Appendix E

Geotechnical Engineering Report

Geotechnical Engineering Report

John Anson Ford Park Infiltration Cistern Project

8000 Park Lane
Bell Gardens, California 90201

November 19, 2018
Terracon Project No. 60185137

Prepared for:
CWE Corporation
Fullerton, California

Prepared by:
Terracon Consultants, Inc.
Tustin, California

terracon.com

Terracon

Environmental ■ Facilities ■ Geotechnical ■ Materials

November 19, 2018

CWE Corporation
1561 E. Orangethorpe Avenue, Suite 240
Fullerton, CA 92831

Attn: Mr. Vik Bapna, P.E.
Principal
P: 714-526-7500 ext.212
E: vbapna@cwecorp.com

Re: **Geotechnical Engineering Report**
John Anson Ford Park Infiltration Cistern Project
8000 Park Lane
Bell Gardens, California 90201
Terracon Project No. 60185137

Dear Mr. Bapna:

Terracon has completed geotechnical engineering exploration for the proposed infiltration project to be located within the John Anson Ford Park at 8000 Park Lane, Bell Gardens, California. The purpose of this study was to evaluate the pertinent geotechnical conditions at the site and to develop geotechnical parameters which will assist in the design and construction of the planned infiltration systems onsite.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

PROFESSIONAL ENGINEER
S. PIRATHIVIRAJ
C 71662
EXP. 12/31/19
CIVIL
STATE OF CALIFORNIA

Sivasubramaniam (Raj) Pirathiviraj, P.E., G.E.
Senior Engineer

F. Fred Buhamdan, P.E.
Principal

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GEOTECHNICAL ENGINEERING REPORT
JOHN ANSON FORD PARK INFILTRATION CISTERN PROJECT
8000 PARK LANE
BELL GARDENS, CALIFORNIA
Terracon Project No. 60185137
November 19, 2018

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services performed for the proposed infiltration project located within John Anson Ford Park at 8000 Park Lane, Bell Gardens, California. The Site Location Plan (Exhibit A-1) is included in Appendix A of this report. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- earthwork
- percolation rates
- pavement design
- groundwater conditions
- lateral earth pressures for shoring
- liquefaction analysis

Our geotechnical scope of work included the advancement of three (3) test borings to approximate depths of 101.5 feet below existing ground surface (bgs), and five (5) percolation borings to approximate depths of 30 and 35 feet bgs.

Logs of the borings along with a Boring Location Diagram (Exhibit A-2) are included in Appendix A of this report. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included in Appendix B of this report.

2.0 PROJECT INFORMATION

ITEM	DESCRIPTION
Proposed Systems	This project is proposing an infiltration facility within the John Anson Ford Park. It will include constructing bottomless cisterns in the northern parking lot and adjacent baseball field and soccer field located at 8000 Park Lane, Bell Gardens, California. The cisterns will infiltrate storm water approximately 30 feet below existing surface. The construction of such cisterns will require excavations up to 30 feet bgs, shoring, utility trenching, and new pavements.
Location	This project site is located within John Anson Ford Park at 8000 Park Lane, Bell Gardens, California. The Park Lane is located on the north side of the park. Golf courses are located on east and south side of the project and the Rio Hondo Channel is running along the southeastern side project site.

ITEM	DESCRIPTION
Existing site features	The project site is an existing park including baseball fields and soccer fields with vegetation and asphaltic concrete parking lot.
Existing Topography	The project site is relatively level.
Current ground cover	The ground within the park is currently covered with landscaping, grass, vegetation, and asphaltic concrete in the parking lot area.

3.0 SUBSURFACE CONDITIONS

3.1 Field Exploration

The scope of the services performed for this project included site reconnaissance by a field representative, subsurface exploration program, laboratory testing, and engineering analyses for the proposed improvement. Three (3) test borings to approximate depths of 101.5 feet bgs, five (5) percolation borings to approximate depths of 30 and 35 feet were performed on site as shown on Exhibit A-2 in Site Location. The borings were marked on-site using the site plan, aerial photograph, and a handheld GPS device. The accuracy of the boring locations should only be assumed to the level implied by the method used.

Continuous lithologic logs of the test borings were recorded by our field representative during the drilling operations. At selected intervals, samples of subsurface materials were taken by driving split-spoon or ring-lined barrel samplers. Groundwater conditions were evaluated in the borings at the time of site exploration.

Penetration resistance measurements were obtained by driving the split-spoon and ring-barrel samplers into the subsurface materials with a 140-pound automatic hammer falling 30 inches. The penetration resistance value is a useful index in estimating the consistency or relative density of materials encountered.

An automatic hammer was used to advance the split-barrel sampler in the borings performed on this site. A significantly greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the SPT-N value. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions. The borings were backfilled with auger cuttings and capped with concrete patch prior to the drill crew leaving the site.

Selected soils samples were tested for the following engineering properties:

- In-situ Dry Density
- Sieve Analysis
- Direct Shear Tests
- Soil Resistivity
- Sulfides
- In-situ Water Content
- Atterberg Limits
- pH
- Chlorides
- Red-Ox Potential

3.2 Typical Subsurface Profile

Based on the results of the borings, the subsurface conditions encountered at the project site predominantly interbedded loose to medium dense sand with variable amounts of silt and clay, and medium stiff to very stiff clay and silt with variable amounts of sand to the depth of about 50 feet bgs. Predominantly medium dense to very dense sand with variable amounts of silt and clay with layers of medium stiff to very stiff lean clay was encountered below the depth of 50 feet bgs to the maximum depth explored at 101.5 feet bgs.

Laboratory tests were conducted on selected soil samples and the test results are presented in Appendix B. The Atterberg limits test results indicated that the onsite materials exhibit low plasticity. A direct shear test was performed on silt materials encountered at the depths of 5 and 15 feet and indicated an ultimate friction angle of 31° with corresponding cohesion value of 138 psf.

3.3 Groundwater

Groundwater was encountered in borings B-1, B-2, and B-3 at 90, 90, and 91 feet bgs, respectively. These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations. Groundwater conditions can change with varying seasonal and weather conditions, and other factors.

Based on the LA County Public Work Historical Well Measurement Data, the historic high groundwater depth is 74 feet between 1970 and 2006. This information was collected from well #1543F, which is located 1,500 feet north of the site.

3.4 Seismic Considerations

3.4.1 Seismic Site Classification Parameters

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7.

Description	Value
2016 California Building Code Site Classification (CBC) [1]	D
Site Latitude	33.9582°N
Site Longitude	118.1547°W

1. Seismic site classification in general accordance with the *2016 California Building Code*.

3.4.2 Faulting and Estimated Ground Motions

The site is located in Southern California, which is a seismically active area. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. As calculated using the USGS Unified Hazard Tool, the Puente Hills (Santa Fe Springs) Fault is considered to have the most significant effect at the site from a design standpoint. This fault has a maximum credible earthquake magnitude of 7.03 and the fault is located approximately 5.3 kilometers from the site.

Based on the USGS Design Maps Summary Report, using the American Society of Civil Engineers (ASCE 7-10) standard, the peak ground acceleration (PGA_M) at the project site is expected to be 0.773 g. Based on the USGS Unified Hazard Tool, the project site has a mean magnitude of 6.85. Furthermore, the site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.[1]

3.4.3 Liquefaction

Liquefaction is a mode of ground failure that results from the generation of high pore water pressures during earthquake ground shaking, causing loss of shear strength. Liquefaction is typically a hazard where loose sandy soils exist below groundwater. The California Geological Survey (CGS) has designated certain areas as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table.

The project site is located within a liquefaction potential zones as indicated by the CGS. Based on the materials encountered at the project site, subsurface conditions encountered on the project site is predominantly interbedded loose to medium dense sand with variable amounts of silt and clay, and medium stiff to very stiff clay and silt with variable amounts of sand to the depth of about 50 feet bgs. Historical high groundwater in the project vicinity is 74 feet bgs.

Liquefaction analysis for the site was performed in general accordance with the DMG Special Publication 117. The liquefaction study utilized the software “LiquefyPro” by CivilTech Software. This analysis was based on the soils data from Borings B-1, B-2 and B-3. Peak Ground

[1] California Department of Conservation Division of Mines and Geology (CDMG), *“Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region”*, CDMG Compact Disc 2000-003, 2000.

Acceleration (PGA) was of 0.773g was used. Calculations utilized a conservative groundwater depth of 30 feet bgs which is the bottom of the proposed cistern at the project site. Settlement analysis used the Tokimatsu, M-correction method. Fines were corrected for liquefaction using modified Stark and Olson. Liquefaction potential analysis was performed from a depth of 0 to 50 feet bgs. Liquefaction potential analysis is attached in Appendix D of this report.

Based on the subsurface conditions encountered in Borings B-1 through B-3, groundwater depth of 30 feet bgs, and laboratory test results, liquefiable saturated sands are encountered below the groundwater depth conservatively assumed at the bottom of the proposed infiltration cistern. Based on the calculation results, the seismically-induced saturated sand settlement is between 0.5 and 1 inches.

3.5 Percolation Test Results

Five (5) in-situ percolation tests (using falling head borehole permeability) were performed to approximate depths of 25 to 30 feet and 30 to 35 feet bgs. A 2-inch thick layer of gravel was placed in the bottom of each boring after the borings were drilled to investigate the soil profile. A 3-inch diameter perforated pipe was installed on top of the gravel layer in each boring. Gravel was used to backfill between the perforated pipes and the boring sidewall to the top depth of the zone of percolation. Above the zone of percolation, the top of this gravel layer was filled with bentonite. The borings were then filled with water for a pre-soak period. At the beginning of each test, the pipes were refilled with water and readings were taken at standardized time intervals. Percolation rates are provided in the following table:

TEST RESULTS			
Test Location (depth, feet bgs)	**Slowest Measured Percolation Rate (in/hr)**	**Correlated Infiltration Rate* (in/hr)**	**Water Head (in)**
P-1 (25 to 30 ft)	48.0	3.5	63
P-2 (30 to 35 ft)	2.4	0.2	46
P-3 (25 to 30 ft)	12.0	1.2	39
P-4 (25 to 30 ft)	9.6	1.4	26
P-5 (30 to 35 ft)	79.2	8.7	52

*If the proposed infiltration systems will mainly rely on vertical downward seepage, the correlated infiltration rates should be used. The correlated infiltration rates were calculated using the LA County Reduction Factor Method.

