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GEOTECHNICAL SITE INVESTIGATION
SIXTH STREET VIADUCT - PARC IMPROVEMENTS
LOS ANGELES, CALIFORNIA

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

GEOTECHNICAL SITE INVESTIGATION
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1.0 INTRODUCTION

Hushmand Associates, Inc. (HAI) is pleased to provide Tetra Tech Incorporated (TTI) and the City of Los Angeles Bureau of Engineering (City) with this report for geotechnical findings and design recommendations for the proposed Landscape Design of West Park, Arts Plaza, Tunnel Rehabilitation, and East Park areas as part of the Sixth Street Viaduct Replacement Project (PARC Project), as shown in Figure 1. The project site extends along East Sixth Street from Mateo Street and along Whittier Boulevard to west of U.S. Highway 101 (Figure 1).

As part of the PARC project, the following facilities (as shown in Figure 2) are proposed for which design recommendations are requested by TTI:

- 700-square foot (SF) Restroom Building;
- Arts Plaza;
- Los Angeles River Bike Path; and
- 2,000 SF Restroom/Concession Building.

HAI has reviewed the available existing geotechnical investigations and reports for the project area. The following reports from previous investigations in addition to the current investigation were used in providing design recommendations:

- Foundation Report, Sixth Street Viaduct (Replace) Bridge No. 53C-1880/53-0595, Sixth Street Viaduct Replacement Project, Los Angeles, CA, 07-LA-101, PM S0.20, prepared by Earth Mechanics, Inc. for HNTB Corporation, and City of Los Angeles, Bureau of Engineering, dated July 19, 2015, EMI Project No. 13-102.
- Foundation Report, West, North East, and South East Bike Ramps, Sixth Street Viaduct Replacement Project, Los Angeles, CA, 07-LA-101, PM S0.20, prepared by Earth Mechanics, Inc. for HNTB Corporation, and City of Los Angeles, Bureau of Engineering, dated March 15, 2016, EMI Project No. 13-102.
- Geotechnical Drilling Report, Sixth Street Viaduct Replacement Project, Installation of Shoring Piles, Westerly Side of the Los Angeles River at Sixth Street, Los Angeles, CA 90013 prepared by California Testing & Inspections for Skanska, Stacy and Witbeck, dated July 14, 2017.

This report was prepared in accordance with the scope of work of HAI's Proposal No. P16-0728R. The scope of work comprised conducting a field investigation, performing laboratory testing and engineering analyses, and preparing this report presenting our findings, conclusions, and recommendations for the project.

2.0 SCOPE OF SERVICES

The scope of this geotechnical investigation comprised field exploration, perform percolation tests, laboratory testing program, interpretation of field and laboratory test data, engineering analyses, and preparation of this report providing geotechnical engineering data for designing the proposed PARC facilities.

Our scope of work included the following tasks:

- Project coordination and review of existing information provided by TTI.
- Site reconnaissance to document the existing condition of the site, and to select and mark the proposed boring locations. Coordinate with Underground Service Alert for marking underground utility locations prior to drilling.
- Drilling and sampling at nine (9) locations provided by TTI in the project area. The purpose of these borings was to assess subsurface soil conditions and collect soil samples for geotechnical and agronomic laboratory testing.
- Performing percolation tests at six (6) boring locations specified by TTI.
- Laboratory testing of soil samples from the drilling program and field and laboratory data compilation and engineering analyses to determine physical properties of the site soils.
- Compilation of field and laboratory data, and engineering analyses required to provide design recommendations for the proposed PARC improvements; and
- Preparation of this report presenting our findings, conclusions and recommendations pertaining to design and construction of PARC improvements.

The engineering conclusions and recommendations presented herein address the following:

- Potential seismic hazards;
- Site seismic design coefficients;
- Earthwork and compaction criteria;
- Lateral earth pressures;
- Shallow foundation design parameters;
- Agronomic Testing of site soils;
- Pavement design;
- Pipe bedding and shading and trench zone requirements;
- Concrete flatworks, and
- Corrosion potential of soils.

Our scope of services did not include evaluations or recommendations regarding groundwater quality, hazardous waste, asbestos or lead abatement, or demolition of existing structures, utilities, or other facilities.

3.0 FIELD EXPLORATION

3.1 PRE- FIELD INVESTIGATION ACTIVITIES

Prior to the field investigation, a site reconnaissance was performed by our staff to mark the proposed boring locations and to evaluate this location with respect to utility lines and other subsurface structures. Underground Service Alert (USA) was then notified for the proposed nine (9) boring locations (GB-1, GB-2, GB-3, GB-4, GB-6, GB-7, GB-8, GB-9, and GB-10 with corresponding USA ticket nos. A73041625, A73041628, A73041630, A73041633, A73041636, A173100477, A73041642, A73041643, and A73041645, respectively).

The field investigation activities were performed from November 3 through 8, 2017 and consisted of drilling nine (9) borings to a maximum depth of 39.08 feet below ground surface (bgs) and performing percolation tests at six (6) different locations (Borings GB-1, GB-3, GB-6, GB-7, GB-8, and GB-10) at the depths of around 5 to 6 feet bgs.

3.2 SOIL BORINGS

The borings were drilled with 8-inch outside diameter hollow-stem auger (HSA) on a truck-mounted drill rig. California Pacific Drilling (CalPac) from Calimesa, California was subcontracted to drill the boring under the field supervision of HAI personnel. In order not to interfere with any utilities at the proposed drilling location, the upper five (5) feet of onsite soils were drilled using hand auger drilling equipment. Bulk samples were retrieved from the upper five (5) to six (6) feet of onsite soils at the drilling location.

At deep boreholes (GB-2, GB-4, and GB-9), relatively undisturbed samples were recovered from five (5) feet to the maximum drilling depth. Samples were taken at about every 2.5 or 5 feet using either Standard Penetration Test (SPT) sampler or a Modified California (MC) ring sampler. The MC sampler has a 2.42-inch inside diameter and a 3.0-inch outside diameter and was used to collect relatively undisturbed samples.

After the sampler was withdrawn from the boring, soil samples were carefully removed, visually inspected and classified according to the Unified Soil Classification System (USCS), sealed to reduce moisture loss, and delivered to our laboratory for further inspection, soil classification, and testing. All the deep boreholes were backfilled with cement-bentonite grout. The excess soil cuttings generated from drilling activities were stored in drums and temporarily stored at the site. After receipt of analytical tests drums containing the soil cuttings were disposed offsite by professional drum disposal company, Belshire Environmental Services, Inc.

Approximate locations of the exploratory borings are shown on Figure 3. Logs of exploratory borings, as well as a key to these logs, are presented in Appendix A.

Table 3.1 Summary of Soil Borings

Boring ID	Final Depth (ft)	Purpose
GB-1	6.00	Percolation Test & Agronomic Testing
GB-2	21.00	Geotechnical Design Parameters
GB-3	6.00	Percolation Test & Agronomic Testing
GB-4	39.08	Geotechnical Design Parameters
GB-6	6.08	Percolation Test & Agronomic Testing
GB-7	6.04	Percolation Test & Agronomic Testing
GB-8	5.67	Percolation Test & Agronomic Testing
GB-9	21.50	Geotechnical Design Parameters
GB-10	6.08	Percolation Test & Agronomic Testing

3.3 SOIL PERCOLATION/INFILTRATION TESTS

Per the locations provided by TTI, we performed six (6) infiltration rate tests at the borehole locations (GB-1, GB-3, GB-6, GB-7, GB-8, and GB-10) from November 6 through 8, 2017 as shown in Figure 3, in general accordance with the County of Los Angeles guidelines:

- Guidelines for Design, Investigation, and Reporting Low Impact Development Stormwater Infiltration, Document No. GS200.1, Administrative Manual, County of Los Angeles, Department of Public Works, Geotechnical and Material Engineering Division.

To perform the percolation test, 8-inch diameter hand-auger borings were excavated to approximate depths ranging from 5 feet to 6 feet below the existing ground surface. Due to gravelly and cobbly nature of the soils, some of the (GB-1, GB-6, and GB-6) 8-inch diameter holes became larger and irregular shape. A 3-inch diameter perforated PVC pipe with end cap was installed in each of the percolation test borings. Annular space between PVC pipe and native soil were filled with pea gravel.. The hole was pre saturated following the above mentioned guidelines (LADWP, 2014). Finally, the PVC pipe was filled up to the desired elevation with water and the percolation rate was monitored. After the test, the hole was backfilled with the gravels.

The infiltration test results are presented in Appendix A and summarized in Table 3.2.

Table 3.2 Summary of Field Infiltration Test Results

Boring ID	Infiltration Rate (in/hr)
GB-1	58.1
GB-3	17.8
GB-6	116.8
GB-7	37.9
GB-8	38.9
GB-10	16.6

3.4 AGRONOMIC TESTS

As specified in the proposal and provided information by TTI, we collected six (6) soil samples to perform agronomic testing. Wallace Laboratories from El Segundo, California was subcontracted to perform the required laboratory testing and preparation of Soil Management Report.

4.0 LABORATORY TESTING

4.1 GEOTECHNICAL

Soil samples collected during the field investigation were delivered to HAI's geotechnical laboratory for further examination and testing. Selected soil samples were visually inspected to evaluate their physical characteristics including in-situ conditions, classification, index and engineering properties.

The tests were performed in accordance with the following testing procedures:

- In-situ Moisture Content (ASTM D2216) and Dry Density (ASTM D2937);
- Particle Size Analysis (ASTM D6913);
- Swell/Collapse Potential (ASTM D4546);
- Direct Shear (ASTM D3080);
- R-value (CTM 301); and

- Corrosion potential (including pH, minimum resistivity, soluble sulfates and soluble chlorides tests, in accordance with Cal DOT Standard Test Nos. 643, 417 and 422).

R-value and Corrosion potential tests were performed by Labelle-Marvin and Project X laboratories, respectively. Laboratory test results are presented in Appendix B.

4.2 AGRONOMIC TESTING

Wallace Laboratories performed the required laboratory testing and prepared a Soil Management Report as attached in Appendix C.

4.3 ENVIRONMENTAL TESTING FOR SOIL DISPOSAL

To dispose the soil cuttings generated during the field investigation activities, representative composite samples from the soil drums for the following chemical testing:

- Title 22 Metals using EPA Method 6010B;
- Total Petroleum Hydrocarbons (TPH) using EPA Method 8015 Modified; and
- Volatile Organic Compounds (VOCs) using EPA Method 8260.

Based on the obtained test results, the soil cuttings were profiled as non-hazardous. The soil cuttings were disposed by Belshire Environmental Services, Inc. from Foothill Ranch, California at the Soil Recycling Facility located in Adelanto, CA with appropriate soil manifest documentation. The manifest generated during the disposal is attached in Appendix A.

5.0 SITE AND SUBSURFACE CONDITIONS

The Sixth Street Viaduct crosses the Los Angeles River in a predominantly commercial area of downtown Los Angeles. The site elevations vary between 310 feet above mean sea level (AMSL) at the east abutment to around 250 AMSL feet at the west abutment with the lowest elevation in the river channel area around 210 AMSL feet.

5.1 LOCAL GEOLOGY

According to the California Geological Survey (CGS) Seismic Hazard Zone Report for the Los Angeles 7.5-Minute Quadrangle (CGS, 1998), the project site is located in a region with Holocene age Quaternary alluvial deposits fan consisting sand, silt and gravel. Regional geology is presented in Figure 4.

More detailed discussion about the site geologic conditions is presented in foundation reports prepared by Earth Mechanics, Inc. (EMI) for Viaduct Replacement and Bike Ramps.

5.2 SUBSURFACE SOILS

The subsurface soils encountered during the current investigation were very consistent with those observed during the previous investigations. The boreholes performed during this investigation were shallow compared to the available information from previous investigations. The subsurface conditions consisted of about 5 to 20 feet of fill soils consisting of loose to medium dense silty sand to poorly graded sand with silt. The fill is underlain by generally dense to very dense coarse grained materials comprising of sands, silty sands, gravelly sands, sandy gravels, cobbles, and possibly boulders. Detailed information on deeper soil deposits is described in EMI's 2015 Foundation Report for Viaduct Replacement. As part of this work, the subsurface information from previous investigations was also used in our design analysis for obtaining recommendations.

5.3 GROUNDWATER

Groundwater was not encountered in any of the boreholes performed during this investigation. Based on the information from previous investigations, the groundwater elevation varies significantly along the viaduct length. Groundwater elevations encountered in the previous field investigations discussed in EMI's 2015 Foundation Report for the Viaduct Replacement. Historic high groundwater levels according to California Geological Survey (CDMG, 1998) are much lower than those encountered in those field investigations. Therefore, design groundwater elevations proposed by EMI were used in our analysis for each proposed PARC facility. The design groundwater elevations are specified in the notes to the generalized soil profiles for each PARC facility (Table 5.1 through Table 5.4), which are presented in the following section.

5.4 GENERALIZED SOIL PROFILES

Based on the information collected in the previous and current field investigations, generalized soil profiles were developed for use in developing seismic and foundation recommendations for the proposed PARC facilities. Shear strength parameters were estimated using laboratory test data and correlations between field blow count and shear strength. The generalized soil profiles for the proposed PARC facilities are presented in Table 5.1 through Table 5.4.

Table 5.1 Generalized Soil Profile for 700 SF Restroom Building

Elevations of Soil Layer (ft)		Predominant Soil Type	Total Unit Weight (pcf)	Friction Angle (degrees)	Cohesion/Undrained Shear Strength (psf)
Top	Bottom				
Ground Surface	232	SP, SP-SM, SM	110	30	200
232	222	SP, SW, SP-SM	120	35	0
222	150	GP, GP-SM, SW, SW-SM, SM	125	38	0
150	Below	CL, ML	125	0	6,000

Notes:
1. Based on HAI Boring GB2, and EMI Borings A-13-01, 08-03, 08-04.
2. Design groundwater at El. +185 ft.
3. Ground surface at approximately El. +253.

Table 5.2 Generalized Soil Profile for Arts Plaza

Elevations of Soil Layer (ft)		Predominant Soil Type	Total Unit Weight (pcf)	Friction Angle (degrees)	Cohesion/Undrained Shear Strength (psf)
Top	Bottom				
Ground Surface	242	SP, SM	110	30	100
242	222	SP, SP-SM, SM	120	34	0
222	147	GP, GP-GM, SP, SP-SM	125	38	0
147	122	CL, ML	125	0	5,000
122	Below	CL, ML	125	0	6,000

Notes:
1. Based on HAI Boring GB4 and EMI Borings R-13-02, 08-06, A13-21.
2. Design groundwater at El. +195 ft.
3. Ground surface at approximately El. +252.

Table 5.3 Generalized Soil Profile for Los Angeles River Bike Path

Elevations of Soil Layer (ft)		Predominant Soil Type	Total Unit Weight (pcf)	Friction Angle (degrees)	Cohesion/Undrained Shear Strength (psf)
Top	Bottom				
Ground Surface	222	SP-SM, SM	110	32	100
222	210	GP, SP, SP-SM, SM	120	34	0
210	152	GP, SP, SP-SM, SW-SM, SM, SC	130	38	0
152	110	CL, ML	125	0	5,000
110	Below	CL, ML	125	0	6,000

Notes:
1. Based on EMI Borings R-13-03, R-13-04, A-13-23, and 04-02.
2. Design groundwater at El. +210 ft.
3. Ground surface at approximately El. +243.

Table 5.4 Generalized Soil Profile for 2,000 SF Restroom/Concession Building

Elevations of Soil Layer (ft)		Predominant Soil Type	Total Unit Weight (pcf)	Friction Angle (degrees)	Cohesion/Undrained Shear Strength (psf)
Top	Bottom				
Ground Surface	232	SP, SP-SM	110	32	0
232	222	SP, SP-SM	125	35	0
222	200	GP, GP-GM, SP, SP-SM, SW-SM	130	38	0
200	173	SP-SM, SM, SC, ML	125	32	0
173	160	SP-SM	130	38	0
160	140	CL, ML	125	0	6,000
140	Below	CL	125	0	8,000

Notes:
1. Based on HAI Boring GB9 and EMI Borings R-13-12, 04-05.
2. Design groundwater at El. +200 ft.
3. Ground surface at approximately El. +251.

6.0 SEISMIC DESIGN CONSIDERATIONS

6.1 SITE SEISMICITY

The project site is located within a seismically active region. The site is not located within a State-defined Alquist-Priolo Fault Hazard zone, but there are several faults in the region that could produce significant ground shaking.

More detailed site seismicity is discussed in EMI's 2015 Foundation Report for the Viaduct Replacement. The nearby active faults to the project site based on Caltrans Fault Database are summarized in the following Table 6.1.

Table 6.1 Nearby Active Faults

Fault Name	Fault Type	Maximum Earthquake (M_{max})	Approximate Distance from Site (miles)
Elysian Park (Lower CFM)	Reverse	6.7	1.5
Elysian Park (Upper)	Reverse	6.6	1.9
Puente Hills (LA)	Reverse	6.9	3.7
Hollywood	Strike-Slip	6.6	5.75
Raymond	Strike-Slip	6.7	5.7
Verdugo-Eagle Rock	Reverse	6.8	7.8
Newport-Inglewood Fault Zone	Strike-Slip	7.2	7.9
Elsinore Fault Zone (Whittier section)	Strike-Slip	7.5	10.3

6.2 SITE SEISMIC DESIGN COEFFICIENTS

The seismic design coefficients based on Chapter 11 of the ASCE 7-10 are provided in Table 6.2.

Table 6.2 Site Categorization and Site Coefficients

Categorization/Coefficient	Design Value*
Site Coordinates	34.03851°N, 118.22804°W
Site Soil Classification	S_D
Short Period Spectral Acceleration S_S (g)	2.353
1-sec. Period Spectral Acceleration S_1 (g)	0.823
Short Period (MCE_R) Spectral Acceleration S_{MS} (g)	2.353
1-sec. Period (MCE_R) Spectral Acceleration S_{M1} (g)	1.234
Short Period Design Spectral Acceleration S_{DS} (g)	1.568
1-sec. Period Design Spectral Acceleration S_{D1} (g)	0.823

Note: MCE_R stands for Risk-Targeted Maximum Considered Earthquake.

* Values obtained from *USGS U.S. Seismic Design Maps* tool, based on 2010 ASCE 7 Standard with March 2013 errata,

http://earthquake.usgs.gov/designmaps/us/application.php

Based on the available shear wave velocity data from previous site investigations, average shear wave velocity for the top 100 feet (V_{s30}) is around 1,050 ft/s. Therefore, the site classification was assumed as Site Class S_D. The Mapped Peak Ground Acceleration (PGA_M) adjusted for site effects at the site is 0.886g, as defined by ASCE 7-10 Chapter 11. Note that the PGA obtained using USGS database corresponds to earthquake hazard event with a return period of 2,475 years (2% in 50 years) whereas PGA of 0.7g obtained by EMI from Caltrans ARS is for a return period event of 975 years.

6.3 FAULT RUPTURE HAZARDS

Primary ground rupture is ground deformation that occurs along the surface trace of an active fault during an earthquake. CGS defines an active fault as one that has experienced surface rupture within the last approximately 11,000 years (Holocene time). According to CGS Special Publication 42 (1997a), the proposed improvements are not located within an Alquist-Priolo Earthquake Fault Zone. The seismic

hazard map is presented on Figure 5. No known surface expression of active faults is believed to exist within the site. Based on the above mentioned reference, the potential for a fault rupture through the site is considered very low.

6.4 LIQUEFACTION

Soil liquefaction results in loss of strength during cyclic loading, such as imposed by earthquakes. Soils most susceptible to liquefaction are loose to moderately dense, saturated granular soils with poor drainage, such as silty sands or sands and gravels capped by or containing seams of impermeable sediment or non-plastic fine-grained soils. When seismic ground shaking occurs, the cohesionless soil is subjected to cyclic shear stresses that can cause increased pore water pressure that induces liquefaction. Liquefaction can cause softening and large cyclic deformations. In loose granular soils, softening can also be accompanied by a loss of shear strength that may lead to large shear deformations or even flow failure under moderate to high shear stresses, such as beneath a foundation or sloping ground (NCEER/NSF, 1998). Loose granular soil can also settle (densify) during liquefaction and as pore pressures dissipate following an earthquake.

According to the CGS Seismic Hazard Map for the Los Angeles Quadrangle (CGS, 1998), the project site is not located within liquefaction-prone zone. In addition, due to relatively deep groundwater and dense granular onsite soils, soil liquefaction is not expected to develop at the project site during a seismic event. Therefore, a liquefaction potential analysis in accordance with the "Guidelines for Evaluating and Mitigating Seismic Hazards in California" Special Publication 117 of the CGS (formerly the Division of Mines and Geology) is not performed for this project.

6.5 LANDSLIDES

The subject of landslides is a widely encompassing subject and cannot be fully covered in a brief summary; however, landslides are downslope motions of conglomerations of earth materials or bedrock or combinations of both. Landslides are a more defined unit and are similar to slumps, but are on a larger scale. They can move in a translational movement or rotational settlement or motion. It occurs because of the loss of ability of earth materials to maintain their integrity at a specific gradient and settle or deform into a lesser gradient or position of greater equilibrium. The internal strength of the material is lost and the material settles into a form where the mass is centralized on the downhill side of motion. Landslides are usually associated with water increasing the unit weight and decreasing the internal strength of the materials. The chances of a landslide occurring are increased by increases in slope gradient, looseness of materials, unfavorable bedding (out of slope), clay content of the bedrock, underground springs, unfavorable slope orientation with existing fault boundaries, human disturbance of the landslide or its boundaries, rise of groundwater, earthquake forces helping to mobilize the mass, looseness of in-situ materials, increases in water content, and disturbance of the lateral confining forces and/or the toe of a slope.

According to the CGS Seismic Hazard Map for the Los Angeles Quadrangle (CGS, 1998), the project site is not located within earthquake-induced landslide zones.

6.6 COLLAPSE POTENTIAL

Collapsible soils are soils that undergo settlement upon wetting, even without the application of additional load. Water weakens or destroys the bonds between soil particles and severely reduces the bearing capacity of the soil. Typical collapsible soils are lightly colored, are low in plasticity and have relatively low densities.

Based on our current investigation, laboratory analysis and experience with similar projects in the vicinity, it is not anticipated that the soils underlying the subject site are susceptible to collapse. Therefore, potential impacts due to collapsible soil conditions are expected to be low.

6.7 CORROSION POTENTIAL

Three (3) samples were collected at different depths and were submitted to Project X Corrosion Testing Laboratory for pH, minimum resistivity, soluble sulfates and soluble chlorides content testing. The results of the tests are summarized in Table 1. Details of the test results are presented in Appendix B.

Table 6.3 Results of Corrosivity Testing

Boring ID	Sample Depth (feet)	Chloride (mg/kg)[1]	Sulfate (mg/kg)[1]	pH	Minimum Resistivity (ohm-cm)	Estimated Corrosivity Based on Resistivity[2]	Estimated Corrosivity Based on Sulfates[3]	Estimated Corrosivity Based on Caltrans Provision[4]
GB-2	0-5	108	30	8.97	5,695	Mildly Corrosive	S0	Non Corrosive
GB-4	20-21.5	27	15	9.01	12,060	Very Mildly Corrosive	S0	Non Corrosive
GB-9	0-5	42	24	9.75	5,360	Mildly Corrosive	S0	Non Corrosive

Notes:
(1) mg/kg = milligrams per kilogram (parts per million, ppm) of dry soil.
(2) The approximate relationship between soil resistivity and soil corrosivity was developed based on the findings of studies presented in ASTM STP 1013 titled "Effects of Soil Characteristics on Corrosion" (February, 1989).
(3) The approximate relationship between water-soluble sulfate (SO_4) in soil (percent by weight) and soil corrosivity was developed based on the 2016 California Building Code (CBC), referring to ACI 318-14.
(4) Based on Caltrans Corrosion Guidelines Version 2.1 dated January 2015, the site is considered to be corrosive if Chloride concentration is 500 ppm or greater, or sulfate concentration is 2000 ppm or greater, or the pH is 5.5 or less.

These above tests were performed for screening purposes only. Our firm does not practice corrosion engineering; therefore, we recommend that a corrosion engineer be retained to evaluate the corrosion potential of the onsite soils and any impact on the proposed project structures.

7.0 PAVEMENT DESIGN

Based on R-value test results from representative subgrade soil samples collected during the field investigation, Table 7.1 presents our recommendations for minimum pavement structural sections for traffic index (TI) values from 6 to 12.

Table 7.1 Recommended Pavement Structural Sections (Design R-value = 65)

Option	Traffic Index	6	7	8	9	10	11	12	13
I	Hot Mix Asphalt (in.)	3.0	4.0	5.0	5.5	6.5	7.0	7.5	8.0
	Class 2 Aggregate Base (in.)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
II	Portland Cement Concrete (in.)	8.5				9.0	10.0	-	-
	Class 2 Aggregate Base (in.)	6.0				7.5	8.5	-	-
III	Full-Depth Hot Mix Asphalt (in.)	4.0	5.0	6.0	7.0	8.0	9.0	9.5	10.5

Notes:
1. Caltrans Class 2 aggregate base; minimum R-Value equal to 78.
2. Minimum layer thickness of aggregate base is 4.5 inches.
3. Design life of pavement sections is 20 years.
4. Thicknesses shown for Jointed Plain Concrete Pavement (JPCP) are for doweled pavement only.
5. Thickness shown considers a rigid pavement structural section with lateral support.
6. Transverse construction joints in the concrete slab should be placed at regular intervals not exceeding 15 feet in both directions and should be doweled per Caltrans. To control shrinkage and temperature stresses which may cause cracks, a 4x4–W1.4xW1.4 welded wire fabric should be placed in the middle of the concrete slab. This steel reinforcement is assumed not to contribute for the strength of pavement structural section.

The recommendations provided below are considered general and should be complemented with latest editions of Caltrans' Highway Design Manual (HDM) and the Standard Specifications of Public Work Construction "Greenbook", including all subsequent amendments, supplements and additions. In case of a conflict, the most stringent recommendations should prevail.

Subgrade Preparation: In the case of full depth asphalt pavement, the top 8 inches of the subgrade soil should then be scarified, brought to 2 to 3 percent above optimum moisture content and re-compacted to a minimum of 90 percent relative compaction in accordance with ASTM D1557, latest version. In the case of asphalt over aggregate base pavement, the top 8 inches of the subgrade soil should then be scarified, brought to 2 to 3 percent above optimum moisture content and re-compacted to a minimum of 90 percent relative compaction in accordance with ASTM D1557, latest version. Unsuitable materials encountered during grading should be removed to the satisfaction of the geotechnical engineer and replaced with aggregate base or other materials approved by the geotechnical engineer.

Aggregate Base (AB): In all cases, AB should be in accordance with Class 2 AB per Caltrans' Standard Specifications (latest edition). AB material should be compacted in 6-inch thick lifts to a minimum of 95 percent relative compaction per ASTM D1557, latest edition.

Hot Mix Asphalt (HMA): HMA should be compacted to a minimum of 95 percent of the HMA density determined by ASTM D1561 test procedure (latest version) in lifts not exceeding 3 inches. A "tack coat" should be applied between HMA layers.

Portland Cement Concrete (PCC): PCC should have engineering properties shown in Table 622.1 of Caltrans' HDM. We assume that additional corrosion tests will be performed during construction to verify the cement type. In addition, pavements should be restrained laterally by a concrete shoulder or curb. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

8.0 FINDINGS AND CONCLUSIONS/RECOMMENDATIONS

The discussions and recommendations presented in the following sections are based on our understanding of the proposed project requirements, the results of our geotechnical investigation, and our professional judgment.

It is our opinion that based on the above-cited geotechnical findings, the site is suitable for construction of the proposed PARC facilities, provided that the recommendations in this report are followed, and onsite construction observations and field testing are performed.

8.1 Earthwork

8.1.1. Clearing and Site Preparation

Prior to construction, the site should be cleared of all above-ground obstacles and structures. Existing utility and irrigation lines should be protected in-place, rerouted, or removed if they interfere with the proposed construction. The resulting cavities from removal of utility lines should be properly backfilled and compacted under the supervision of the project geotechnical engineer. Vegetation, debris, and organic matter should not be incorporated into the structural fill.

8.1.2. Over-Excavation and Preparation for New Improvements

In areas receiving fills, complete removal of compressible surficial materials including topsoil, loose or soft alluvium, and unsuitable fill is required prior to fill placement. The excavation should extend to a horizontal distance of at least 2 feet beyond the proposed improvement footprint or the depth of the excavation whichever is deeper.

8.1.3. Subgrade Preparation

After the site has been properly cleared, stripped, and required overexcavations have been made, removal bottom areas receiving fill should be scarified in-place to a depth of 8 inches, moisture conditioned to approximately 2 percent above optimum moisture, and compacted in accordance with the recommendations for fill presented in the "Fill Placement and Compaction" subsection. The finished compacted subgrade should be firm and non-yielding under the weight of compaction equipment. If soft, incompetent soils are found at the excavation bottom, to provide a relatively stable subgrade for placement of the fill we recommend using engineering fabrics and/or crushed rock or chemical treatment.

8.1.4. Fill Placement and Compaction

The onsite soil free of debris, organics, oversized material (larger than 3 inches) and other deleterious materials may be used as fill. Engineered fill, general fill, as well as scarified surface soils in those areas to receive fill should be compacted to at least 90 percent relative compaction as determined by ASTM Test Designation D1557, latest edition. Fill should be placed in lifts no greater than 8 inches in uncompacted thickness at a moisture content of 2 percent points higher than the laboratory optimum. Each successive lift should be firm and non-yielding under the weight of construction equipment. The upper 12 inches of subgrade and all aggregate base should be compacted to at least 95 percent underneath paved areas.

8.1.5. Oversize Materials and Import Soils

Based on the information provided, we understand that during the installation of soldier piles shoring for Bent 5 in the west side of Los Angeles River Channel area, Skanska (Prime contractor for the Viaduct Construction) encountered significant amounts of gravel and cobble sized rocks or debris (larger than 5-inch size) within near surface soils up to depths of 15 feet, which was different from EMI' findings during their investigations. Therefore, Skanska subcontracted California Testing & Inspections (CTI) to perform field investigation to observe and assess the amount of oversize materials at the site during shoring

system installation. 5-inch size was the largest size of rock or debris removed from the fill as observed by CTI due to limitations of the size of the augers used in their field investigation. But, Skanska reported that during the installation of initial soldier piles, cobble and boulder sized rocks up to 3 feet in size were encountered. We recommend removal of any oversize rocks (above 3 inches in size) encountered during grading operations at the site.

If import soil is considered as an alternative, the import soil should not exhibit an Expansion Index (EI) greater than 20 and contain more than 35 percent fines. The proposed import source should be screened by the geotechnical engineer for the following tests:

- Particle Size Analysis (ASTM D6913);
- Atterberg Limits (ASTM D4318);
- Expansion Index (ASTM D4829); and
- Soluble Sulfate, Soluble Chloride, and pH and Soil Resistivity (CTM 417, CTM 422, and CTM 643)

Additional tests may be required if the proposed import source passes the initial screening.

8.1.6. Wet Weather Conditions

Earthwork contractors should be made aware of the moisture sensitivity of fine grained soils and potential compaction difficulties if encountered. If construction is undertaken during wet weather conditions, some of the surficial soils may become saturated, soft and unworkable. Subgrade stabilization techniques might include the use of engineering fabrics and/or crushed rock or chemical treatment.

8.1.7. Surface Drainage

Positive surface water drainage gradients (2 percent minimum) should be provided adjacent to the structures to direct surface water away from foundations and slabs towards suitable discharge facilities. Ponding of surface water should not be allowed on or adjacent to structures or pavements.

8.2 Lateral Earth Pressure for Retaining Structures

8.2.1. 700-Square Foot Restroom Facility

Based on previously available information and encountered soil conditions, the recommended lateral earth pressures for this facility are shown below:

Table 8.1 Recommended Lateral Earth Pressures for 700 SF Restroom Facility

Design Parameter	Design Value
Active Pressure (P_a)	40 H + 0.33 q
At-Rest Pressure (P_o)	60 H + 0.50 q
Passive Pressure (P_p)	Minimum of (350 H, 3500 psf)
Seismic Force (F_e)	$P_e = 27 H^2$ (for cantilever walls, expect some deformations)
Coefficient of Friction (μ)	0.39

Notes:

1. All Design Values were calculated based on zero cohesion, an internal friction angle of 30°, and a unit weight of 120 pcf.
2. All values of height (H) in feet (ft), pressure (P) and surcharge (q) in pounds per square feet (psf) and force (F) in pound force (lbf) are for unit width of walls.
3. The above pressure values apply to horizontal backfill and do not include hydrostatic pressures that might be caused by groundwater or water trapped behind the structure.
4. μ is the friction coefficient applied to dead normal (buoyant) loads. P_e is in addition to the active and at-rest pressures, Pa and Po.
5. For passive pressure use a factor of safety of 2.5 if wall rotation (D/H) is smaller than 0.04. The passive pressure might not be used if soil is subjected to scour.
6. Neglect the upper 1 foot for passive pressure unless the surface is contained by pavement or a slab.
7. Equivalent ground acceleration of 0.443 g (a one-half reduction of the PGA = 0.886g as recommended by AASHTO), and Mononobe-Okabe methodology, were used to calculate Fe. The earthquake load (Fe) may be distributed as an inverted triangle along the wall height.
8. As specified above, retaining walls must be designed to resist horizontal pressures that may be generated by surcharge loads applied at the ground surface such as from uniform loads or vehicle loads.

An efficient drainage system should be provided behind retaining walls, which should consist of a curtain of free-draining material, such as Caltrans permeable Class 2 Aggregate. This drain curtain should be a minimum of 2 feet wide and extend from the bottom of the wall to within 1.5 feet of finish grade. Additionally, drainage geocomposite (Miradrain or equivalent) should be used to wrap the gravel material. The upper 1.5 feet should be a select material of low permeability (clayey soil) to minimize infiltration. A perforated pipe should be placed along the base of the wall and should be sloped at least two percent to drain water by gravity to a suitable discharge facility.

8.2.2. Arts Plaza

Based on the information provided by TTI, the structures which need geotechnical design recommendations at this facility are:

- U-Wall with a maximum height of 17 feet; and
- East Wall with a maximum height of 21 feet.

