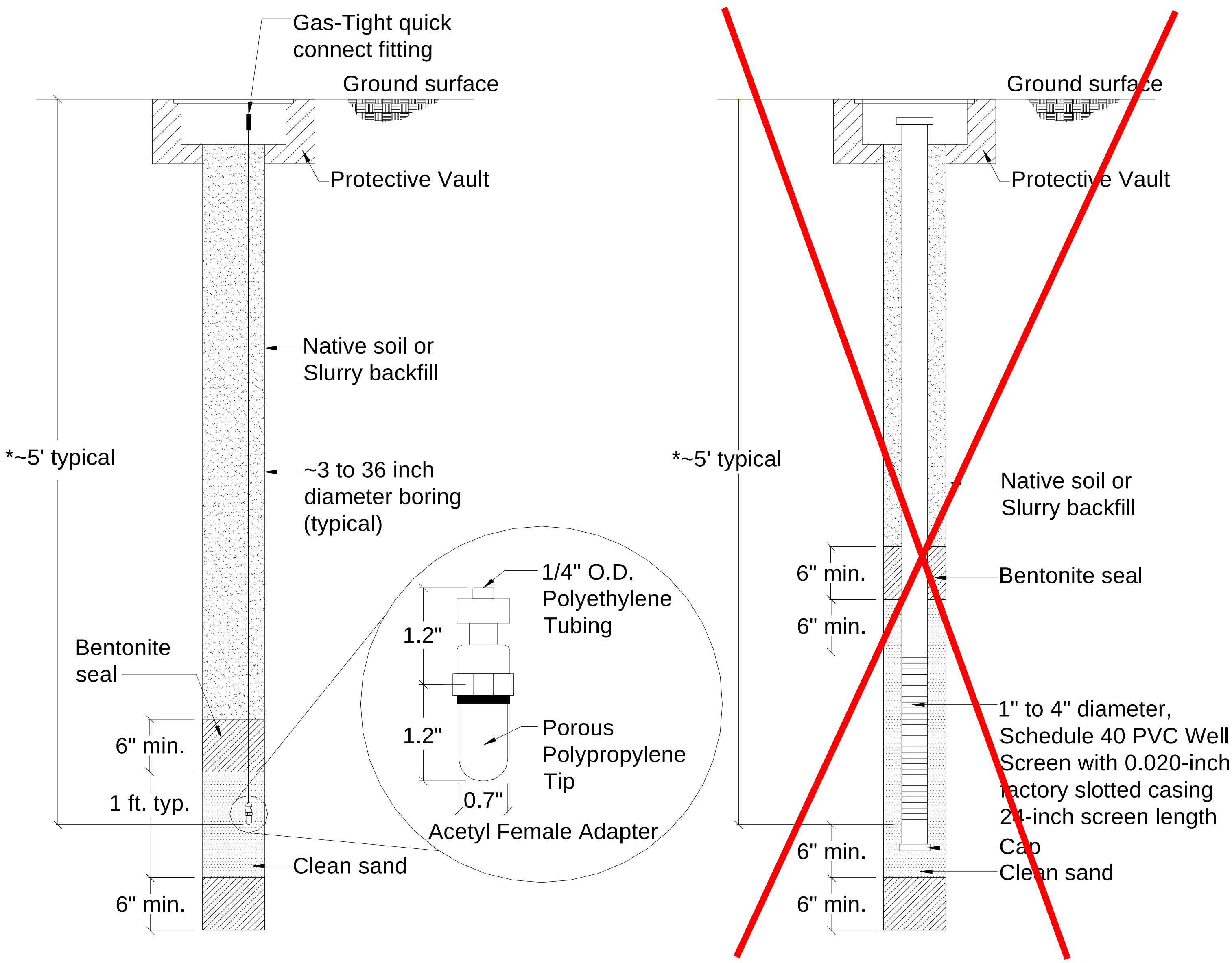
Image taken from Google Maps. 2-9-17

Legend

1 Probe Locations with #	Parcel Boundary
Approximate Site Boundary	

2522 Chambers Road # 100 Tustin, CA 92780
Phone: 714-508-1111

SHALLOW SOIL GAS TEST EQUIPMENT SET-UP



*Note: Measurement from Shallow Soil Gas Test shall be taken above ground water level.