Based on our test results, the correlated infiltration rates were found to be greater than 0.3 in/hr between depths of 25 and 30 feet and 30 and 35 feet bgs. Since the project site is located within the liquefaction potential hazard zone, liquefaction analyses were performed considering the groundwater at the bottom of the proposed cistern which is 30 feet bgs. Based on the liquefaction analysis, the seismically-induced saturated sand settlement is between 0.5 and 1 inches. Therefore, the liquefaction hazard potential is considered low. Furthermore, the proposed

improvements do not include structures with human occupancy. Therefore, the infiltration onsite may be considered feasible from geotechnical standpoint.

The field test results are not intended to be design rates. They represent the result of our tests, at the depths and locations indicated, as described above. The design rate should be determined by the designer by applying an appropriate factor of safety. Based on the County of Los Angeles Department of Public Works GS200.2 document, the following reduction factors are recommended:

LA County Reduction Factor	Value
RF_t	2
RF_v	1
RF_s	2
RF, Total Reduction Factor $RF=RF_t x RF_v x RF_s$	4

With time, the bottoms of infiltration systems tend to plug with organics, sediments, and other debris. Long term maintenance will likely be required to remove these deleterious materials to help reduce decreases in actual percolation rates.

Infiltration rates will be significantly impacted by the compaction of soils at the bottom of the proposed infiltration cisterns. Therefore, we recommend that compaction is avoided at the bottom of excavation. In the event construction traffic densifies the upper soils during excavation, such soils should be scarified prior to the installation of the proposed cisterns.

The percolation test was performed with clear water, whereas the storm water will likely not be clear, but may contain organics, fines, and grease/oil. The presence of these deleterious materials will tend to decrease the rate that water percolates from the infiltration systems. Design of the storm water infiltration systems should account for the presence of these materials and should incorporate structures/devices to remove these deleterious materials.

Based on the soils encountered in our borings, we expect the percolation rates of the soils could be different than measured in the field due to variations in fines and gravel content. The design elevation and size of the proposed infiltration system should account for this expected variability in infiltration rates.

Infiltration testing should be performed after construction of the infiltration system to verify the design infiltration rates. It should be noted that siltation and vegetation growth along with other factors may affect the infiltration rates of the infiltration areas. The actual infiltration rate may vary from the values reported here. Infiltration systems should be located a minimum of 20 feet from any existing or proposed foundation system.

3.6 Corrosion Potential

Results of soluble sulfate testing indicate that ASTM Type I/II Portland cement may be used for all concrete on and below grade. Structural concrete may be designed for sulfate exposure category class S0 in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 19.

Laboratory test results indicate that the on-site soils have pH values of 7.89 and 8.84, minimum resistivity values of 446 and 8,924 ohm-centimeters, water soluble sulfate contents of 0.01% and 0.09%, Red-Ox potential values of +679 and +691 mV, negligible sulfides, and chloride contents of 75 and 488 parts per million (ppm) as shown on the attached Results of Corrosivity Analysis sheet. These values should be used to evaluate corrosive potential of the on-site soils to underground ferrous metals.

Refer to the Results of Corrosivity Analysis sheet in Appendix B for the complete results of the corrosivity testing conducted in conjunction with this geotechnical exploration.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Lateral Earth Pressure

4.1.1 Cantilevered Shoring Recommendations

The lateral earth pressure recommendations herein are applicable to the design of cantilevered shoring system. The lateral earth pressures are based on the free draining level backfill conditions.

The parameters below consider a soil profile of existing soils as backfill materials:

ITEM	VALUE
Active Case Backfill	38 psf/ft
Passive Case	375 psf/ft
At-Rest Case	58 psf/ft
Surcharge Pressure	0.3*(Surcharge)
Ultimate Coefficient of Friction*	0.3

The lateral earth pressures herein do not include any factor of safety and are not applicable for submerged soils/hydrostatic loading. Additional recommendations may be necessary if such conditions are to be included in the design.

The design of any shoring system should consider surcharge loads imposed by the existing buildings and vehicular loads in the vicinity of the shoring. In general, surcharge loads should be considered where they are located within a horizontal distance behind the shoring equal to the height of the shoring.

Surcharge loads acting at the top of the shoring should be applied to the shoring over the backfill as a uniform pressure over the entire shoring height and should be added to the static earth pressures. Surcharge stresses due to point loads, line loads, and those of limited extent, such as compaction equipment, should be evaluated using elastic theory.

4.1.2 Braced Shoring Recommendations

For the design of braced shoring, we recommend such shoring be designed using a rectangular-shaped distribution of lateral earth pressure of 25H (in psf) (H is the total height of excavation).

The design of the shored excavation should be performed by an engineer knowledgeable and experienced with the on-site soil conditions. The contractor should be aware that slope height, slope inclination or excavation depths should in no case exceed those specified in local, state or federal safety regulations, e.g. OSHA Health and Safety Standards for Excavation, 29 CFR Part 1926, or successor regulations. Such regulations are strictly enforced and, if not followed, the owner or the contractor could be liable for substantial penalties.

4.1.3 Below Grade Structures Considerations

Based on our understanding of the project, we anticipate that excavations up to 30 feet below existing grade are planned for the construction of the infiltration system. For vertical sided excavations, the excavations will require the use of shoring, bracing or some form of retention to prevent sloughing and caving of the soil into the excavation.

As a safety measure, no equipment should be operated within 5 feet of the edge of the excavation and no materials should be stockpiled within 10 feet of the excavation. Excavations should not approach closer than 10 feet from existing structures/facilities without some form of protection for the facilities. Proper berm or ditch should be performed to divert any surface runoff away from the excavation.

Soils from the pits excavation should not be stockpiled higher than six (6) feet or within ten (10) feet of the edge of an open trench. Construction of open cuts adjacent to existing structures, including underground pipes, is not recommended within a 1½ H:1V plane extending beyond and down from the perimeter of structures. Cuts that are proposed within five (5) feet of light standards, other utilities, underground structures, and pavement should be provided with temporary shoring.

4.2 Earthwork

The recommendations presented are for the design and construction of earth supported elements are contingent upon following the recommendations outlined in this report.

Strip and remove existing pavements, vegetations, and other deleterious materials from proposed construction area. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction.

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than three inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

The on-site soils are considered suitable to be used as backfill materials. Backfill materials should be mechanically placed and compacted to minimum of 90% of relative compaction per the modified proctor test (ASTM D1557) with moisture contents ranging between -1% and +4% of optimum moisture content. Backfill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed eight inches loose thickness.

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively workable. However, the workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

On-site clayey soils may pump or become unworkable at high water contents. The workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. Workability may be improved by scarifying and drying. Lightweight excavation equipment may be required to reduce subgrade pumping. Should unstable subgrade conditions develop stabilization measures will need to be employed.

At the time of our study, moisture contents of the surface and near-surface native soils ranged from about 1 to 22 percent. Based on these moisture contents, some moisture conditioning may be needed for the project. The soils may need to be dried by aeration during dry weather conditions, or an additive, such as lime, cement, or kiln dust, may be needed to stabilize the soil. If the construction schedule does not allow for drying by aeration, clay sand soils may be stabilized using triaxial geogrid and coarse aggregate materials.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proof-rolling, placement and compaction of controlled compacted fills, backfilling of excavations to the completed subgrade.

We recommend that the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November

through April) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork operations may require additional mitigation measures beyond that which would be expected during the drier summer and fall months. This could include diversion of surface runoff around exposed soils and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

The individual contractor(s) is responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Underground utility lines may be encountered during construction. Furthermore, evidence of fill materials or underground facilities such as septic tanks, cesspools, and basements was not observed during the site reconnaissance, such features could be encountered during construction. If unexpected fills or utility lines or underground facilities are encountered, such features should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

4.3 Utility Trenches

It is anticipated that the on-site soils will provide suitable support for underground utilities and piping that may be installed. Any loose and/or unsuitable material encountered at the bottom of excavations should be removed and be replaced with an adequate bedding material. A non-expansive granular material with a sand equivalent greater than 30 is recommended for bedding and shading of utilities, unless otherwise allowed by the utility manufacturer.

On-site materials are considered suitable for backfill of utility and pipe trenches from one foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances. Trench backfill should be mechanically placed and compacted to minimum of 90% of relative compaction (upper 12 inches should be compacted to 95% of relative compaction within the pavements) per the modified proctor test (ASTM D1557) with moisture contents ranging between -1% and +4% of optimum moisture content. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill. Flooding or jetting for placement and compaction of backfill is not recommended.

4.4 Pavements

4.4.1 Design Recommendations

An estimated design R-Value was used to calculate the asphalt concrete pavement thickness sections and the portland cement concrete pavement sections. R-value testing should be completed prior to pavement construction to verify the design R-value.

Assuming the pavement subgrades will be prepared as recommended within this report, the following pavement sections should be considered minimums for this project for the traffic indices assumed in the table below. As more specific traffic information becomes available, we should be contacted to reevaluate the pavement calculations.

	Recommended Pavement Section Thickness (inches)*	
	Light (Automobile) Parking Assumed Traffic Index (TI) = 4.5	**On-site Driveways and Delivery Areas, Assumed TI = 5.5**
Section I Portland Cement Concrete (600 psi Flexural Strength)	5-inches PCC over 4-inches Class II Aggregate Base	6-inches PCC over 4-inches Class II Aggregate Base
Section II Asphaltic Concrete	3-inches AC over 5-inches Class II Aggregate Base	3-inches AC over 8-inches Class II Aggregate Base

* All materials should meet the CALTRANS Standard Specifications for Highway Construction.

All pavements should be supported on a minimum of 10 inches of scarified, moisture conditioned, and compacted materials. The subgrade and aggregate base materials beneath the pavements should be compacted to minimum of 95% of relative compaction per the modified proctor test (ASTM D1557) with moisture contents ranging between -1% and +4% of optimum moisture content. These pavement sections are considered minimal sections based upon the expected traffic and the existing subgrade conditions. However, they are expected to function with periodic maintenance and overlays if good drainage is provided and maintained.

Subsequent to clearing, grubbing, and removal of topsoil, subgrade soils beneath all pavements should be scarified, moisture conditioned, and compacted to a minimum depth of 10 inches. All materials should meet the CALTRANS Standard Specifications for Highway Construction. Aggregate base materials should meet the gradation and quality requirement of Class 2 Aggregate Base (¾ inch maximum) in Caltrans Standard Specifications, latest edition, Sections 25 through 29.