Based on previously available information and encountered soil condition, the recommended lateral earth pressures for this facility are shown below:

Table 8.2 Recommended Lateral Earth Pressures for Arts Plaza

Design Parameter	Design Value
Active Pressure (P_a)	40 H + 0.33 q
At-Rest Pressure (P_o)	60 H + 0.50 q
Passive Pressure (P_p)	Minimum of (350 H, 3500 psf)
Seismic Force (F_e)	$P_e = 27 H^2$ (for cantilever walls, expect some deformations)
Coefficient of Friction (μ)	0.36

Notes:

1. All Design Values were calculated based on zero cohesion, an internal friction angle of 30°, and a unit weight of 120 pcf.
2. All values of height (H) in feet (ft), pressure (P) and surcharge (q) in pounds per square feet (psf) and force (F) in pound force (lbf) are for unit width of walls.
3. The above pressure values apply to horizontal backfill and do not include hydrostatic pressures that might be caused by groundwater or water trapped behind the structure.
4. μ is the friction coefficient applied to dead normal (buoyant) loads. P_e is in addition to the active and at-rest pressures, Pa and Po.
5. For passive pressure use a factor of safety of 2.5 if wall rotation (D/H) is smaller than 0.04. The passive pressure might not be used if soil is subjected to scour.
6. Neglect the upper 1 foot for passive pressure unless the surface is contained by pavement or a slab.
7. Equivalent ground acceleration of 0.443 g (a one-half reduction of the PGA = 0.886g as recommended by AASHTO), and Mononobe-Okabe methodology, were used to calculate Fe. The earthquake load (Fe) may be distributed as an inverted triangle along the wall height.
8. As specified above, retaining walls must be designed to resist horizontal pressures that may be generated by surcharge loads applied at the ground surface such as from uniform loads or vehicle loads. Must consider railroad surcharge, heavy equipment surcharge and any other possible vehicular surcharge.

An efficient drainage system should be provided behind retaining walls, which should consist of a curtain of free-draining material, such as Caltrans permeable Class 2 Aggregate. This drain curtain should be a minimum of 2 feet wide and extend from the bottom of the wall to within 1.5 feet of finish grade. Additionally, drainage geocomposite (Miradrain or equivalent) should be used to wrap the gravel material. The upper 1.5 feet should be a select material of low permeability (clayey soil) to minimize infiltration. A perforated pipe should be placed along the base of the wall and should be sloped at least two percent to drain water by gravity to a suitable discharge facility.

8.2.3. Los Angeles River Bike Path

Based on the information provided by TTI, the structures which need geotechnical design recommendations at this facility are:

- Retaining Walls with a maximum height of 12 feet.

Based on previously available information, the recommended lateral earth pressures are shown below:

Table 8.3 Recommended Lateral Earth Pressures for Los Angeles River Bike Path

Design Parameter	Design Value
Active Pressure (P_a)	37 H + 0.31 q
At-Rest Pressure (P_o)	56 H + 0.47 q
Passive Pressure (P_p)	Minimum of (390 H, 3500 psf)
Seismic Force (F_e)	$P_e = 25\ H^2$ (for cantilever walls, expect some deformations)
Coefficient of Friction (μ)	0.39

Notes:

1. All Design Values were calculated based on zero cohesion, an internal friction angle of 32°, and a unit weight of 120 pcf.
2. All values of height (H) in feet (ft), pressure (P) and surcharge (q) in pounds per square feet (psf) and force (F) in pound force (lbf) are for unit width of walls.
3. The above pressure values apply to horizontal backfill and do not include hydrostatic pressures that might be caused by groundwater or water trapped behind the structure.
4. μ is the friction coefficient applied to dead normal (buoyant) loads. P_e is in addition to the active and at-rest pressures, Pa and Po.
5. For passive pressure use a factor of safety of 2.5 if wall rotation (D/H) is smaller than 0.04. The passive pressure might not be used if soil is subjected to scour.
6. Neglect the upper 1 foot for passive pressure unless the surface is contained by pavement or a slab.
7. Equivalent ground acceleration of 0.443 g (a one-half reduction of the PGA = 0.886g as recommended by AASHTO), and Mononobe-Okabe methodology, were used to calculate Fe. The earthquake load (Fe) may be distributed as an inverted triangle along the wall height.
8. As specified above, retaining walls must be designed to resist horizontal pressures that may be generated by surcharge loads applied at the ground surface such as from uniform loads or vehicle loads. Must consider railroad surcharge, vehicular surcharge along bike path, heavy equipment surcharge and any other possible vehicular surcharge.
9. To consider the full passive resistance at the foundation, the foundation face shall be 4 feet away from the slope face. Otherwise, the passive resistance should be reduced 60 percent.

An efficient drainage system should be provided behind retaining walls, which should consist of a curtain of free-draining material, such as Caltrans permeable Class 2 Aggregate. This drain curtain should be a minimum of 2 feet wide and extend from the bottom of the wall to within 1.5 feet of finish grade. Additionally, drainage geocomposite (Miradrain or equivalent) should be used to wrap the gravel material. The upper 1.5 feet should be a select material of low permeability (clayey soil) to minimize infiltration. A perforated pipe should be placed along the base of the wall and should be sloped at least two percent to drain water by gravity to a suitable discharge facility.

8.2.4. 2,000-Square Foot Restroom Facility

Based on previously available information and encountered soil condition, the recommended lateral earth pressures for this facility are shown below:

Table 8.4 Recommended Lateral Earth Pressures for 2,000 SF Restroom Facility

Design Parameter	Design Value
Active Pressure (P_a)	37 H + 0.31 q
At-Rest Pressure (P_o)	56 H + 0.47 q
Passive Pressure (P_p)	Minimum of (390 H, 3500 psf)
Seismic Force (F_e)	$P_e = 25\ H^2$ (for cantilever walls, expect some deformations)
Coefficient of Friction (μ)	0.39

Notes:

1. All Design Values were calculated based on zero cohesion, an internal friction angle of 32°, and a unit weight of 120 pcf.
2. All values of height (H) in feet (ft), pressure (P) and surcharge (q) in pounds per square feet (psf) and force (F) in pound force (lbf) are for unit width of walls.
3. The above pressure values apply to horizontal backfill and do not include hydrostatic pressures that might be caused by groundwater or water trapped behind the structure.
4. μ is the friction coefficient applied to dead normal (buoyant) loads. P_e is in addition to the active and at-rest pressures, Pa and Po.
5. For passive pressure use a factor of safety of 2.5 if wall rotation (D/H) is smaller than 0.04. The passive pressure might not be used if soil is subjected to scour.
6. Neglect the upper 1 foot for passive pressure unless the surface is contained by pavement or a slab.
7. Equivalent ground acceleration of 0.443 g (a one-half reduction of the PGA = 0.886g as recommended by AASHTO), and Mononobe-Okabe methodology, were used to calculate Fe. The earthquake load (Fe) may be distributed as an inverted triangle along the wall height.
8. In addition to the abovementioned pressures, retaining walls must be designed to resist horizontal pressures that may be generated by surcharge loads applied at the ground surface such as from uniform loads or vehicle loads.

An efficient drainage system should be provided behind retaining walls, which should consist of a curtain of free-draining material, such as Caltrans permeable Class 2 Aggregate. This drain curtain should be a minimum of 2 feet wide and extend from the bottom of the wall to within 1.5 feet of finish grade. Additionally, drainage geocomposite (Miradrain or equivalent) should be used to wrap the gravel material. The upper 1.5 feet should be a select material of low permeability (clayey soil) to minimize infiltration. A perforated pipe should be placed along the base of the wall and should be sloped at least two percent to drain water by gravity to a suitable discharge facility.

8.3 TEMPORARY EXCAVATION AND SHORING SUPPORT SYSTEM

All temporary excavations, including utility trenches, retaining wall excavations, and other excavations should be performed in accordance with project plans, specifications and all Occupational Safety and Health Administration (OSHA) requirements. Excavations near existing footings or improvements should be performed with care so that the existing footings/improvements are not undermined and the subgrade supporting the footings/improvements is not disturbed. Due to the presence of sandy soils with minor cementation, caving sand may be encountered in excavations. The soil type should be verified or revised based on geotechnical observation and testing during construction, as soil classifications may vary over short horizontal distances.

All excavation deeper than 5 feet should be either shored or sloped. No surcharge loads should be permitted within a horizontal distance equal to the height of cut or five feet, whichever is greater from the

top of the slope, unless the cut is shored appropriately. It should be the Contractor's responsibility to monitor the slopes and provide adequate and safe support for the excavation, as well as nearby structures.

For 700 SF Restroom and Arts Plaza area, an equivalent fluid pressure of 40 psf/ft may be used for designing free cantilever shoring with level ground surface behind the excavation. A uniform pressure of 26 psf may be used for designing braced shoring.

For LA River Bike Path and 2000 SF Restroom area, an equivalent fluid pressure of 37 psf/ft may be used for designing free cantilever shoring with level ground surface behind the excavation. A uniform pressure of 24 psf may be used for designing braced shoring.

Lateral earth pressure for other ground surface configurations can be provided upon request. The project geotechnical engineer should review the contractor's shoring design prior to implementation.

8.4 FOUNDATIONS

Relatively light structures could be supported on continuous or spread footings bearing on 2 feet of compacted clean "granular" soils (soils having less than 20 percent passing standard sieve #200, free of debris, vegetation, and with rocks less than 6 inches in diameter with no more than 15 percent greater than 3 inches in diameter, confirmed with laboratory testing prior to construction) and extending to a zone of 3 feet beyond the edge of the footings and building structure/footprints, compacted in 8-inch-thick lifts (measured in loose state) to a minimum of 95 percent relative compaction per ASTM D1557 (Modified Proctor, latest edition). Imported soils (clean "granular" soils) shouldn't be more corrosive than the onsite soils.

Prior to placing any clean "granular" soil, the upper 8 inches of the excavation bottom should be scarified, moisture-conditioned to approximately 3 percent above the optimum moisture content, and recompacted to at least 90 percent of the maximum dry density per ASTM D1557 (Modified Proctor Test, latest edition) to counteract the potential adverse effects of soil expansiveness.

8.4.1. 700-Square Foot Restroom Facility

Based on information from previous and current investigations, an allowable bearing capacity of 2,500 pounds per square foot may be used for design of 18-inch square or 24-inch wide continuous footings embedded a minimum of 18 inches below adjacent level ground. This value may be increased by 250 and 500 pounds per square foot for every additional foot of width or depth increase, respectively, to a maximum of 4,000 pounds per square foot.

A lateral passive soil resistance on footing walls embedded in compacted engineered fill of 350 psf per foot of depth below the lowest adjacent finished grade, to a maximum of 3,500 psf, may be used for design. This lateral passive resistance may be combined with a lateral base friction resistance. A base friction coefficient of 0.36 may be used. The coefficient of friction should be multiplied by the dead load to obtain the lateral base friction resistance.

Where footings are adjacent to below-grade walls or underground utilities, the footings should extend below a 45-degree plane projected upward from the backside of the wall footing or bottom of the underground utility. Structural loads were not available at the time of our investigation. We should be retained to review the final foundation plans and structural loads for soil settlement estimation.

8.4.2. Arts Plaza

Based on information from previous and current investigations, an allowable bearing capacity of 3,200 pounds per square foot may be used for design of 18-inch square or 24-inch wide continuous footings embedded a minimum of 18 inches below adjacent level ground. This value may be increased by 400 pounds per square foot

for every additional foot of width or depth increase, respectively, to a maximum of 4,000 pounds per square foot.

A lateral passive soil resistance on footing walls embedded in compacted engineered fill of 350 psf per foot of depth below the lowest adjacent finished grade, to a maximum of 3,500 psf, may be used for design. This lateral passive resistance may be combined with a lateral base friction resistance. A base friction coefficient of 0.36 may be used. The coefficient of friction should be multiplied by the dead load to obtain the lateral base friction resistance.

Where footings are adjacent to below-grade walls or underground utilities, the footings should extend below a 45-degree plane projected upward from the backside of the wall footing or bottom of the underground utility. Structural loads were not available at the time of our investigation. We should be retained to review the final foundation plans and structural loads for soil settlement estimation.

8.4.3. Los Angeles River Bike Path

Based on information from previous investigations, an allowable bearing capacity of 3,200 pounds per square foot may be used for design of 18-inch square or 24-inch wide continuous footings embedded a minimum of 18 inches below adjacent level ground. This value may be increased by 400 pounds per square foot for every additional foot of width or depth increase, respectively, to a maximum of 4,000 pounds per square foot.

A lateral passive soil resistance on footing walls embedded in compacted engineered fill of 390 psf per foot of depth below the lowest adjacent finished grade, to a maximum of 3,500 psf, may be used for design. This lateral passive resistance may be combined with a lateral base friction resistance. A base friction coefficient of 0.39 may be used. The coefficient of friction should be multiplied by the dead load to obtain the lateral base friction resistance.

Where footings are adjacent to below-grade walls or underground utilities, the footings should extend below a 45-degree plane projected upward from the backside of the wall footing or bottom of the underground utility. Structural loads were not available at the time of our investigation. We should be retained to review the final foundation plans and structural loads for soil settlement estimation.

To consider the full foundation resistance, the foundation face shall be 4 feet away from the slope face. Otherwise, the passive resistance should be reduced 60 percent.

8.4.4. 2,000-Square Foot Restroom Facility

Based on information from previous and current investigations, an allowable bearing capacity of 3,200 pounds per square foot may be used for design of 18-inch square or 24-inch wide continuous footings embedded a minimum of 18 inches below adjacent level ground. This value may be increased by 400 pounds per square foot for every additional foot of width or depth increase, respectively, to a maximum of 4,000 pounds per square foot.

A lateral passive soil resistance on footing walls embedded in compacted engineered fill of 390 psf per foot of depth below the lowest adjacent finished grade, to a maximum of 3,500 psf, may be used for design. This lateral passive resistance may be combined with a lateral base friction resistance. A base friction coefficient of 0.39 may be used. The coefficient of friction should be multiplied by the dead load to obtain the lateral base friction resistance.

Where footings are adjacent to below-grade walls or underground utilities, the footings should extend below a 45-degree plane projected upward from the backside of the wall footing or bottom of the underground utility. Structural loads were not available at the time of our investigation. We should be retained to review the final foundation plans and structural loads for soil settlement estimation.

8.5 SLABS-ON-GRADE

8.5.1. Building Floor Slab

Concrete slabs-on-grade subjected to special loads should be designed by the structural engineer. For conventional light floor loading conditions, slab-on-grade floors should be at least 5 inches thick and reinforcement should be designed by a structural engineer.

Slabs-on-grade covered with moisture-sensitive flooring, or supporting moisture-sensitive equipment, should be underlain by 6 inches of compacted free-draining granular materials. The free-draining granular material should contain less than 3 percent fines (material passing the #200 sieve) and should be placed immediately below the slab-on-grade. Moisture vapor may tend to migrate through the slab-on-grade. To reduce vapor migration through the floor slabs a minimum 10-mil thick plastic vapor barrier should be placed between the granular materials and the slab. Care should be taken to overlap barrier joints by at least 6 inches, seal the plastic vapor barrier around plumbing, electrical, and other conduits, and avoid sand layer above plastic vapor barrier. The plastic vapor barrier should satisfy the requirements of ASTM E 1745 (Class "A") and should be installed in accordance with ASTM E 1643. Care should be taken to seal the plastic vapor barrier and avoid puncturing the vapor barrier during construction.

8.5.2. Exterior Concrete Flatwork

We recommend that exterior concrete flatwork be supported on at least 6 inches of non-expansive fill placed and compacted based on the "Compaction" section of this report. Exterior concrete sidewalks should be at least 4 inches thick and underlain by at least 4 inches of Class 2 aggregate base compacted to a minimum of 95 percent relative compaction in accordance with ASTM Test Method D1557, latest edition. If sidewalks are subject to wheel loads, they should be separately designed.

8.6 UTILITY TRENCH BACKFILL

8.6.3. Pipe Zone Bedding and Shading Backfill

Pipe bedding should extend to a depth of at least 6 inches or pipe manufacturer's recommendation below the pipeline invert and the shading should extend from the top of the bedding to a height of at least 12 inches over the top of the pipe or pipe manufacturer's recommendation. In addition, there should be a minimum range of 6 to 8 inches of pipe zone backfill material on either side of the pipe or pipe manufacturer's recommendation.

The bedding and shading material may consist of compacted, free draining sand, gravel, or crushed rock, having a sand equivalent of not less than 30, and meeting the gradation and compaction requirements of the Greenbook, latest edition, or pipe manufacturer's recommendation. If open grade rock or crushed slag base is used around the pipe and within any portion of trench backfill, it should be separated from surrounding finer-grained material by installation of a geo-filter fabric. Properties of the pipe zone bedding and shading material should be confirmed with laboratory testing prior to construction. Onsite soils are not recommended to be used as pipe zone bedding or shading backfill.

The bedding material should be compacted to a minimum relative compaction of 90 percent per ASTM D1557 (Modified Proctor). Backfilling should be carried on simultaneously on each side of the pipe to ensure proper protection of the pipe. The bedding layer should be supported on firm, competent material, as determined by the project geotechnical engineer. Disturbed, loose/soft materials at the excavation bottom should be removed to expose firm native material per the project geotechnical engineer recommendations. If firm material is not encountered, the upper 1 foot of the onsite soils below the pipe bedding should be scarified, moisture-conditioned to approximately 2 percent above the optimum moisture content, and recompacted to at least 90 percent of the maximum dry density per ASTM D1557 (Modified Proctor) to counteract the potential adverse effects of soil expansiveness. If compaction of the

native soils below the bedding material is not feasible at any location, a 12-inch thick layer of crushed rock wrapped in geofabric should be placed below the pipe bedding. Questionable areas should be reviewed individually by the project geotechnical engineer to evaluate and recommend corrective measures, as necessary.

Placement of bedding and shading backfill should be observed by the project geotechnical engineer or his representative in the field and tested for compliance with the recommended relative compaction and moisture conditions.

Field density testing should conform to ASTM D6938 (Nuclear Method) and D1556 (Sand Cone Method), latest editions. Tests should be taken at a minimum of every 2 vertical feet of fill placed and every 200 feet of length, or at a frequency otherwise specified by the local regulations, whichever is stricter. Actual test intervals may vary with field conditions. Backfill found not to be in conformance should be removed or recompacted as recommended by the project geotechnical engineer.

Densification by water jetting within the pipe bedding and shading zone is not recommended. During removal of the shoring system, gaps should be filled and compacted. Pipes that are deeper than 5 feet should be able to handle stresses due to moving traffic. Casing of the pipeline might be necessary if pipes are placed shallower than 5 feet.

8.6.4. Trench Zone

Non expansive clean “granular” soils (confirmed with laboratory testing prior to construction) may be used as compacted structural fill, provided they are free of organic material, construction debris, and not containing rocks greater than 6 inches in diameter, with no more than 15 percent rocks greater than 3 inches in diameter. Clean “granular” soils should be placed in thin, loose lifts not more than 8 inches in thickness, moisture-conditioned to approximately 3 percent above the optimum moisture content and compacted to at least 90 percent of the maximum dry density per ASTM D1557 (Modified Proctor) to counteract the potential adverse effect of soil expansiveness. For pavement areas, the upper 12 inches of the trench zone should be moisture-conditioned to approximately 2 percent above the optimum moisture content and compacted to at least 95 percent of the maximum dry density per ASTM D1557 (Modified Proctor).

Placement of backfill should be observed by the project geotechnical engineer or his representative in the field and tested for compliance with the recommended relative compaction and moisture conditions. Field density testing should conform to ASTM D6938 (Nuclear Method) and D1556 (Sand Cone Method). Tests should be taken at a minimum of every 2 vertical feet of fill placed and every 200 feet of length, or at a frequency otherwise specified by the local regulations, whichever is stricter. Actual test intervals may vary with field conditions.

Backfill found not to be in conformance should be removed or recompacted as recommended by the project geotechnical engineer. During removal of the shoring system, gaps should be filled and compacted.

8.7 EXISTING UTILITIES

The proposed facilities will be located near to and/or cross several existing utilities. The contractor should exercise care not to disturb these utilities and to support them during construction. Compacting backfill above the pipe zone could be detrimental to surrounding utilities; we recommend a weak slurry mix (minimum compressive strength of 100 pound per square inch [psi]) to be used for the backfilling operations wherever soil compaction is not feasible. These areas should be limited to zones between two pipes and not exceeding 2 feet on either side of the crossing.

8.8 SITE DRAINAGE

The site should be graded to provide adequate drainage away from building foundations and to prevent ponding on pavements in accordance with guidelines established by the City, Greenbook (latest edition), and the 2016 CBC. Special surface drainage features should be incorporated to drain surface sheet flow of water from retaining walls and intercept sheet flow over the paved areas.

8.9 AGRONOMIC USAGE OF SITE SOILS

Based on laboratory testing of the obtained soil samples from the project site, Wallace Laboratories provided detailed recommendations on the Soil Management for agronomic usage as attached in Appendix C.

8.10 CONSTRUCTION OBSERVATIONS AND FIELD TESTING

Construction observations and field testing should be performed by representatives of a qualified geotechnical engineer to confirm that the conditions and assumptions described in this report are the best representation of the actual conditions.

At a minimum, we recommend that the geotechnical engineer and/or his representative be present to observe and test during the following construction activities:

- Excavation, site grading of cuts and fills;
- Placement of all backfill, and pavement structural sections;
- Backfilling of utility trenches and pits; and
- When any unusual conditions are encountered during grading.

Onsite observation and field testing will be a key component to a suitable geotechnical design for this project. A final report of grading should be submitted to the City.

9.0 ADDITIONAL SERVICES AND LIMITATIONS

9.1 ADDITIONAL SERVICES

If considerable modifications to the concepts included herein are implemented over the course of the design, specific geotechnical consultation and input will be required. Accordingly, we recommend that Hushmand Associates, Inc. be retained to provide such consultation during site preparation and grading on an as-needed basis. As a minimum Hushmand Associates, Inc. should be retained to review the grading and design plans prior to their issuance for conformance and compatibility with the recommendations presented in this report.

9.2 LIMITATIONS

This report is based on the project location and geotechnical data as described herein. The materials encountered on the project site and utilized in our laboratory investigation are believed representative of the project area, and the conclusions and recommendations contained in this report are presented on that basis. However, soils can vary in characteristics between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein. As such, observation and testing by a geotechnical consultant during the construction phase of the project are essential to confirming the basis of this report. To provide the greatest degree of continuity between the design and construction phases, consideration should be given to retaining HAI for construction services. If we are not retained for these services, HAI cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of HAI's report by others. Furthermore, HAI will cease to be the Geotechnical-Engineer-of-Record if we are not retained for these services and/or at the time another consultant is retained for follow up services to this report.

This report has been prepared consistent with the level of care being provided by other professionals providing similar services at the same locale and in the same time period. This report provides our professional opinions and as such, they are not to be considered a guaranty or warranty. This report should be reviewed and updated after a period of one year or if the site conditions, ownership or project concept changes from those described herein. This report has not been prepared for use by parties or projects other than those named or described herein and may not contain sufficient information for other parties or other purposes.

The recommendations in this report are based on requirements and anticipated conditions provided by Tetra Tech, Inc. If considerable modifications to these criteria and requirements are implemented over the course of design, specific geotechnical consultation and input will be required. Accordingly, we recommend that HAI be retained to review the proposed construction plans prior to their issuance for conformance and compatibility with the recommendations presented in this report.

10.0 REFERENCES

American Concrete Institute (ACI), 2014, Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary.

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FIGURES

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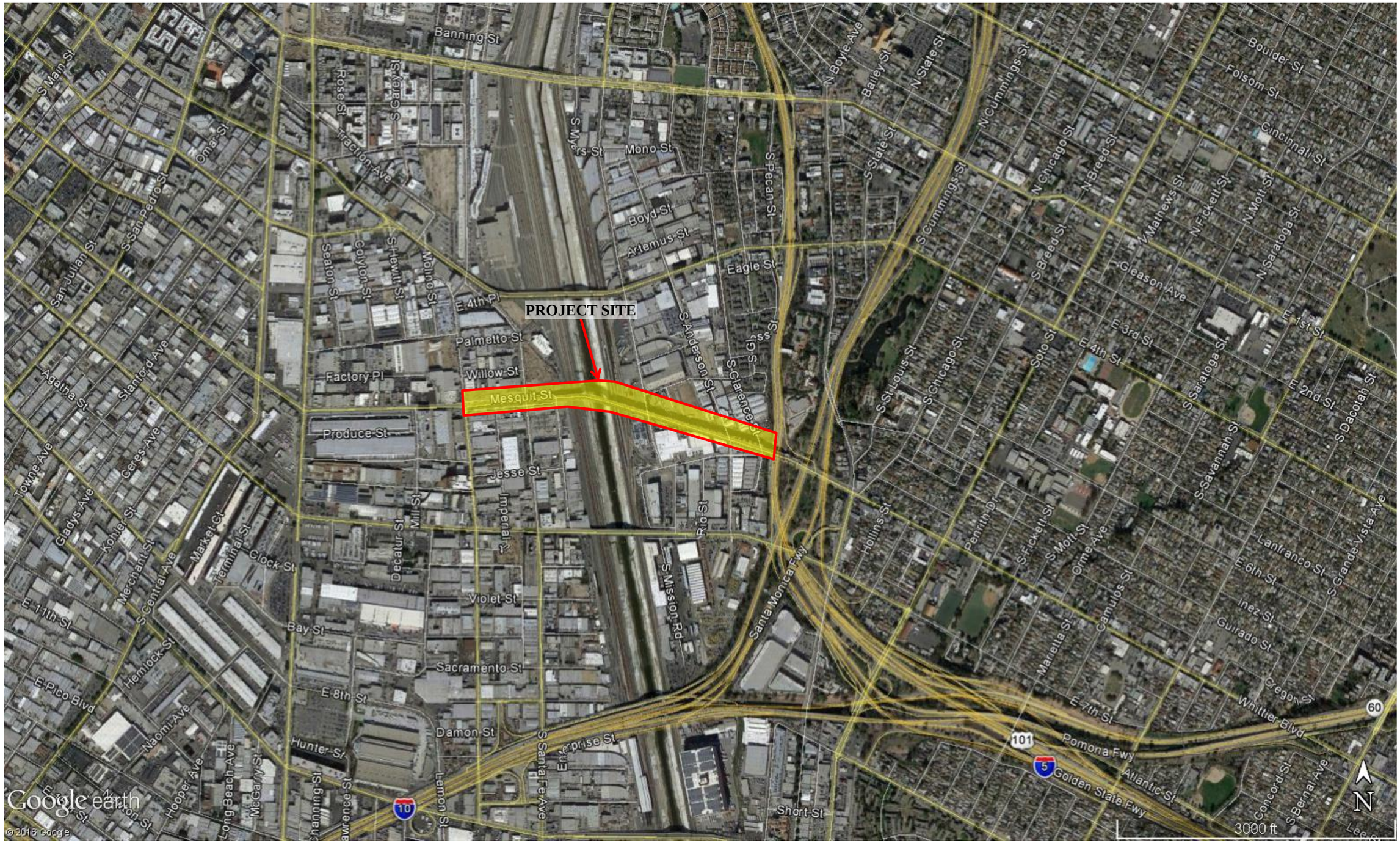

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**SIXTH STREET VIADUCT – PARC IMPROVEMENTS** Los Angeles, California	**SITE VICINITY MAP**	Figure **1**

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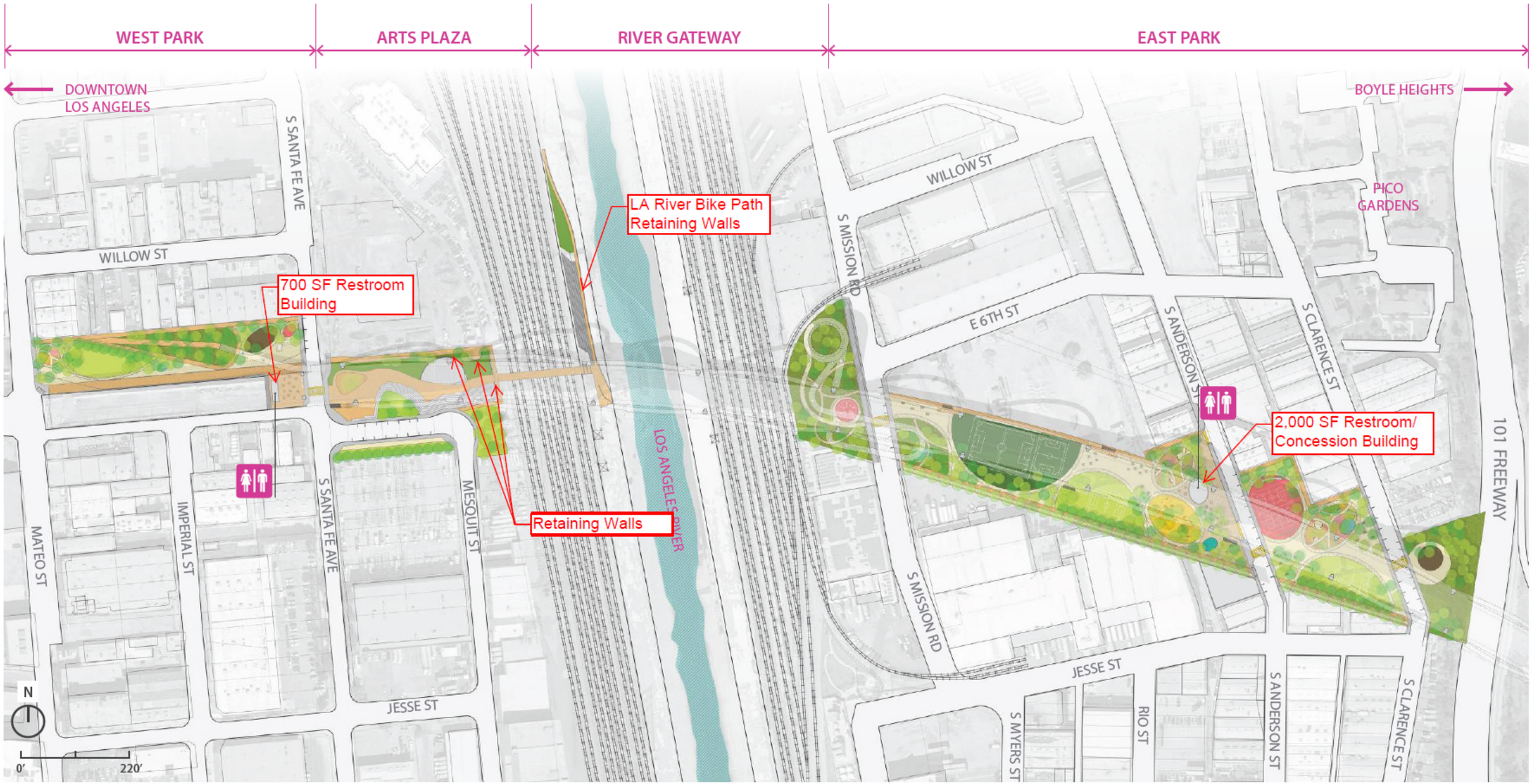

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**SIXTH STREET VIADUCT – PARC IMPROVEMENTS** Los Angeles, California	**CONCEPTUAL DESIGN PLAN**	Figure **2**

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GB-4
Approximate Boring Location

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**SIXTH STREET VIADUCT – PARC IMPROVEMENTS** Los Angeles, California	**APPROXIMATE SOIL BORING LOCATIONS**	Figure **3A**

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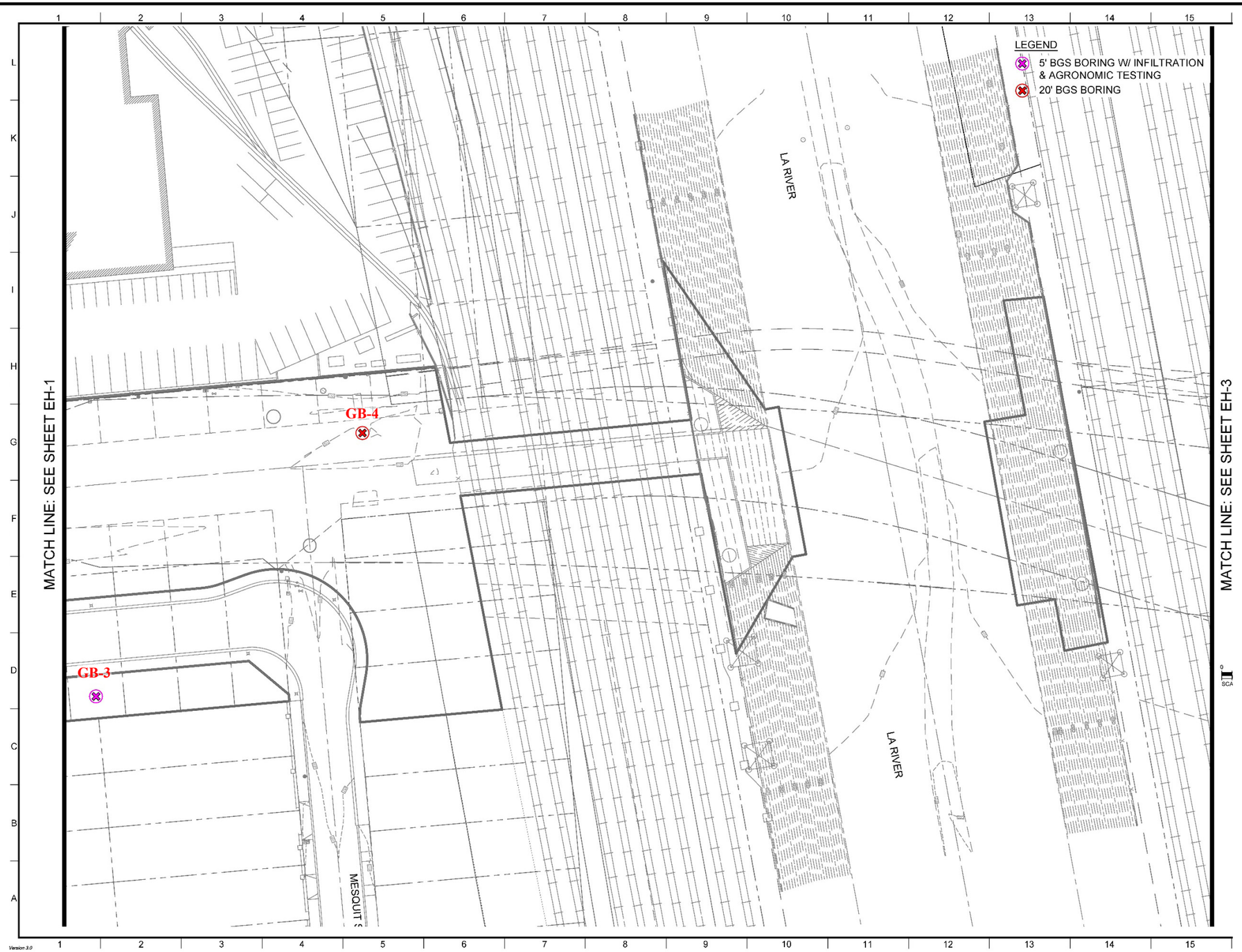