Table 1 - Methane Probe Readings

Sares Regis - Paseo Marina - 13400 Maxella Ave, Marina Del Rey

	2/8/17		2/9/17		Notes	Probe Location
Probe Number	CH4 (ppm)	Time	CH4 (ppm)	Time		
1	1000	8:05 AM	700	2:00 PM		Near Barnes & Noble
2	630	8:10 AM	1050	2:05 PM		In front of Coffee Bean
3	15	8:12 AM	40	2:08 PM		In front of AMC & Fatburger
4	N/A	-	N/A	-	Removed before testing	In front of O' My Sole
5	10	8:16 AM	110	1:35 PM		Side of Pavillions
6	80	8:18 AM	15	1:40 PM		Side of Pavillions
7	460	8:22 AM	300	1:37 PM	Water	Side of Pavillions, further out
8	440	8:27 AM	230	1:43 PM	Water	East side of DSW
9	N/A	8:30 AM	290	1:48 PM	Water	SW side of DSW
10	220	8:35 AM	380	1:52 PM	Water	NW side of DSW
11	20	8:40 AM	120	1:55 PM		West of Barnes & Noble

* Pressure readings for all probes were less than 0.1 inches

CH4 = Methane ppm = parts per million

2-14-17 JA

Table 1B - MITIGATION REQUIREMENTS FOR METHANE BUFFER ZONE (See notes)

Site Design Level			Level I		Level II		Level III		Level IV		Level V
Design Methane Concentration (ppmv)			0 - 100		101 - 1,000		1,001 - 5,000		5,001 - 12,500		> 12,500
Design Methane Pressure (See note 1) (inches of water column)			≤ 2"	> 2"	≤ 2"	> 2"	≤ 2"	> 2"	≤ 2"	> 2"	All Pressure
PASSIVE SYSTEM	De-watering System			X		X		X	X	X	X
PASSIVE SYSTEM	Sub-Slab Vent System	Perforated Horizontal Pipes		X		X		X	X	X	X
PASSIVE SYSTEM	Sub-Slab Vent System	Gravel Blanket Thickness Under Impervious Membrane		2"		3"		3"	2"	4"	4"
PASSIVE SYSTEM	Sub-Slab Vent System	Gravel Thickness Surrounding Perforated Horizontal Pipes		2"		3"		3"	2"	4"	4"
PASSIVE SYSTEM	Sub-Slab Vent System	Vent Risers		X		X		X	X	X	X
PASSIVE SYSTEM	Impervious Membrane			X		X		X	X	X	X
ACTIVE SYSTEM	Sub-Slab System	Mechanical Extraction System (See note 2)								X	X
ACTIVE SYSTEM	Lowest Occupied Space System	Gas Detection System (See note 3)		X		X		X	X	X	X
ACTIVE SYSTEM	Lowest Occupied Space System	Mechanical Ventilation (See Notes 3, 4, 5)		X		X		X	X	X	X
ACTIVE SYSTEM	Lowest Occupied Space System	Alarm System		X		X		X	X	X	X
ACTIVE SYSTEM	Control Panel			X		X		X	X	X	X
MISC. SYSTEM	Trench Dam			X		X		X	X	X	X
MISC. SYSTEM	Conduit or Cable Seal Fitting			X		X		X	X	X	X
MISC. SYSTEM	Additional Vent Risers (See note 5)										X