All concrete for rigid pavements should have a minimum flexural strength of 600 psi (4,250 psi Compressive Strength), and be placed with a maximum slump of four inches. 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.

4.4.2 Construction Considerations

Materials and construction of pavements for the project should be in accordance with the requirements and specifications of the State of California Department of Transportation, or other approved local governing specifications.

Base course or pavement materials should not be placed when the surface is wet. Surface drainage should be provided away from the edge of paved areas to minimize lateral moisture transmission into the subgrade.

Preventative maintenance should be planned and provided for through an on-going pavement management program in order to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment.

Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications, so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

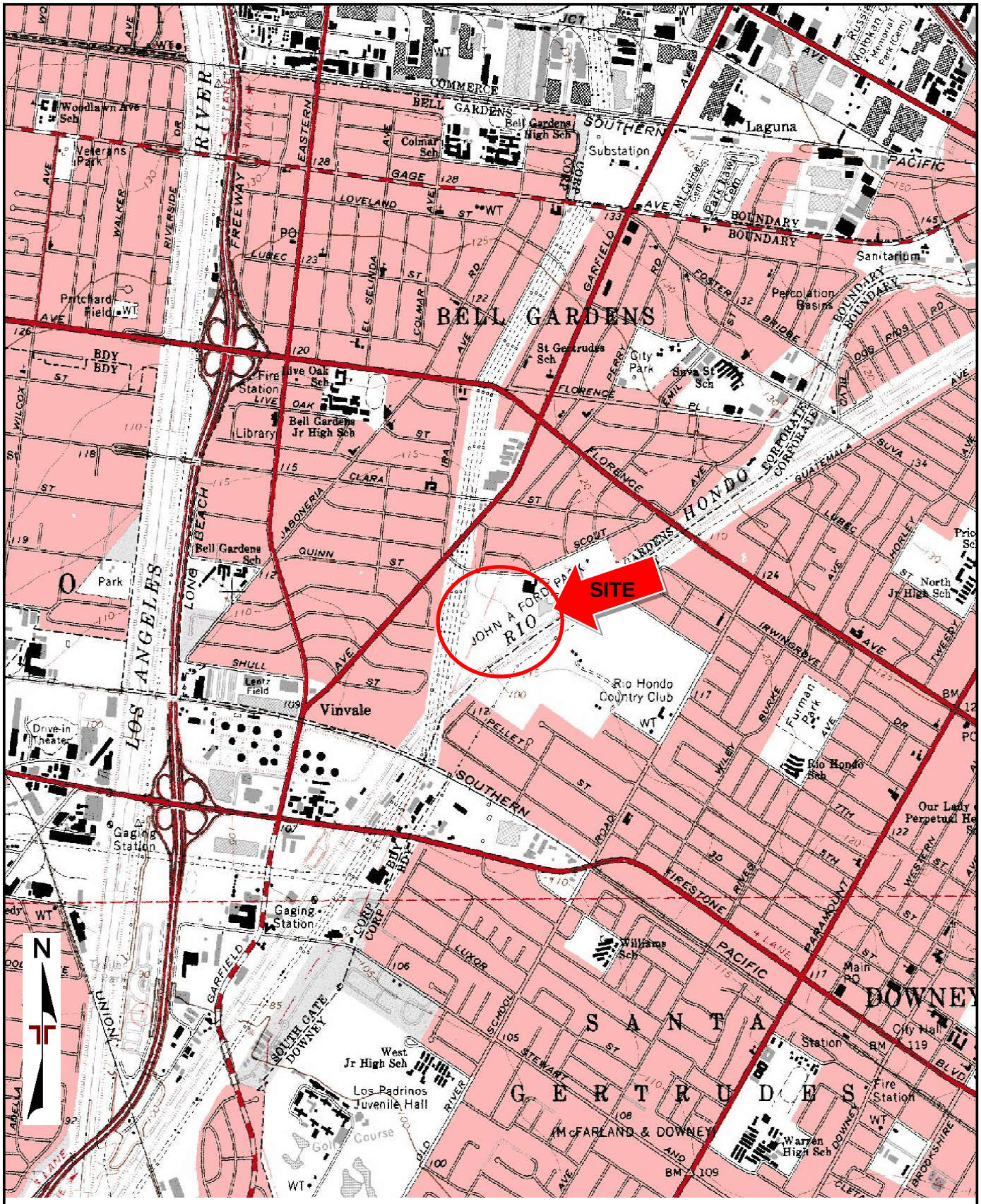
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION



TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: SOUTH GATE, CA (1/1/1981).

Project Manager: SP	Project No. 60185137	Terracon	SITE LOCATION
Drawn by: SP	Scale: 1"=2,000'	1421 Edinger Ave, Ste C Tustin, CA 92780-6287	John Anson Ford Park Infiltration Cistern Project **8000 Park Lane** **Bell Gardens, CA**
Checked by: FFB	File Name: A-1 and A-2		Exhibit A-1
Approved by: FFB	Date: Nov 2018		

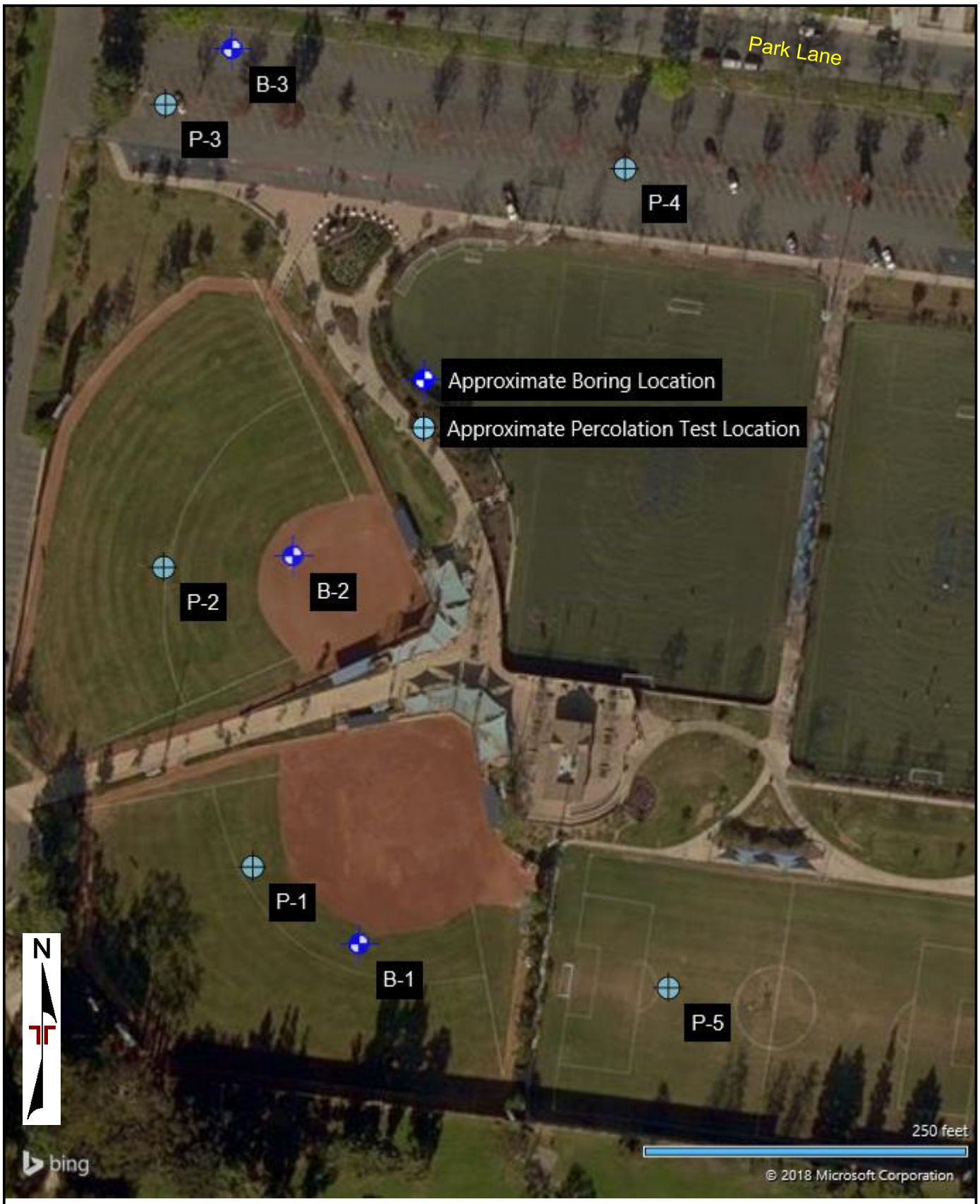


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

Project Manager: SP Drawn by: SP Checked by: FFB Approved by: FFB	Project No. 60185137 Scale: AS SHOWN File Name: A-1 and A-2 Date: Nov 2018	Terracon 1421 Edinger Ave, Ste C Tustin, CA 92780-6287	EXPLORATION PLAN John Anson Ford Park Infiltration Cistern Project **8000 Park Lane** **Bell Gardens, CA**	Exhibit A-2

BORING LOG NO. B-1

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9572° Longitude: -118.1545°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	CLAYEY SAND (SC), yellow brown											
	2.5											
	SANDY LEAN CLAY (CL), yellow brown, very stiff				4-9-19				14	112		
	5.0	5										
	SANDY SILT (ML), brown, medium stiff to stiff				6-6-2 N=8							64
	7.5											
	POORLY GRADED SAND (SP), yellow brown, loose				6-4-4				1			4
	11.0	10			1-2-3 N=5							
	SANDY SILT (ML), brown, medium stiff											
	very stiff	15			5-11-13				22	103	34-26-8	65
	20.0	20										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-22-2018 | Boring Completed: 10-22-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-3

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-1

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9572° Longitude: -118.1545°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND WITH SILT (SP-SM), light gray, medium dense				4-7-8 N=15							
		25			5-6-8 N=14							9
	30.0											
	SANDY LEAN CLAY (CL), gray, medium stiff	30			3-3-4 N=7							51
	dark gray, stiff	35			4-6-7 N=13							50
	40.0	40										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-22-2018 | Boring Completed: 10-22-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-3