GB-4 **Approximate Boring Location**

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

SIXTH STREET VIADUCT – PARC IMPROVEMENTS
Los Angeles, California

APPROXIMATE SOIL BORING LOCATIONS

Figure **3B**

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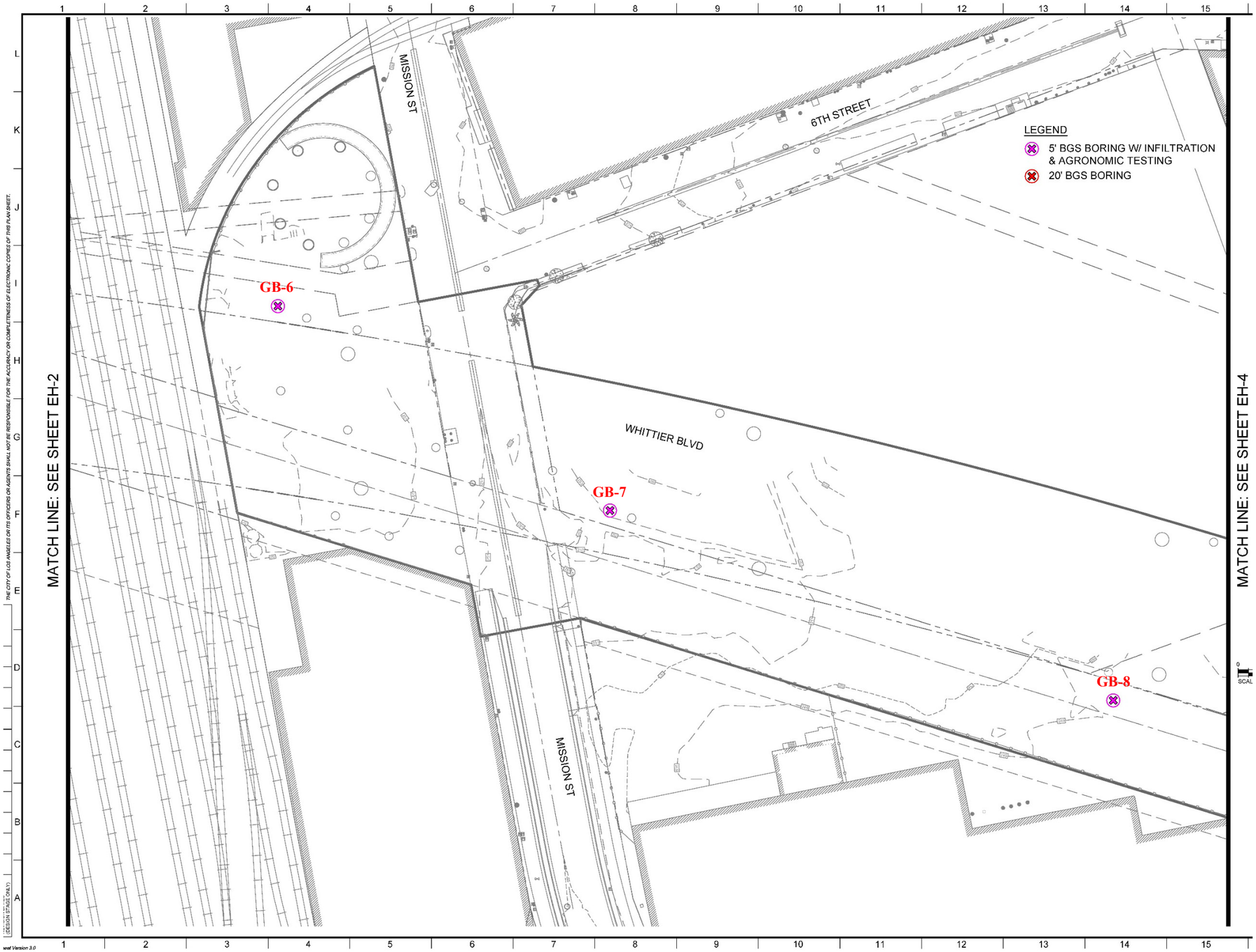

GB-4 ⊗ **Approximate Boring Location**

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers

SIXTH STREET VIADUCT – PARC IMPROVEMENTS
Los Angeles, California

APPROXIMATE SOIL BORING LOCATIONS

Figure **3C**

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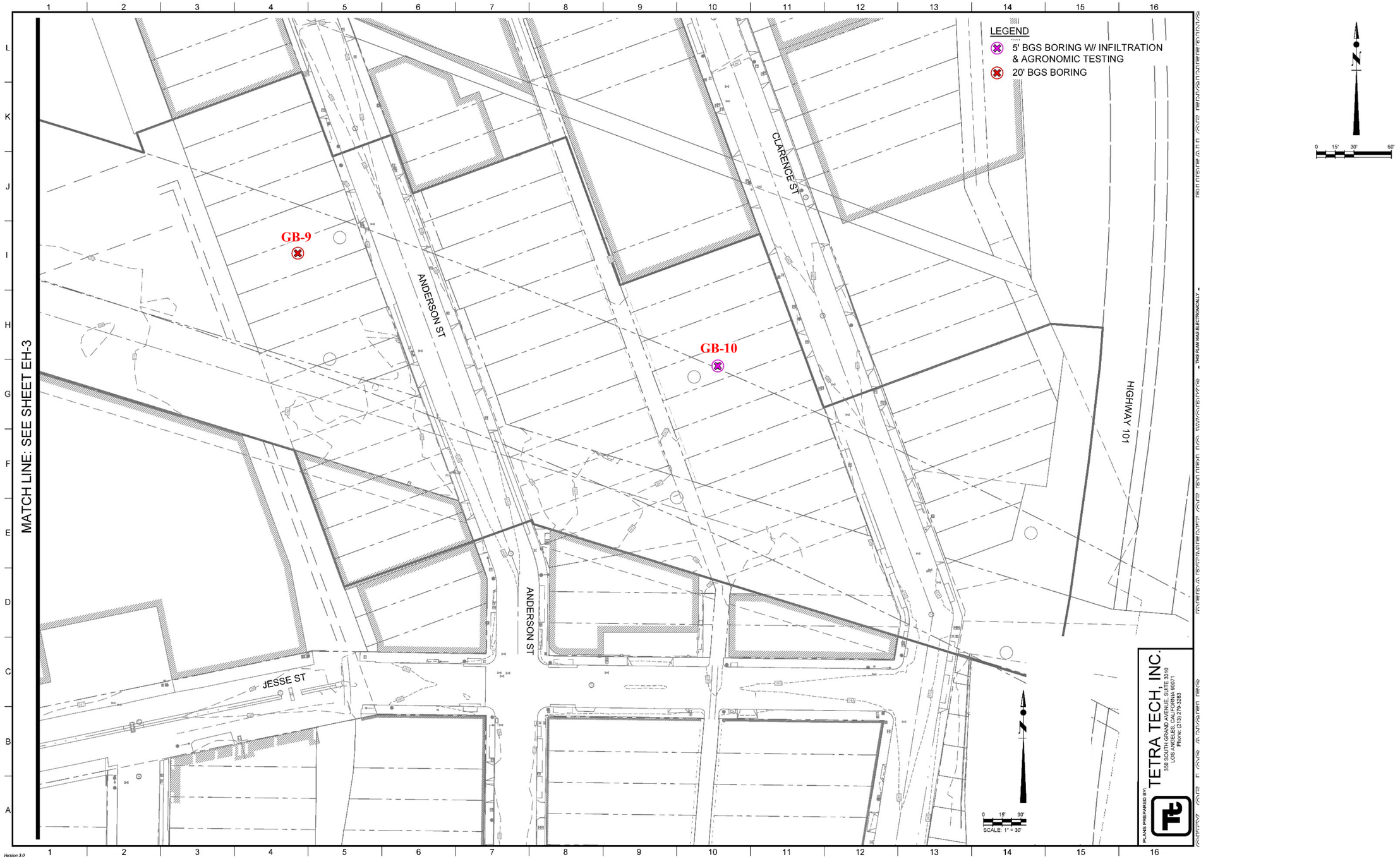


GB-4 **Approximate Boring Location**

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	**SIXTH STREET VIADUCT – PARC IMPROVEMENTS** Los Angeles, California	**APPROXIMATE SOIL BORING LOCATIONS**

Figure **3D**

N

ONE MILE

SCALE

Source: Quaternary Geologic Map of Los Angeles 7.5-Minute Quadrangle (CGS, 1998)

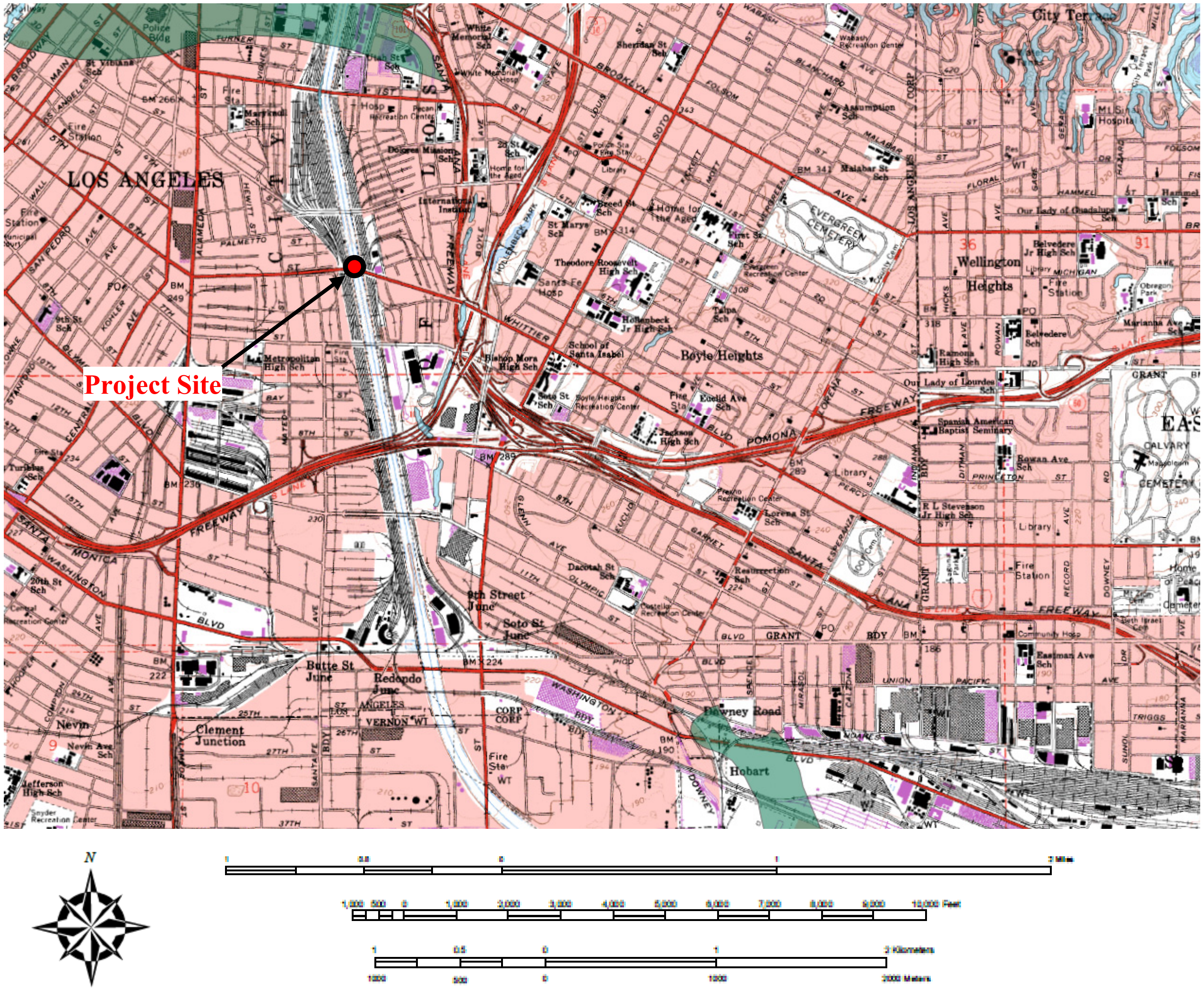
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

SIXTH STREET VIADUCT – PARC IMPROVEMENTS
Los Angeles, California

Project No. LAC-17-001

GEOLOGY MAP

Figure 4



MAP EXPLANATION

ALQUIST-PRIOLO EARTHQUAKE FAULT ZONES

Earthquake Fault Zones
Zone boundaries are delineated by straight-line segments; the boundaries define the zone encompassing active faults that constitute a potential hazard to structures from surface faulting or fault creep such that avoidance as described in Public Resources Code Section 2621.5(a) would be required.

Active Fault Traces
Faults considered to have been active during Holocene time and to have potential for surface rupture: Solid Line in Black or Red where Accurately Located; Long Dash in Black or Solid Line in Purple where Approximately Located; Short Dash in Black or Solid Line in Orange where Inferred; Dotted Line in Black or Solid Line in Rose where Concealed; Query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by fault creep.

SEISMIC HAZARD ZONES

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

Earthquake-Induced Landslide Zones
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Source: CGS Earthquake Zones of Required Investigation for Los Angeles 7.5-Minute Quadrangle (CGS, 2017)

HUSHMAND ASSOCIATES, INC. Geotechnical and Earthquake Engineers	SIXTH STREET VIADUCT – PARC IMPROVEMENTS Los Angeles, California Project No. LAC-17-001	SEISMIC HAZARD MAP	Figure 5

APPENDIX A
FIELD INFORMATION

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APPENDIX A-1
BOREHOLE LOGS

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SOIL CLASSIFICATION SYSTEM - ASTM D2487

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE)	GRAVEL AND GRAVELLY SOILS (MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE)	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS (MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE)	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE)	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SAMPLERS

- AU Auger Cuttings
- GB Grab Sample
- MC Modified California Sampler
- RC Rock Core
- SPT Standard Penetration Test Sampler
- ST Shelby Tube

LABORATORY TESTS

RV	: R-Value
CONS	: Consolidation
SA	: Sieve Analysis
COMP	: Compaction
EI	: Expansion Index
SE	: Sand Equivalent
UC	: Unconfined Compression
DS	: Direct Shear
HA	: Hydrometer Analysis
%200	: Percentage Passing No. 200 Sieve
AL	: Atterberg Limits
HC	: Hydraulic Conductivity
CORR	: Corrosion Potential
SW	: Swell Potential
OM	: Organic Matter

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Hushmand Associates, Inc.

BORING NUMBER GB-1

CLIENT Tetra Tech/City of Los Angeles
PROJECT NAME Sixth Street Viaduct PARC
PROJECT NUMBER LAC-17-001
PROJECT LOCATION 6th Street, Los Angeles, CA
DATE STARTED 11/7/17 **COMPLETED** 11/7/17
GROUND ELEVATION _____ **HOLE SIZE** 10"
DRILLING CONTRACTOR CAL PAC Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger/Hollow Stem Auger
AT TIME OF DRILLING Not Encountered
LOGGED BY RN **CHECKED BY** NM
AT END OF DRILLING Not Encountered
NOTES Borehole was backfilled with GRAVEL after completion of percolation testing **AFTER DRILLING** Not Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		SILT with SAND (ML): Brown, moist, fine grained SAND							
		SILTY SAND (SM): Brown, moist, fine grained SAND.			AU 1A				SA
		SILTY SAND (SM): Brown, moist, fine grained SAND, sub-angular to sub-rounded GRAVEL up to 2" dia. encountered.							
		More sub-angular to sub-rounded GRAVEL up to 3" dia. encountered.							
5		SILTY SAND (SM): Brown, moist, fine to medium grained SAND, GRAVEL up to 3" dia.			AU 1B				
		Poorly graded SAND (SP): Brown, moist, fine to coarse grained SAND, GRAVEL up to 3" dia.							
		Borehole terminated at 6 feet.							

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Hushmand Associates, Inc.

BORING NUMBER GB-2

CLIENT Tetra Tech/City of Los Angeles
PROJECT NAME Sixth Street Viaduct PARC
PROJECT NUMBER LAC-17-001
PROJECT LOCATION 6th Street, Los Angeles, CA
DATE STARTED 11/3/17 **COMPLETED** 11/3/17
GROUND ELEVATION _____ **HOLE SIZE** 6"
DRILLING CONTRACTOR CAL PAC Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger/Hollow Stem Auger
AT TIME OF DRILLING Not Encountered
LOGGED BY RN **CHECKED BY** NM
AT END OF DRILLING Not Encountered
NOTES Backfilled with cement grout
AFTER DRILLING Not Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		SILTY SAND (SM): Brown, dry to moist, fine to medium grained SAND.		■	AU 1				RV CORR SW
5		@ 4': 6" COBBLE encountered.							
		Well-graded SAND with SILT and GRAVEL (SW-SM): Brown, moist, loose, fine to medium grained SAND.	■		MC 2	6-5-4 (9)	107	2	DS
		Well-graded SAND with SILT and GRAVEL (SW-SM): Brown, moist, medium dense, fine to medium grained SAND. @7.5': 2" dia. sub-angular to sub-rounded GRAVEL encountered.	⊠		SPT 3	2-5-8 (13)			SA
10		Poorly graded SAND (SP): Brown, moist, medium dense, fine to medium grained SAND.	■		MC 4	5-9-19 (28)	105	3	
		Poorly graded SAND with GRAVEL (SP): Brown, moist, very dense, fine to medium grained SAND, scattered sub-angular to sub-rounded fine GRAVEL up to 5 mm.	⊠		SPT 5	20-27-21 (48)			
15		Poorly graded SAND with GRAVEL (SP): Pale gray to brown, moist, very dense, fine to medium grained SAND, sub-angular to sub-rounded fine to coarse GRAVEL up to 3" dia. Few sub-angular COBBLES up to 4" dia. encountered.	■		MC 6	20-21-21 (42)	104	2	SA
		Poorly graded SAND with GRAVEL (SP): Pale gray to brown, moist, dense, fine to coarse grained SAND with fine to coarse grained GRAVEL up to 2" dia. No Sample Recovery	⊠		SPT 7	13-16-22 (38)			
20		SILTY SAND (SM): Gray, very moist, very dense, fine grained SAND.	■		MC 8	13-50	115	4	
		Poorly graded SAND (SP): Gray, very moist, very dense, medium grained SAND.							
		Borehole terminated at 21 feet.							

HAI-AMIR LAC-17-001, SIXTH STREET VIADUCT PARC.GPJ GINT US.GDT 1/12/18

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Hushmand Associates, Inc.

BORING NUMBER GB-3

CLIENT Tetra Tech/City of Los Angeles
PROJECT NAME Sixth Street Viaduct PARC
PROJECT NUMBER LAC-17-001
PROJECT LOCATION 6th Street, Los Angeles, CA
DATE STARTED 11/8/17 **COMPLETED** 11/8/17
GROUND ELEVATION **HOLE SIZE** 8"
DRILLING CONTRACTOR CAL PAC Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger/Hollow Stem Auger
AT TIME OF DRILLING Not Encountered
LOGGED BY RN **CHECKED BY** NM
AT END OF DRILLING Not Encountered
NOTES Borehole was backfilled with GRAVEL after completion of percolation testing **AFTER DRILLING** Not Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		CONCRETE ~ 3 inches							
		SILTY SAND (SM): Brown, moist, fine grained SAND.			AU 1				
5									
		Borehole terminated at 6 feet.							

DRAFT

Hushmand Associates, Inc.

BORING NUMBER GB-4

CLIENT Tetra Tech/City of Los Angeles
PROJECT NAME Sixth Street Viaduct PARC
PROJECT NUMBER LAC-17-001
PROJECT LOCATION 6th Street, Los Angeles, CA
DATE STARTED 11/6/17 **COMPLETED** 11/6/17
GROUND ELEVATION **HOLE SIZE** 6"
DRILLING CONTRACTOR CAL PAC Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger/Hollow Stem Auger
AT TIME OF DRILLING Not Encountered
LOGGED BY RN **CHECKED BY** NM
AT END OF DRILLING Not Encountered
NOTES Backfilled with cement grout
AFTER DRILLING Not Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		SILTY SAND (SM): Dark grayish brown, moist, fine grained SAND with sub-rounded to sub-angular GRAVEL up to 2" encountered.			AU 1				
5		SILTY SAND (SM): Dark grayish brown, moist, loose, fine grained SAND.			SPT 2	5-3-3 (6)			
		Poorly graded SAND (SP): Gray, moist, loose, fine to coarse grained SAND.							
		SILTY SAND (SM): Brown, moist, loose, fine grained SAND.			MC 3	4-5-7 (12)			SW
10		Same as above.			SPT 4	2-2-2 (4)			SA
		Poorly graded SAND (SP): Grayish brown, moist, loose, fine to medium grained SAND, fine GRAVEL up to 5 mm. dia.			MC 5	5-4-4 (8)	107	9	DS
15		Poorly graded SAND (SP): Grayish brown, moist, medium dense, fine to medium grained SAND, fine GRAVEL up to 5 mm. dia.			SPT 6	4-5-9 (14)			
		Well-graded SAND (SW): Yellowish brown, moist, medium dense, fine to medium grained SAND, fine GRAVEL up to 5 mm. dia.							
		Poorly graded SAND (SP): Mixture of pale yellow to pale brown, moist, dense, medium to coarse grained SAND, occasional fine GRAVEL.			MC 7	10-18-24 (42)	103	2	SA
20		Poorly graded SAND with GRAVEL (SP): Mixture of pale yellow to pale brown, moist, dense, medium to coarse grained SAND, fine GRAVEL.							
		Poorly graded SAND (SP): Mixture of pale yellow to pale brown, moist, very dense, medium to coarse grained SAND, fine to coarse GRAVEL up to 1.5" dia.			SPT 8	10-21-26 (47)			CORR
25									

HAI-AMIR LAC-17-001, SIXTH STREET VIADUCT PARC.GPJ GINT US.GDT 1/12/18

(Continued Next Page)

CLIENT Tetra Tech/City of Los Angeles
PROJECT NAME Sixth Street Viaduct PARC
PROJECT NUMBER LAC-17-001
PROJECT LOCATION 6th Street, Los Angeles, CA

DEPTH (ft)	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
	SILTY SAND with GRAVEL (SM): Grayish brown, moist, dense, fine to medium grained SAND.	X		MC 9	12-16-22 (38)	109	4	DS
30	SILTY SAND with GRAVEL (SM): Gray, moist, very dense, fine SAND with fine GRAVEL, with GRAVEL up to 2" dia.	X		SPT 10	21-50/2"			
	@ 30.5' to 31': Color change to dark gray							
	SILTY SAND with GRAVEL (SM): Gray, moist, very dense, fine to medium grained SAND with fine sub-angluar to sub-rounded fine GRAVEL. GRAVEL up to 2" dia. encountered occasionally.							
35	Poorly graded SAND with SILT (SP-SM): Gray, moist, very dense, fine to medium grained SAND. 3" dia. sub-rounded GRAVEL encountered at the bottom of sampler.	X		MC 11	50	102	10	DS
	Same as above.	X		SPT 12	50/1"			
	Borehole terminated at 39.08 feet.							

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Hushmand Associates, Inc.

BORING NUMBER GB-6

CLIENT Tetra Tech/City of Los Angeles
PROJECT NAME Sixth Street Viaduct PARC
PROJECT NUMBER LAC-17-001
PROJECT LOCATION 6th Street, Los Angeles, CA
DATE STARTED 11/7/17 **COMPLETED** 11/7/17
GROUND ELEVATION _____ **HOLE SIZE** 9"
DRILLING CONTRACTOR CAL PAC Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger/Hollow Stem Auger
AT TIME OF DRILLING Not Encountered
LOGGED BY RN **CHECKED BY** NM
AT END OF DRILLING Not Encountered
NOTES Borehole was backfilled with GRAVEL after completion of percolation testing **AFTER DRILLING** Not Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		SILTY SAND with GRAVEL (SM): Brown, moist, fine grained SAND, sub-angular to sub-rounded fine to coarse GRAVEL up to 3" dia.							
		@ 1': 4" dia. COBBLE encountered.			AU 1A				SA
		More GRAVEL and COBBLES encountered. Very difficult conditions to perform hand auguring.							
		Poorly graded SAND with SILT and GRAVEL (SP-SM): Brown, moist, fine to medium grained SAND, fine GRAVEL.			AU 1B				
5		@ 4.75': more GRAVEL and COBBLES encountered. Very difficult conditions to perform hand auguring.							
		Poorly graded SAND (SP): Brown, moist, medium grained SAND.							
		Borehole terminated at 6.08 feet.							

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Hushmand Associates, Inc.

BORING NUMBER GB-7

CLIENT Tetra Tech/City of Los Angeles
PROJECT NAME Sixth Street Viaduct PARC
PROJECT NUMBER LAC-17-001
PROJECT LOCATION 6th Street, Los Angeles, CA
DATE STARTED 11/8/17 **COMPLETED** 11/8/17
GROUND ELEVATION _____ **HOLE SIZE** 8"
DRILLING CONTRACTOR CAL PAC Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger/Hollow Stem Auger
AT TIME OF DRILLING Not Encountered
LOGGED BY RN **CHECKED BY** NM
AT END OF DRILLING Not Encountered
NOTES Borehole was backfilled with GRAVEL after completion of percolation testing **AFTER DRILLING** Not Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ASPHALT ~ 3 inches							
		SILT with SAND (ML): Brown, fine SILT with fine grained SAND, sub-rounded GRAVEL up to 1.5" dia.			AU 1A				
		SILTY SAND (SM): Brown, moist, fine grained SAND, sub-rounded GRAVEL up to 1.5" dia.							
5		Poorly graded SAND (SP): Brown, moist, fine grained SAND.			AU 1B				
		Borehole terminated at 6.04 feet.							

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Hushmand Associates, Inc.

BORING NUMBER GB-8

CLIENT Tetra Tech/City of Los Angeles
PROJECT NAME Sixth Street Viaduct PARC
PROJECT NUMBER LAC-17-001
PROJECT LOCATION 6th Street, Los Angeles, CA
DATE STARTED 11/6/17 **COMPLETED** 11/6/17
GROUND ELEVATION _____ **HOLE SIZE** 10"
DRILLING CONTRACTOR CAL PAC Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger/Hollow Stem Auger
AT TIME OF DRILLING Not Encountered
LOGGED BY RN **CHECKED BY** NM
AT END OF DRILLING Not Encountered
NOTES Borehole was backfilled with GRAVEL after completion of percolation testing **AFTER DRILLING** Not Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		ASPHALT ~ 3 inches							
		SILTY SAND (SM): Brown, moist, fine grained SAND.			AU 1				
5		Borehole terminated at 5.67 feet.							

HAI-AMIR LAC-17-001. SIXTH STREET VIADUCT PARC.GPJ GINT US.GDT 1/12/18

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Hushmand Associates, Inc.

BORING NUMBER GB-9

CLIENT Tetra Tech/City of Los Angeles
PROJECT NAME Sixth Street Viaduct PARC
PROJECT NUMBER LAC-17-001
PROJECT LOCATION 6th Street, Los Angeles, CA
DATE STARTED 11/3/17 **COMPLETED** 11/3/17
GROUND ELEVATION _____ **HOLE SIZE** 8"
DRILLING CONTRACTOR CAL PAC Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger/Hollow Stem Auger
AT TIME OF DRILLING Not Encountered
LOGGED BY RN **CHECKED BY** NM
AT END OF DRILLING Not Encountered
NOTES Backfilled with cement grout
AFTER DRILLING Not Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		Poorly graded SAND (SP): Gray, moist, fine to medium grained, with angular gravel up to 1" dia.							
		@ 2': 2" dia. GRAVEL encountered.			AU 1				RV CORR
5		Poorly graded SAND (SP): Light gray, moist, medium dense, fine to medium grained.			MC 2	5-5-9 (14)	101	3	DS
		Poorly graded SAND with SILT and GRAVEL(SP): Brown, moist, medium dense, fine to medium grained.			SPT 3	5-15-11 (26)			SA
		@ 8.25': sub-angular GRAVEL up to 1.5" dia. encountered.							
10		Poorly graded SAND (SP): Light gray, moist, dense fine to medium grained.			MC 4	15-24-28 (52)	118	3	
		3" dia. sub-angular GRAVEL found at the bottom of sampler.							
		Poorly graded SAND (SP): Gray to light brown, moist, dense, medium to coarse grained, fine sub-angular gravel up to 1" dia.			SPT 5	7-10-10 (20)			
15		Poorly graded SAND (SP): Gray, moist, medium dense, fine to coarse grained SAND.			MC 6	10-13-15 (28)	106	3	
		Well-graded SAND with GRAVEL (SW): Light brown, moist, dense, fine to coarse grained SAND.			SPT 7	6-10-14 (24)			SA
		SILTY SAND (SM): Light brown, moist dense, fine grained SAND.							
20		Poorly graded SAND (SP): Light brown, medium dense, fine to coarse grained SAND, fine to coarse GRAVEL up to 1.5" dia.			MC 8	13-16-10 (26)	118	3	
		3" dia. GRAVEL encountered at the bottom of sampler.							
		Borehole terminated at 21.5 feet.							

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BORING NUMBER GB-10

Hushmand Associates, Inc.

CLIENT Tetra Tech/City of Los Angeles
PROJECT NAME Sixth Street Viaduct PARC
PROJECT NUMBER LAC-17-001
PROJECT LOCATION 6th Street, Los Angeles, CA
DATE STARTED 11/7/17 **COMPLETED** 11/7/17
GROUND ELEVATION **HOLE SIZE** 8"
DRILLING CONTRACTOR CAL PAC Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger/Hollow Stem Auger
AT TIME OF DRILLING Not Encountered
LOGGED BY RN **CHECKED BY** NM
AT END OF DRILLING Not Encountered
NOTES Borehole was backfilled with GRAVEL after completion of percolation testing **AFTER DRILLING** Not Encountered

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	CORE SAMPLE	BULK SAMPLE	SAMPLE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	OTHER LABORATORY TESTS
		Poorly graded SAND with SILT (SP-SM): Light brown, moist, fine grained SAND with SILT.							
		SILTY SAND (SM): Brown, moist, fine grained, sub-angular to sub-rounded GRAVEL and COBBLES up to 4" dia. encountered.			AU 1A				SA
5		SILTY SAND (SM): Brown, moist, fine grained SAND.							
		Poorly graded SAND (SP): Brown, moist, fine to coarse grained SAND, very little GRAVEL up to 1.5" dia.			AU 1B				
		Borehole terminated at 6 feet.							