Produced from Sheet 4 of the LADBS Methane Code

2-16-17

FORM 1 - CERTIFICATE OF COMPLIANCE FOR METHANE TEST DATA

Part 1: Certification Sheet

Site Address: 13400 Maxella Ave Marina Del Rey, CA 90292
Legal Description: Tract: ______ Lot: ______ Block: ______
Building Use: Commercial

Architect's, Engineer's or Geologist's Stamp:

CERTIFIED ENGINEERING GEOLOGIST
DONALD A. TERRES
No. CEG 1362
Exp. 1-31-19
STATE OF CALIFORNIA

Name of Architect, Engineer, or Geologist:
Carlin Environmental Consulting, Inc.
Mailing Address:
2522 Chambers Rd #100
Tustin, CA 92780
Telephone: (714) 508-1111

Name of Testing Laboratory:
Geokinetics
City Test Lab License #: TA 10234
Telephone: (714) 508-1111

I hereby certify that I have tested the above site for the purpose of methane mitigation and that all procedures were conducted by a City of Los Angeles licensed testing agency in conformity with the requirements of the LADBS Information Bulletin P/BC 2002-101. Where the inspection and testing of all or part of the work above is delegated, full responsibility shall be assumed by the architect, engineer or geologist whose signature is affixed thereon.

Signed: ______________________ date 2-15-2017

Required Data:

- Project is in the (Methane Zone) or (Methane Buffer Zone) (Tidal influence)
- Depth of ground water observed during testing: 6-8' feet below the Impervious Membrane.
- Depth of Historical High Ground Water Table Elevation*: 15' feet below the Impervious Membrane.
- Design Methane Concentration**: 1050 parts per million in volume (ppmv).
- Design Methane Pressure***: <2" inches of water column.
- Site Design Level: (Level I, Level II, Level III, Level IV, Level V) with ≤2" inches of water column.

De-watering:

- De-watering (is) (is not) required per Section 91.7104.3.7.
- Pump discharge rate N/A cubic feet per minute per reference geology or soil report: N/A dated N/A.

Additional Investigation:

- Additional investigation (was) (was not) conducted.

Latest Grading on Site:

- Date of last grading on site (was) (was not) more than 30 days before Site Testing.
- See Attached explanation of the effect on soil gas survey results by grading operations.

Notes:

* Historical High Ground Water Table Elevation shall mean the highest recorded elevation of ground water table based on historical records and field investigations as determined by the engineer for the methane mitigation system.

** Design Methane Concentration shall mean the highest recorded measured methane concentration from either Shallow Soil Gas Test or any Gas Probe Set on the site.

*** Design Methane Pressure shall mean the highest total pressure measured from any Gas Probe Set on the site.

LA DBS
DEPARTMENT OF BUILDING AND SAFETY

FORM 1 (CONTINUED) - CERTIFICATE OF COMPLIANCE FOR METHANE TEST DATA

Part 2: Test Data - Shallow Soil Gas Test and Gas Probe Test

Site Address: 13400 Maxella Ave
Description of Gas Analysis Instrument(s):
Instrument Name and Model: RKI Eagle   Instrument Accuracy: ± 250 ppmv.
City of Los Angeles Testing License #: TA 10234

Date	Time	Probe Set #	Concentration (ppmv)	Pressure (inches water column)	Probe Depth (feet)	Description / Probe Location
2-8-17	8:05	1	1000	<2"	5'	See map
	8:10	2	630			See map
	8:12	3	15			probe removed
	-	4	-			See map
	8:16	5	10			"
	8:18	6	80			"
	8:22	7	460			"
	8:27	8	440			"
	8:30	9	-			"
	8:35	10	220			"
	8:40	11	20			"
2-9-17	2:00	1	700			"
	2:05	2	1050			"
	2:08	3	40			"
	-	4	-			probe removed
	1:35	5	110			See map
	1:40	6	15			"
	1:37	7	300			"
	1:43	8	230			"
	1:48	9	290			"
	1:52	10	380			"
	1:55	11	120			"