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-1

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

GRAPHIC LOG	LOCATION / DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LOCATION See Exhibit A-2 Latitude: 33.9572° Longitude: -118.1545°											
	LEAN CLAY WITH SAND (CL), dark gray, stiff				3-5-6 N=11							83
	45.0	45										
	LEAN CLAY (CL), dark gray, stiff				2-3-6 N=9							
	50.0	50										
	POORLY GRADED SAND (SP), light gray, dense				9-16-18 N=34							
	60.0	55										
		60										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-22-2018 | Boring Completed: 10-22-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-3

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-1

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9572° Longitude: -118.1545°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND WITH SILT (SP-SM), dark gray, medium dense	65			6-6-10 N=16							
	70.0	70			11-18-26 N=44							
	POORLY GRADED SAND (SP), light gray, dense	75										
	80.0	80										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-22-2018 | Boring Completed: 10-22-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-3

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-1

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9572° Longitude: -118.1545°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), dark gray, very stiff	85			4-12-13 N=25							
	90.0											
	POORLY GRADED SAND WITH SILT (SP-SM), brown medium dense	90	▽		6-10-14 N=24							
		95										
		100										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-22-2018 | Boring Completed: 10-22-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-3

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-1

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 33.9572° Longitude: -118.1545° DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND WITH SILT (SP-SM), brown *(continued)* dense 101.5				8-11-19 N=30							
	Boring Terminated at 101.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-22-2018 | Boring Completed: 10-22-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-3

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-2

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9581° Longitude: -118.1547°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
CLAYEY SAND (SC), brown medium dense					3-6-9 N=15							
5.0		5										
SILTY SAND (SM), brown, medium dense					6-13-19				10	107		
loose					1-2-2 N=4							25
brown to light gray		10			2-7-9				4	94		
15.0		15										
SANDY LEAN CLAY (CL), brown to dark gray, stiff					2-4-5 N=9						29-22-7	53
20.0		20										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-23-2018 | Boring Completed: 10-23-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-4

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-2

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9581° Longitude: -118.1547°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), brown, medium dense				8-16-26				10	105		17
	dark gray	25			4-6-8 N=14							
	30.0											
	SANDY SILT (ML), light gray, very stiff	30			8-12-16				12	98		50
	35.0											
	SILT WITH SAND (ML), trace gravel, dark gray, stiff	35			4-5-6 N=11							85
	40.0	40										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-23-2018 | Boring Completed: 10-23-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-4

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-2

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9581° Longitude: -118.1547°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), dark gray, stiff				5-5-5 N=10							
	45.0	45										
	SILTY CLAYEY SAND (SC-SM), dark gray, medium dense				4-7-9 N=16							35
	55.0	50										
	POORLY GRADED SAND (SP), light gray, dense	55			9-16-20 N=36							
		60										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-23-2018 | Boring Completed: 10-23-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-4

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-2

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9581° Longitude: -118.1547°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND (SP), light gray, dense *(continued)*	65			11-17-24 N=41							
		70										
	75.0	75			6-12-15 N=27							
	CLAYEY SAND (SC), dark gray, medium dense	80										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-23-2018 | Boring Completed: 10-23-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-4

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-2

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9581° Longitude: -118.1547°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	CLAYEY SAND (SC), dark gray, medium dense *(continued)*											
	85.0	85			11-17-26 N=43							
	POORLY GRADED SAND WITH SILT (SP-SM), yellow brown, dense	90	▽									
		95										
	100.0	100										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-23-2018 | Boring Completed: 10-23-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-4

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-2

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

GRAPHIC LOG	LOCATION / DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LOCATION See Exhibit A-2 Latitude: 33.9581° Longitude: -118.1547°											
	POORLY GRADED SAND (SP), yellow brown, very dense 101.5	—			14-26-40 N=66							
	Boring Terminated at 101.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-23-2018 | Boring Completed: 10-23-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-4

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-3

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9591° Longitude: -118.1549°

DEPTH	GRAPHIC LOG	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.4		**ASPHALT**, 5" thickness											
0.8		**AGGREGATE BASE COURSE**, 4" thickness											
		SILTY SAND (SM), brown, loose											
		yellow brown				3-4-6				15	100		
			5			3-3-4 N=7							17
7.5		**SANDY LEAN CLAY (CL)**, dark gray, stiff				2-5-10				22	103		
10.0		**SILTY SAND (SM)**, dark gray, loose	10			4-4-4 N=8						31-25-6	49
15.0		**SILT WITH SAND (ML)**, brown, very stiff	15			5-9-15				16	109		74
20.0			20										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-24-2018 | Boring Completed: 10-24-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-5

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-3

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9591° Longitude: -118.1549°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	SILTY SAND (SM), brown to light gray, medium dense				5-9-13 N=22							27
	25.0	25										
	SILTY CLAYEY SAND (SC-SM), dark gray, medium dense				3-8-11				21	93		
	30.0	30										
	CLAYEY SAND (SC), dark gray, medium dense				2-6-9 N=15							39
	35.0	35										
	SILTY SAND (SM), light gray, medium dense				7-22-30				3	99		25
	40.0	40										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-24-2018 | Boring Completed: 10-24-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-5

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-3

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9591° Longitude: -118.1549°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LEAN CLAY WITH SAND (CL), dark gray, medium stiff to stiff				3-3-5 N=8						38-34-4	76
	45.0	45										
	SILTY CLAYEY SAND (SC-SM), yellow brown, medium dense				8-10-12 N=22							
	50.5	50										
	LEAN CLAY (CL), dark gray, very stiff				4-10-10 N=20							
	60.0	55										
		60										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-24-2018 | Boring Completed: 10-24-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-5

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-3

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9591° Longitude: -118.1549°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	SANDY LEAN CLAY (CL), dark gray, very stiff				5-15-15 N=30							
	70.0	65										
	LEAN CLAY (CL), trace sand, dark gray, medium stiff to stiff	70			2-3-5 N=8							
	80.0	75										
		80										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-24-2018 | Boring Completed: 10-24-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-5

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-3

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

GRAPHIC LOG	LOCATION / DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LOCATION See Exhibit A-2 Latitude: 33.9591° Longitude: -118.1549° DEPTH											
	POORLY GRADED SAND (SP), yellow brown, very dense	85			14-25-32 N=57							
		90	▽		28-50/5"							
		95										
		100										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-24-2018 | Boring Completed: 10-24-2018
Drill Rig: CME-75 | Driller: Martini Drilling
Project No.: 60185137 | Exhibit: A-5

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. B-3

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

GRAPHIC LOG	LOCATION / DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LOCATION See Exhibit A-2 Latitude: 33.9591° Longitude: -118.1549°											
	POORLY GRADED SAND (SP), yellow brown, very dense *(continued)*				19-24-29 N=53							
	101.5											
	Boring Terminated at 101.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-24-2018 | Boring Completed: 10-24-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-5

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. P-1

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9574° Longitude: -118.1548°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	CLAYEY SAND (SC), brown											
	5.0	5										
	SANDY SILT (ML), brown											
	10.0	10										
	SILTY CLAYEY SAND (SC-SM), dark brown											
	20.0	15										
		20										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-22-2018 | Boring Completed: 10-22-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-6

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. P-1

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

GRAPHIC LOG	LOCATION / DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LOCATION See Exhibit A-2 Latitude: 33.9574° Longitude: -118.1548°											
	DEPTH											
	LEAN CLAY (CL), brown											
	trace sand	25										
	30.0											
	Boring Terminated at 30 Feet	30										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-22-2018 | Boring Completed: 10-22-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-6

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. P-2

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.958° Longitude: -118.155°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	CLAYEY SAND (SC), yellow brown	5										
	10.5	10			3-3-3 N=6							
	POORLY GRADED SAND (SP), light gray, loose											
	14.0	15										
	POORLY GRADED SAND WITH SILT (SP-SM), brown											
	20.0	20										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-23-2018 | Boring Completed: 10-23-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-7

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. P-2

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.958° Longitude: -118.155°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	SANDY SILT (ML), brown, very stiff				4-8-10 N=18							70
	25.0	25										
	SILTY CLAYEY SAND (SC-SM), dark gray											
	medium dense	30			6-7-8 N=15							45
	35.0	35										
	Boring Terminated at 35 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-23-2018 | Boring Completed: 10-23-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-7

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. P-3

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.959° Longitude: -118.155°

DEPTH	GRAPHIC LOG	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.4		**ASPHALT**, 4.5" Thickness											
0.7		**AGGREGATE BASE COURSE**, 3.5" Thickness											
		SILTY SAND (SM), brown											
		loose	5										
			10			2-3-4 N=7							
15.5		**POORLY GRADED SAND (SP)**, yellow brown to light gray, medium dense	15										
			20										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-24-2018 | Boring Completed: 10-24-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-8

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. P-3

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.959° Longitude: -118.155°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND (SP), yellow brown to light gray, medium dense *(continued)*				5-9-9 N=18							
	22.0											
	SANDY SILT (ML), dark gray medium stiff	25			3-3-4 N=7						37-26-11	70
	30.0	30										
	Boring Terminated at 30 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-24-2018 | Boring Completed: 10-24-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-8

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. P-4

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9589° Longitude: -118.1538°

DEPTH	GRAPHIC LOG	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
0.3		**ASPHALT**, 4" Thickness											
0.7		**AGGREGATE BASE COURSE**, 4" Thickness											
		SILTY SAND (SM), brown											
		loose	5										
11.0			10			2-3-4 N=7							
		LEAN CLAY (CL), dark gray, medium stiff											
18.0			15										
		POORLY GRADED SAND (SP), yellow brown to light gray											
			20										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-24-2018 | Boring Completed: 10-24-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-9

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. P-4

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9589° Longitude: -118.1538°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	POORLY GRADED SAND (SP), yellow brown to light gray *(continued)* medium dense				4-6-9 N=15							
	22.0											
	LEAN CLAY (CL), dark gray											
	medium stiff	25			3-3-4 N=7							88
	30.0											
	Boring Terminated at 30 Feet	30										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-24-2018 | Boring Completed: 10-24-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-9

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. P-5

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9571° Longitude: -118.1537°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	SILTY CLAYEY SAND (SC-SM), brown loose	5			2-4-4 N=8							
	10.0 **SILTY CLAY (CL-ML)**, brown medium stiff	10 15			3-3-5 N=8							
		20										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-25-2018 | Boring Completed: 10-25-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-10