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APPENDIX A-2
PERCOLATION TEST LOGS

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HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Field Percolation Test Results

Project Location	Sixth Street, Los Angeles	Test Number	GB-1
Project No.	LAC-17-001	Diameter of Boring (in)	10
Date	11/8/2017	Diameter of Casing	3" Perforated PVC
Tested By	RN	Depth of Boring (ft)	6.00
Test Method	Water Level Sounder	Depth of Invert of BMP (ft)	N/A
		Depth of Groundwater (ft)	Unknown
		Depth to Initial Water Depth (in)	60

Time Interval Standard

Start Time for Pre-Soak	14:51	Water Remaining in Boring (Y/N)	N
Start Time for Standard	15:06	Standard Time Interval Between Readings	1 min

Reading Number	Time Start/ End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Standard Time Interval Δd (inches)	Percolation Rate for Reading (in/hr)	Soil Description/ Notes/ Comments
1	15:06 15:07	1	3.0	180.0	
2	15:09 15:10	1	3.0	180.0	
3	15:15 15:16	1	3.0	180.0	
4	15:18 15:19	1	3.0	180.0	
5	15:21 15:22	1	3.0	180.0	
Pre-adjusted Parameter			**3.0**	**180.0**	
		Reduction Factor (Rf)		3.1	
		Adjusted Percolation Rate		**58.1**	in/hr

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HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Field Percolation Test Results

Project Location	Sixth Street, Los Angeles	Test Number	GB-3
Project No.	LAC-17-001	Diameter of Boring (in)	8
Date	11/8/2017	Diameter of Casing	3" Perforated PVC
Tested By	RN	Depth of Boring (ft)	6.00
Test Method	Water Level Sounder	Depth of Invert of BMP (ft)	N/A
		Depth of Groundwater (ft)	Unknown
		Depth to Initial Water Depth (in)	60

Time Interval Standard

Start Time for Pre-Soak	9:00	Water Remaining in Boring (Y/N)	N
Start Time for Standard	9:37	Standard Time Interval Between Readings	5 min

Reading Number	Time Start/ End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Standard Time Interval Δd (inches)	Percolation Rate for Reading (in/hr)	Soil Description/ Notes/ Comments
1	9:37 9:42	5	5.25	63.0	
2	9:46 9:51	5	5.25	63.0	
3	9:54 9:59	5	5.00	60.0	
4	10:03 10:08	5	5.00	60.0	
5	10:10 10:15	5	5.00	60.0	
6	10:17 10:22	5	4.75	57.0	
7	10:24 10:29	5	4.75	57.0	
8	10:30 10:35	5	4.75	57.0	
Pre-adjusted Parameter			**5.0**	**60.0**	
		Reduction Factor (Rf)		3.4	
		Adjusted Percolation Rate		**17.8**	in/hr

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HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Field Percolation Test Results

Project Location	Sixth Street, Los Angeles	Test Number	GB-6
Project No.	LAC-17-001	Diameter of Boring (in)	9
Date	11/7/2017	Diameter of Casing	3" Perforated PVC
Tested By	RN	Depth of Boring (ft)	6.08
Test Method	Water Level Sounder	Depth of Invert of BMP (ft)	N/A
		Depth of Groundwater (ft)	Unknown
		Depth to Initial Water Depth (in)	56

Time Interval Standard

Start Time for Pre-Soak	9:30	Water Remaining in Boring (Y/N)	N
Start Time for Standard	9:44	Standard Time Interval Between Readings	1 min

Reading Number	Time Start/ End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Standard Time Interval Δd (inches)	Percolation Rate for Reading (in/hr)	Soil Description/ Notes/ Comments
1	9:44 9:45	1	12.00	720.0	
2	9:47 9:48	1	13.00	780.0	
3	9:51 9:52	1	12.00	720.0	
4	9:53 9:54	1	6.00	360.0	
5	9:56 9:57	1	6.00	360.0	
6	10:00 10:01	1	6.00	360.0	
7	10:02 10:03	1	6.00	360.0	
8	10:05 10:06	1	6.00	360.0	
Pre-adjusted Parameter			**6.00**	**480.0**	
		Reduction Factor (Rf)		4.1	
		Adjusted Percolation Rate		**116.8**	in/hr

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HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Field Percolation Test Results

Project Location	Sixth Street, Los Angeles	Test Number	GB-7
Project No.	LAC-17-001	Diameter of Boring (in)	8
Date	11/8/2017	Diameter of Casing	3" Perforated PVC
Tested By	RN	Depth of Boring (ft)	6.04
Test Method	Water Level Sounder	Depth of Invert of BMP (ft)	N/A
		Depth of Groundwater (ft)	Unknown
		Depth to Initial Water Depth (in)	60

Time Interval Standard

Start Time for Pre-Soak	12:03	Water Remaining in Boring (Y/N)	N
Start Time for Standard	12:19	Standard Time Interval Between Readings	2 min

Reading Number	Time Start/ End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Standard Time Interval Δd (inches)	Percolation Rate for Reading (in/hr)	Soil Description/ Notes/ Comments
1	12:19 12:21	2	5.00	150.0	
2	12:22 12:24	2	4.75	142.5	
3	12:27 12:29	2	4.75	142.5	
4	12:30 12:32	2	4.50	135.0	
5	12:33 12:35	2	4.50	135.0	
6	12:45 12:47	2	4.50	135.0	
7	12:49 12:51	2	4.50	135.0	
8	12:53 12:55	2	4.50	135.0	
Pre-adjusted Parameter			**4.50**	**135.0**	
		Reduction Factor (Rf)		3.6	
		Adjusted Percolation Rate		**37.9**	in/hr

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HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Field Percolation Test Results

Project Location	Sixth Street, Los Angeles	Test Number	GB-8
Project No.	LAC-17-001	Diameter of Boring (in)	8
Date	11/6/2017	Diameter of Casing	3" Perforated PVC
Tested By	RN	Depth of Boring (ft)	5.67
Test Method	Water Level Sounder	Depth of Invert of BMP (ft)	N/A
		Depth of Groundwater (ft)	Unknown
		Depth to Initial Water Depth (in)	51

Time Interval Standard

Start Time for Pre-Soak	12:36	Water Remaining in Boring (Y/N)	N
Start Time for Standard	13:10	Standard Time Interval Between Readings	1 min

Reading Number	Time Start/ End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Standard Time Interval Δd (inches)	Percolation Rate for Reading (in/hr)	Soil Description/ Notes/ Comments
1	13:10 13:11	1	17.00	1020.0	
2	13:20 13:21	1	17.00	1020.0	
3	13:23 13:24	1	12.00	720.0	
4	13:30 13:31	1	6.00	360.0	
5	13:35 13:36	1	6.00	360.0	
6	13:41 13:42	1	3.00	180.0	
7	13:45 13:46	1	3.00	180.0	
8	13:48 13:49	1	3.00	180.0	
Pre-adjusted Parameter			5.00	180.0	
		Reduction Factor (Rf)		4.6	
		Adjusted Percolation Rate		**38.9**	in/hr

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HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Field Percolation Test Results

Project Location	Sixth Street, Los Angeles	Test Number	GB-10
Project No.	LAC-17-001	Diameter of Boring (in)	8
Date	11/7/2017	Diameter of Casing	3" Perforated PVC
Tested By	RN	Depth of Boring (ft)	6.08
Test Method	Water Level Sounder	Depth of Invert of BMP (ft)	N/A
		Depth of Groundwater (ft)	Unknown
		Depth to Initial Water Depth (in)	60

Time Interval Standard

Start Time for Pre-Soak	11:38	Water Remaining in Boring (Y/N)	N
Start Time for Standard	12:20	Standard Time Interval Between Readings	5 min

Reading Number	Time Start/ End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Standard Time Interval Δd (inches)	Percolation Rate for Reading (in/hr)	Soil Description/ Notes/ Comments
1	12:20 12:25	5	5.00	60.0	
2	12:27 12:32	5	5.00	60.0	
3	12:33 12:38	5	5.00	60.0	
4	12:40 12:45	5	5.00	60.0	
5	12:47 12:52	5	5.00	60.0	
6	12:53 12:58	5	5.00	60.0	
Pre-adjusted Parameter			**5.00**	**60.0**	
		Reduction Factor (Rf)		3.6	
		Adjusted Percolation Rate		**16.6**	in/hr

APPENDIX B
LABORATORY TEST RESULTS

GEOTECHNICAL

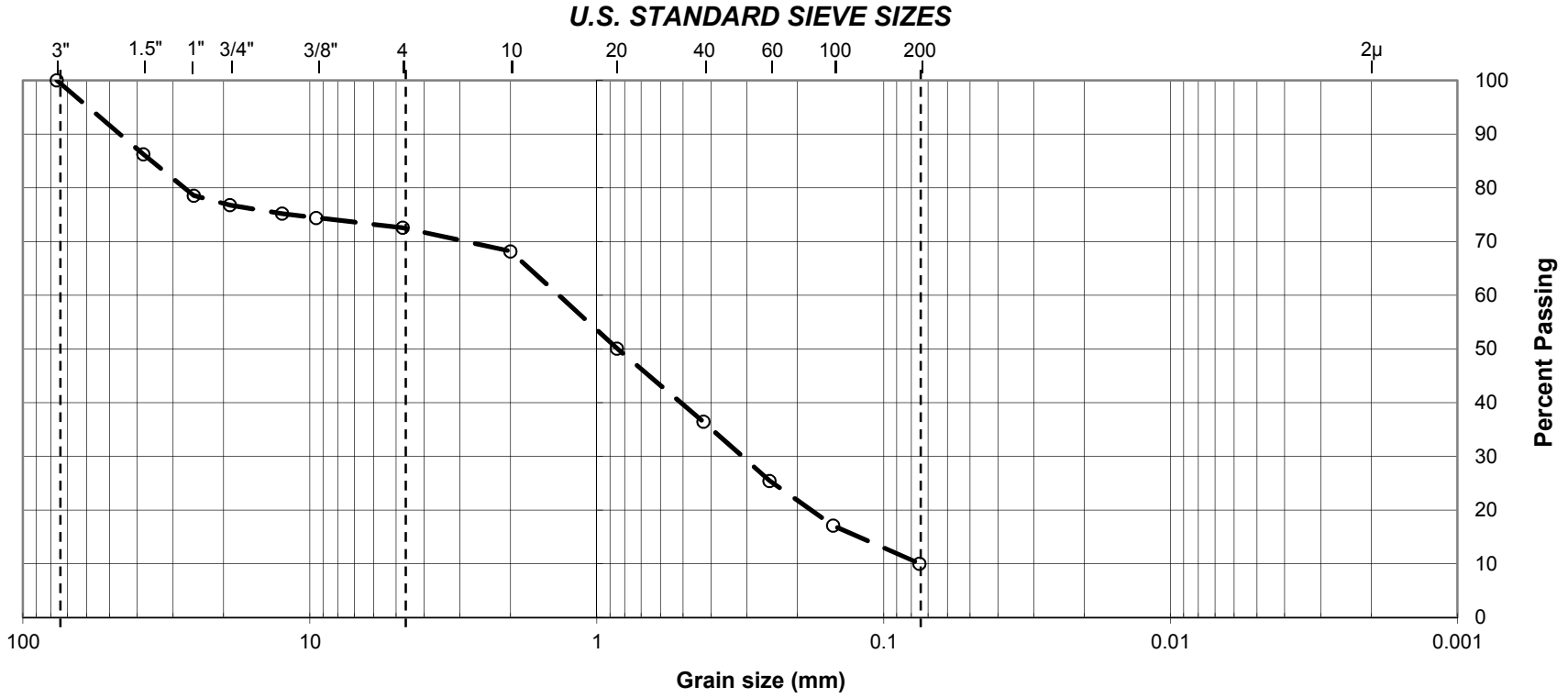
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D6913)

Client:	City of Los Angeles/Tetra Tech	***HAI Project No.:***	LAC-17-001
Project Name:	Sixth Street Viaduct PARC	***Tested by:***	GA
Project No.:	LAC-17-001	***Checked by:***	KL/MJ
		Date:	11/29/2017

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	



Boring No.	Sample No.	Depth (ft)	Symbol	USCS	% Gravel	% Sand	% Fines
GB-1	Bulk 1A	0-4	○	Brown, Poorly graded Sand with Silt and Gravel (SP-SM)	27.4	62.5	10.0

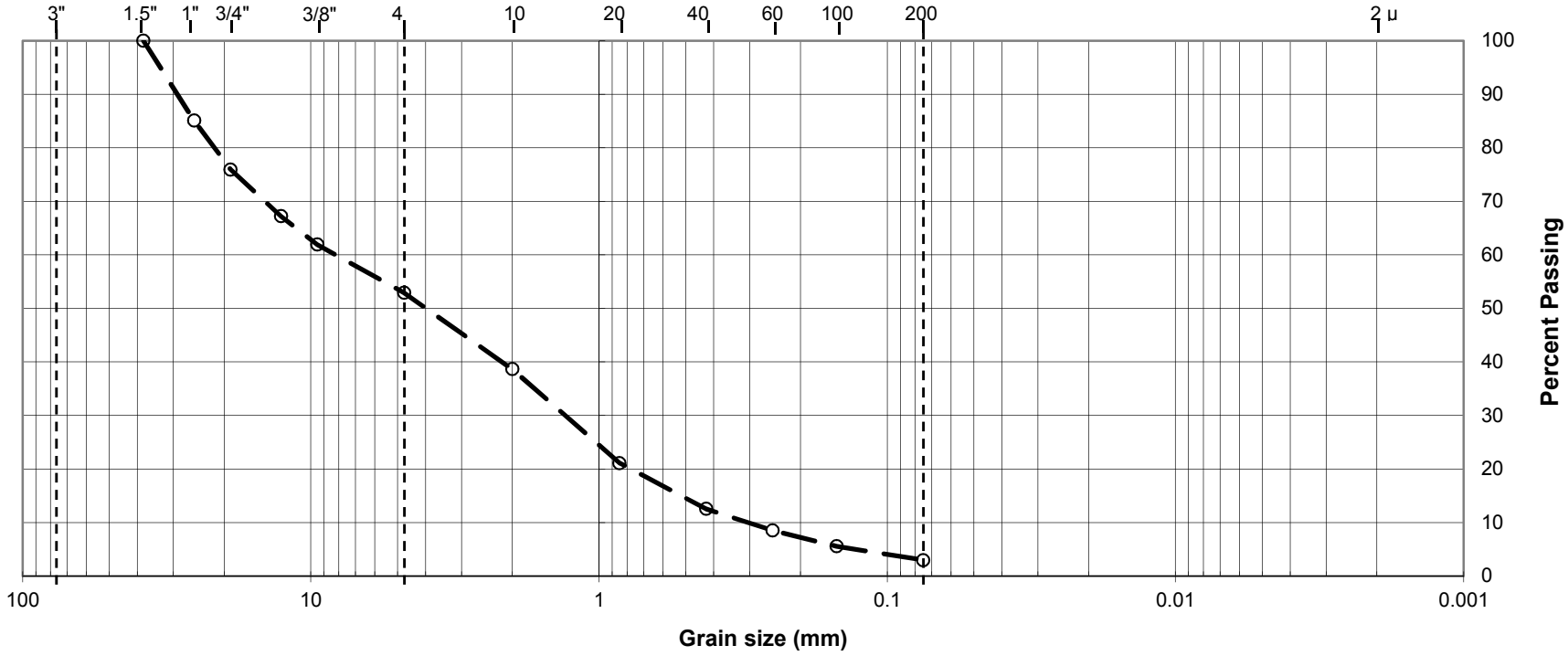
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM D6913

Client:	City of Los Angeles/Tetra Tech	***HAI Project No.:***	LAC-17-001
Project Name:	Sixth Street Viaduct PARC	***Tested by:***	GA
Project No.:	LAC-17-001	***Checked by:***	KL/MJ
		Date:	11/29/2017

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Depth (ft)	Symbol	USCS	% Gravel	% Sand	% Fines
GB-2	MC6A	15.5	○	Brown, Poorly graded Sand with Gravel (SP)	47.1	49.9	3.0

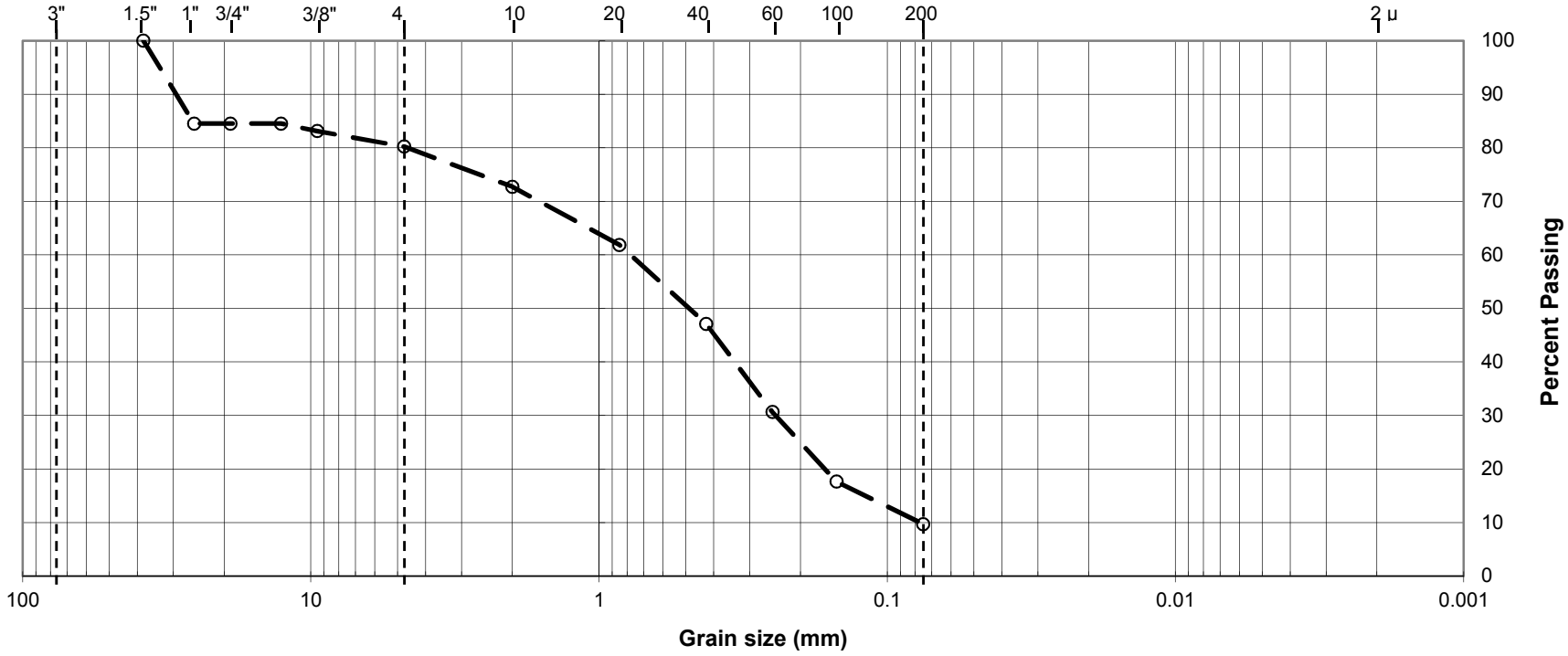
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM D6913

Client:	City of Los Angeles/Tetra Tech	***HAI Project No.:***	LAC-17-001
Project Name:	Sixth Street Viaduct PARC	***Tested by:***	GA
Project No.:	LAC-17-001	***Checked by:***	KL/MJ
		Date:	11/29/2017

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Depth (ft)	Symbol	USCS	% Gravel	% Sand	% Fines
GB-2	SPT3	7.5	○	Brown, Well-graded Sand with Silt and Gravel (SW-SM)	19.8	70.5	9.7

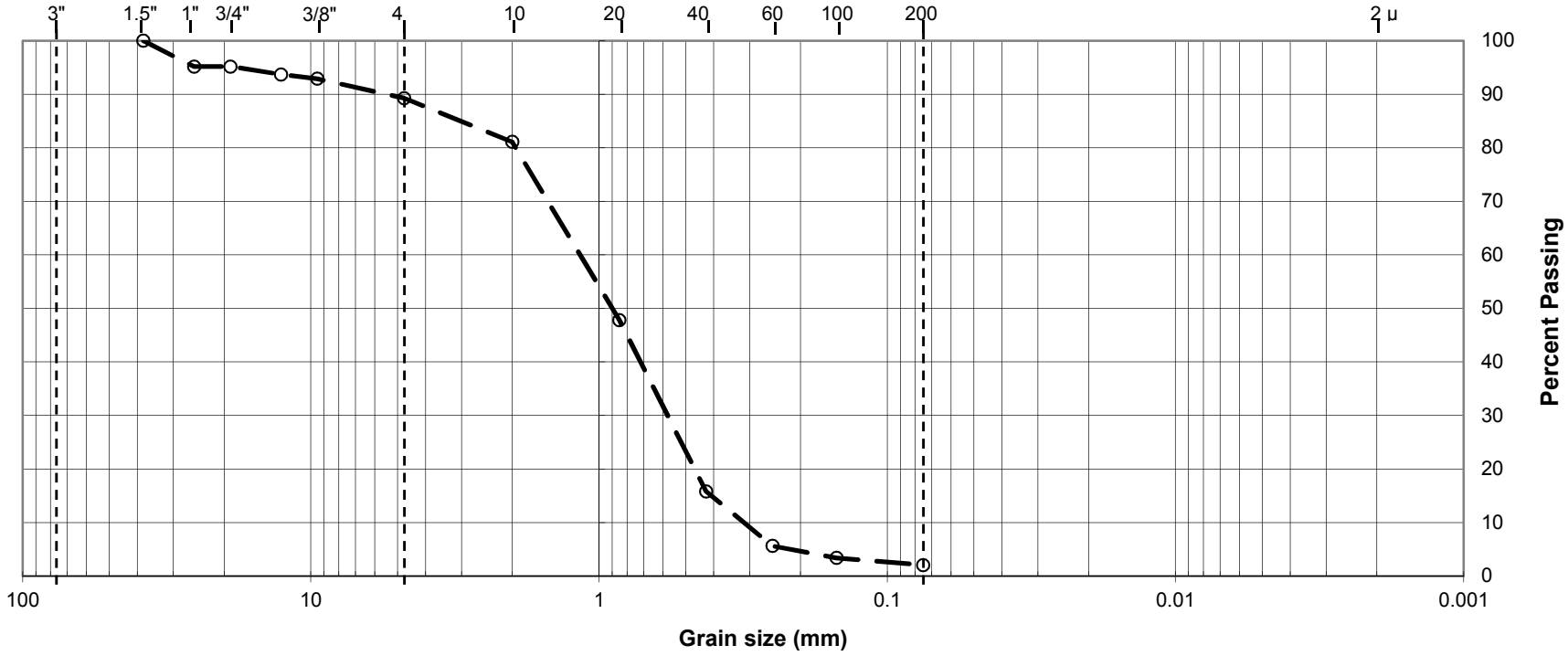
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM D6913

Client:	City of Los Angeles/Tetra Tech	***HAI Project No.:***	LAC-17-001
Project Name:	Sixth Street Viaduct PARC	***Tested by:***	GA
Project No.:	LAC-17-001	***Checked by:***	KL/MJ
		Date:	11/29/2017

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



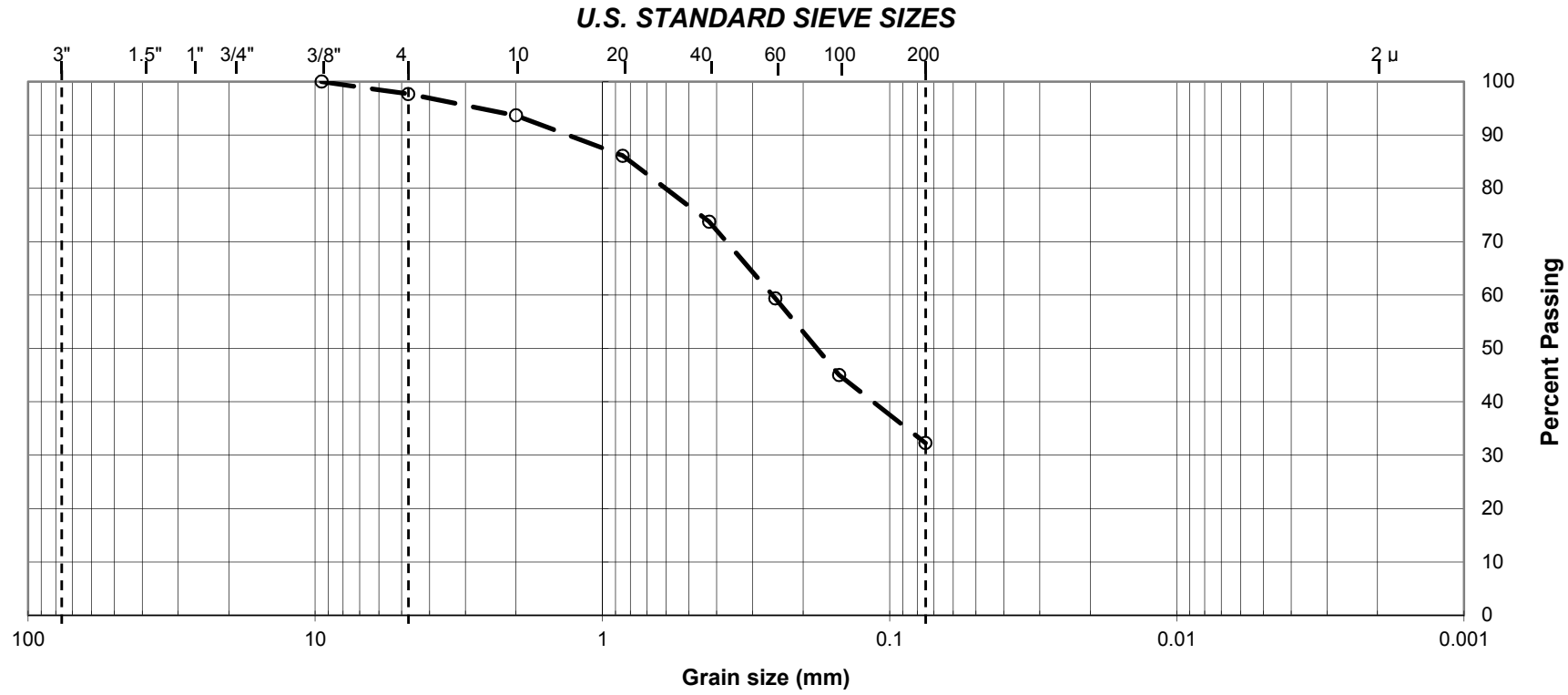
Boring No.	Sample No.	Depth (ft)	Symbol	USCS	% Gravel	% Sand	% Fines
GB-4	MC7A	18	○	Brown, Poorly Graded Sand (SP)	10.7	87.2	2.1

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM D6913

Client:	City of Los Angeles/Tetra Tech	***HAI Project No.:***	LAC-17-001
Project Name:	Sixth Street Viaduct PARC	***Tested by:***	GA
Project No.:	LAC-17-001	***Checked by:***	KL/MJ
		Date:	11/29/2017

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	



Boring No.	Sample No.	Depth (ft)	Symbol	USCS	% Gravel	% Sand	% Fines
GB-4	SPT4	10	○	Brown, Silty Sand (SM)	2.3	65.4	32.3

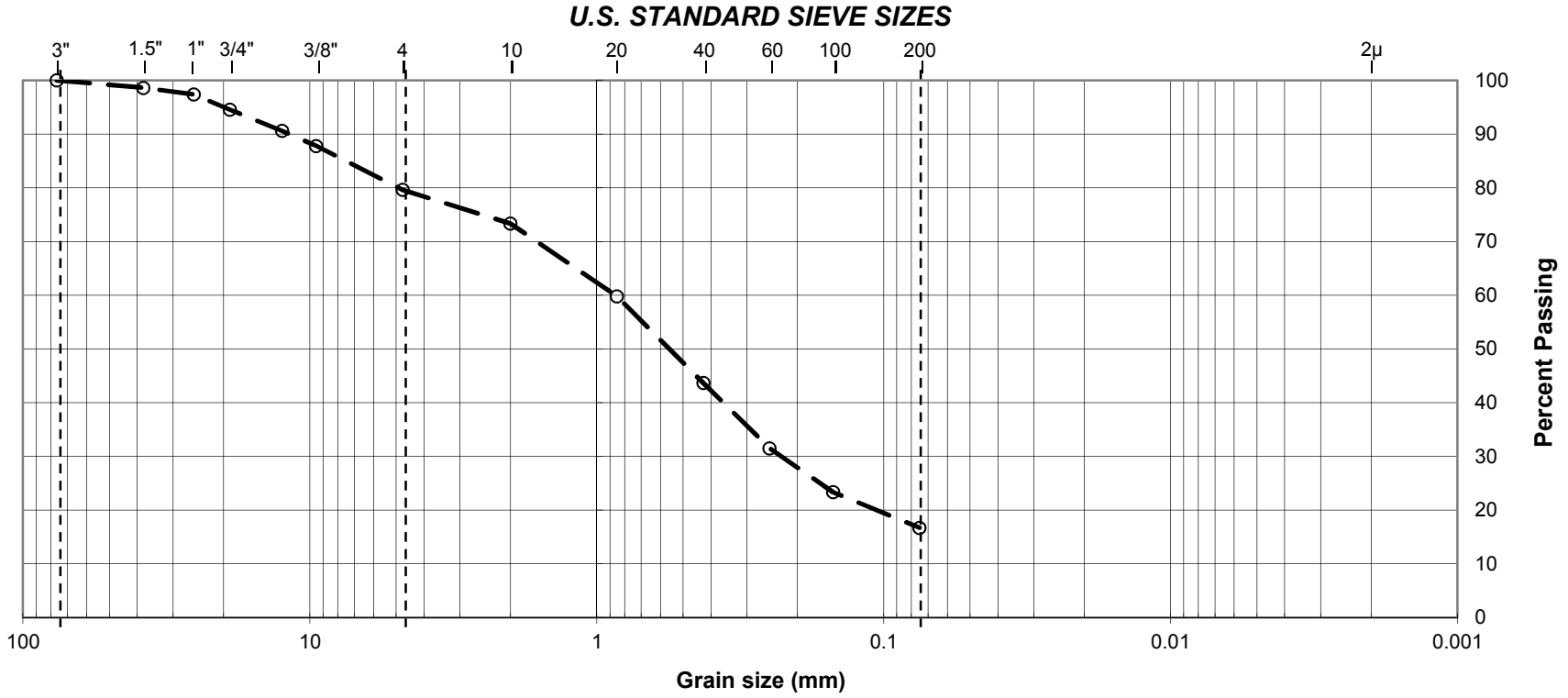
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D6913)

Client:	City of Los Angeles/Tetra Tech	***HAI Project No.:***	LAC-17-001
Project Name:	Sixth Street Viaduct PARC	***Tested by:***	GA
Project No.:	LAC-17-001	***Checked by:***	KL/MJ
		Date:	11/29/2017

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	



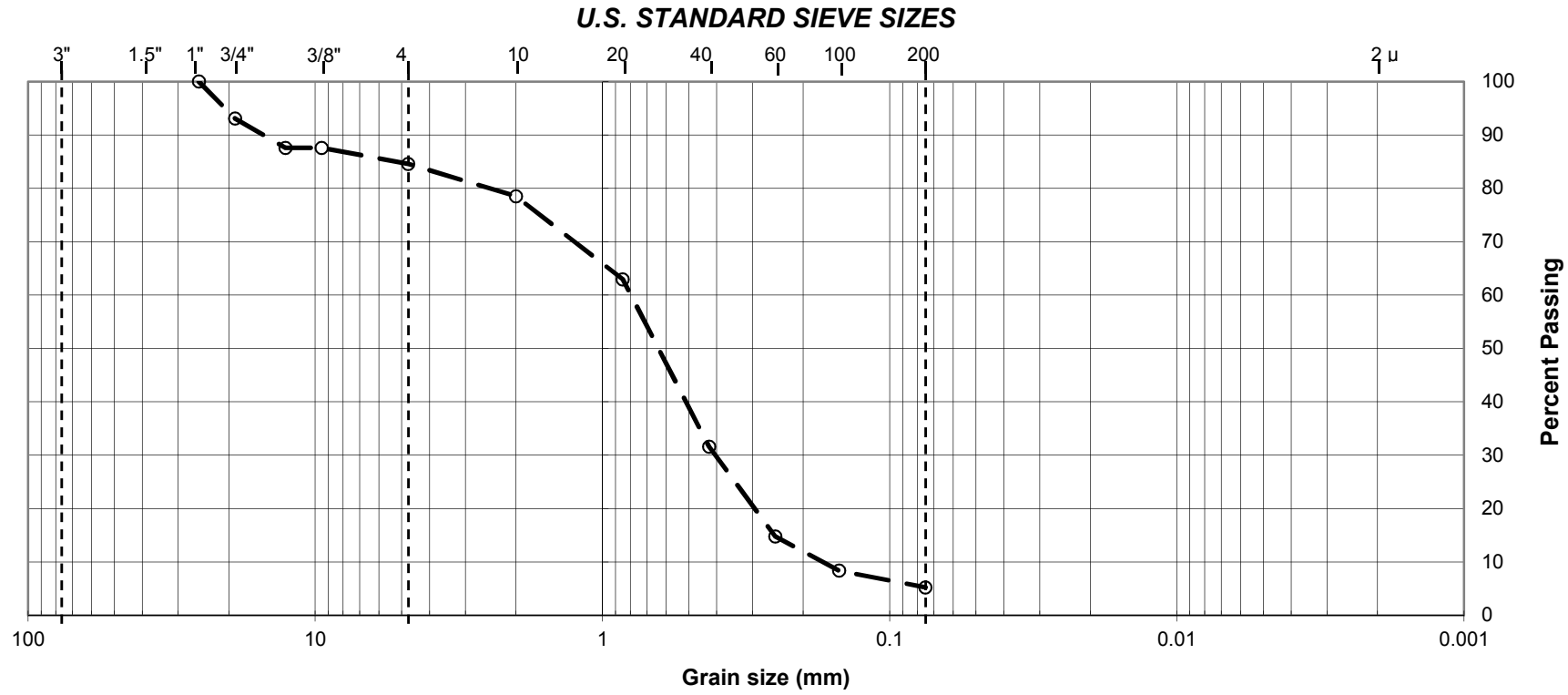
Boring No.	Sample No.	Depth (ft)	Symbol	USCS	% Gravel	% Sand	% Fines
GB-6	Bulk 1A	0-4	○	Brown, Silty Sand with Gravel (SM)	20.4	62.9	16.7

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM D6913

Client:	City of Los Angeles/Tetra Tech	***HAI Project No.:***	LAC-17-001
Project Name:	Sixth Street Viaduct PARC	***Tested by:***	GA
Project No.:	LAC-17-001	***Checked by:***	KL/MJ
		Date:	11/29/2017

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	



Boring No.	Sample No.	Depth (ft)	Symbol	USCS	% Gravel	% Sand	% Fines
GB-9	SPT3	7.5	○	Brown, Poorly graded Sand with Silt and Gravel (SP-SM)	15.4	79.4	5.2

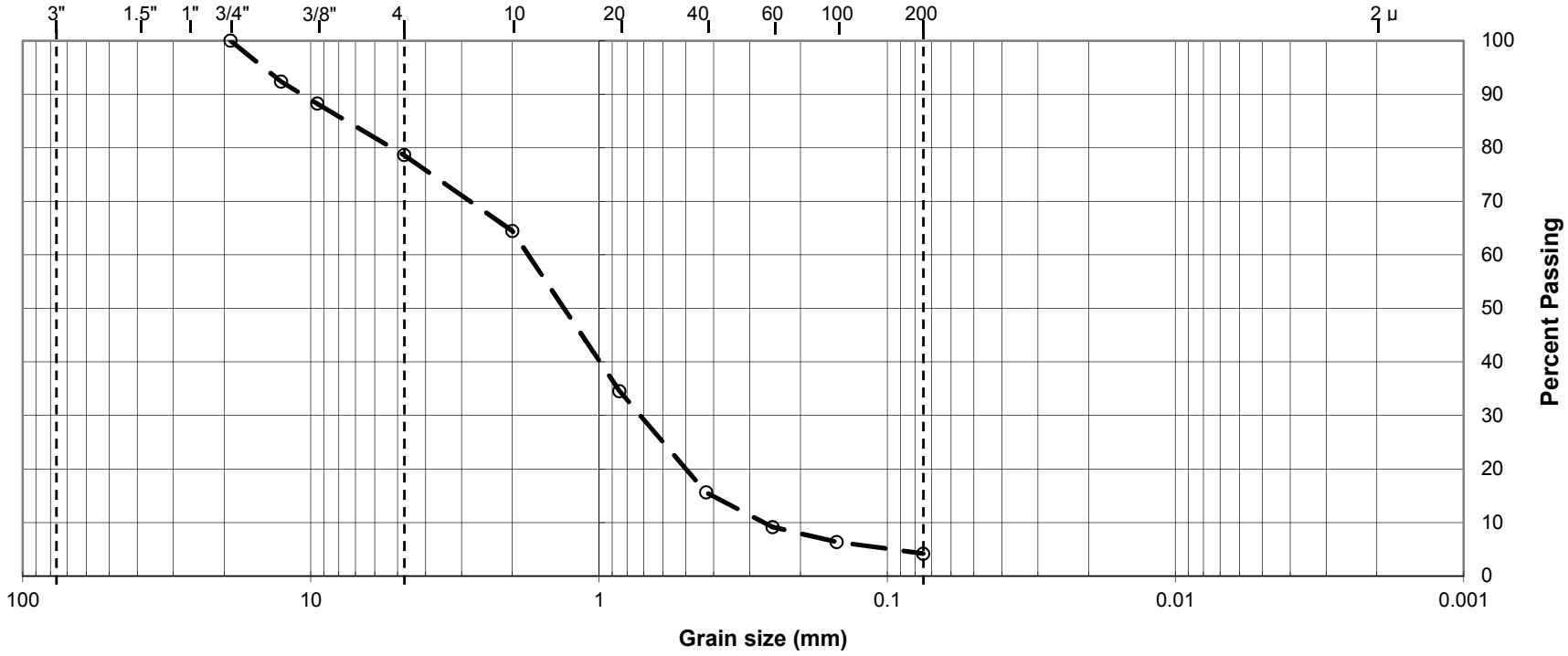
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM D6913

Client:	City of Los Angeles/Tetra Tech	***HAI Project No.:***	LAC-17-001
Project Name:	Sixth Street Viaduct PARC	***Tested by:***	GA
Project No.:	LAC-17-001	***Checked by:***	KL/MJ
		Date:	11/29/2017

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Depth (ft)	Symbol	USCS	% Gravel	% Sand	% Fines
GB-9	SPT7	17.5	○	Brown, Well-graded Sand with Gravel (SW)	21.4	74.5	4.2

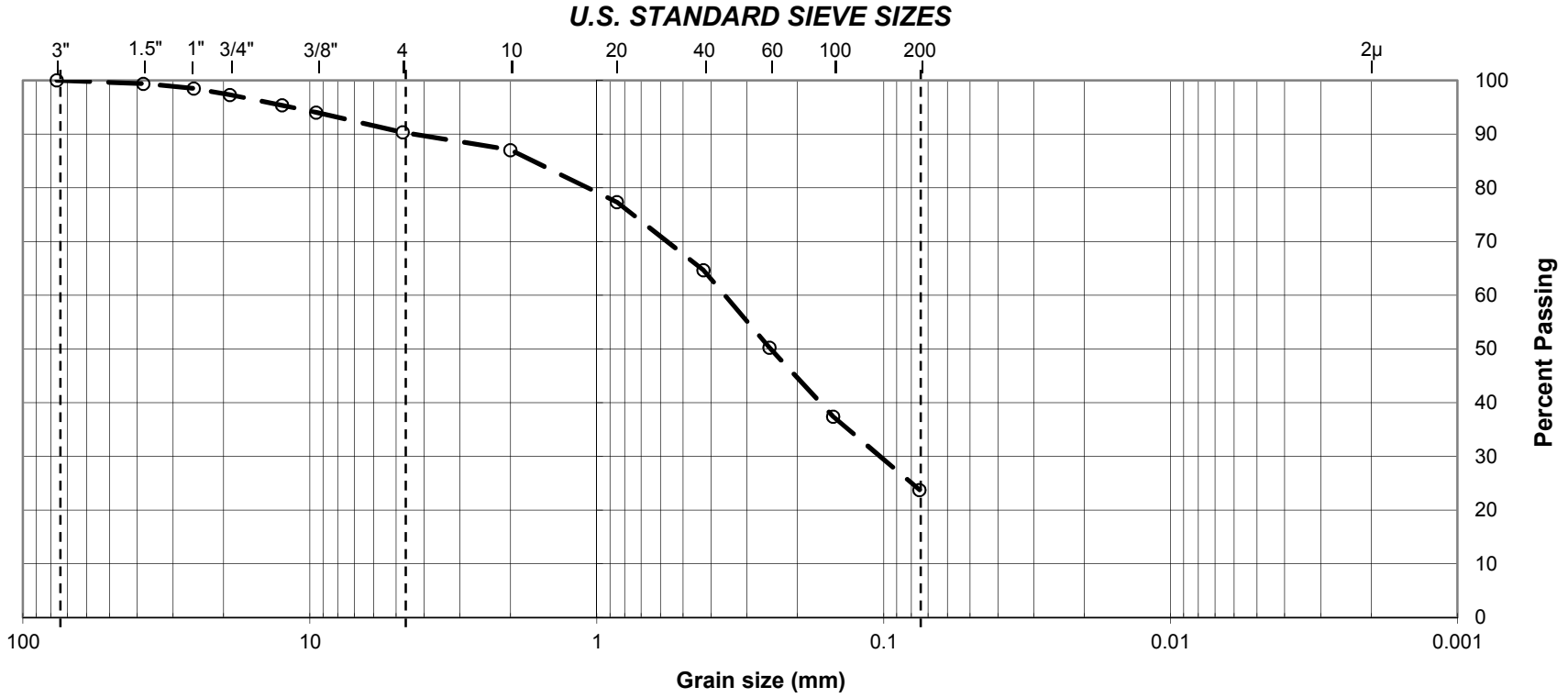
HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

PARTICLE-SIZE ANALYSIS OF SOILS

(ASTM D6913)

Client:	City of Los Angeles/Tetra Tech	***HAI Project No.:***	LAC-17-001
Project Name:	Sixth Street Viaduct PARC	***Tested by:***	GA
Project No.:	LAC-17-001	***Checked by:***	KL/MJ
		Date:	11/29/2017

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	



Boring No.	Sample No.	Depth (ft)	Symbol	USCS	% Gravel	% Sand	% Fines
GB-10	Bulk 1A	0-4	○	Brown, Silty Sand (SM)	9.7	66.5	23.8

DRAFT

SWELL / COLLAPSE TEST
ASTM D4546

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

Client :	City of Los Angeles/Tetra Tech	***HAI Project No.:***	LAC-17-001
Project Name:	Sixth Street Viaduct PARC	***Tested by:***	KL
Project No.:	LAC-17-001	***Checked by:***	KL/MJ
Boring No.:	GB-4	***Date:***	12/18/17
Sample No.:	MC3A		
Type of Sample:	Undisturbed Ring		
Depth (ft):	8		
Soil Description:	Brown, Silty Sand (SM)		

Initial Total Weight (g)	Final Total Weight (g)	Final Dry Weight (g)
134.83	164.18	131.90

			Initial Conditions	Unload
Height	H	(in)	1.003	0.997
Height of Solids	Hs	(in)	0.658	0.658
Height of Water	Hw	(in)	0.039	0.430
Height of Air	Ha	(in)	0.306	0.000
Dry Density		**(pcf)**	**109.2**	**110.3**
Water Content		**(%)**	**2.2**	**24.5**
Saturation		**(%)**	**11.3**	**100.0**

* Saturation is calcualted based on Gs=2.68

Load (ksf)	δH (in)	H (in)	Voids (in)	e	Consol. (%)	a_v (ksf^{-1})	M_v (ksf^{-1})	Comment
0.01	-------	1.0030	0.345	0.525	0			
0.25	0.0010	1.0020	0.344	0.524	0.1	6.7E-03	4.4E-03	
0.5	0.0035	0.9995	0.342	0.520	0.3	1.5E-02	9.8E-03	
1	0.0077	0.9953	0.338	0.514	0.8	1.3E-02	8.4E-03	
0.5	0.0073	0.9957	0.338	0.514	0.7	Unload		
0.25	0.0064	0.9966	0.339	0.515	0.6			
0.5	0.0069	0.9961	0.339	0.515	0.7	2.7E-03	1.8E-03	
1	0.0082	0.9948	0.337	0.513	0.8	4.0E-03	2.6E-03	
1	0.0200	0.9830	0.325	0.495	2.0	Water Added		

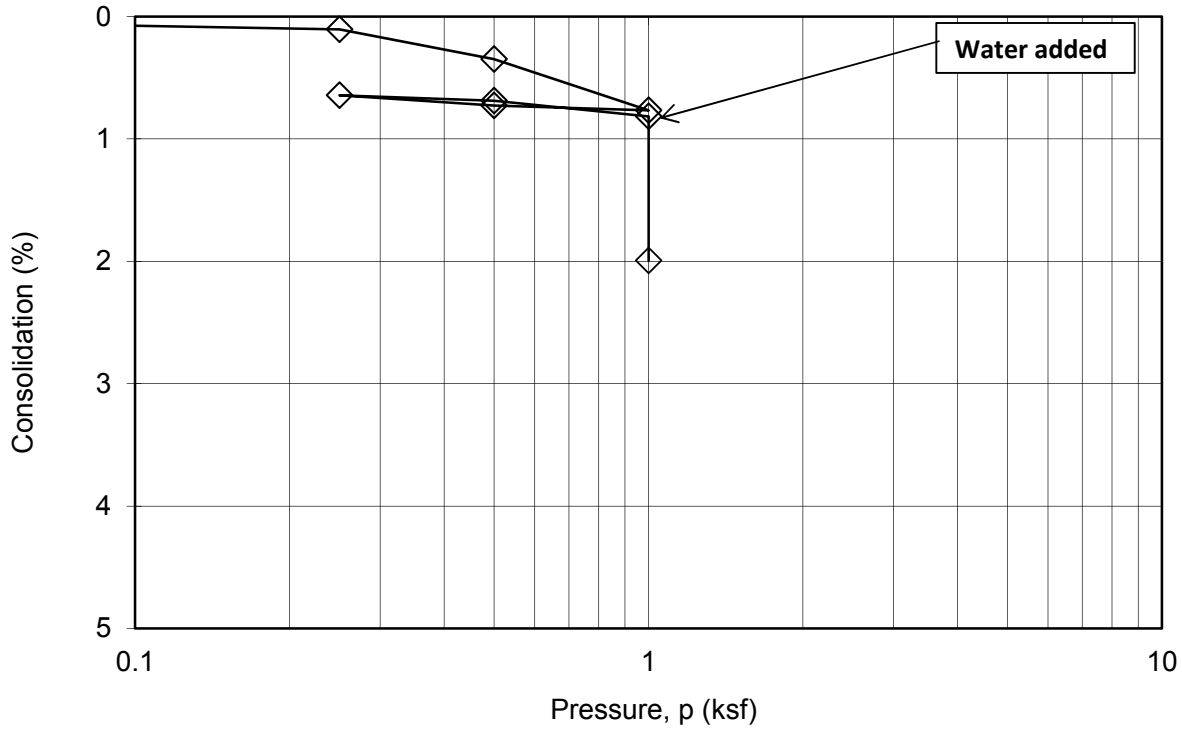
DRAFT

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

SWELL / COLLAPSE TEST

ASTM D4546

Client:	City of Los Angeles/Tetra Tech	***HAI Project No.:***	LAC-17-001
Project Name:	Sixth Street Viaduct PARC	***Tested by:***	KL
Project No.:	LAC-17-001	***Checked by:***	KL/MJ
Boring No.:	GB-4	***Date:***	12/18/17
Sample No.:	MC3A		
Type of Sample:	Undisturbed Ring		
Depth (ft):	8		
Soil Description:	Brown, Silty Sand (SM)		



HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

DIRECT SHEAR TEST

ASTM D3080

HAI Pr No.: LAC-17-001

Tested by: KL/MJ

Checked by: MJ/MZ

Date: 11/29/2017

Client: City of Los Angeles/Tetra Tech

Project Name: Sixth Street Viaduct PARC

Project Number: LAC-17-001

Boring No.: GB-2

Sample No.: MC2B

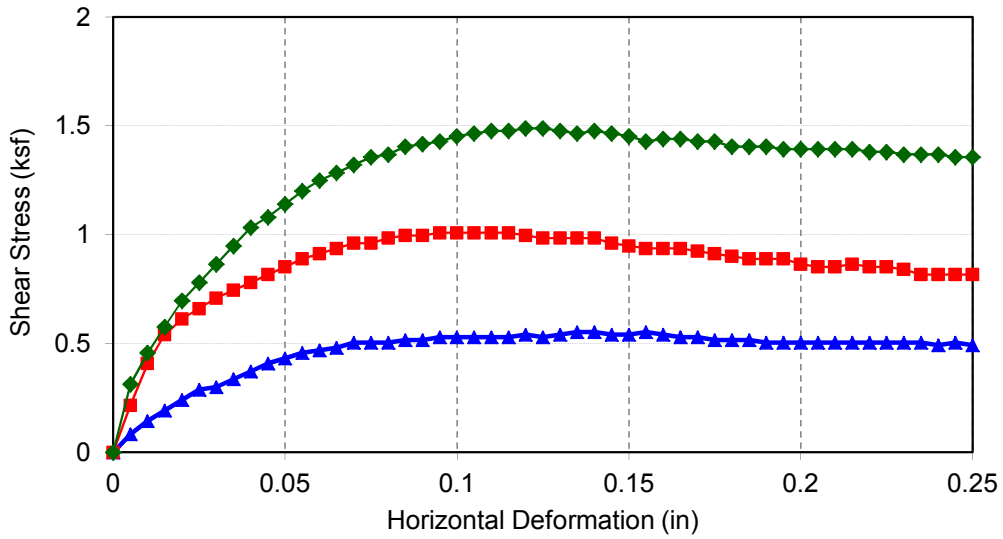
Sample type: Undristributed Ring

Depth (ft): 6

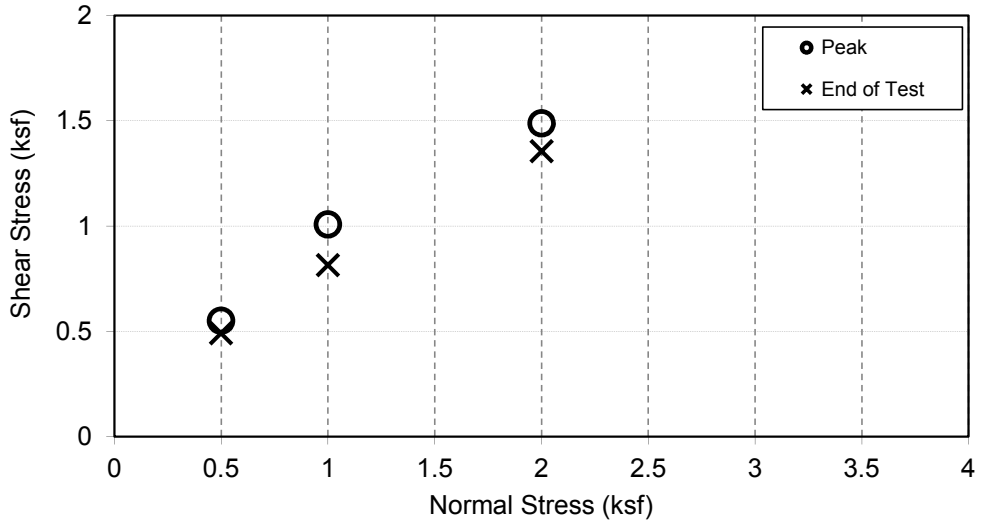
Soil description: Light Brown, Well-graded Sand with Silt and Gravel (SW-SM)

Type of test: **Consolidated, Drained**

Test No.	1	2	3
Symbol	▲	■	◆
Normal Stress (ksf)	**0.5**	**1**	**2**
Deformation Rate (in/min)	**0.002**	**0.002**	**0.002**



Peak Shear Stress (ksf)	**O**	**0.55**	**1.01**	**1.49**
Shear Stress @ End of Test (ksf)	**X**	**0.49**	**0.82**	**1.36**



Initial Height of Sample (in)	1.002	1.001	0.999
Height of Sample before Shear (in)	0.9909	0.9921	0.9757
Diameter of Sample (in)	2.416	2.416	2.416
Initial Moisture Content (%)	**1.7**	**1.7**	**1.7**
Final Moisture Content (%)	**15.0**	**15.2**	**15.2**
Dry Density (pcf)	**107.9**	**105.7**	**107.1**

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

DIRECT SHEAR TEST

ASTM D3080

HAI Pr No.: LAC-17-001

Tested by: KL/MJ

Checked by: MJ/MZ

Date: 11/29/2017

Client: City of Los Angeles/Tetra Tech

Project Name: Sixth Street Viaduct PARC

Project Number: LAC-17-001

Boring No.: GB-4

Sample No.: MC5B

Sample type: Undristributed Ring

Depth (ft): 13.5

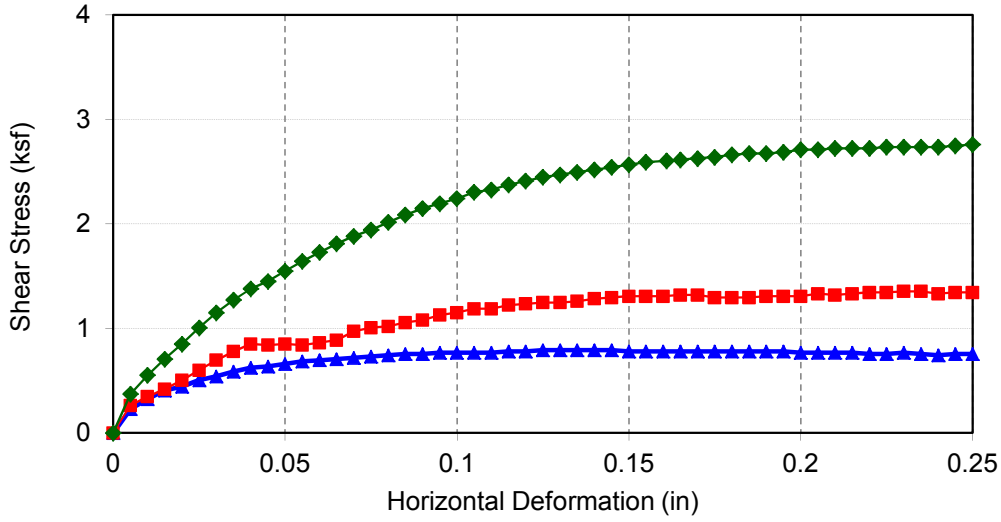
Soil description: Light Brown, Poorly Graded Sand (SP)

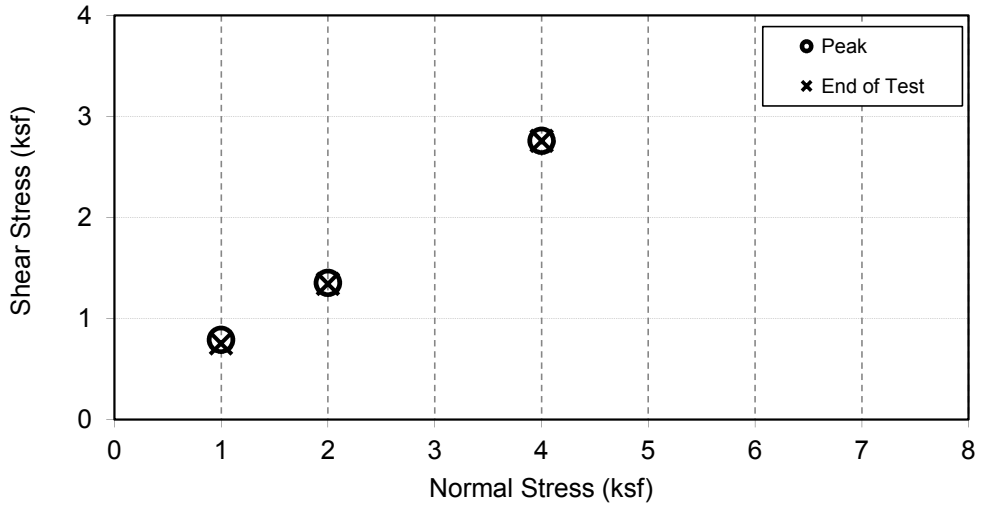
Type of test: **Consolidated, Drained**

Test No.	1	2	3
Symbol	▲	■	◆
Normal Stress (ksf)	**1**	**2**	**4**
Deformation Rate (in/min)	**0.002**	**0.002**	**0.002**

Peak Shear Stress (ksf)	**O**	**0.79**	**1.36**	**2.76**
Shear Stress @ End of Test (ksf)	**X**	**0.76**	**1.34**	**2.76**

Initial Height of Sample (in)	1.009	1.017	1.015
Height of Sample before Shear (in)	1.0320	0.9888	0.9012
Diameter of Sample (in)	2.416	2.416	2.416
Initial Moisture Content (%)	**9.2**	**9.2**	**9.2**
Final Moisture Content (%)	**17.7**	**17.5**	**17.7**
Dry Density (pcf)	**107.2**	**107.4**	**106.8**





HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

DIRECT SHEAR TEST

ASTM D3080

HAI Pr No.: LAC-17-001

Client: City of Los Angeles/Tetra Tech

Project Name: Sixth Street Viaduct PARC

Project Number: LAC-17-001

Boring No.: GB-4

Sample No.: MC9B

Sample type: Undristributed Ring

Depth (ft): 26

Soil description: Light Brown, Silty Sand with trace Gravel (SM)

Tested by: KL/MJ

Checked by: MJ/MZ

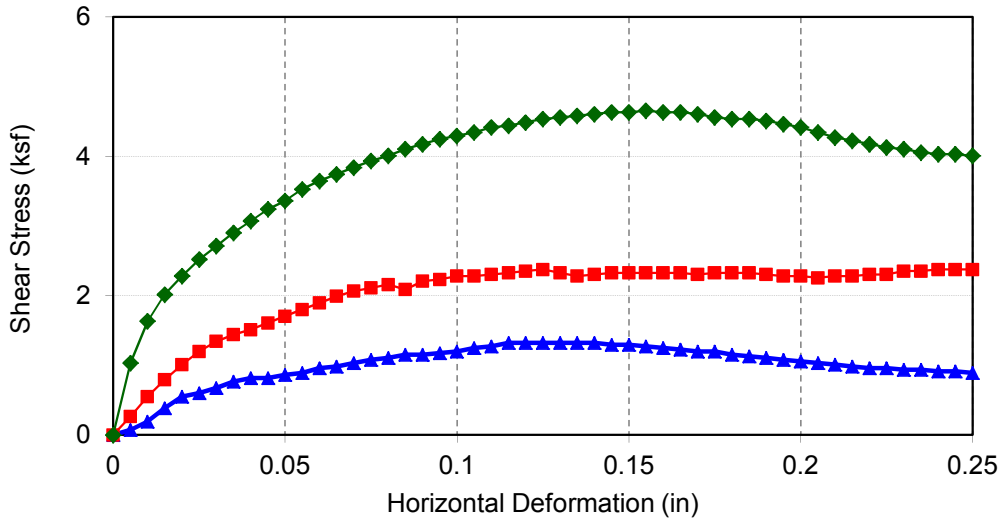
Date: 11/29/2017

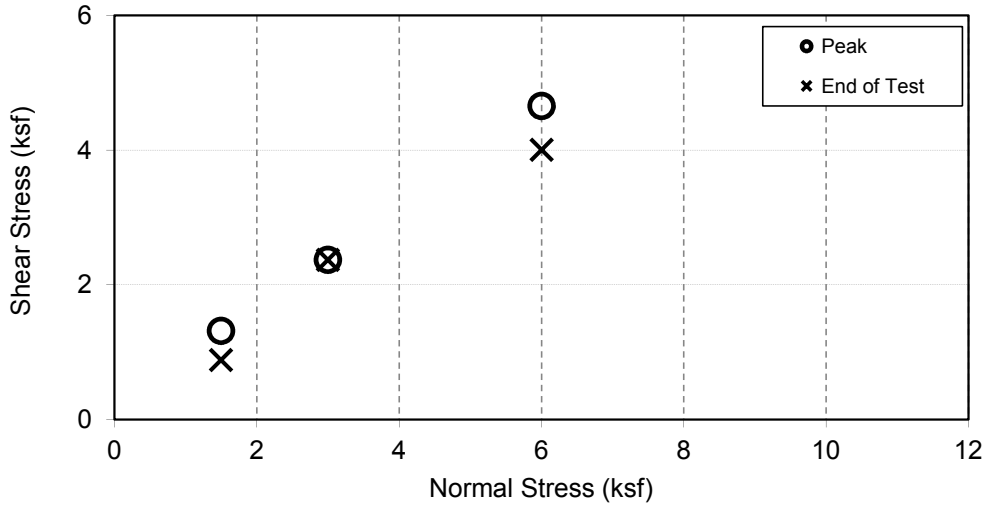
Type of test: **Consolidated, Drained**

Test No.	1	2	3
Symbol	▲	■	◆
Normal Stress (ksf)	**1.5**	**3**	**6**
Deformation Rate (in/min)	**0.002**	**0.002**	**0.002**

Peak Shear Stress (ksf)	**O**	**1.32**	**2.38**	**4.66**
Shear Stress @ End of Test (ksf)	**X**	**0.89**	**2.38**	**4.01**

Initial Height of Sample (in)	1.007	1.018	1.022
Height of Sample before Shear (in)	1.0249	0.9900	0.9824
Diameter of Sample (in)	2.416	2.416	2.416
Initial Moisture Content (%)	**9.6**	**9.6**	**9.6**
Final Moisture Content (%)	**20.0**	**19.0**	**19.1**
Dry Density (pcf)	**102.0**	**101.4**	**102.5**





HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

DIRECT SHEAR TEST

ASTM D3080

HAI Pr No.: LAC-17-001

Client: City of Los Angeles/Tetra Tech

Project Name: Sixth Street Viaduct PARC

Project Number: LAC-17-001

Boring No.: GB-4

Sample No.: MC11B

Sample type: Undristributed Ring

Depth (ft): 35.5

Soil description: Yellowish Brown, Poorly graded Sand with Silt (SP-SM)

Tested by: KL/MJ

Checked by: MJ/MZ

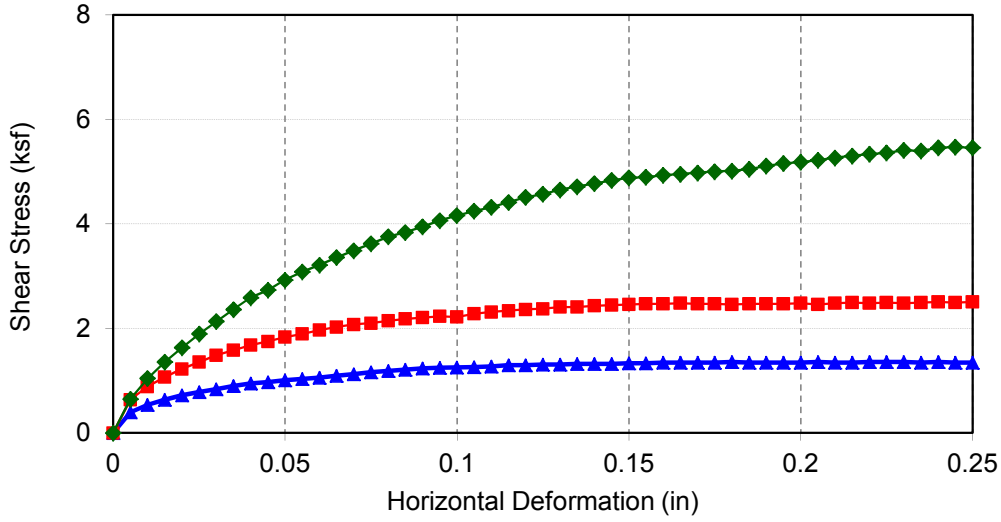
Date: 11/29/2017

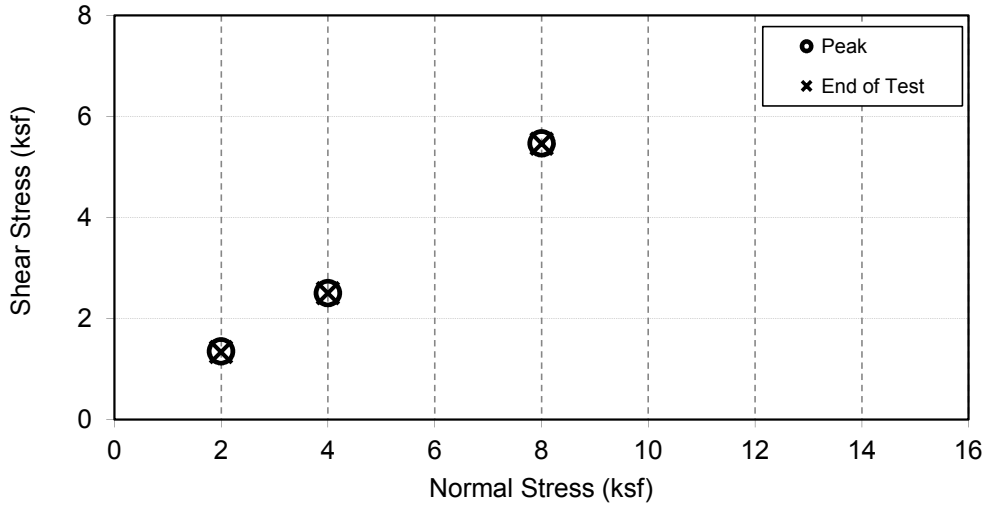
Type of test: **Consolidated, Drained**

Test No.	1	2	3
Symbol	▲	■	◆
Normal Stress (ksf)	**2**	**4**	**8**
Deformation Rate (in/min)	**0.002**	**0.002**	**0.002**

Peak Shear Stress (ksf)	**O**	**1.36**	**2.51**	**5.47**
Shear Stress @ End of Test (ksf)	**X**	**1.34**	**2.51**	**5.46**

Initial Height of Sample (in)	1.014	0.997	1.005
Height of Sample before Shear (in)	1.0697	0.9488	0.9551
Diameter of Sample (in)	2.416	2.416	2.416
Initial Moisture Content (%)	**2.8**	**2.8**	**2.8**
Final Moisture Content (%)	**16.6**	**16.5**	**13.9**
Dry Density (pcf)	**100.1**	**103.3**	**102.9**





HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

DIRECT SHEAR TEST

ASTM D3080

HAI Pr No.: LAC-17-001

Tested by: KL/MJ

Checked by: MJ/MZ

Date: 11/29/2017

Client: City of Los Angeles/Tetra Tech

Project Name: Sixth Street Viaduct PARC

Project Number: LAC-17-001

Boring No.: GB-9

Sample No.: MC2B

Sample type: Undristributed Ring

Depth (ft): 6

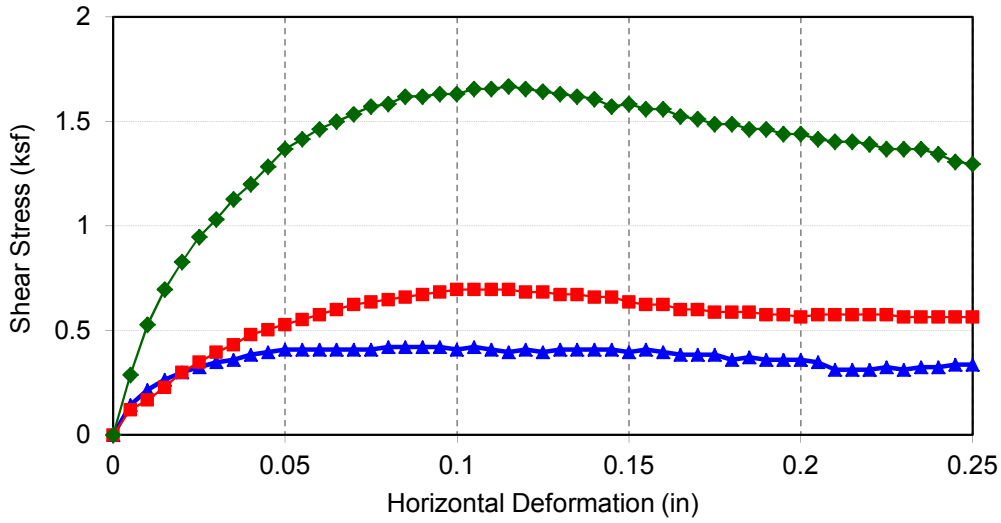
Soil description: Light Yellowish Brown, Poorly graded Sand (SP)

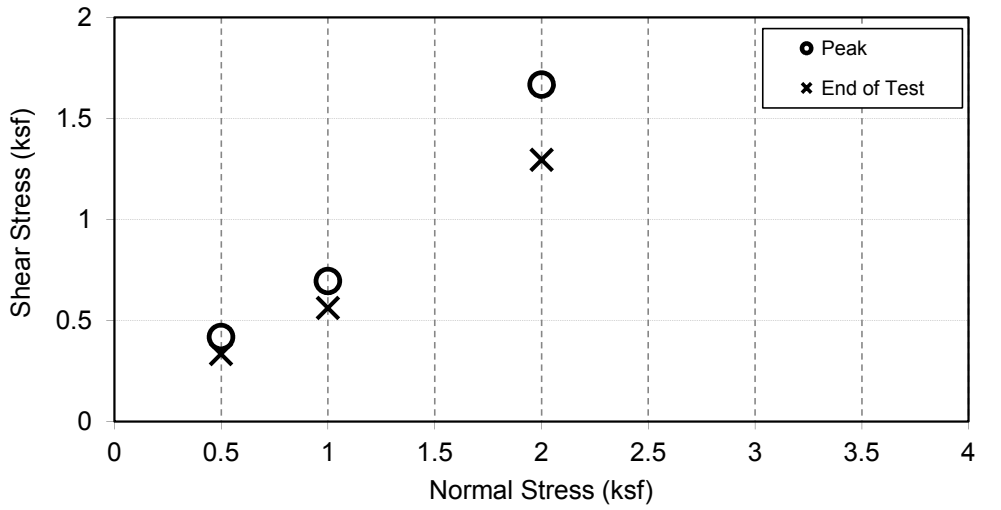
Type of test: **Consolidated, Drained**

Test No.	1	2	3
Symbol	▲	■	◆
Normal Stress (ksf)	**0.5**	**1**	**2**
Deformation Rate (in/min)	**0.002**	**0.002**	**0.002**

Peak Shear Stress (ksf)	O	**0.42**	**0.70**	**1.67**
Shear Stress @ End of Test (ksf)	X	**0.34**	**0.56**	**1.30**

Initial Height of Sample (in)	0.999	1.005	0.999
Height of Sample before Shear (in)	0.994	0.984	0.988
Diameter of Sample (in)	2.416	2.416	2.416
Initial Moisture Content (%)	**3.3**	**3.3**	**3.3**
Final Moisture Content (%)	**20.9**	**22.5**	**19.5**
Dry Density (pcf)	**100.8**	**101.2**	**102.1**





DRAFT

R - VALUE DATA SHEET

LaBelle Marvin

PROJECT No. 43086

DATE: 12/20/2017

BORING NO. GB-2 @ 0'-5'

Sixth Street Viaduct PARC

P.N. LAC-17-001

SAMPLE DESCRIPTION: Brown Silty Sand

R-VALUE TESTING DATA | CA TEST 301

	SPECIMEN ID		
	a	b	c
Mold ID Number	4	5	6
Water added, grams	68	81	61
Initial Test Water, %	8.3	9.6	7.7
Compact Gage Pressure,psi	350	150	350
Exudation Pressure, psi	446	123	551
Height Sample, Inches	2.58	2.58	2.56
Gross Weight Mold, grams	3112	3122	3107
Tare Weight Mold, grams	1959	1960	1958
Sample Wet Weight, grams	1153	1162	1149
Expansion, Inches x 10exp-4	0	0	6
Stability 2,000 lbs (160psi)	13 / 21	16 / 28	12 / 20
Turns Displacement	5.09	5.40	4.80
R-Value Uncorrected	76	69	78
R-Value Corrected	77	71	79
Dry Density, pcf	125.0	124.6	126.3

DESIGN CALCULATION DATA

Traffic Index	Assumed:	4.0	4.0	4.0
G.E. by Stability		0.24	0.30	0.22
G. E. by Expansion		0.00	0.00	0.20

Equilibrium R-Value	**74** by EXUDATION	Examined & Checked: 12 /20/ 17
REMARKS:	Gf = 1.25 10.3% Retained on the 3/4" Sieve.	REGISTERED PROFESSIONAL ENGINEER STEVEN R. MARVIN C 30659 CIVIL STATE OF CALIFORNIA Steven R. Marvin, RCE 30659