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

BORING LOG NO. P-5

PROJECT: John Anson Ford Park Infiltration Cistern Project

CLIENT: CWE Corp
Fullerton, CA

SITE: 8000 Park Lane
Bell Gardens, CA

LOCATION See Exhibit A-2

Latitude: 33.9571° Longitude: -118.1537°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	SILTY CLAY (CL-ML), brown *(continued)*											
25.0		25										
	SILTY CLAY WITH SAND (CL-ML), brown, medium stiff to stiff				2-4-4 N=8							78
30.0		30										
	CLAYEY SAND (SC), dark gray, medium dense				3-8-14 N=22							40
35.0		35										
	Boring Terminated at 35 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement grout upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 10-25-2018 | Boring Completed: 10-25-2018

Drill Rig: CME-75 | Driller: Martini Drilling

Project No.: 60185137 | Exhibit: A-10

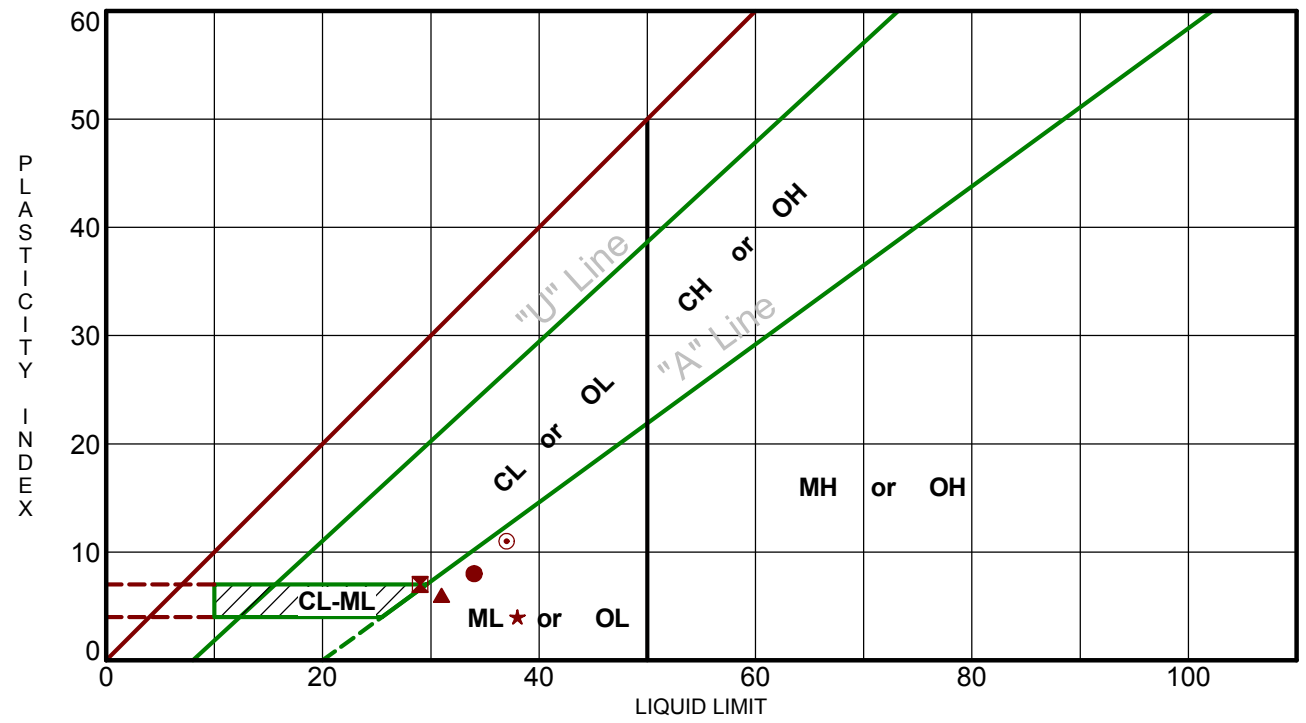
THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/20/18

APPENDIX B

LABORATORY TESTING

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
B-1	15 - 16.5	34	26	8	65	ML	SANDY SILT
B-2	15 - 16.5	29	22	7	53	CL-ML	SANDY SILTY CLAY
B-3	10 - 11.5	31	25	6	49	SM	SILTY SAND
B-3	40 - 41.5	38	34	4	76	ML	SILT with SAND
P-3	25 - 26.5	37	26	11	70	ML	SANDY SILT

PROJECT: John Anson Ford Park Infiltration Cistern Project

SITE: 8000 Park Lane
Bell Gardens, CA

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

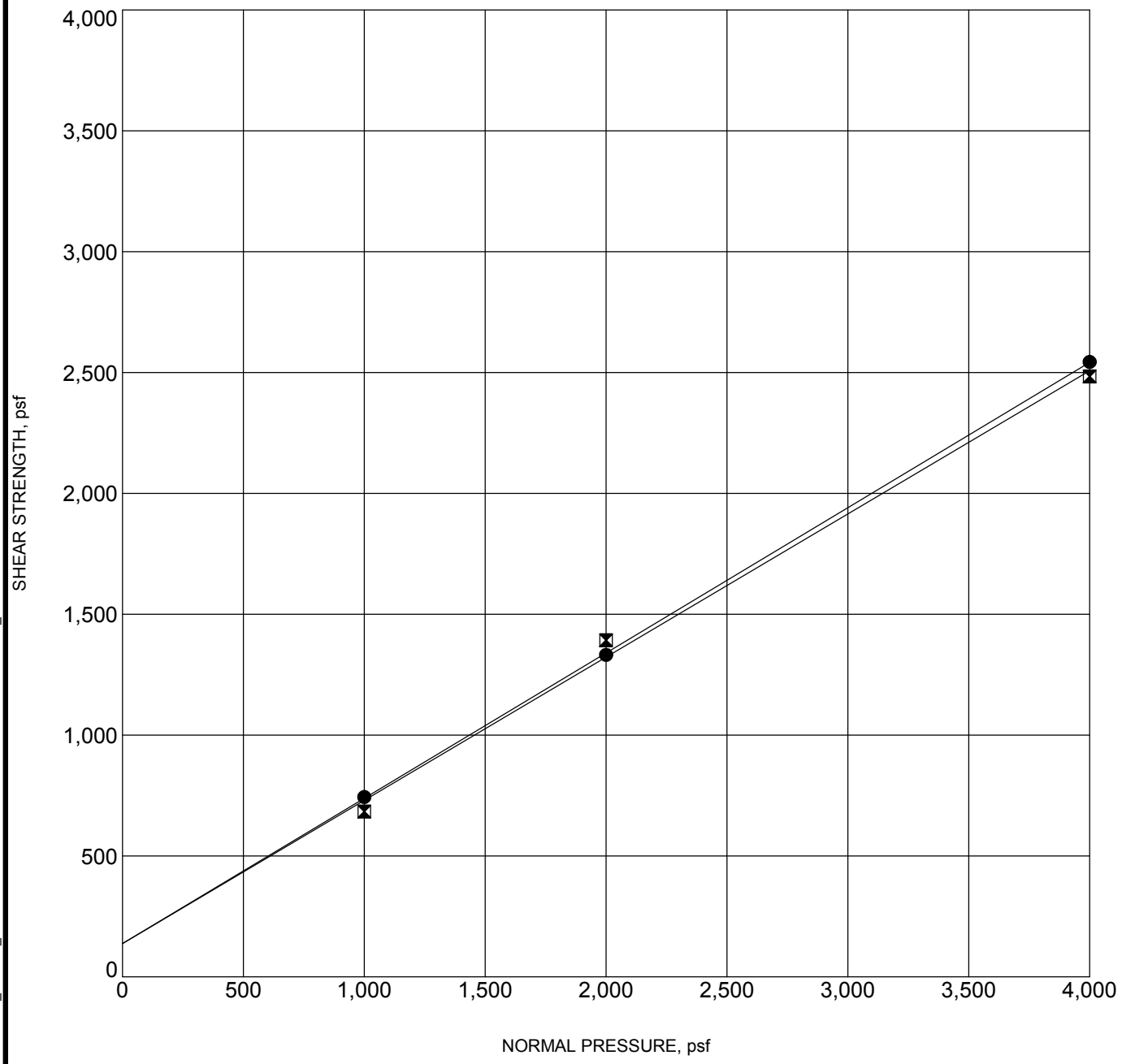
PROJECT NUMBER: 60185137

CLIENT: CWE Corp
Fullerton, CA

EXHIBIT: B-1

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/19/18

DIRECT SHEAR TEST ASTM D3080



	Specimen Identification		Classification	γ_d, pcf	WC,%	c, psf	ϕ°
●	B-1	5 - 6.5	SANDY SILT ML	107	10	138	31
⊠	B-3	15 - 16.5	SILT WITH SAND ML	109	16	138	31

PROJECT: John Anson Ford Park Infiltration Cistern Project

SITE: 8000 Park Lane
Bell Gardens, CA

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

PROJECT NUMBER: 60185137

CLIENT: CWE Corp
Fullerton, CA

EXHIBIT: B-2

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_DIRECT_SHEAR 60185137 BORING LOGS.GPJ TERRACON_DATATEMPLATE.GDT 11/19/18

CHEMICAL LABORATORY TEST REPORT

Project Number: 60185137
Service Date: 11/02/18
Report Date: 11/05/18
Task:

Terracon
750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Client

CWE Corp

Project

CWE: John Anson Ford Park Infiltration Study

Sample Submitted By: Terracon (60) **Date Received:** 10/30/2018 **Lab No.: 18-1320**

Results of Corrosion Analysis

Sample Number		
Sample Location	B-1	B-3
Sample Depth (ft.)	Bulk	Bulk
pH Analysis, AWWA 4500 H	7.89	8.84
Water Soluble Sulfate (SO4), AWWA 4500 E (percent %)	0.09	0.01
Sulfides, AWWA 4500-S D, (mg/kg)	Nil	Nil
Chlorides, ASTM D 512, (mg/kg)	488	75
Red-Ox, AWWA 2580, (mV)	+691	+679
Total Salts, AWWA 2520 B, (mg/kg)	3847	373
Resistivity, ASTM G 57, (ohm-cm)	446	8924

Analyzed By:

Trisha Campo
Chemist

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

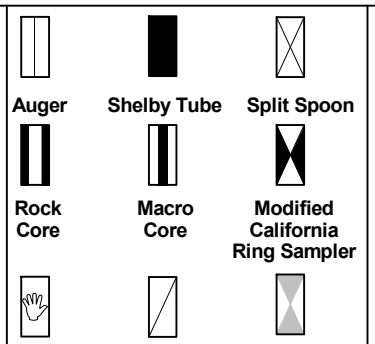
APPENDIX C

SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	**Hand Penetrometer**
(T)	**Torvane**
(b/f)	**Standard Penetration Test (blows per foot)**
N	**N value**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**
(WOH)	Weight of Hammer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels and sands.			**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance Includes silts and clays.			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