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

R-VALUE GRAPHICAL PRESENTATION

LaBelle Marvin

PROJECT NO. 43086

DATE: 12 /20/ 17

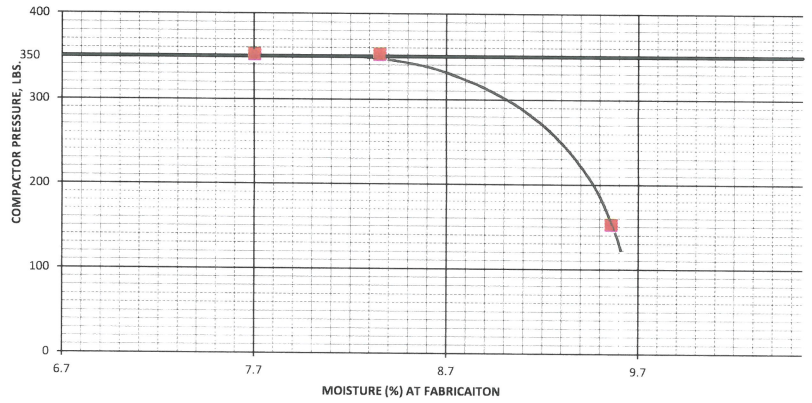
REMARKS:

BORING NO. GB-2 @ 0'-5'

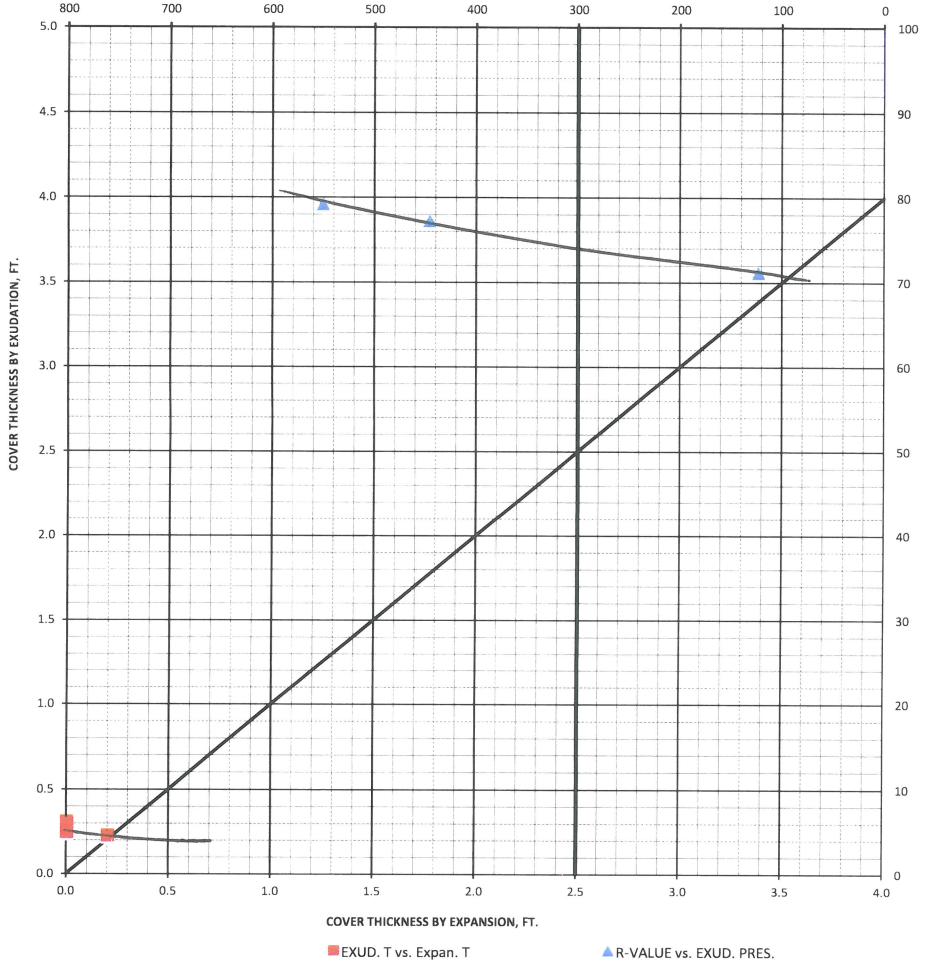
Sixth Street Viaduct PARC

P.N. LAC-17-001

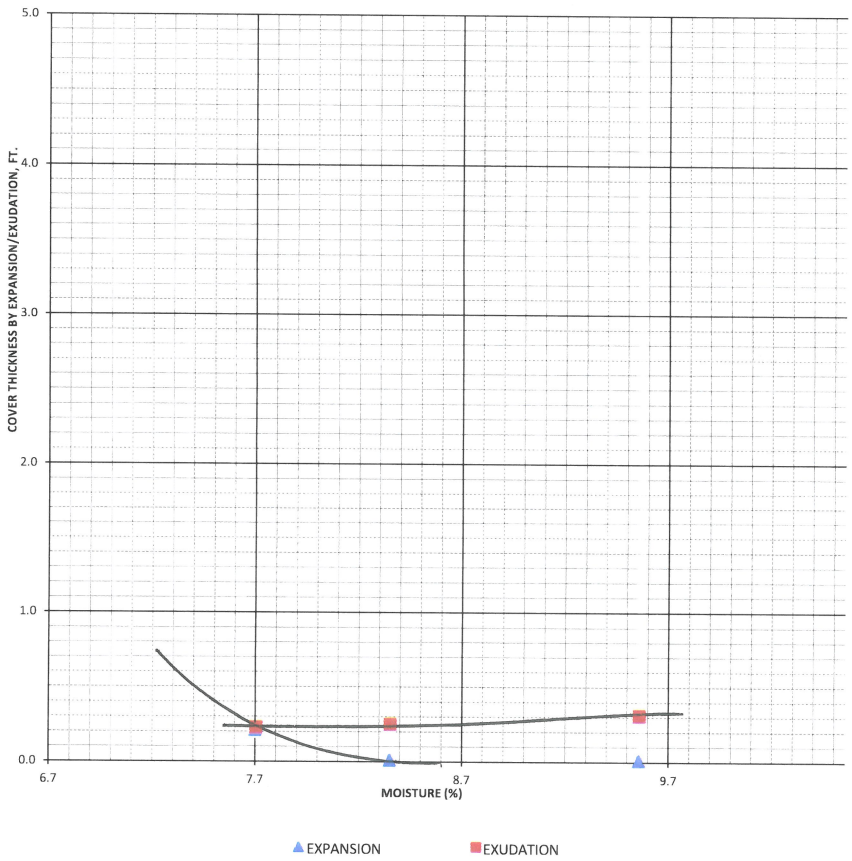
COMPACTOR PRESSURE vs MOISTURE %



COVER THICKNESS BY EXUDATION vs COVER THICKNESS BY EXPANSION



COVER THICKNESS vs MOISTURE %



DRAFT

R - VALUE DATA SHEET

LaBelle Marvin

PROJECT No. 43086

DATE: 12/20/2017

BORING NO. GB-9 @ 0'-5'

Sixth Street Viaduct PARC

P.N. LAC-17-001

SAMPLE DESCRIPTION: Brown Slightly Silty Sand

R-VALUE TESTING DATA | CA TEST 301			
	SPECIMEN ID		
	a	b	c
Mold ID Number	1	2	3
Water added, grams	88	73	81
Initial Test Water, %	10.8	9.3	10.1
Compact Gage Pressure,psi	350	350	350
Exudation Pressure, psi	203	506	350
Height Sample, Inches	2.61	2.58	2.59
Gross Weight Mold, grams	3024	3020	2998
Tare Weight Mold, grams	1946	1956	1949
Sample Wet Weight, grams	1078	1064	1049
Expansion, Inches x 10exp-4	0	0	0
Stability 2,000 lbs (160psi)	16 / 29	14 / 27	15 / 28
Turns Displacement	5.65	5.35	5.54
R-Value Uncorrected	67	70	68
R-Value Corrected	69	72	70
Dry Density, pcf	113.0	114.3	111.5

DESIGN CALCULATION DATA

Traffic Index	Assumed:	4.0	4.0	4.0
G.E. by Stability		0.32	0.29	0.31
G. E. by Expansion		0.00	0.00	0.00

Equilibrium R-Value	**70** by EXUDATION	Examined & Checked: 12 /20/ 17
REMARKS:	Gf = 1.25 0.0% Retained on the 3/4" Sieve. Free Drainage.	Steven R. Marvin, RCE 30659

REGISTERED PROFESSIONAL ENGINEER STEVEN R. MARVIN C 30659 CIVIL STATE OF CALIFORNIA

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

R-VALUE GRAPHICAL PRESENTATION

LaBelle Marvin

PROJECT NO. 43086

DATE: 12 /20/ 17

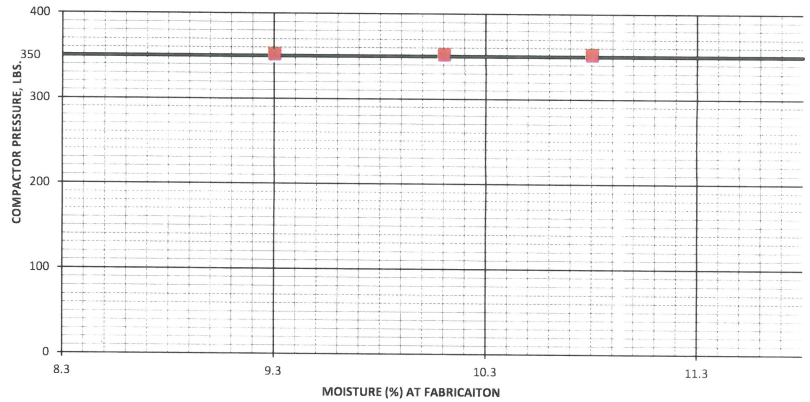
REMARKS:

BORING NO. GB-9 @ 0'-5'

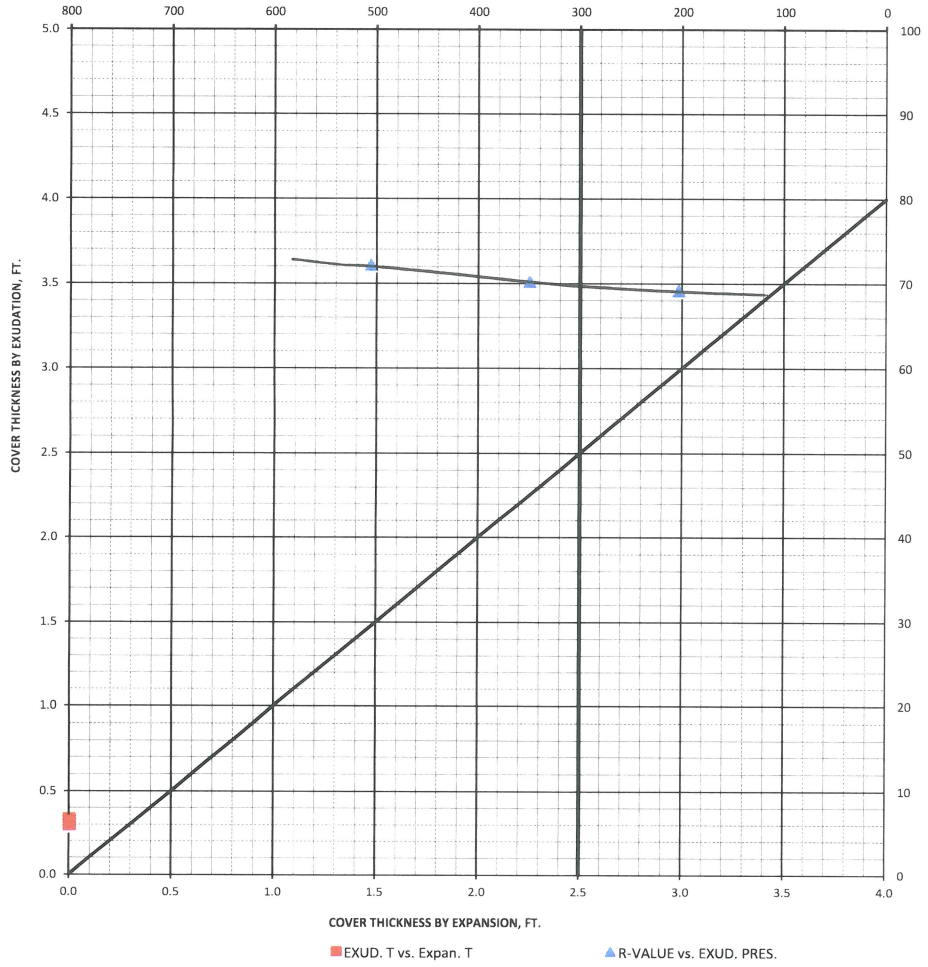
Sixth Street Viaduct PARC

P.N. LAC-17-001

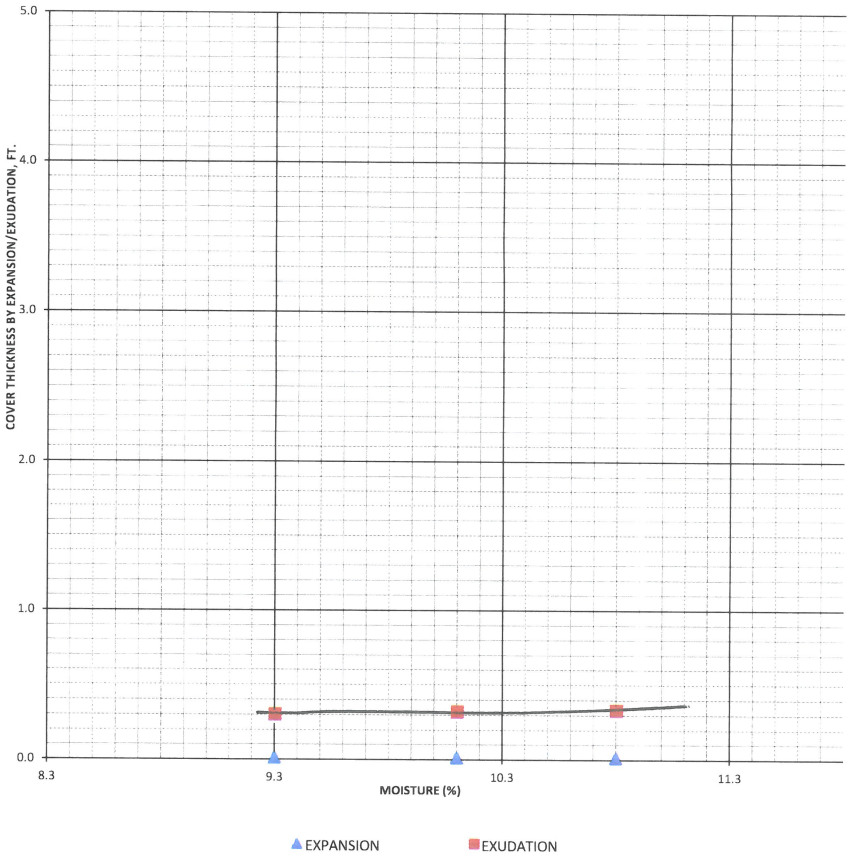
COMPACTOR PRESSURE vs MOISTURE %



COVER THICKNESS BY EXUDATION vs COVER THICKNESS BY EXPANSION



COVER THICKNESS vs MOISTURE %



Soil Analysis Lab Results

Client: HAI
Job Name: Sixth Street Viaduct PARC
Client Job Number: LAC-17-001
Project X Job Number: S171130A
December 6, 2017

	Method	ASTM G187		ASTM D516		ASTM D512B		ASTM G51
Bore# / Description	**Depth**	**Resistivity** As Rec'd | Minimum		**Sulfates**		**Chlorides**		**pH**
	(ft)	(Ohm-cm)	(Ohm-cm)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	
GB-2, BULK	0.0-5.0	44,890	5,695	30	0.0030	108	0.0108	8.97
GB-4, SPT8	20.0	227,800	12,060	15	0.0015	27	0.0027	9.01
GB-9, BULK	0.0-5.0	93,800	5,360	24	0.0024	42	0.0042	9.75

Unk = Unknown
NT = Not Tested
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
mg/L - milligrams per liter of liquid volume
Chemical Analysis performed on 1:3 Soil-To-Water extract

Please call if you have any questions.

Prepared by,

Ernesto Padilla, BSME
Field Engineer

Respectfully Submitted,

Eddie Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com

REGISTERED PROFESSIONAL ENGINEER
EDUARDO HERNANDEZ
No. M37102
MECHANICAL
STATE OF CALIFORNIA

DRAFT

ENVIRONMENTAL

DRAFT

ADVANCED TECHNOLOGY LABORATORIES

November 16, 2017

Nitha R. Nitharsan
Hushmand Associates, Inc.
250 Goddard
Irvine, CA 92618
Tel: (949) 777-1266
Fax:(949) 777-1276

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003

Re: ATL Work Order Number : 1703996

Client Reference : Sixth Street Viaduct PARC, LAC-17-001

Enclosed are the results for sample(s) received on November 08, 2017 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

for

Eddie Rodriguez
Laboratory Director

Certificate of Analysis

Hushmand Associates, Inc.		Project Number :	Sixth Street Viaduct PARC, LAC-17-001
250 Goddard		Report To :	Nitha R. Nitharsan
Irvine , CA 92618		Reported :	11/16/2017

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Drum 1 - Sample 1	1703996-01	Soil	11/08/17 13:47	11/08/17 15:50
Drum 1 - Sample 2	1703996-02	Soil	11/08/17 13:49	11/08/17 15:50
Drum 2 - Sample 1	1703996-03	Soil	11/08/17 13:52	11/08/17 15:50
Drum 2 - Sample 2	1703996-04	Soil	11/08/17 13:54	11/08/17 15:50

DRAFT

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Client Sample ID Drum 1 - Sample 1

Lab ID: 1703996-01

Title 22 Metals by ICP-AES EPA 6010B

Analyst: GO

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Arsenic	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Barium	**50**	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Beryllium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Cadmium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Chromium	**7.6**	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Cobalt	**4.8**	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Copper	**8.7**	2.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Lead	**5.4**	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Molybdenum	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Nickel	**5.0**	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Selenium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Silver	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Thallium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Vanadium	**19**	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	
Zinc	**29**	1.0	1	B7K0386	11/14/2017	11/14/17 16:44	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: KEK

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B7K0388	11/14/2017	11/14/17 16:21	

Gasoline Range Organics by EPA 8015B (Modified)

Analyst: VW

Analyte		Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Gasoline Range Organics		ND	1.0	1	B7K0246	11/09/2017	11/09/17 13:58	
Surrogate: 4-Bromofluorobenzene	*111 %*		*50 - 138*		B7K0246	11/09/2017	*11/09/17 13:58*	

Diesel Range Organics by EPA 8015B

Analyst: TKT

Analyte		Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
DRO		ND	10	1	B7K0303	11/10/2017	11/10/17 16:30	
Surrogate: p-Terphenyl	*112 %*		*22 - 143*		B7K0303	11/10/2017	*11/10/17 16:30*	

DRAFT

Certificate of Analysis

Hushmand Associates, Inc.		Project Number :	Sixth Street Viaduct PARC, LAC-17-001
250 Goddard		Report To :	Nitha R. Nitharsan
Irvine , CA 92618		Reported :	11/16/2017

Client Sample ID Drum 1 - Sample 1

Lab ID: 1703996-01

Volatile Organic Compounds by EPA 8260B **Analyst: AG**

Analyte	Result (ug/kg)	PQL (ug/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
1,1,1,2-Tetrachloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,1,1-Trichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,1,2,2-Tetrachloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,1,2-Trichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,1-Dichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,1-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,1-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,2,3-Trichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,2,3-Trichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,2,4-Trichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,2,4-Trimethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,2-Dibromo-3-chloropropane	ND	10	1	B7K0249	11/09/2017	11/09/17 15:50	
1,2-Dibromoethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,2-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,2-Dichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,2-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,3,5-Trimethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,3-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,3-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
1,4-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
2,2-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
2-Chlorotoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
4-Chlorotoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
4-Isopropyltoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Benzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Bromobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Bromochloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Bromodichloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Bromoform	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Bromomethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Carbon disulfide	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Carbon tetrachloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Chlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Chloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Chloroform	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Chloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
cis-1,2-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	

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Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Client Sample ID Drum 1 - Sample 1

Lab ID: 1703996-01

Volatile Organic Compounds by EPA 8260B **Analyst: AG**

Analyte	Result (ug/kg)	PQL (ug/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
cis-1,3-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Di-isopropyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Dibromochloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Dibromomethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Dichlorodifluoromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Ethyl Acetate	ND	50	1	B7K0249	11/09/2017	11/09/17 15:50	
Ethyl Ether	ND	50	1	B7K0249	11/09/2017	11/09/17 15:50	
Ethyl tert-butyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Ethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Freon-113	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Hexachlorobutadiene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Isopropylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
m,p-Xylene	ND	10	1	B7K0249	11/09/2017	11/09/17 15:50	
Methylene chloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
MTBE	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
n-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
n-Propylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Naphthalene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
o-Xylene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
sec-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Styrene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
tert-Amyl methyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
tert-Butanol	ND	100	1	B7K0249	11/09/2017	11/09/17 15:50	
tert-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Tetrachloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Toluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
trans-1,2-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
trans-1,3-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Trichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Trichlorofluoromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Vinyl acetate	ND	50	1	B7K0249	11/09/2017	11/09/17 15:50	
Vinyl chloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 15:50	
Surrogate: 1,2-Dichloroethane-d4	*77.1 %*	*32 - 140*		B7K0249	11/09/2017	*11/09/17 15:50*	
Surrogate: 4-Bromofluorobenzene	*97.6 %*	*68 - 131*		B7K0249	11/09/2017	*11/09/17 15:50*	
Surrogate: Dibromofluoromethane	*84.4 %*	*49 - 134*		B7K0249	11/09/2017	*11/09/17 15:50*	
Surrogate: Toluene-d8	*98.4 %*	*75 - 132*		B7K0249	11/09/2017	*11/09/17 15:50*	

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Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Client Sample ID Drum 1 - Sample 2

Lab ID: 1703996-02

Title 22 Metals by ICP-AES EPA 6010B

Analyst: GO

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Arsenic	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Barium	**47**	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Beryllium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Cadmium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Chromium	**7.4**	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Cobalt	**4.2**	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Copper	**7.1**	2.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Lead	**4.3**	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Molybdenum	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Nickel	**4.6**	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Selenium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Silver	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Thallium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Vanadium	**18**	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	
Zinc	**24**	1.0	1	B7K0386	11/14/2017	11/14/17 16:48	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: KEK

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B7K0388	11/14/2017	11/14/17 16:33	

Gasoline Range Organics by EPA 8015B (Modified)

Analyst: VW

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Gasoline Range Organics	ND	1.0	1	B7K0246	11/09/2017	11/09/17 14:16	
Surrogate: 4-Bromofluorobenzene *109 %*		*50 - 138*		B7K0246	11/09/2017	*11/09/17 14:16*	

Diesel Range Organics by EPA 8015B

Analyst: TKT

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
DRO	**24**	10	1	B7K0303	11/10/2017	11/10/17 16:45	
Surrogate: p-Terphenyl *102 %*		*22 - 143*		B7K0303	11/10/2017	*11/10/17 16:45*	

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Client Sample ID Drum 1 - Sample 2

Lab ID: 1703996-02

Volatile Organic Compounds by EPA 8260B **Analyst: AG**

Analyte	Result (ug/kg)	PQL (ug/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
1,1,1,2-Tetrachloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,1,1-Trichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,1,2,2-Tetrachloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,1,2-Trichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,1-Dichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,1-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,1-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,2,3-Trichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,2,3-Trichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,2,4-Trichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,2,4-Trimethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,2-Dibromo-3-chloropropane	ND	10	1	B7K0249	11/09/2017	11/09/17 16:09	
1,2-Dibromoethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,2-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,2-Dichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,2-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,3,5-Trimethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,3-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,3-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
1,4-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
2,2-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
2-Chlorotoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
4-Chlorotoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
4-Isopropyltoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Benzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Bromobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Bromochloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Bromodichloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Bromoform	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Bromomethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Carbon disulfide	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Carbon tetrachloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Chlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Chloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Chloroform	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Chloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
cis-1,2-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Client Sample ID Drum 1 - Sample 2

Lab ID: 1703996-02

Volatile Organic Compounds by EPA 8260B **Analyst: AG**

Analyte	Result (ug/kg)	PQL (ug/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
cis-1,3-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Di-isopropyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Dibromochloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Dibromomethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Dichlorodifluoromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Ethyl Acetate	ND	50	1	B7K0249	11/09/2017	11/09/17 16:09	
Ethyl Ether	ND	50	1	B7K0249	11/09/2017	11/09/17 16:09	
Ethyl tert-butyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Ethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Freon-113	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Hexachlorobutadiene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Isopropylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
m,p-Xylene	ND	10	1	B7K0249	11/09/2017	11/09/17 16:09	
Methylene chloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
MTBE	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
n-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
n-Propylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Naphthalene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
o-Xylene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
sec-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Styrene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
tert-Amyl methyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
tert-Butanol	ND	100	1	B7K0249	11/09/2017	11/09/17 16:09	
tert-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Tetrachloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Toluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
trans-1,2-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
trans-1,3-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Trichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Trichlorofluoromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Vinyl acetate	ND	50	1	B7K0249	11/09/2017	11/09/17 16:09	
Vinyl chloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:09	
Surrogate: 1,2-Dichloroethane-d4	*77.7 %*	*32 - 140*		B7K0249	11/09/2017	*11/09/17 16:09*	
Surrogate: 4-Bromofluorobenzene	*99.9 %*	*68 - 131*		B7K0249	11/09/2017	*11/09/17 16:09*	
Surrogate: Dibromofluoromethane	*86.3 %*	*49 - 134*		B7K0249	11/09/2017	*11/09/17 16:09*	
Surrogate: Toluene-d8	*103 %*	*75 - 132*		B7K0249	11/09/2017	*11/09/17 16:09*	

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Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Client Sample ID Drum 2 - Sample 1

Lab ID: 1703996-03

Title 22 Metals by ICP-AES EPA 6010B

Analyst: GO

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Arsenic	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Barium	**60**	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Beryllium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Cadmium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Chromium	**9.2**	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Cobalt	**4.3**	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Copper	**11**	2.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Lead	**15**	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Molybdenum	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Nickel	**9.1**	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Selenium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Silver	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Thallium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Vanadium	**18**	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	
Zinc	**37**	1.0	1	B7K0386	11/14/2017	11/14/17 16:49	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: KEK

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B7K0388	11/14/2017	11/14/17 16:35	

Gasoline Range Organics by EPA 8015B (Modified)

Analyst: VW

Analyte		Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Gasoline Range Organics		ND	1.0	1	B7K0246	11/09/2017	11/09/17 14:35	
Surrogate: 4-Bromofluorobenzene	*110 %*		*50 - 138*		B7K0246	11/09/2017	*11/09/17 14:35*	

Diesel Range Organics by EPA 8015B

Analyst: TKT

Analyte		Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
DRO		**230**	10	1	B7K0303	11/10/2017	11/10/17 18:41	
Surrogate: p-Terphenyl	*110 %*		*22 - 143*		B7K0303	11/10/2017	*11/10/17 18:41*	

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Client Sample ID Drum 2 - Sample 1

Lab ID: 1703996-03

Volatile Organic Compounds by EPA 8260B **Analyst: AG**

Analyte	Result (ug/kg)	PQL (ug/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
1,1,1,2-Tetrachloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,1,1-Trichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,1,2,2-Tetrachloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,1,2-Trichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,1-Dichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,1-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,1-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,2,3-Trichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,2,3-Trichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,2,4-Trichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,2,4-Trimethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,2-Dibromo-3-chloropropane	ND	10	1	B7K0249	11/09/2017	11/09/17 16:28	
1,2-Dibromoethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,2-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,2-Dichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,2-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,3,5-Trimethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,3-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,3-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
1,4-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
2,2-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
2-Chlorotoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
4-Chlorotoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
4-Isopropyltoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Benzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Bromobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Bromochloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Bromodichloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Bromoform	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Bromomethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Carbon disulfide	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Carbon tetrachloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Chlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Chloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Chloroform	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Chloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
cis-1,2-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Client Sample ID Drum 2 - Sample 1

Lab ID: 1703996-03

Volatile Organic Compounds by EPA 8260B **Analyst: AG**

Analyte	Result (ug/kg)	PQL (ug/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
cis-1,3-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Di-isopropyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Dibromochloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Dibromomethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Dichlorodifluoromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Ethyl Acetate	ND	50	1	B7K0249	11/09/2017	11/09/17 16:28	
Ethyl Ether	ND	50	1	B7K0249	11/09/2017	11/09/17 16:28	
Ethyl tert-butyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Ethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Freon-113	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Hexachlorobutadiene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Isopropylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
m,p-Xylene	ND	10	1	B7K0249	11/09/2017	11/09/17 16:28	
Methylene chloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
MTBE	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
n-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
n-Propylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Naphthalene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
o-Xylene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
sec-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Styrene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
tert-Amyl methyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
tert-Butanol	ND	100	1	B7K0249	11/09/2017	11/09/17 16:28	
tert-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Tetrachloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Toluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
trans-1,2-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
trans-1,3-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Trichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Trichlorofluoromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Vinyl acetate	ND	50	1	B7K0249	11/09/2017	11/09/17 16:28	
Vinyl chloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:28	
Surrogate: 1,2-Dichloroethane-d4	*85.7 %*	*32 - 140*		B7K0249	11/09/2017	*11/09/17 16:28*	
Surrogate: 4-Bromofluorobenzene	*99.9 %*	*68 - 131*		B7K0249	11/09/2017	*11/09/17 16:28*	
Surrogate: Dibromofluoromethane	*85.5 %*	*49 - 134*		B7K0249	11/09/2017	*11/09/17 16:28*	
Surrogate: Toluene-d8	*106 %*	*75 - 132*		B7K0249	11/09/2017	*11/09/17 16:28*	

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Client Sample ID Drum 2 - Sample 2

Lab ID: 1703996-04

Title 22 Metals by ICP-AES EPA 6010B

Analyst: GO

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Arsenic	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Barium	**67**	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Beryllium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Cadmium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Chromium	**7.5**	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Cobalt	**5.4**	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Copper	**8.4**	2.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Lead	**6.6**	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Molybdenum	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Nickel	**5.8**	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Selenium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Silver	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Thallium	ND	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Vanadium	**20**	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	
Zinc	**33**	1.0	1	B7K0386	11/14/2017	11/14/17 16:50	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: KEK

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B7K0388	11/14/2017	11/14/17 16:37	

Gasoline Range Organics by EPA 8015B (Modified)

Analyst: VW

Analyte		Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Gasoline Range Organics		ND	1.0	1	B7K0246	11/09/2017	11/09/17 14:53	
Surrogate: 4-Bromofluorobenzene	*107 %*		*50 - 138*		B7K0246	11/09/2017	*11/09/17 14:53*	

Diesel Range Organics by EPA 8015B

Analyst: TKT

Analyte		Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
DRO		**30**	10	1	B7K0303	11/10/2017	11/10/17 17:16	
Surrogate: p-Terphenyl	*102 %*		*22 - 143*		B7K0303	11/10/2017	*11/10/17 17:16*	

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Client Sample ID Drum 2 - Sample 2

Lab ID: 1703996-04

Volatile Organic Compounds by EPA 8260B **Analyst: AG**

Analyte	Result (ug/kg)	PQL (ug/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
1,1,1,2-Tetrachloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,1,1-Trichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,1,2,2-Tetrachloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,1,2-Trichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,1-Dichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,1-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,1-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,2,3-Trichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,2,3-Trichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,2,4-Trichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,2,4-Trimethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,2-Dibromo-3-chloropropane	ND	10	1	B7K0249	11/09/2017	11/09/17 16:46	
1,2-Dibromoethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,2-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,2-Dichloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,2-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,3,5-Trimethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,3-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,3-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
1,4-Dichlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
2,2-Dichloropropane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
2-Chlorotoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
4-Chlorotoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
4-Isopropyltoluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Benzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Bromobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Bromochloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Bromodichloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Bromoform	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Bromomethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Carbon disulfide	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Carbon tetrachloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Chlorobenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Chloroethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Chloroform	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Chloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
cis-1,2-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Client Sample ID Drum 2 - Sample 2

Lab ID: 1703996-04

Volatile Organic Compounds by EPA 8260B **Analyst: AG**

Analyte	Result (ug/kg)	PQL (ug/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
cis-1,3-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Di-isopropyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Dibromochloromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Dibromomethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Dichlorodifluoromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Ethyl Acetate	ND	50	1	B7K0249	11/09/2017	11/09/17 16:46	
Ethyl Ether	ND	50	1	B7K0249	11/09/2017	11/09/17 16:46	
Ethyl tert-butyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Ethylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Freon-113	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Hexachlorobutadiene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Isopropylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
m,p-Xylene	ND	10	1	B7K0249	11/09/2017	11/09/17 16:46	
Methylene chloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
MTBE	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
n-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
n-Propylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Naphthalene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
o-Xylene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
sec-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Styrene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
tert-Amyl methyl ether	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
tert-Butanol	ND	100	1	B7K0249	11/09/2017	11/09/17 16:46	
tert-Butylbenzene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Tetrachloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Toluene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
trans-1,2-Dichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
trans-1,3-Dichloropropene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Trichloroethene	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Trichlorofluoromethane	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Vinyl acetate	ND	50	1	B7K0249	11/09/2017	11/09/17 16:46	
Vinyl chloride	ND	5.0	1	B7K0249	11/09/2017	11/09/17 16:46	
Surrogate: 1,2-Dichloroethane-d4	*81.4 %*	*32 - 140*		B7K0249	11/09/2017	*11/09/17 16:46*	
Surrogate: 4-Bromofluorobenzene	*99.7 %*	*68 - 131*		B7K0249	11/09/2017	*11/09/17 16:46*	
Surrogate: Dibromofluoromethane	*85.7 %*	*49 - 134*		B7K0249	11/09/2017	*11/09/17 16:46*	
Surrogate: Toluene-d8	*98.9 %*	*75 - 132*		B7K0249	11/09/2017	*11/09/17 16:46*	

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

QUALITY CONTROL SECTION

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	MDL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0386 - EPA 3050B_S										
Blank (B7K0386-BLK1)						Prepared: 11/14/2017 Analyzed: 11/14/2017				
Antimony	ND	2.0	0.51							
Arsenic	ND	1.0	0.12							
Barium	ND	1.0	0.12							
Beryllium	ND	1.0	0.03							
Cadmium	ND	1.0	0.14							
Chromium	ND	1.0	0.26							
Cobalt	ND	1.0	0.07							
Copper	ND	2.0	0.19							
Lead	ND	1.0	0.18							
Molybdenum	ND	1.0	0.12							
Nickel	ND	1.0	0.18							
Selenium	ND	1.0	0.40							
Silver	ND	1.0	0.12							
Thallium	ND	1.0	0.38							
Vanadium	ND	1.0	0.06							
Zinc	ND	1.0	0.15							
LCS (B7K0386-BS1)						Prepared: 11/14/2017 Analyzed: 11/14/2017				
Antimony	45.6112	2.0	0.51	50.0000		91.2	80 - 120			
Arsenic	43.5969	1.0	0.12	50.0000		87.2	80 - 120			
Barium	46.6267	1.0	0.12	50.0000		93.3	80 - 120			
Beryllium	43.7392	1.0	0.03	50.0000		87.5	80 - 120			
Cadmium	43.6016	1.0	0.14	50.0000		87.2	80 - 120			
Chromium	46.8695	1.0	0.26	50.0000		93.7	80 - 120			
Cobalt	46.1333	1.0	0.07	50.0000		92.3	80 - 120			
Copper	46.2422	2.0	0.19	50.0000		92.5	80 - 120			
Lead	45.3338	1.0	0.18	50.0000		90.7	80 - 120			
Molybdenum	45.3817	1.0	0.12	50.0000		90.8	80 - 120			
Nickel	45.3607	1.0	0.18	50.0000		90.7	80 - 120			
Selenium	42.3506	1.0	0.40	50.0000		84.7	80 - 120			
Silver	49.3328	1.0	0.12	50.0000		98.7	80 - 120			
Thallium	45.7493	1.0	0.38	50.0000		91.5	80 - 120			
Vanadium	46.6600	1.0	0.06	50.0000		93.3	80 - 120			
Zinc	44.4248	1.0	0.15	50.0000		88.8	80 - 120			
Matrix Spike (B7K0386-MS1)			**Source: 1703996-01**			Prepared: 11/14/2017 Analyzed: 11/14/2017				
Antimony	86.2468	2.0	0.51	125.000	ND	69.0	33 - 98			
Arsenic	93.5651	1.0	0.12	125.000	0.407764	74.5	48 - 101			
Barium	147.722	1.0	0.12	125.000	50.1790	78.0	25 - 131			
Beryllium	94.7580	1.0	0.03	125.000	ND	75.8	56 - 97			

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	MDL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0386 - EPA 3050B_S (continued)										
Matrix Spike (B7K0386-MS1) - Continued			**Source: 1703996-01**		Prepared: 11/14/2017 Analyzed: 11/14/2017					
Cadmium	89.3384	1.0	0.14	125.000	ND	71.5	53 - 94			
Chromium	104.070	1.0	0.26	125.000	7.55846	77.2	45 - 113			
Cobalt	97.8859	1.0	0.07	125.000	4.81123	74.5	51 - 97			
Copper	106.742	2.0	0.19	125.000	8.73328	78.4	51 - 113			
Lead	97.3045	1.0	0.18	125.000	5.40702	73.5	33 - 127			
Molybdenum	96.1816	1.0	0.12	125.000	ND	76.9	54 - 97			
Nickel	97.7072	1.0	0.18	125.000	4.97417	74.2	46 - 102			
Selenium	88.7738	1.0	0.40	125.000	ND	71.0	52 - 93			
Silver	102.228	1.0	0.12	125.000	ND	81.8	58 - 98			
Thallium	84.0913	1.0	0.38	125.000	ND	67.3	46 - 93			
Vanadium	115.158	1.0	0.06	125.000	19.1259	76.8	55 - 104			
Zinc	116.766	1.0	0.15	125.000	28.8526	70.3	26 - 118			
Matrix Spike Dup (B7K0386-MSD1)			**Source: 1703996-01**		Prepared: 11/14/2017 Analyzed: 11/14/2017					
Antimony	80.4972	2.0	0.51	125.000	ND	64.4	33 - 98	6.90	20	
Arsenic	89.4080	1.0	0.12	125.000	0.407764	71.2	48 - 101	4.54	20	
Barium	146.594	1.0	0.12	125.000	50.1790	77.1	25 - 131	0.767	20	
Beryllium	92.3674	1.0	0.03	125.000	ND	73.9	56 - 97	2.56	20	
Cadmium	86.2134	1.0	0.14	125.000	ND	69.0	53 - 94	3.56	20	
Chromium	101.261	1.0	0.26	125.000	7.55846	75.0	45 - 113	2.74	20	
Cobalt	94.7490	1.0	0.07	125.000	4.81123	72.0	51 - 97	3.26	20	
Copper	106.140	2.0	0.19	125.000	8.73328	77.9	51 - 113	0.566	20	
Lead	128.007	1.0	0.18	125.000	5.40702	98.1	33 - 127	27.3	20	R
Molybdenum	91.1926	1.0	0.12	125.000	ND	73.0	54 - 97	5.33	20	
Nickel	94.7101	1.0	0.18	125.000	4.97417	71.8	46 - 102	3.12	20	
Selenium	84.9832	1.0	0.40	125.000	ND	68.0	52 - 93	4.36	20	
Silver	99.3504	1.0	0.12	125.000	ND	79.5	58 - 98	2.85	20	
Thallium	79.3074	1.0	0.38	125.000	ND	63.4	46 - 93	5.86	20	
Vanadium	114.614	1.0	0.06	125.000	19.1259	76.4	55 - 104	0.474	20	
Zinc	116.611	1.0	0.15	125.000	28.8526	70.2	26 - 118	0.133	20	

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	MDL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0388 - EPA 7471_S										
Blank (B7K0388-BLK1)					Prepared: 11/14/2017 Analyzed: 11/14/2017					
Mercury	ND	0.10	0.005							
LCS (B7K0388-BS1)					Prepared: 11/14/2017 Analyzed: 11/14/2017					
Mercury	0.815209	0.10	0.005	0.833333		97.8	80 - 120			
Matrix Spike (B7K0388-MS1)			**Source: 1703996-01**		Prepared: 11/14/2017 Analyzed: 11/14/2017					
Mercury	0.939807	0.10	0.005	0.833333	0.068355	105	70 - 130			
Matrix Spike Dup (B7K0388-MSD1)			**Source: 1703996-01**		Prepared: 11/14/2017 Analyzed: 11/14/2017					
Mercury	0.953310	0.10	0.005	0.833333	0.068355	106	70 - 130	1.43	20	
Post Spike (B7K0388-PS1)			**Source: 1703996-01**		Prepared: 11/14/2017 Analyzed: 11/14/2017					
Mercury	0.006585			5.00000E-3	0.000820	115	85 - 115			M1

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Gasoline Range Organics by EPA 8015B (Modified) - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	MDL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0246 - GCVOA_S										
Blank (B7K0246-BLK1)						Prepared: 11/9/2017 Analyzed: 11/9/2017				
Gasoline Range Organics	ND	1.0	0.20							
Surrogate: 4-Bromofluorobenzene	*0.2124*			*0.200000*		*106*	*50 - 138*			
LCS (B7K0246-BS1)						Prepared: 11/9/2017 Analyzed: 11/9/2017				
Gasoline Range Organics	4.28800	1.0	0.20	5.00000		85.8	70 - 130			
Surrogate: 4-Bromofluorobenzene	*0.2108*			*0.200000*		*105*	*50 - 138*			
Matrix Spike (B7K0246-MS1)			**Source: 1703992-01**			Prepared: 11/9/2017 Analyzed: 11/9/2017				
Gasoline Range Organics	2.72000	1.0	0.20	5.00000	ND	54.4	17 - 141			
Surrogate: 4-Bromofluorobenzene	*0.2245*			*0.200000*		*112*	*50 - 138*			
Matrix Spike Dup (B7K0246-MSD1)			**Source: 1703992-01**			Prepared: 11/9/2017 Analyzed: 11/9/2017				
Gasoline Range Organics	2.94800	1.0	0.20	5.00000	ND	59.0	17 - 141	8.05	20	
Surrogate: 4-Bromofluorobenzene	*0.2268*			*0.200000*		*113*	*50 - 138*			

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Diesel Range Organics by EPA 8015B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	MDL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0303 - GCSEMI_DRO_S										
Blank (B7K0303-BLK1)						Prepared: 11/10/2017 Analyzed: 11/10/2017				
DRO	ND	10	10							
Surrogate: p-Terphenyl	*92.73*			*80.0000*		*116*	*22 - 143*			
LCS (B7K0303-BS1)						Prepared: 11/10/2017 Analyzed: 11/10/2017				
DRO	1207.87	10	10	1000.00		121	30 - 133			
Surrogate: p-Terphenyl	*90.37*			*80.0000*		*113*	*22 - 143*			
Matrix Spike (B7K0303-MS1)			**Source: 1704013-01**			Prepared: 11/10/2017 Analyzed: 11/10/2017				
DRO	1170.73	10	10	1000.00	ND	117	13 - 148			
Surrogate: p-Terphenyl	*87.48*			*80.0000*		*109*	*22 - 143*			
Matrix Spike Dup (B7K0303-MSD1)			**Source: 1704013-01**			Prepared: 11/10/2017 Analyzed: 11/10/2017				
DRO	1175.10	10	10	1000.00	ND	118	13 - 148	0.373	20	
Surrogate: p-Terphenyl	*87.22*			*80.0000*		*109*	*22 - 143*			

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Volatile Organic Compounds by EPA 8260B - Quality Control

Analyte	Result (ug/kg)	PQL (ug/kg)	MDL (ug/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0249 - MSVOA_S										
Blank (B7K0249-BLK1)					Prepared: 11/9/2017 Analyzed: 11/9/2017					
1,1,1,2-Tetrachloroethane	ND	5.0	0.96							
1,1,1-Trichloroethane	ND	5.0	1.1							
1,1,2,2-Tetrachloroethane	ND	5.0	0.62							
1,1,2-Trichloroethane	ND	5.0	1.6							
1,1-Dichloroethane	ND	5.0	0.81							
1,1-Dichloroethene	ND	5.0	2.6							
1,1-Dichloropropene	ND	5.0	2.3							
1,2,3-Trichloropropane	ND	5.0	0.54							
1,2,3-Trichlorobenzene	ND	5.0	1.2							
1,2,4-Trichlorobenzene	ND	5.0	1.1							
1,2,4-Trimethylbenzene	ND	5.0	1.5							
1,2-Dibromo-3-chloropropane	ND	10	1.6							
1,2-Dibromoethane	ND	5.0	3.2							
1,2-Dichlorobenzene	ND	5.0	1.1							
1,2-Dichloroethane	ND	5.0	1.2							
1,2-Dichloropropane	ND	5.0	1.8							
1,3,5-Trimethylbenzene	ND	5.0	1.7							
1,3-Dichlorobenzene	ND	5.0	1.3							
1,3-Dichloropropane	ND	5.0	1.1							
1,4-Dichlorobenzene	ND	5.0	1.2							
2,2-Dichloropropane	ND	5.0	1.2							
2-Chlorotoluene	ND	5.0	1.6							
4-Chlorotoluene	ND	5.0	1.5							
4-Isopropyltoluene	ND	5.0	2.3							
Benzene	ND	5.0	0.64							
Bromobenzene	ND	5.0	1.1							
Bromochloromethane	ND	5.0	0.64							
Bromodichloromethane	ND	5.0	1.2							
Bromoform	ND	5.0	0.80							
Bromomethane	ND	5.0	2.5							
Carbon disulfide	ND	5.0	3.5							
Carbon tetrachloride	ND	5.0	1.2							
Chlorobenzene	ND	5.0	1.0							
Chloroethane	ND	5.0	1.1							
Chloroform	ND	5.0	0.82							
Chloromethane	ND	5.0	1.4							
cis-1,2-Dichloroethene	ND	5.0	0.67							
cis-1,3-Dichloropropene	ND	5.0	1.9							
Di-isopropyl ether	ND	5.0	0.55							
Dibromochloromethane	ND	5.0	1.0							
Dibromomethane	ND	5.0	1.6							

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Volatile Organic Compounds by EPA 8260B - Quality Control (cont'd)

Analyte	Result (ug/kg)	PQL (ug/kg)	MDL (ug/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0249 - MSVOA_S (continued)										
Blank (B7K0249-BLK1) - Continued					Prepared: 11/9/2017 Analyzed: 11/9/2017					
Dichlorodifluoromethane	ND	5.0	2.2							
Ethyl Acetate	ND	50	8.1							
Ethyl Ether	ND	50	6.1							
Ethyl tert-butyl ether	ND	5.0	0.67							
Ethylbenzene	ND	5.0	0.91							
Freon-113	ND	5.0	2.8							
Hexachlorobutadiene	ND	5.0	2.5							
Isopropylbenzene	ND	5.0	1.8							
m,p-Xylene	ND	10	1.5							
Methylene chloride	ND	5.0	2.3							
MTBE	ND	5.0	0.63							
n-Butylbenzene	ND	5.0	2.4							
n-Propylbenzene	ND	5.0	2.2							
Naphthalene	ND	5.0	0.97							
o-Xylene	ND	5.0	0.87							
sec-Butylbenzene	ND	5.0	2.3							
Styrene	ND	5.0	1.5							
tert-Amyl methyl ether	ND	5.0	0.59							
tert-Butanol	ND	100	19							
tert-Butylbenzene	ND	5.0	2.0							
Tetrachloroethene	ND	5.0	1.6							
Toluene	ND	5.0	0.94							
trans-1,2-Dichloroethene	ND	5.0	0.59							
trans-1,3-Dichloropropene	ND	5.0	2.1							
Trichloroethene	ND	5.0	3.1							
Trichlorofluoromethane	ND	5.0	1.4							
Vinyl acetate	ND	50	9.8							
Vinyl chloride	ND	5.0	1.7							
Surrogate: 1,2-Dichloroethane-d4	*40.45*			*50.0000*		*80.9*	*32 - 140*			
Surrogate: 4-Bromofluorobenzene	*51.51*			*50.0000*		*103*	*68 - 131*			
Surrogate: Dibromofluoromethan	*43.59*			*50.0000*		*87.2*	*49 - 134*			
Surrogate: Toluene-d8	*52.29*			*50.0000*		*105*	*75 - 132*			
LCS (B7K0249-BS1)					Prepared: 11/9/2017 Analyzed: 11/9/2017					
1,1,1,2-Tetrachloroethane	49.2700	5.0	0.96	50.0000		98.5	80 - 117			
1,1,1-Trichloroethane	44.1300	5.0	1.1	50.0000		88.3	70 - 122			
1,1,2,2-Tetrachloroethane	47.7500	5.0	0.62	50.0000		95.5	69 - 115			
1,1,2-Trichloroethane	52.3400	5.0	1.6	50.0000		105	74 - 120			
1,1-Dichloroethane	43.6200	5.0	0.81	50.0000		87.2	72 - 118			
1,1-Dichloroethene	39.5200	5.0	2.6	50.0000		79.0	61 - 124			
1,1-Dichloropropene	46.5900	5.0	2.3	50.0000		93.2	74 - 128			

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Volatile Organic Compounds by EPA 8260B - Quality Control (cont'd)

Analyte	Result (ug/kg)	PQL (ug/kg)	MDL (ug/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0249 - MSVOA_S (continued)										
LCS (B7K0249-BS1) - Continued					Prepared: 11/9/2017 Analyzed: 11/9/2017					
1,2,3-Trichloropropane	47.1600	5.0	0.54	50.0000		94.3	67 - 116			
1,2,3-Trichlorobenzene	49.3200	5.0	1.2	50.0000		98.6	86 - 127			
1,2,4-Trichlorobenzene	51.6800	5.0	1.1	50.0000		103	88 - 137			
1,2,4-Trimethylbenzene	52.6100	5.0	1.5	50.0000		105	78 - 125			
1,2-Dibromo-3-chloropropane	48.9500	10	1.6	50.0000		97.9	70 - 134			
1,2-Dibromoethane	49.7100	5.0	3.2	50.0000		99.4	73 - 127			
1,2-Dichlorobenzene	53.0400	5.0	1.1	50.0000		106	85 - 116			
1,2-Dichloroethane	47.3100	5.0	1.2	50.0000		94.6	65 - 120			
1,2-Dichloropropane	47.7100	5.0	1.8	50.0000		95.4	81 - 114			
1,3,5-Trimethylbenzene	51.7300	5.0	1.7	50.0000		103	76 - 125			
1,3-Dichlorobenzene	51.6200	5.0	1.3	50.0000		103	83 - 117			
1,3-Dichloropropane	48.5400	5.0	1.1	50.0000		97.1	79 - 119			
1,4-Dichlorobenzene	53.4300	5.0	1.2	50.0000		107	84 - 115			
2,2-Dichloropropane	44.3900	5.0	1.2	50.0000		88.8	72 - 121			
2-Chlorotoluene	49.6500	5.0	1.6	50.0000		99.3	76 - 120			
4-Chlorotoluene	49.1500	5.0	1.5	50.0000		98.3	77 - 122			
4-Isopropyltoluene	54.1800	5.0	2.3	50.0000		108	77 - 131			
Benzene	93.8100	5.0	0.64	100.000		93.8	78 - 115			
Bromobenzene	47.1500	5.0	1.1	50.0000		94.3	79 - 113			
Bromochloromethane	43.4800	5.0	0.64	50.0000		87.0	66 - 123			
Bromodichloromethane	47.9600	5.0	1.2	50.0000		95.9	79 - 112			
Bromoform	49.2500	5.0	0.80	50.0000		98.5	67 - 125			
Bromomethane	42.0500	5.0	2.5	50.0000		84.1	49 - 150			
Carbon disulfide	40.0300	5.0	3.5	50.0000		80.1	61 - 146			
Carbon tetrachloride	47.1600	5.0	1.2	50.0000		94.3	65 - 133			
Chlorobenzene	50.0300	5.0	1.0	50.0000		100	82 - 113			
Chloroethane	40.7000	5.0	1.1	50.0000		81.4	46 - 146			
Chloroform	44.4700	5.0	0.82	50.0000		88.9	73 - 116			
Chloromethane	40.5500	5.0	1.4	50.0000		81.1	46 - 158			
cis-1,2-Dichloroethene	42.5700	5.0	0.67	50.0000		85.1	72 - 121			
cis-1,3-Dichloropropene	47.1300	5.0	1.9	50.0000		94.3	79 - 123			
Di-isopropyl ether	45.2300	5.0	0.55	50.0000		90.5	67 - 125			
Dibromochloromethane	46.0600	5.0	1.0	50.0000		92.1	79 - 116			
Dibromomethane	48.1700	5.0	1.6	50.0000		96.3	72 - 117			
Dichlorodifluoromethane	36.5500	5.0	2.2	50.0000		73.1	38 - 168			
Ethyl Acetate	478.470	50	8.1	500.000		95.7	55 - 144			
Ethyl Ether	384.400	50	6.1	500.000		76.9	52 - 133			
Ethyl tert-butyl ether	45.1700	5.0	0.67	50.0000		90.3	68 - 126			
Ethylbenzene	111.120	5.0	0.91	100.000		111	79 - 116			
Freon-113	40.9500	5.0	2.8	50.0000		81.9	66 - 134			
Hexachlorobutadiene	54.5800	5.0	2.5	50.0000		109	84 - 133			
Isopropylbenzene	48.4700	5.0	1.8	50.0000		96.9	67 - 134			

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Volatile Organic Compounds by EPA 8260B - Quality Control (cont'd)

Analyte	Result (ug/kg)	PQL (ug/kg)	MDL (ug/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0249 - MSVOA_S (continued)										
LCS (B7K0249-BS1) - Continued						Prepared: 11/9/2017 Analyzed: 11/9/2017				
m,p-Xylene	109.590	10	1.5	100.000		110	78 - 126			
Methylene chloride	42.3100	5.0	2.3	50.0000		84.6	31 - 148			
MTBE	43.8300	5.0	0.63	50.0000		87.7	59 - 131			
n-Butylbenzene	57.8200	5.0	2.4	50.0000		116	75 - 141			
n-Propylbenzene	50.2000	5.0	2.2	50.0000		100	73 - 127			
Naphthalene	47.2600	5.0	0.97	50.0000		94.5	78 - 129			
o-Xylene	104.000	5.0	0.87	100.000		104	81 - 113			
sec-Butylbenzene	53.4200	5.0	2.3	50.0000		107	73 - 129			
Styrene	49.0000	5.0	1.5	50.0000		98.0	88 - 118			
tert-Amyl methyl ether	44.4400	5.0	0.59	50.0000		88.9	62 - 122			
tert-Butanol	230.120	100	19	250.000		92.0	36 - 142			
tert-Butylbenzene	51.4100	5.0	2.0	50.0000		103	74 - 126			
Tetrachloroethene	45.8600	5.0	1.6	50.0000		91.7	74 - 127			
Toluene	108.730	5.0	0.94	100.000		109	79 - 119			
trans-1,2-Dichloroethene	41.3700	5.0	0.59	50.0000		82.7	61 - 128			
trans-1,3-Dichloropropene	53.2200	5.0	2.1	50.0000		106	75 - 116			
Trichloroethene	47.0600	5.0	3.1	50.0000		94.1	76 - 123			
Trichlorofluoromethane	41.7000	5.0	1.4	50.0000		83.4	58 - 134			
Vinyl acetate	479.880	50	9.8	500.000		96.0	63 - 143			
Vinyl chloride	38.1900	5.0	1.7	50.0000		76.4	51 - 145			
Surrogate: 1,2-Dichloroethane-d4	*51.55*			*50.0000*		*103*	*32 - 140*			
Surrogate: 4-Bromofluorobenzene	*51.34*			*50.0000*		*103*	*68 - 131*			
Surrogate: Dibromofluoromethan	*49.98*			*50.0000*		*100*	*49 - 134*			
Surrogate: Toluene-d8	*52.77*			*50.0000*		*106*	*75 - 132*			
Matrix Spike (B7K0249-MS1)			**Source: 1703918-02**			Prepared: 11/9/2017 Analyzed: 11/9/2017				
1,1,1,2-Tetrachloroethane	41.5500	5.0	0.96	50.0000	ND	83.1	27 - 130			
1,1,1-Trichloroethane	40.3700	5.0	1.1	50.0000	ND	80.7	32 - 135			
1,1,2,2-Tetrachloroethane	44.8000	5.0	0.62	50.0000	ND	89.6	17 - 135			
1,1,2-Trichloroethane	44.3000	5.0	1.6	50.0000	ND	88.6	31 - 129			
1,1-Dichloroethane	39.5300	5.0	0.81	50.0000	ND	79.1	37 - 130			
1,1-Dichloroethene	36.7200	5.0	2.6	50.0000	ND	73.4	41 - 125			
1,1-Dichloropropene	40.6300	5.0	2.3	50.0000	ND	81.3	33 - 138			
1,2,3-Trichloropropane	44.7000	5.0	0.54	50.0000	ND	89.4	20 - 137			
1,2,3-Trichlorobenzene	38.9900	5.0	1.2	50.0000	13.1600	51.7	0 - 147			
1,2,4-Trichlorobenzene	79.4300	5.0	1.1	50.0000	42.3600	74.1	0 - 156			
1,2,4-Trimethylbenzene	36.9800	5.0	1.5	50.0000	ND	74.0	10 - 139			
1,2-Dibromo-3-chloropropane	43.0800	10	1.6	50.0000	ND	86.2	17 - 145			
1,2-Dibromoethane	41.2800	5.0	3.2	50.0000	ND	82.6	25 - 136			
1,2-Dichlorobenzene	35.8900	5.0	1.1	50.0000	ND	71.8	8 - 134			
1,2-Dichloroethane	40.1800	5.0	1.2	50.0000	ND	80.4	31 - 123			

Certificate of Analysis

Hushmand Associates, Inc.
250 Goddard
Irvine , CA 92618

Project Number : Sixth Street Viaduct PARC, LAC-17-001
Report To : Nitha R. Nitharsan
Reported : 11/16/2017

Volatile Organic Compounds by EPA 8260B - Quality Control (cont'd)

Analyte	Result (ug/kg)	PQL (ug/kg)	MDL (ug/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0249 - MSVOA_S (continued)										
Matrix Spike (B7K0249-MS1) - Continued			**Source: 1703918-02**		Prepared: 11/9/2017 Analyzed: 11/9/2017					
1,2-Dichloropropane	39.8500	5.0	1.8	50.0000	ND	79.7	38 - 123			
1,3,5-Trimethylbenzene	37.2400	5.0	1.7	50.0000	ND	74.5	10 - 139			
1,3-Dichlorobenzene	35.2000	5.0	1.3	50.0000	ND	70.4	8 - 134			
1,3-Dichloropropane	42.3100	5.0	1.1	50.0000	ND	84.6	34 - 130			
1,4-Dichlorobenzene	36.5300	5.0	1.2	50.0000	ND	73.1	10 - 134			
2,2-Dichloropropane	40.9500	5.0	1.2	50.0000	ND	81.9	36 - 133			
2-Chlorotoluene	38.2200	5.0	1.6	50.0000	ND	76.4	15 - 133			
4-Chlorotoluene	38.0500	5.0	1.5	50.0000	ND	76.1	13 - 135			
4-Isopropyltoluene	34.7700	5.0	2.3	50.0000	ND	69.5	2 - 146			
Benzene	78.6900	5.0	0.64	100.000	ND	78.7	40 - 123			
Bromobenzene	38.9800	5.0	1.1	50.0000	ND	78.0	18 - 132			
Bromochloromethane	38.6000	5.0	0.64	50.0000	ND	77.2	32 - 130			
Bromodichloromethane	40.3500	5.0	1.2	50.0000	ND	80.7	33 - 122			
Bromoform	42.3300	5.0	0.80	50.0000	ND	84.7	20 - 134			
Bromomethane	34.2300	5.0	2.5	50.0000	ND	68.5	35 - 140			
Carbon disulfide	36.1600	5.0	3.5	50.0000	ND	72.3	32 - 143			
Carbon tetrachloride	39.3200	5.0	1.2	50.0000	ND	78.6	23 - 144			
Chlorobenzene	40.5700	5.0	1.0	50.0000	ND	81.1	24 - 128			
Chloroethane	37.2000	5.0	1.1	50.0000	ND	74.4	35 - 135			
Chloroform	39.4000	5.0	0.82	50.0000	ND	78.8	36 - 126			
Chloromethane	35.6400	5.0	1.4	50.0000	ND	71.3	36 - 146			
cis-1,2-Dichloroethene	38.4800	5.0	0.67	50.0000	ND	77.0	31 - 136			
cis-1,3-Dichloropropene	40.1600	5.0	1.9	50.0000	ND	80.3	28 - 130			
Di-isopropyl ether	39.7000	5.0	0.55	50.0000	ND	79.4	32 - 133			
Dibromochloromethane	40.1900	5.0	1.0	50.0000	ND	80.4	30 - 129			
Dibromomethane	40.6200	5.0	1.6	50.0000	ND	81.2	28 - 126			
Dichlorodifluoromethane	34.6300	5.0	2.2	50.0000	ND	69.3	23 - 162			
Ethyl Acetate	388.780	50	8.1	500.000	ND	77.8	0 - 156			
Ethyl Ether	340.220	50	6.1	500.000	ND	68.0	33 - 128			
Ethyl tert-butyl ether	40.0100	5.0	0.67	50.0000	ND	80.0	33 - 138			
Ethylbenzene	88.9700	5.0	0.91	100.000	ND	89.0	22 - 132			
Freon-113	36.7100	5.0	2.8	50.0000	ND	73.4	31 - 140			
Hexachlorobutadiene	24.2200	5.0	2.5	50.0000	ND	48.4	0 - 150			
Isopropylbenzene	38.9300	5.0	1.8	50.0000	ND	77.9	15 - 144			
m,p-Xylene	83.0100	10	1.5	100.000	ND	83.0	19 - 138			
Methylene chloride	36.8700	5.0	2.3	50.0000	ND	73.7	9 - 145			
MTBE	39.3100	5.0	0.63	50.0000	ND	78.6	31 - 136			
n-Butylbenzene	32.8000	5.0	2.4	50.0000	ND	65.6	0 - 153			
n-Propylbenzene	37.4300	5.0	2.2	50.0000	ND	74.9	12 - 141			
Naphthalene	30.1100	5.0	0.97	50.0000	ND	60.2	0 - 145			
o-Xylene	83.7100	5.0	0.87	100.000	ND	83.7	20 - 129			
sec-Butylbenzene	34.9600	5.0	2.3	50.0000	ND	69.9	4 - 143			

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Volatile Organic Compounds by EPA 8260B - Quality Control (cont'd)

Analyte	Result (ug/kg)	PQL (ug/kg)	MDL (ug/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0249 - MSVOA_S (continued)										
Matrix Spike (B7K0249-MS1) - Continued			**Source: 1703918-02**		Prepared: 11/9/2017 Analyzed: 11/9/2017					
Styrene	38.8900	5.0	1.5	50.0000	ND	77.8	19 - 136			
tert-Amyl methyl ether	38.8300	5.0	0.59	50.0000	ND	77.7	30 - 128			
tert-Butanol	201.340	100	19	250.000	ND	80.5	22 - 146			
tert-Butylbenzene	36.0100	5.0	2.0	50.0000	ND	72.0	9 - 140			
Tetrachloroethene	36.5400	5.0	1.6	50.0000	ND	73.1	18 - 143			
Toluene	85.3300	5.0	0.94	100.000	ND	85.3	30 - 132			
trans-1,2-Dichloroethene	37.5300	5.0	0.59	50.0000	ND	75.1	32 - 134			
trans-1,3-Dichloropropene	44.0700	5.0	2.1	50.0000	ND	88.1	23 - 127			
Trichloroethene	40.1700	5.0	3.1	50.0000	ND	80.3	17 - 158			
Trichlorofluoromethane	39.9600	5.0	1.4	50.0000	ND	79.9	36 - 135			
Vinyl acetate	267.780	50	9.8	500.000	ND	53.6	0 - 154			
Vinyl chloride	36.8600	5.0	1.7	50.0000	ND	73.7	38 - 140			
Surrogate: 1,2-Dichloroethane-d4	*51.50*			*50.0000*		*103*	*32 - 140*			
Surrogate: 4-Bromofluorobenzene	*49.91*			*50.0000*		*99.8*	*68 - 131*			
Surrogate: Dibromofluoromethan	*49.03*			*50.0000*		*98.1*	*49 - 134*			
Surrogate: Toluene-d8	*50.54*			*50.0000*		*101*	*75 - 132*			
Matrix Spike Dup (B7K0249-MSD1)			**Source: 1703918-02**		Prepared: 11/9/2017 Analyzed: 11/9/2017					
1,1,1,2-Tetrachloroethane	39.6300	5.0	0.96	50.0000	ND	79.3	27 - 130	4.73	20	
1,1,1-Trichloroethane	38.4000	5.0	1.1	50.0000	ND	76.8	32 - 135	5.00	20	
1,1,2,2-Tetrachloroethane	41.8600	5.0	0.62	50.0000	ND	83.7	17 - 135	6.79	20	
1,1,2-Trichloroethane	41.6200	5.0	1.6	50.0000	ND	83.2	31 - 129	6.24	20	
1,1-Dichloroethane	36.6200	5.0	0.81	50.0000	ND	73.2	37 - 130	7.64	20	
1,1-Dichloroethene	33.3400	5.0	2.6	50.0000	ND	66.7	41 - 125	9.65	20	
1,1-Dichloropropene	38.0100	5.0	2.3	50.0000	ND	76.0	33 - 138	6.66	20	
1,2,3-Trichloropropane	41.5800	5.0	0.54	50.0000	ND	83.2	20 - 137	7.23	20	
1,2,3-Trichlorobenzene	34.7000	5.0	1.2	50.0000	13.1600	43.1	0 - 147	11.6	20	
1,2,4-Trichlorobenzene	67.8600	5.0	1.1	50.0000	42.3600	51.0	0 - 156	15.7	20	
1,2,4-Trimethylbenzene	33.6700	5.0	1.5	50.0000	ND	67.3	10 - 139	9.37	20	
1,2-Dibromo-3-chloropropane	41.7600	10	1.6	50.0000	ND	83.5	17 - 145	3.11	20	
1,2-Dibromoethane	39.5700	5.0	3.2	50.0000	ND	79.1	25 - 136	4.23	20	
1,2-Dichlorobenzene	33.1400	5.0	1.1	50.0000	ND	66.3	8 - 134	7.97	20	
1,2-Dichloroethane	39.6700	5.0	1.2	50.0000	ND	79.3	31 - 123	1.28	20	
1,2-Dichloropropane	38.6800	5.0	1.8	50.0000	ND	77.4	38 - 123	2.98	20	
1,3,5-Trimethylbenzene	33.9200	5.0	1.7	50.0000	ND	67.8	10 - 139	9.33	20	
1,3-Dichlorobenzene	31.6600	5.0	1.3	50.0000	ND	63.3	8 - 134	10.6	20	
1,3-Dichloropropane	40.7500	5.0	1.1	50.0000	ND	81.5	34 - 130	3.76	20	
1,4-Dichlorobenzene	33.0200	5.0	1.2	50.0000	ND	66.0	10 - 134	10.1	20	
2,2-Dichloropropane	38.9400	5.0	1.2	50.0000	ND	77.9	36 - 133	5.03	20	
2-Chlorotoluene	35.1400	5.0	1.6	50.0000	ND	70.3	15 - 133	8.40	20	
4-Chlorotoluene	34.9800	5.0	1.5	50.0000	ND	70.0	13 - 135	8.41	20	

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Volatile Organic Compounds by EPA 8260B - Quality Control (cont'd)