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UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

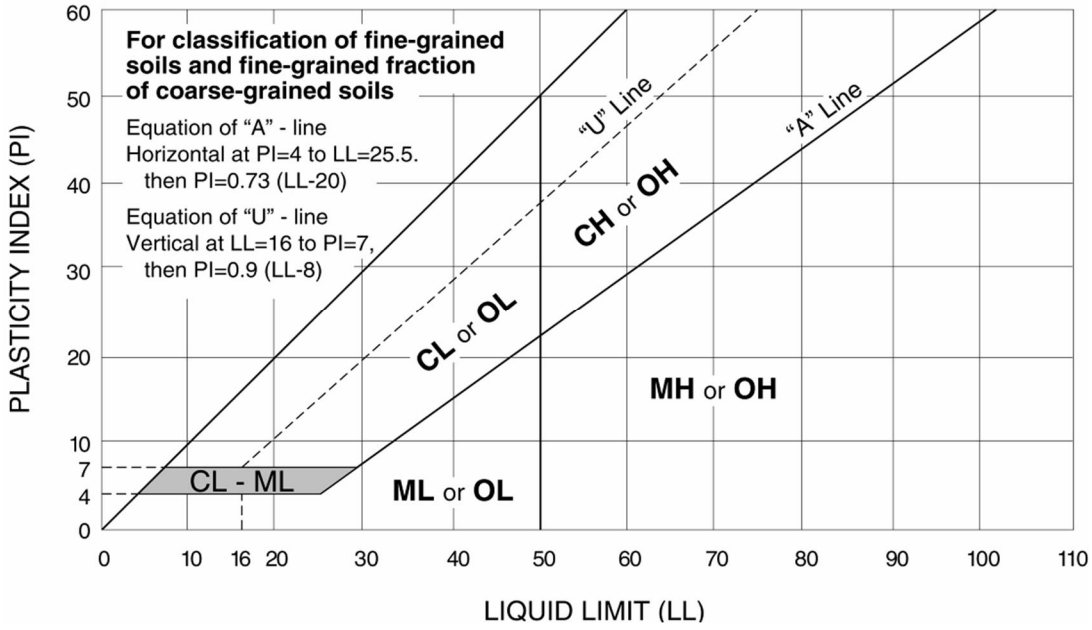

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Exhibit C-2

APPENDIX D

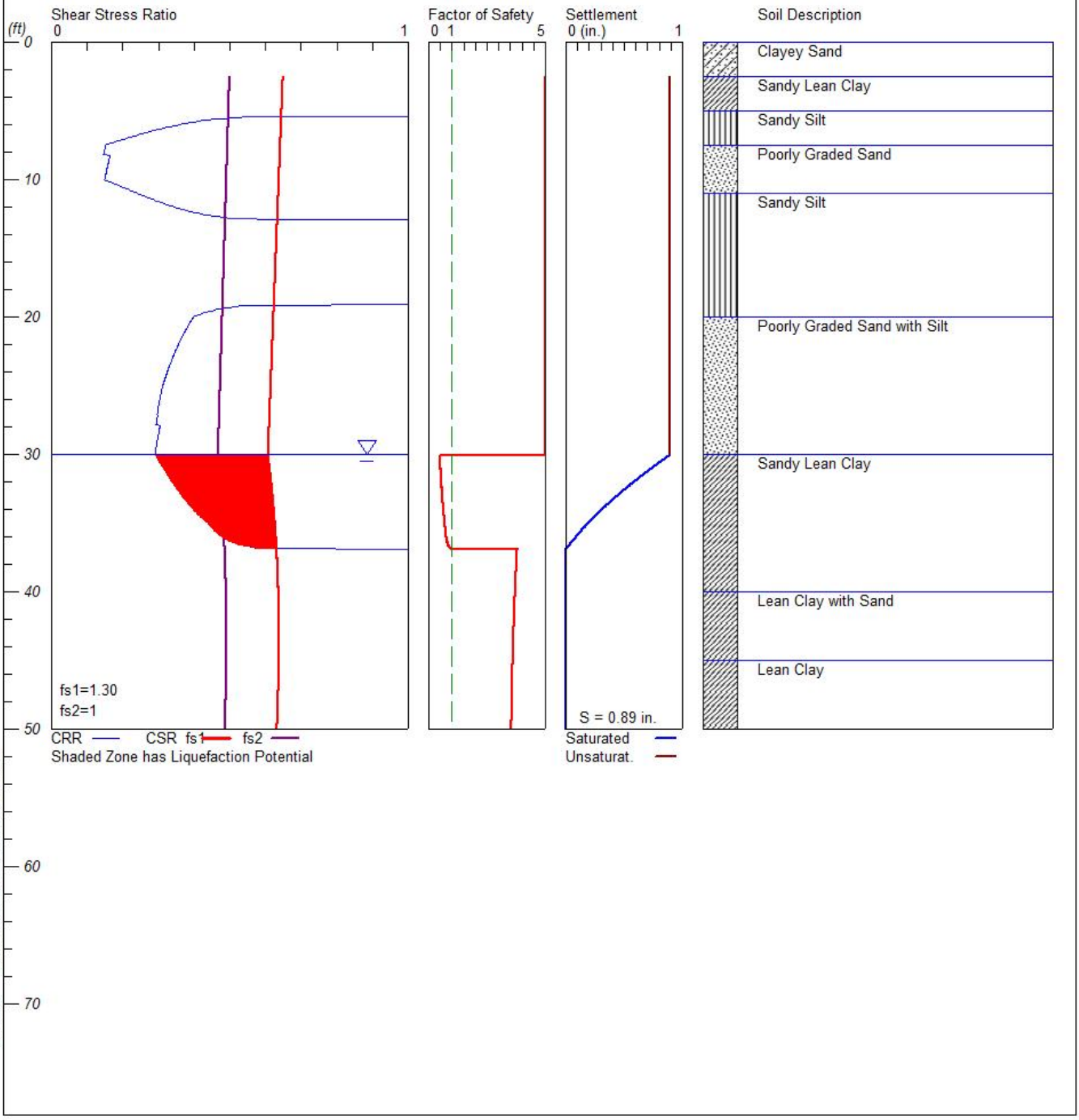
LIQUEFACTION ANALYSIS

LIQUEFACTION ANALYSIS

John Anson Ford Park Infiltration Cistern Project

Hole No.=B-1 ***Water Depth=30 ft***

Magnitude=6.85
Acceleration=0.773g



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LIQUEFACTION ANALYSIS SUMMARY
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Input File Name: N:\Projects\2018\60185137\Working Files\Calculations-Analyses\B1.liq
Title: John Anson Ford Park Infiltration Cistern Project
Subtitle: 60185137

Surface Elev.=
Hole No.=B-1
Depth of Hole= 50.00 ft
Water Table during Earthquake= 30.00 ft
Water Table during In-Situ Testing= 90.00 ft
Max. Acceleration= 0.77 g
Earthquake Magnitude= 6.85

Input Data:
Surface Elev.=
Hole No.=B-1
Depth of Hole=50.00 ft
Water Table during Earthquake= 30.00 ft
Water Table during In-Situ Testing= 90.00 ft
Max. Acceleration=0.77 g
Earthquake Magnitude=6.85
No-Liquefiable Soils: Based on Analysis

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu, M-correction
3. Fines Correction for Liquefaction: Modify Stark/Olson
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: Liq. zone only
6. Hammer Energy Ratio, Ce = 1.4
7. Borehole Diameter, Cb= 1.15
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1.3
   Plot two CSR (fs1=User, fs2=1)
10. Use Curve Smoothing: Yes*
* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
2.50	18.00	120.00	64.00
5.00	8.00	120.00	64.00
7.50	5.00	120.00	4.00
10.00	5.00	120.00	4.00
15.00	16.00	120.00	65.00
20.00	15.00	120.00	9.00
25.00	14.00	120.00	9.00
30.00	7.00	120.00	51.00
35.00	13.00	120.00	50.00
40.00	11.00	120.00	83.00
45.00	9.00	120.00	90.00
50.00	34.00	120.00	9.00

Output Results:
Settlement of Saturated Sands=0.89 in.
Settlement of Unsaturated Sands=0.00 in.
Total Settlement of Saturated and Unsaturated Sands=0.89 in.
Differential Settlement=0.444 to 0.587 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.

2.50	2.52	0.65	5.00	0.89	0.00	0.89
3.50	2.52	0.65	5.00	0.89	0.00	0.89
4.50	2.52	0.65	5.00	0.89	0.00	0.89
5.50	0.51	0.64	5.00	0.89	0.00	0.89
6.50	0.28	0.64	5.00	0.89	0.00	0.89
7.50	0.15	0.64	5.00	0.89	0.00	0.89
8.50	0.16	0.64	5.00	0.89	0.00	0.89
9.50	0.15	0.64	5.00	0.89	0.00	0.89
10.50	0.19	0.64	5.00	0.89	0.00	0.89
11.50	0.29	0.64	5.00	0.89	0.00	0.89
12.50	0.42	0.63	5.00	0.89	0.00	0.89
13.50	2.52	0.63	5.00	0.89	0.00	0.89
14.50	2.52	0.63	5.00	0.89	0.00	0.89
15.50	2.52	0.63	5.00	0.89	0.00	0.89
16.50	2.52	0.63	5.00	0.89	0.00	0.89
17.50	2.52	0.63	5.00	0.89	0.00	0.89
18.50	2.52	0.63	5.00	0.89	0.00	0.89
19.50	0.46	0.62	5.00	0.89	0.00	0.89
20.50	0.39	0.62	5.00	0.89	0.00	0.89
21.50	0.36	0.62	5.00	0.89	0.00	0.89
22.50	0.35	0.62	5.00	0.89	0.00	0.89
23.50	0.33	0.62	5.00	0.89	0.00	0.89
24.50	0.32	0.62	5.00	0.89	0.00	0.89
25.50	0.31	0.61	5.00	0.89	0.00	0.89
26.50	0.30	0.61	5.00	0.89	0.00	0.89
27.50	0.30	0.61	5.00	0.89	0.00	0.89
28.50	0.30	0.61	5.00	0.89	0.00	0.89
29.50	0.29	0.61	5.00	0.89	0.00	0.89
30.50	0.30	0.61	0.49*	0.81	0.00	0.81
31.50	0.32	0.61	0.53*	0.66	0.00	0.66
32.50	0.35	0.62	0.57*	0.51	0.00	0.51
33.50	0.38	0.62	0.61*	0.37	0.00	0.37
34.50	0.42	0.63	0.66*	0.25	0.00	0.25
35.50	0.45	0.63	0.72*	0.14	0.00	0.14
36.50	0.52	0.63	0.82*	0.04	0.00	0.04
37.50	2.39	0.63	3.78	0.00	0.00	0.00
38.50	2.38	0.63	3.75	0.00	0.00	0.00
39.50	2.37	0.64	3.72	0.00	0.00	0.00
40.50	2.35	0.64	3.70	0.00	0.00	0.00
41.50	2.34	0.64	3.67	0.00	0.00	0.00
42.50	2.33	0.64	3.65	0.00	0.00	0.00
43.50	2.32	0.64	3.63	0.00	0.00	0.00
44.50	2.31	0.64	3.61	0.00	0.00	0.00
45.50	2.29	0.64	3.60	0.00	0.00	0.00
46.50	2.28	0.64	3.58	0.00	0.00	0.00
47.50	2.27	0.64	3.57	0.00	0.00	0.00
48.50	2.26	0.63	3.56	0.00	0.00	0.00
49.50	2.25	0.63	3.55	0.00	0.00	0.00

* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

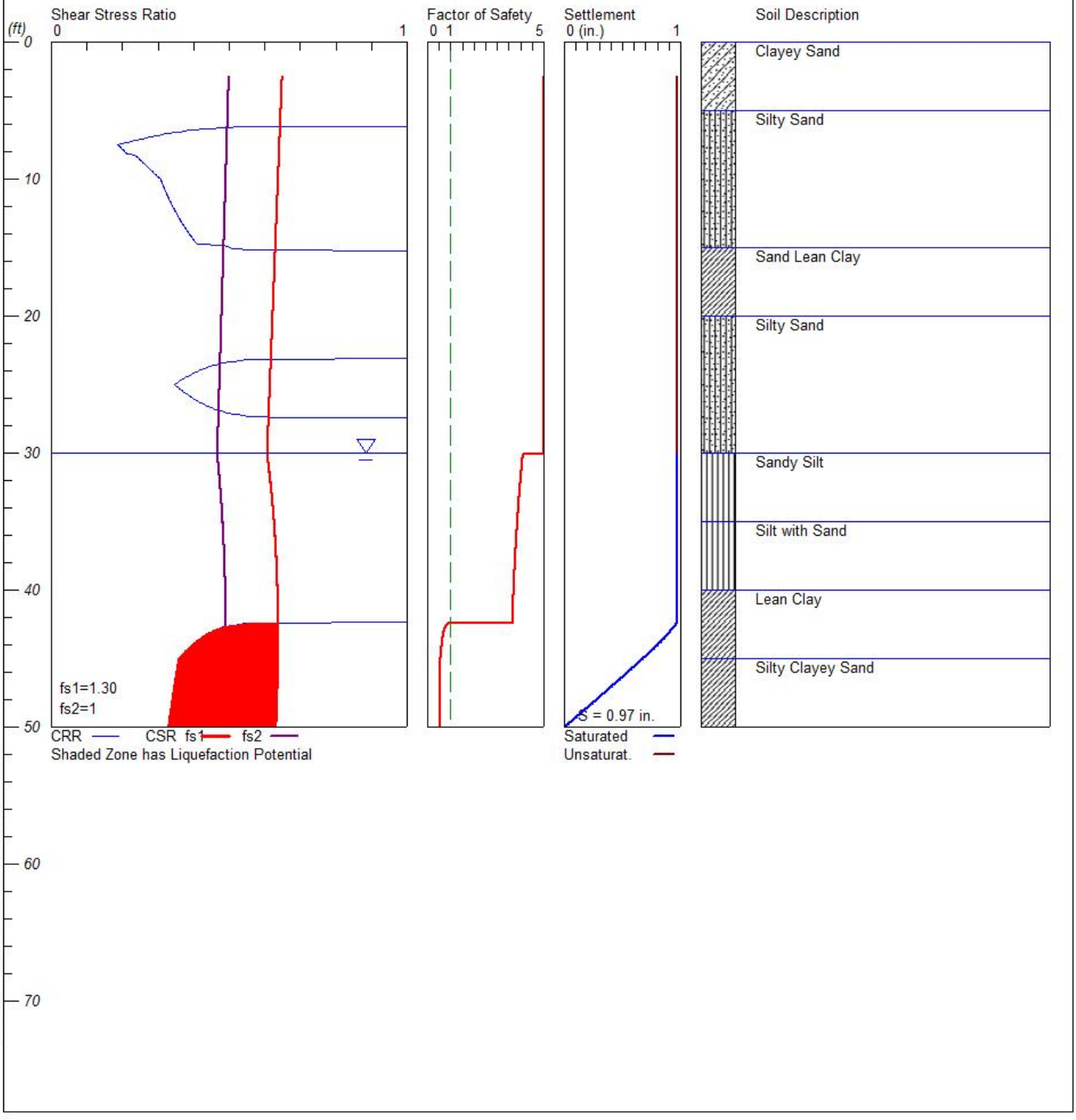
1 atm (atmosphere) = 1 tsf (ton/ft2)
CRRm Cyclic resistance ratio from soils
CSRsf Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S. Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat Settlement from saturated sands
S_dry Settlement from Unsaturated Sands
S_all Total Settlement from Saturated and Unsaturated Sands
NoLiq No-Liquefy Soils

LIQUEFACTION ANALYSIS

John Anson Ford Park Infiltration Cistern Project

Hole No.=B-2 ***Water Depth=30 ft***

Magnitude=6.85
Acceleration=0.773g



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Input File Name: N:\Projects\2018\60185137\Working Files\Calculations-Analyses\B2.liq
Title: John Anson Ford Park Infiltration Cistern Project
Subtitle: 60185137

Surface Elev.=
Hole No.=B-2
Depth of Hole= 50.00 ft
Water Table during Earthquake= 30.00 ft
Water Table during In-Situ Testing= 90.00 ft
Max. Acceleration= 0.77 g
Earthquake Magnitude= 6.85

Input Data:
Surface Elev.=
Hole No.=B-2
Depth of Hole=50.00 ft
Water Table during Earthquake= 30.00 ft
Water Table during In-Situ Testing= 90.00 ft
Max. Acceleration=0.77 g
Earthquake Magnitude=6.85
No-Liquefiable Soils: Based on Analysis

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu, M-correction
3. Fines Correction for Liquefaction: Modify Stark/Olson
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: Liq. zone only
6. Hammer Energy Ratio, Ce = 1.4
7. Borehole Diameter, Cb= 1.15
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   Plot two CSR (fs1=User, fs2=1)
10. Use Curve Smoothing: Yes*
* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
2.50	15.00	120.00	25.00
5.00	16.00	120.00	25.00
7.50	4.00	120.00	25.00
10.00	8.00	120.00	25.00
15.00	9.00	120.00	53.00
20.00	22.00	120.00	17.00
25.00	14.00	120.00	17.00
30.00	18.00	120.00	50.00
35.00	11.00	120.00	85.00
40.00	10.00	120.00	90.00
45.00	16.00	120.00	35.00

Output Results:
Settlement of Saturated Sands=0.97 in.
Settlement of Unsaturated Sands=0.00 in.
Total Settlement of Saturated and Unsaturated Sands=0.97 in.
Differential Settlement=0.483 to 0.638 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.

						B2.sum
2.50	2.52	0.65	5.00	0.97	0.00	0.97
3.50	2.52	0.65	5.00	0.97	0.00	0.97
4.50	2.52	0.65	5.00	0.97	0.00	0.97
5.50	2.52	0.64	5.00	0.97	0.00	0.97
6.50	0.37	0.64	5.00	0.97	0.00	0.97
7.50	0.19	0.64	5.00	0.97	0.00	0.97
8.50	0.25	0.64	5.00	0.97	0.00	0.97
9.50	0.29	0.64	5.00	0.97	0.00	0.97
10.50	0.31	0.64	5.00	0.97	0.00	0.97
11.50	0.33	0.64	5.00	0.97	0.00	0.97
12.50	0.35	0.63	5.00	0.97	0.00	0.97
13.50	0.37	0.63	5.00	0.97	0.00	0.97
14.50	0.40	0.63	5.00	0.97	0.00	0.97
15.50	2.52	0.63	5.00	0.97	0.00	0.97
16.50	2.52	0.63	5.00	0.97	0.00	0.97
17.50	2.52	0.63	5.00	0.97	0.00	0.97
18.50	2.52	0.63	5.00	0.97	0.00	0.97
19.50	2.52	0.62	5.00	0.97	0.00	0.97
20.50	2.52	0.62	5.00	0.97	0.00	0.97
21.50	2.52	0.62	5.00	0.97	0.00	0.97
22.50	2.52	0.62	5.00	0.97	0.00	0.97
23.50	0.47	0.62	5.00	0.97	0.00	0.97
24.50	0.38	0.62	5.00	0.97	0.00	0.97
25.50	0.37	0.61	5.00	0.97	0.00	0.97
26.50	0.43	0.61	5.00	0.97	0.00	0.97
27.50	2.53	0.61	5.00	0.97	0.00	0.97
28.50	2.52	0.61	5.00	0.97	0.00	0.97
29.50	2.50	0.61	5.00	0.97	0.00	0.97
30.50	2.49	0.61	4.08	0.97	0.00	0.97
31.50	2.47	0.61	4.03	0.97	0.00	0.97
32.50	2.46	0.62	3.98	0.97	0.00	0.97
33.50	2.45	0.62	3.93	0.97	0.00	0.97
34.50	2.43	0.63	3.89	0.97	0.00	0.97
35.50	2.42	0.63	3.85	0.97	0.00	0.97
36.50	2.41	0.63	3.81	0.97	0.00	0.97
37.50	2.39	0.63	3.78	0.97	0.00	0.97
38.50	2.38	0.63	3.75	0.97	0.00	0.97
39.50	2.37	0.64	3.72	0.97	0.00	0.97
40.50	2.35	0.64	3.70	0.97	0.00	0.97
41.50	2.34	0.64	3.67	0.97	0.00	0.97
42.50	0.53	0.64	0.83*	0.96	0.00	0.96
43.50	0.42	0.64	0.66*	0.86	0.00	0.86
44.50	0.37	0.64	0.59*	0.74	0.00	0.74
45.50	0.35	0.64	0.55*	0.61	0.00	0.61
46.50	0.35	0.64	0.55*	0.48	0.00	0.48
47.50	0.34	0.64	0.54*	0.34	0.00	0.34
48.50	0.34	0.63	0.53*	0.21	0.00	0.21
49.50	0.33	0.63	0.52*	0.07	0.00	0.07