Analyte	Result (ug/kg)	PQL (ug/kg)	MDL (ug/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0249 - MSVOA_S (continued)										
Matrix Spike Dup (B7K0249-MSD1) - Continued			**Source: 1703918-02**		Prepared: 11/9/2017 Analyzed: 11/9/2017					
4-Isopropyltoluene	31.2900	5.0	2.3	50.0000	ND	62.6	2 - 146	10.5	20	
Benzene	75.4800	5.0	0.64	100.000	ND	75.5	40 - 123	4.16	20	
Bromobenzene	36.4200	5.0	1.1	50.0000	ND	72.8	18 - 132	6.79	20	
Bromochloromethane	37.5700	5.0	0.64	50.0000	ND	75.1	32 - 130	2.70	20	
Bromodichloromethane	38.5600	5.0	1.2	50.0000	ND	77.1	33 - 122	4.54	20	
Bromoform	39.4300	5.0	0.80	50.0000	ND	78.9	20 - 134	7.09	20	
Bromomethane	32.4700	5.0	2.5	50.0000	ND	64.9	35 - 140	5.28	20	
Carbon disulfide	33.1600	5.0	3.5	50.0000	ND	66.3	32 - 143	8.66	20	
Carbon tetrachloride	37.2300	5.0	1.2	50.0000	ND	74.5	23 - 144	5.46	20	
Chlorobenzene	38.0600	5.0	1.0	50.0000	ND	76.1	24 - 128	6.38	20	
Chloroethane	34.7700	5.0	1.1	50.0000	ND	69.5	35 - 135	6.75	20	
Chloroform	37.6100	5.0	0.82	50.0000	ND	75.2	36 - 126	4.65	20	
Chloromethane	33.0900	5.0	1.4	50.0000	ND	66.2	36 - 146	7.42	20	
cis-1,2-Dichloroethene	36.4600	5.0	0.67	50.0000	ND	72.9	31 - 136	5.39	20	
cis-1,3-Dichloropropene	38.7500	5.0	1.9	50.0000	ND	77.5	28 - 130	3.57	20	
Di-isopropyl ether	38.4400	5.0	0.55	50.0000	ND	76.9	32 - 133	3.22	20	
Dibromochloromethane	37.9300	5.0	1.0	50.0000	ND	75.9	30 - 129	5.79	20	
Dibromomethane	37.5800	5.0	1.6	50.0000	ND	75.2	28 - 126	7.77	20	
Dichlorodifluoromethane	32.3900	5.0	2.2	50.0000	ND	64.8	23 - 162	6.68	20	
Ethyl Acetate	356.140	50	8.1	500.000	ND	71.2	0 - 156	8.76	20	
Ethyl Ether	324.850	50	6.1	500.000	ND	65.0	33 - 128	4.62	20	
Ethyl tert-butyl ether	39.0300	5.0	0.67	50.0000	ND	78.1	33 - 138	2.48	20	
Ethylbenzene	84.0800	5.0	0.91	100.000	ND	84.1	22 - 132	5.65	20	
Freon-113	34.7700	5.0	2.8	50.0000	ND	69.5	31 - 140	5.43	20	
Hexachlorobutadiene	22.9500	5.0	2.5	50.0000	ND	45.9	0 - 150	5.38	20	
Isopropylbenzene	36.1400	5.0	1.8	50.0000	ND	72.3	15 - 144	7.43	20	
m,p-Xylene	77.5000	10	1.5	100.000	ND	77.5	19 - 138	6.87	20	
Methylene chloride	34.8900	5.0	2.3	50.0000	ND	69.8	9 - 145	5.52	20	
MTBE	38.2400	5.0	0.63	50.0000	ND	76.5	31 - 136	2.76	20	
n-Butylbenzene	29.3900	5.0	2.4	50.0000	ND	58.8	0 - 153	11.0	20	
n-Propylbenzene	34.6200	5.0	2.2	50.0000	ND	69.2	12 - 141	7.80	20	
Naphthalene	27.9900	5.0	0.97	50.0000	ND	56.0	0 - 145	7.30	20	
o-Xylene	79.0300	5.0	0.87	100.000	ND	79.0	20 - 129	5.75	20	
sec-Butylbenzene	30.8300	5.0	2.3	50.0000	ND	61.7	4 - 143	12.6	20	
Styrene	36.6100	5.0	1.5	50.0000	ND	73.2	19 - 136	6.04	20	
tert-Amyl methyl ether	37.9000	5.0	0.59	50.0000	ND	75.8	30 - 128	2.42	20	
tert-Butanol	221.980	100	19	250.000	ND	88.8	22 - 146	9.75	20	
tert-Butylbenzene	32.9100	5.0	2.0	50.0000	ND	65.8	9 - 140	9.00	20	
Tetrachloroethene	35.1900	5.0	1.6	50.0000	ND	70.4	18 - 143	3.76	20	
Toluene	82.9500	5.0	0.94	100.000	ND	83.0	30 - 132	2.83	20	
trans-1,2-Dichloroethene	35.0400	5.0	0.59	50.0000	ND	70.1	32 - 134	6.86	20	
trans-1,3-Dichloropropene	41.5000	5.0	2.1	50.0000	ND	83.0	23 - 127	6.01	20	

Certificate of Analysis

Hushmand Associates, Inc.	Project Number : Sixth Street Viaduct PARC, LAC-17-001
250 Goddard	Report To : Nitha R. Nitharsan
Irvine , CA 92618	Reported : 11/16/2017

Volatile Organic Compounds by EPA 8260B - Quality Control (cont'd)

Analyte	Result (ug/kg)	PQL (ug/kg)	MDL (ug/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B7K0249 - MSVOA_S (continued)										
Matrix Spike Dup (B7K0249-MSD1) - Continued			**Source: 1703918-02**		Prepared: 11/9/2017 Analyzed: 11/9/2017					
Trichloroethene	37.5800	5.0	3.1	50.0000	ND	75.2	17 - 158	6.66	20	
Trichlorofluoromethane	36.9600	5.0	1.4	50.0000	ND	73.9	36 - 135	7.80	20	
Vinyl acetate	227.450	50	9.8	500.000	ND	45.5	0 - 154	16.3	20	
Vinyl chloride	33.7900	5.0	1.7	50.0000	ND	67.6	38 - 140	8.69	20	
Surrogate: 1,2-Dichloroethane-d4	*50.40*			*50.0000*		*101*	*32 - 140*			
Surrogate: 4-Bromofluorobenzene	*49.91*			*50.0000*		*99.8*	*68 - 131*			
Surrogate: Dibromofluoromethan	*48.53*			*50.0000*		*97.1*	*49 - 134*			
Surrogate: Toluene-d8	*50.88*			*50.0000*		*102*	*75 - 132*			

Certificate of Analysis

Hushmand Associates, Inc.		Project Number :	Sixth Street Viaduct PARC, LAC-17-001
250 Goddard		Report To :	Nitha R. Nitharsan
Irvine , CA 92618		Reported :	11/16/2017

Notes and Definitions

R	RPD value outside acceptance criteria. Calculation is based on raw values.
M1	Matrix spike recovery outside of acceptance limit. The analytical batch was validated by the laboratory control sample.
ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED ATECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 ● Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 1

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver:20130715

Method of Transport		Sample Conditions Upon Receipt					
		Condition	Y	N	Condition	Y	N
☐Client	☑ATL	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
☐FedEx	☐OnTrac	2. HEADSPACE (VOA)	N/A	☐	6. PRESERVED	☑	☐
☐GSO		3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C:	5.9	
☐Other:		4. SEALED	☐	☐			

ice in bottle

CUSTOMER

Company:	Hushmand Associates, Inc	Address:	250 Goddard	Tel:	(949) 777-1266
		City:	Irvine	State: CA Zip: 92618	Fax: (949) 777-1276

SEND REPORT TO:		SEND INVOICE TO: ☑same as SEND REPORT TO	
Attn:	Nitha R. Nitharsan	Attn:	
Email:	nitha@haieng.com	Email:	
Company:	Hushmand Associates, Inc.	Company:	
Address:	250 Goddard	Address:	
City:	Irvine	City:	
State:	CA	State:	
Zip:	92618	Zip:	

PROJECT SAMPLES

Project Name:	Sixth Street Viaduct PARC	Quote #:	E17E51
Project No.:	LAC-17-001	PO #:	
Sampler:	RN	Special Instructions/Comments:	

ITEM	Lab No.	Sample Description: Sample ID / Location	Date	Time	6010 / 7000 (Title 22 Metals)	8015 (DRO)	8015 (GRO)	8081 (Organochlorine Pesticides)	8082 (PCBs)	8260 / 624 (Volatiles)	8270 (Semi-volatiles)	TO-15	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Select Soil Matrix (SOIL)	Select Solid Matrix	Select Water Matrix	Select Wastewater Matrix	Select Aqueous Matrix	Enter Custom Matrix	TAT	Container: #	Container: Type	Container: Material	Preservative	REMARKS
1	703996-01	Drum 1 - Sample 1	11/8/17	9:47a	X	X	X		X	X													X							1	5	1		
2	-02	Drum 1 - Sample 2	11/8/17	9:49a	X	X	X		X	X													X							1	5	1		
3	-03	Drum 2 - Sample 1	11/8/17	1:52p	X	X	X		X	X													X							1	5	1		
4	-04	Drum 2 - Sample 2	11/8/17	1:54p	X	X	X		X	X													X							1	5	1		
5																																		
6																																		
7																																		
8																																		
9																																		
10																																		

QA/QC: ☐Routine ☐Caltrans ☐Legal ☐RWQCB ☐Level IV

Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4 = 4C; 5=Zn (Ac)2; 6=NaOH; 7=NA2S2O3

Material: 1=Glass; 2=Plastic; 3=Metal

Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7 = Canister

DRAFT

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples submitted AFTER 3:00 PM are considered received the following business day at 8:00 AM.
3. The following turnaround time conditions apply:
   - TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work --- ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Nitha R. Nitharsan — Submitter Print Name

Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
R. Nitharsan	11/8/17	15:50	Sophal Ken	11/8/17	15:50
Sophal Ken	11/9/17	17:15		11/10/17	17:15

Marnellie Ramos

From: Carmen Aguila
Sent: Thursday, November 9, 2017 8:30 AM
To: Fernando Diwa
Cc: Marnellie Ramos; customer.relations@atlglobal.com
Subject: FW: LAC-17-001, Sixth Street Viaduct PARC - Soil Samples
Attachments: ATL_COC (signed).pdf

Please log accordingly.

From: Naresh Bellana [mailto:naresh@haieng.com]
Sent: Wednesday, November 08, 2017 5:56 PM
To: Rachelle Arada
Cc: Carmen Aguila; Nitha Nitharsan; Naz Mokarram
Subject: LAC-17-001, Sixth Street Viaduct PARC - Soil Samples

Hi Rachelle & Carmen,

One of your representatives picked up four (4) soil samples from our Irvine office today (11/08) evening . We completed COC and Test assignment for the samples as attached. We would like to make changes to the test assignment as follows:

- Exclude PCBs for all the samples.

Please let us know if you have any questions.

Thank you,

Naresh Bellana, MS, PE
Senior Staff Engineer

Hushmand Associates, Inc.
250 Goddard
Irvine, CA 92618

p. (949) 777-1266
d. (949) 777-1275
f. (949) 777-1276

25 Years of Service Excellence

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 1

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver:20130715

Method of Transport: ☐Client ☑ATL ☐FedEx ☐OnTrac ☐SSO ☐Other

Sample Conditions Upon Receipt

Condition	Y	N	Condition	Y	N
1 CHILLED	☐	☐	5 # OF SAMPLES MATCH COC	☐	☐
2 HEADSPACE (VOA)	☐	☐	6 PRESERVED	☐	☐
3 CONTAINER INTACT	☐	☐	7 COOLER TEMP, deg C		
4 SEALED	☐	☐			

CUSTOMER

Company: Hushmand Associates, Inc
Address: 250 Goddard
City: Irvine State: CA Zip: 92618
Tel: (949) 777-1266
Fax: (949) 777-1276

SEND REPORT TO:
Attn: Nitha R. Nitharsan Email: nitha@haieng.com
Company: Hushmand Associates, Inc.
Address: 250 Goddard
City: Irvine State: CA Zip: 92618

SEND INVOICE TO: ☑same as SEND REPORT TO
Attn: Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: Sixth Street Viaduct PARC
Project No.: LAC-17-001
Sampler: RN
Quote #: E17E51
PO #:
Special Instructions/Comments:

ITEM	Lab No.	Sample Description: Sample ID / Location	Date	Time	6010 / 7000 (Title 22 Metals)	8015 (DRO)	8015 (GRO)	8081 (Organochlorine Pesticides)	8082 (PCBs)	8260 / 624 (Volatiles)	8270 (Semi-volatiles)	TO-15	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Select Soil Matrix (SOIL)	Select Solid Matrix	Select Water Matrix	Select Wastewater Matrix	Select Aqueous Matrix	Enter Custom Matrix	TAT	Container: #	Container: Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Bellar; 7=Canister	Container: Material: 1=Glass, 2=Plastic, 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (Ac)2; 6=MeOH; 7=NaHSO3	QA/QC: ☐Routine ☐Caltrans ☐Legal ☐RWQCB ☐Level IV	REMARKS
1		Drum 1 - Sample 1	11/5/17	11:47am	X	X	X		X	X													X							1	S	1			
2		Drum 1 - Sample 2	11/5/17	11:49pm	X	X	X		X	X													X							1	S	1			
3		Drum 2 - Sample 1	11/5/17	1:52pm	X	X	X		X	X													X							1	S	1			
4		Drum 2 - Sample 2	11/5/17	1:54pm	X	X	X		X	X													X							1	S	1			
5																																		
6																																		
7																																		
8																																		
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As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Nitha R. Nitharsan — Submitter Print Name
Nitha — Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
R. Nitha	11/8/17	15:50	[illegible]	11/8/17	1550
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

DRAFT

DRAFT

DISPOSAL MANIFEST

DRAFT

Manifest

SOIL SAFE OF CA – TPST
Non-Hazardous Soils

↓ Manifest # ↓

Generator and/or Consultant

Date of Shipment:	Responsible for Payment:	Transport Truck #:	Facility #:	Approval Number:	Load #
12/22/17		979/476	A07	48167	001

Generator's Name and Billing Address: CITY OF LOS ANGELES SIXTH STREET VIADUCT DIVISION BUREAU OF ENGINEERING, DEPARTMENT OF PUBLIC WORKS 585 S. SANTA FE AVENUE LOS ANGELES, CA 90013	Generator's Phone #: 213-864-4329 Person to Contact: FAX#:	 Customer Account Number
Consultant's Name and Billing Address:	Consultant's Phone #: Person to Contact: FAX#:	 Customer Account Number
Generation Site (Transport from): *(name & address)* SIXTH STREET VIADUCT PARC 585 S. SANTA FE AVENUE LOS ANGELES, CA 90013	Site Phone #: Person to Contact: FAX#:	
Designated Facility (Transport to): *(name & address)* SOIL SAFE 12328 HIBISCUS AVENUE ADELANTO, CA 92301	Facility Phone #: (800) 862-8001 Person to Contact: JOE PROVANSAL FAX#: (760) 246-8004	
Transporter Name and Mailing Address: BELSHIRE 25971 TOWNE CENTRE DRIVE FOOTHILL RANCH, CA 92610 BESI: 288487	Transporter's Phone #: 949-460-5200 Person to Contact: LARRY MOOTHART FAX#: 949-460-5210	CAR000163913 450847 Customer Account Number

Description of Soil	Moisture Content	Contaminated by:	Approx. Qty:	Description of Delivery	Gross Weight	Tare Weight	Net Weight
Sand ☐ Organic ☐ Clay ☐ Other ☐	0 - 10% ☐ 10 - 20% ☐ 20% - over ☐	Gas ☐ Diesel ☐ Other ☐	2 DM	Soil	39480	38300	1180
Sand ☐ Organic ☐ Clay ☐ Other ☐	0 - 10% ☐ 10 - 20% ☐ 20% - over ☐	Gas ☐ Diesel ☐ Other ☐					.59

List any exception to items listed above: Scale Ticket # 138804

Generator's and/or consultant's certification: I/We certify that the soil referenced herein is taken entirely from those soils descried in the Soil Data Sheet completed and certified by me/us for the Generation Site shown above and nothing has been added or done to such soil that would alter it in any way.

Print or Type Name: Generator ☐ Consultant ☐	Signature and date:	Month	Day	Year
Larry Moothart of BESI on behalf of generator		11	16	17

Transporter

Transporter's certification: I/We acknowledge receipt of the soil referenced above and certify that such soil is being delivered in exactly the same condition as when received. I/We further certify that the soil is being directly transported from the Generation Site to the Designated Facility without off-loading, adding to, subtracting from or in any way delaying delivery to such site.

Print or Type Name:	Signature and date:	Month	Day	Year
[illegible]		11	16	17

Recycling Facility

Discrepancies:

Recycling Facility certifies the receipt of the soil covered by this manifest except as noted above:

Print or Type Name:	Signature and date:
J. PROVANSAL	12-22-17

Please print or type.

585SSAN/1718531

TRANSPORTER COPY

DRAFT

APPENDIX C
SOIL MANAGEMENT REPORT

DRAFT

WALLACE LABORATORIES, LLC
365 Coral Circle
El Segundo, CA 90245
phone (310) 615-0116 fax (310) 640-6863

November 13, 2017

Naz Mokarram, naz@haieng.com
Hushmand Associates, Inc.
250 Goddard
Irvine, CA 92618

RE: City of LA Sixth Street Viaduct Parc, Job No. LAC-17-001
Soil Management Report

Dear Naz,

Summary Data

description	pH	lime	salinity	chloride
Boring No GB-1, Bulk 1, 0-6"	7.47	no	1.15	25
Boring No GB-3, Bulk 1, 0-6"	10.47	slight	0.95	9
Boring No GB-6, Bulk 1, 0-6"	8.46	yes	3.68	290
Boring No GB-7, Bulk 1, 3-9"	8.02	low	3.16	54
Boring No GB-8, Bulk 1, 0-6"	10.81	yes	1.46	38
Boring No GB-10, Bulk 1, 0-6"	8.89	yes	3.09	212
average	9.02		2.25	105

description	IR	organic matter	texture	gravel	SAR
Boring No GB-1, Bulk 1, 0-6"	3.02	0.52%	gravelly loamy sand	26.7%	1.6
Boring No GB-3, Bulk 1, 0-6"	1.77	0.79%	sandy loam	18.0%	6.1
Boring No GB-6, Bulk 1, 0-6"	1.49	1.01%	gravelly sandy loam	21.0%	5.3
Boring No GB-7, Bulk 1, 3-9"	0.64	1.80%	gravelly sandy loam	47.4%	2.7
Boring No GB-8, Bulk 1, 0-6"	2.02	0.61%	gravelly loamy sand	28.7%	21.0
Boring No GB-10, Bulk 1, 0-6"	0.87	0.68%	gravelly sandy loam	26.1%	6.9
average	1.64	0.90%	gravelly sandy loam	28.0%	7.3

Alkalinity - The average pH is strongly alkaline at 9.02. The lowest pH is Boring No GB-1, Bulk 1, 0-6" at 7.47. The second lowest pH is 8.02 for Boring No GB-7, Bulk 1, 3-9". Samples Boring No GB-3, Bulk 1, 0-6" and Boring No GB-8, Bulk 1, 0-6" have pH values at 10.47 and 10.81, respectively.

Ideally for best growth, the soil pH should normally be in the range of about 6.5 to 7.5. At least, the pH should be less than about 8.0. The pH can be frequently lowered with the addition of gypsum if needed and with deep irrigation. Since the pH scale is logarithmic, pH value 10.81 is 646 times more alkaline than pH 8.0.

Limestone is present in Borings No. GB-6, GB-8 and GB-10. It induces iron deficiency in acid-loving plants.

Salinity - The average salinity of electroconductivity is 2.25 millimho/cm. Salinity ranges from 0.95 to 3.68 millimho/cm. Chloride is moderate at 105 parts per million in the saturation extract on average. The highest level of chloride is 290 parts per million in the saturation extract is Boring No GB-6, Bulk 1, 0-6". Salt-sensitive plants need chloride below about 150 parts per million.

Resistivity at 100% saturation ranges from 272 to 1,053 ohms-cm in saturation extract

Soluble chloride ranges from 3 to 87 mg/kg.

Sodicity- The average SAR (sodium adsorption ratio) is 7.3. SAR ranges from 1.6 to 21.0 for sample Boring No GB-8, Bulk 1, 0-6". Plant available sodium is

High sodium and high SAR values have adverse effects on soil physical properties including reduced water percolation, decreased soil aggregate stability, increased clay dispersion, increased swelling of expandable clays, increased surface crusting and reduced soil tilth. High sodium also restricts the uptake of competitive ions such as potassium. Normally the SAR should be less than 3. Soils are defined as being sodic if the SAR is over 13. Gypsum can be applied followed with leaching to lower the concentration of sodium and SAR.

Soil Organic matter - The average soil organic matter is 0.90% on a dry weight basis. Soil organic matter ranges from 0.52% for sample Boring No GB-1, Bulk 1, 0-6" to 1.80% for sample Boring No GB-7, Bulk 1, 3-9".

Moderate levels of soil organic matter such as about 3% to 5% are beneficial. The benefits of moderate soil organic matter include:

> Maintenance of physical properties, soil aggregation, soil aeration, reduction in erosion potential, sufficient hydraulic conductivity, etc.
> Increases water availability
> Provides for cation-exchange and base saturation
> Supplies available nutrients

Texture - The average soil texture is gravelly sandy loam. Gravel is 28.0% on average. The content of gravel ranges from 18.0% to 47.4%.

Soils are defined as being gravelly if the gravel content is over 20%. The presence of elevated levels of gravel is undesirable. Gravel dilutes the soil fertility. Soil analyses are made with soil fraction that does not contain gravel. If the amount of gravel were taken into account, the actual fertility would be lower than what is reported. Gravel does not supply nutrients nor does it holds moisture. Gravel blocks root growth. Gravel is not permeable. The path of travel of roots, drainage and air exchange is increased, is tortuous and is circuitous in the presence of large amounts of elevated gravel which restricts rooting, drainage and soil aeration.

Rate of hydraulic conductivity- The average estimated rate of water percolation based on Soil Water Characteristics version 6.02.74 model developed by Keith Saxton of the USDA is moderate at 1.64 inches per hour for normal soil compaction. The model is based on the soil texture, percent gravel and percent soil organic matter. The estimated rates of water percolation range from 0.64 to 3.02 inches per hour.

Fertility - On average, phosphorus and potassium are modest. Nitrogen is low in one sample. Phosphorus is low or modest in four samples. Potassium is low or modest in four samples. Boron is modest. Iron, manganese, zinc, and copper are sufficient. Magnesium is low or modest in three samples. Samples Boring No GB-6, Bulk 1, 0-6" and Boring No GB-7, Bulk 1, 3-9" contain gypsum.

The highest soluble sulfate is 1,890 mg/kg.

Heavy Metals - Plant available lead is modest for these samples. The concentrations of plant available lead ranges from 3 to 13 parts per million. Normally for good plant growth, the concentration of plant available needs to be less than about 30 parts per million.

Recommendations

Use the more suitable soils with lower alkalinity and with lower levels of gravel. If possible reduce the gravel content to less than 20%.

General soil preparation on a square foot basis. Broadcast the following uniformly; rates are per 1,000 square feet for a 6-inch lift. Incorporate them homogeneously 6" deep.

Potassium sulfate (0-0-50) – 10 pounds for Borings GB-6, GB-7 and GB-10
K-Mag (sul-po-mag) (0-0-22) - 12 pounds for Borings GB-1, BG-3, and GB-8
Triple superphosphate (0-45-0) – 4 pounds except Borings GB-1 and GB-3
agricultural gypsum - 10 pounds for Boring GB-1, and 30 pounds for GB-3, GB-8 and GB-9
Organic soil amendment - about 4 cubic yards, sufficient for 3% to 5% soil organic matter

For the preparation on a volume basis, homogeneously blend the following materials into the soil. Rates are expressed per cubic yard:

Potassium sulfate (0-0-50) – 1/2 pound for Borings GB-6, GB-7 and GB-10
K-Mag (sul-po-mag) (0-0-22) - 1/2 pound for Borings GB-1, BG-3, and GB-8
Triple superphosphate (0-45-0) – 1/4 pound except Borings GB-1 and GB-3
agricultural gypsum – 1/2 pound for Boring GB- and, 1.5 pounds for GB-3, GB-8 and GB-9
Organic soil amendment - about 20% by volume, sufficient for 3% to 5% soil organic matter

Organic soil amendment:

1. Humus material shall have an acid-soluble ash content of no less than 6% and no more than 20%. Organic matter shall be at least 50% on a dry weight basis.
2. The pH of the material shall be between 6 and 7.5.
3. The salt content shall be less than 10 millimho/cm @ 25° C. on a saturated paste extract.
4. Boron content of the saturated extract shall be less than 1.0 part per million.
5. Silicon content (acid-insoluble ash) shall be less than 50%.
6. Calcium carbonate shall not be present if to be applied on alkaline soils.
7. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.
8. Composted wood products are conditionally acceptable [stable humus must be present]. Wood based products are not acceptable which are based on red wood or cedar.
9. Sludge-based materials are not acceptable.
10. Carbon:nitrogen ratio is less than 25:1.
11. The compost shall be aerobic without malodorous presence of decomposition products.
12. The maximum particle size shall be 0.5 inch, 80% or more shall pass a No. 4 screen for soil amending.

Maximum total permissible pollutant concentrations in amendment in parts per million on a dry weight basis:

arsenic	12	copper	100	selenium	10
cadmium	15	lead	150	silver	10
chromium	200	mercury	10	vanadium	50
cobalt	50	molybdenum	20	zinc	250
		nickel	100		

Higher amounts of salinity or boron may be present if the soils are to be preleached to reduce the excess or if the plant species will tolerate the salinity and/or boron.

Preleach amended soils prior to planting where needed. Lower the pH to less than 8.0. Lower the SAR to less than 3. Reduce the salinity to less than 3 millimho/cm. Afterwards, apply ammonium sulfate (21-0-0) at 5 pounds per 1,000 square feet if nitrogen is low. Ammonium sulfate (21-0-0) helps to acidify soil.

Monitor the site with periodic testing. Adjust the maintenance program as needed.

Sincerely,

Garn A. Wallace, Ph. D.
GAW:n

WALLACE LABS
365 Coral Circle
El Segundo, CA 90245
(310) 615-0116

SOILS REPORT

Print Date Nov 13, 2017 **DRAFT** Receive Date 11/10/17

Location City of LA Sixth Street Viaduct Parc, Job No. LAC-17-001

Requester Naz Mokarram, Hushmand Associates, Inc.

graphic interpretation: * very low, ** low, *** moderate

ammonium bicarbonate/DTPA

* * * * high, * * * * * very high

extractable - mg/kg soil
Interpretation of data
low medium high

Sample ID Number	17-317-02		17-317-03		17-317-04	
Sample Description	Boring No GB-1, Bulk 1, 0-6"		Boring No GB-3, Bulk 1, 0-6"		Boring No GB-6, Bulk 1, 0-6"	
elements		graphic		graphic		graphic
phosphorus	58.53	*****	17.45	*****	5.79	**
potassium	133.05	****	119.36	***	37.63	**
iron	38.50	*****	40.85	*****	10.54	****
manganese	0.72	***	1.46	****	1.21	****
zinc	11.80	*****	1.80	****	2.21	****
copper	2.65	****	1.74	****	1.68	****
boron	0.19	**	0.18	**	0.26	***
calcium	311.02	***	253.77	***	296.53	***
magnesium	39.76	**	41.11	**	84.01	***
sodium	32.35	*	86.71	**	250.66	****
sulfur	21.14	*	26.75	**	120.96	**
molybdenum	0.02	**	0.02	***	0.05	***
nickel	0.17	*	0.18	*	0.08	*
aluminum	0.22	*	0.08	*	n d	*
arsenic	0.13	*	0.13	*	0.19	*
barium	0.75	*	0.26	*	0.59	*
cadmium	0.05	*	0.03	*	0.03	*
chromium	0.07	*	0.06	*	0.02	*
cobalt	0.02	*	0.06	*	0.02	*
lead	12.95	***	5.23	***	4.26	**
lithium	n d	*	n d	*	0.01	*
mercury	n d	*	n d	*	n d	*
selenium	0.09	*	0.10	*	0.10	*
silver	n d	*	n d	*	n d	*
strontium	1.40	*	0.76	*	1.19	*
tin	0.28	*	0.24	*	0.19	*
vanadium	0.28	*	0.28	*	0.37	*
Saturation Extract						
pH value	7.47	***	10.47	*****	8.46	****
ECe (milli-mho/cm)	1.15	***	0.95	***	3.68	****
		millieq/l		millieq/l		millieq/l
calcium	104.7	5.2	40.0	2.0	430.2	21.5
magnesium	16.5	1.4	2.0	0.2	58.4	4.8
sodium	66.9	2.9	146.6	6.4	439.4	19.1
potassium	36.5	0.9	19.7	0.5	5.9	0.1
cation sum		10.4		9.0		45.6
chloride	25	0.7	9	0.3	290	8.2
nitrate as N	58	4.1	48	3.4	48	3.5
phosphorus as P	1.3	0.0	0.3	0.0	0.1	0.0
sulfate as S	69.6	4.4	54.1	3.4	320.8	20.1
anion sum		9.2		7.1		31.7
boron as B	0.19	*	0.10	*	0.14	*
SAR	1.6	**	6.1	****	5.3	***
est. gypsum requirement-lbs./1,000 square feet	6		15		43	
calculated infiltration rate inches/hour	3.02		1.77		1.49	
soil texture	gravelly loamy sand	gravel > 2 mm	sandy loam	gravel > 2 mm	gravelly sandy loam	gravel > 2 mm
sand	81.0%	26.7%	68.8%	18.0%	70.0%	21.0%
silt	14.8%	gravel > 1/4 inch	23.3%	gravel > 1/4 inch	19.8%	gravel > 1/4 inch
clay	4.2%	21.5%	7.9%	14.9%	10.2%	7.3%
lime (calcium carbonate)	no	gravel > 1/2 inch	slight	gravel > 1/2 inch	yes	gravel > 1/2 inch
Total nitrogen	0.018%	20.1%	0.023%	10.4%	0.019%	2.3%
Total organic carbon	0.258%		0.393%		0.506%	
carbon:nitrogen ratio	14.6		17.3		27.1	
organic matter based on carbon	0.52%		0.79%		1.01%	
moisture content of soil	1.0%		2.6%		2.9%	
half saturation percentage	13.4%		15.8%		15.0%	

The following trace elements may be toxic. The degree of toxicity depends upon the pH of the soil, soil texture, organic matter, and the concentrations of the individual elements as well as to their interactions.

The pH optimum depends upon soil organic matter and clay content- for clay and loam soils: under 5.2 is too acidic 6.5 to 7 is ideal over 9 is too alkaline

The ECe is a measure of the soil salinity: 1-2 affects a few plants, 2-4 affects some plants, > 4 affects many plants.

problems over 150 ppm; good 20 - 30 ppm; toxic over 800

toxic over 1 for many plants

increasing problems start at 3

Elements are expressed as mg/kg dry soil or mg/l for saturation extract.
pH and ECe are measured in a saturation paste extract. nd means not detected.
Analytical data determined on soil fraction passing a 2 mm sieve.

WALLACE LABS
365 Coral Circle
El Segundo, CA 90245
(310) 615-0116

SOILS REPORT

DRAFT

Print Date Nov 13, 2017 Receive Date 11/10/17

Location City of LA Sixth Street Viaduct Parc, Job No. LAC-17-001

Requester Naz Mokarram, Hushmand Associates, Inc.

graphic interpretation: * very low, ** low, *** moderate

ammonium bicarbonate/DTPA

* * * * high, * * * * * very high

extractable - mg/kg soil
Interpretation of data
low medium high

Sample ID Number	17-317-05		17-317-06		17-317-07	
Sample Description	Boring No GB-7, Bulk 1, 3-9"		Boring No GB-8, Bulk 1, 0-6"		Boring No GB-10, Bulk 1, 0-6"	
elements		graphic		graphic		graphic
phosphorus	10.31	***	9.17	***	8.13	***
potassium	39.65	**	82.73	***	33.79	**
iron	14.81	****	34.68	*****	10.50	****
manganese	1.41	****	2.59	****	2.61	****
zinc	9.07	****	4.62	****	2.97	****
copper	2.51	****	2.00	****	2.56	****
boron	0.21	***	0.38	***	0.27	***
calcium	316.43	***	300.54	***	322.72	***
magnesium	228.53	*****	16.25	*	137.69	****
sodium	213.81	****	299.75	****	381.35	*****
sulfur	630.13	****	57.48	**	105.46	**
molybdenum	0.06	***	0.03	***	0.08	***
nickel	0.48	*	0.10	*	0.10	*
aluminum	n d	*	0.05	*	n d	*
arsenic	0.12	*	0.28	*	0.16	*
barium	0.10	*	0.37	*	0.51	*
cadmium	0.14	*	0.04	*	0.03	*
chromium	n d	*	0.11	*	0.02	*
cobalt	0.01	*	0.05	*	0.04	*
lead	2.58	**	6.14	***	4.88	**
lithium	0.03	*	0.01	*	0.03	*
mercury	n d	*	n d	*	n d	*
selenium	0.11	*	0.06	*	0.08	*
silver	n d	*	n d	*	n d	*
strontium	0.36	*	0.73	*	1.56	*
tin	0.20	*	0.17	*	0.15	*
vanadium	0.28	*	0.49	*	0.51	*

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The pH optimum depends upon soil organic matter and clay content- for clay and loam soils: under 5.2 is too acidic, 6.5 to 7 is ideal, over 9 is too alkaline

The ECe is a measure of the soil salinity:
1-2 affects a few plants
2-4 affects some plants,
> 4 affects many plants.

problems over 150 ppm
good 20 - 30 ppm

toxic over 800

toxic over 1 for many plants

increasing problems start at 3

Saturation Extract						
pH value	8.02	****	10.81	*****	8.89	*****
ECe (milli-mho/cm)	3.16	****	1.46	***	3.09	****
		millieq/l		millieq/l		millieq/l
calcium	474.9	23.7	19.5	1.0	283.6	14.2
magnesium	101.0	8.3	2.1	0.2	37.7	3.1
sodium	251.8	10.9	365.3	15.9	466.9	20.3
potassium	5.6	0.1	8.3	0.2	4.0	0.1
cation sum		43.2		17.2		37.7
chloride	54	1.5	38	1.1	212	6.0
nitrate as N	5	0.4	32	2.3	52	3.7
phosphorus as P	0.2	0.0	0.2	0.0	0.2	0.0
sulfate as S	410.3	25.6	136.5	8.5	261.8	16.4
anion sum		27.5		11.9		26.1
boron as B	0.10	*	0.12	*	0.11	*
SAR	2.7	**	21.0	*****	6.9	****
est. gypsum requirement-lbs./1,000 square feet	36		51		65	
calculated infiltration rate inches/hour	0.64		2.02		0.87	
soil texture	gravelly sandy loam	gravel > 2 mm	gravelly loamy sand	gravel > 2 mm	gravelly sandy loam	gravel > 2 mm
sand	62.4%	47.4%	82.8%	28.7%	66.3%	26.1%
silt	22.6%	gravel > 1/4 inch	9.7%	gravel > 1/4 inch	20.1%	gravel > 1/4 inch
clay	15.1%	36.1%	7.5%	17.1%	13.6%	16.4%
lime (calcium carbonate)	low	gravel > 1/2 inch	yes	gravel > 1/2 inch	yes	gravel > 1/2 inch
Total nitrogen	0.019%	28.8%	0.012%	10.2%	0.015%	7.1%
Total organic carbon	0.902%		0.307%		0.340%	
carbon:nitrogen ratio	48.6		25.7		23.0	
organic matter based on carbon	1.80%		0.61%		0.68%	
moisture content of soil	5.1%		2.3%		3.3%	
half saturation percentage	18.2%		13.6%		18.2%	

Elements are expressed as mg/kg dry soil or mg/l for saturation extract.
pH and ECe are measured in a saturation paste extract. nd means not detected.
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