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* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

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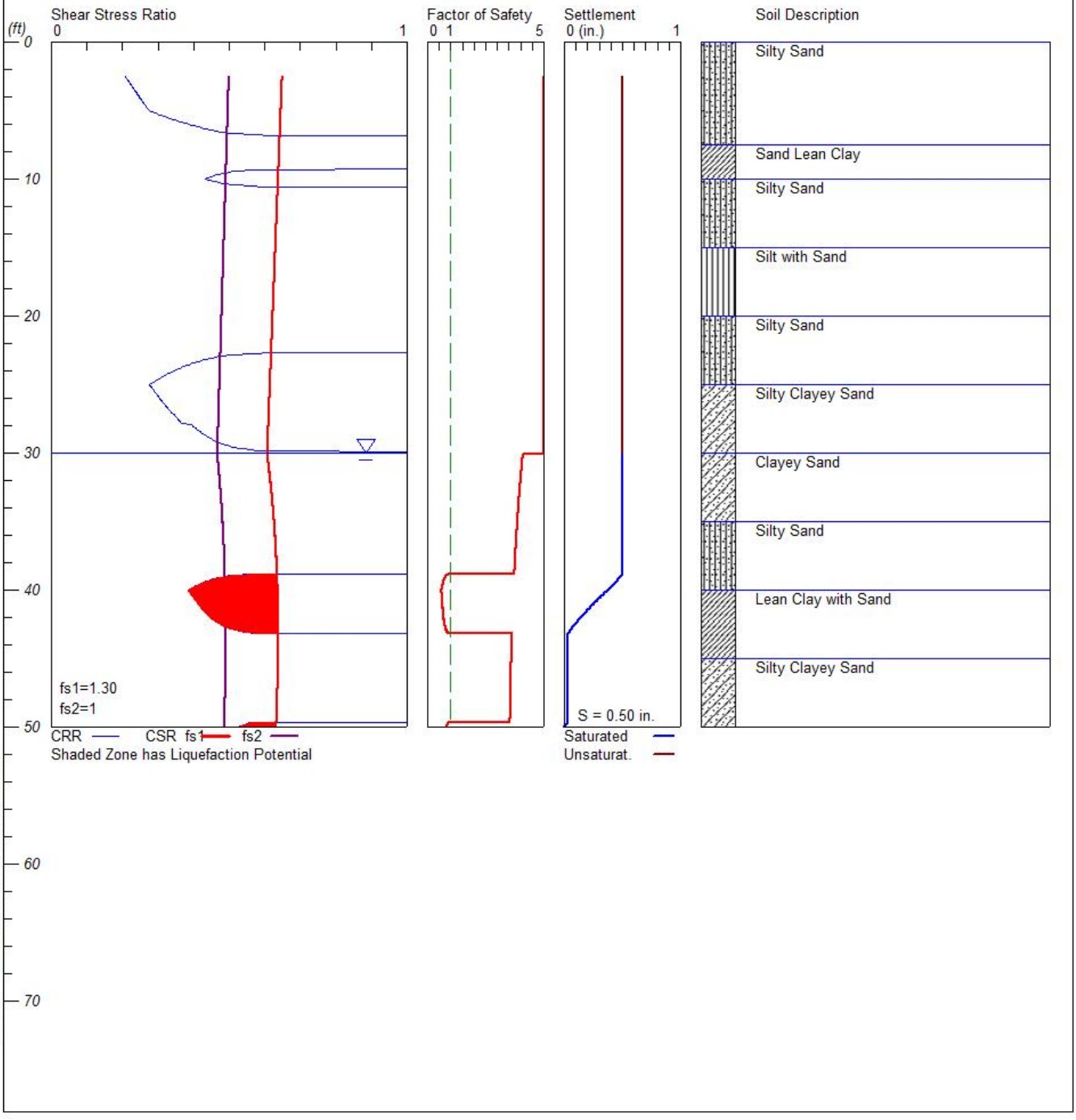
1 atm (atmosphere) = 1 tsf (ton/ft2)
CRRm Cyclic resistance ratio from soils
CSRsf Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S. Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat Settlement from saturated sands
S_dry Settlement from Unsaturated Sands
S_all Total Settlement from Saturated and Unsaturated Sands
NoLiq No-Liquefy Soils

LIQUEFACTION ANALYSIS

John Anson Ford Park Infiltration Cistern Project

Hole No.=B-3 Water Depth=30 ft

Magnitude=6.85
Acceleration=0.773g



LiquefyPro CivilTech Software USA www.civiltech.com

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LIQUEFACTION ANALYSIS SUMMARY
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Input File Name: N:\Projects\2018\60185137\Working Files\Calculations-Analyses\B3.liq
Title: John Anson Ford Park Infiltration Cistern Project
Subtitle: 60185137

Surface Elev.=
Hole No.=B-3
Depth of Hole= 50.00 ft
Water Table during Earthquake= 30.00 ft
Water Table during In-Situ Testing= 90.00 ft
Max. Acceleration= 0.77 g
Earthquake Magnitude= 6.85

Input Data:
Surface Elev.=
Hole No.=B-3
Depth of Hole=50.00 ft
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Max. Acceleration=0.77 g
Earthquake Magnitude=6.85
No-Liquefiable Soils: Based on Analysis

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Tokimatsu, M-correction
3. Fines Correction for Liquefaction: Modify Stark/Olson
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: Liq. zone only
6. Hammer Energy Ratio, Ce = 1.4
7. Borehole Diameter, Cb= 1.15
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1.3
   Plot two CSR (fs1=User, fs2=1)
10. Use Curve Smoothing: Yes*
* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
2.50	5.00	120.00	17.00
5.00	7.00	120.00	17.00
7.50	10.00	120.00	51.00
10.00	8.00	120.00	49.00
15.00	16.00	120.00	74.00
20.00	22.00	120.00	27.00
25.00	10.00	120.00	25.00
30.00	15.00	120.00	39.00
35.00	26.00	120.00	25.00
40.00	8.00	120.00	76.00
45.00	22.00	120.00	25.00

Output Results:
Settlement of Saturated Sands=0.50 in.
Settlement of Unsaturated Sands=0.00 in.
Total Settlement of Saturated and Unsaturated Sands=0.50 in.
Differential Settlement=0.249 to 0.329 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.

2.50	0.21	0.65	5.00	0.50	0.00	0.50
3.50	0.23	0.65	5.00	0.50	0.00	0.50
4.50	0.26	0.65	5.00	0.50	0.00	0.50
5.50	0.32	0.64	5.00	0.50	0.00	0.50
6.50	0.46	0.64	5.00	0.50	0.00	0.50
7.50	2.52	0.64	5.00	0.50	0.00	0.50
8.50	2.52	0.64	5.00	0.50	0.00	0.50
9.50	0.50	0.64	5.00	0.50	0.00	0.50
10.50	0.55	0.64	5.00	0.50	0.00	0.50
11.50	2.52	0.64	5.00	0.50	0.00	0.50
12.50	2.52	0.63	5.00	0.50	0.00	0.50
13.50	2.52	0.63	5.00	0.50	0.00	0.50
14.50	2.52	0.63	5.00	0.50	0.00	0.50
15.50	2.52	0.63	5.00	0.50	0.00	0.50
16.50	2.52	0.63	5.00	0.50	0.00	0.50
17.50	2.52	0.63	5.00	0.50	0.00	0.50
18.50	2.52	0.63	5.00	0.50	0.00	0.50
19.50	2.52	0.62	5.00	0.50	0.00	0.50
20.50	2.52	0.62	5.00	0.50	0.00	0.50
21.50	2.52	0.62	5.00	0.50	0.00	0.50
22.50	2.52	0.62	5.00	0.50	0.00	0.50
23.50	0.39	0.62	5.00	0.50	0.00	0.50
24.50	0.31	0.62	5.00	0.50	0.00	0.50
25.50	0.29	0.61	5.00	0.50	0.00	0.50
26.50	0.32	0.61	5.00	0.50	0.00	0.50
27.50	0.35	0.61	5.00	0.50	0.00	0.50
28.50	0.42	0.61	5.00	0.50	0.00	0.50
29.50	0.50	0.61	5.00	0.50	0.00	0.50
30.50	2.49	0.61	4.08	0.50	0.00	0.50
31.50	2.47	0.61	4.03	0.50	0.00	0.50
32.50	2.46	0.62	3.98	0.50	0.00	0.50
33.50	2.45	0.62	3.93	0.50	0.00	0.50
34.50	2.43	0.63	3.89	0.50	0.00	0.50
35.50	2.42	0.63	3.85	0.50	0.00	0.50
36.50	2.41	0.63	3.81	0.50	0.00	0.50
37.50	2.39	0.63	3.78	0.50	0.00	0.50
38.50	2.38	0.63	3.75	0.50	0.00	0.50
39.50	0.42	0.64	0.66*	0.43	0.00	0.43
40.50	0.40	0.64	0.62*	0.31	0.00	0.31
41.50	0.43	0.64	0.67*	0.19	0.00	0.19
42.50	0.47	0.64	0.74*	0.09	0.00	0.09
43.50	2.32	0.64	3.63	0.03	0.00	0.03
44.50	2.31	0.64	3.61	0.03	0.00	0.03
45.50	2.29	0.64	3.60	0.03	0.00	0.03
46.50	2.28	0.64	3.58	0.03	0.00	0.03
47.50	2.27	0.64	3.57	0.03	0.00	0.03
48.50	2.26	0.63	3.56	0.03	0.00	0.03
49.50	2.25	0.63	3.55	0.03	0.00	0.03

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* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

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1 atm (atmosphere) = 1 tsf (ton/ft2)

CRRm	Cyclic resistance ratio from soils
CSRsf	Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S.	Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat	Settlement from saturated sands
S_dry	Settlement from Unsaturated Sands
S_all	Total Settlement from Saturated and Unsaturated Sands
NoLiq	No-Liquefy Soils