Appendix E

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



Environmental Facilities Geotechnical Materials





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.

71662

Sincerely,

Terracon Consultants, Inc.

Sivasubramaniam (Raj) Pirathiviraj, P.E

Senior Engineer

F. Fred Buhamdan, P.E.

Principal

John Anson Ford Park Infiltration Cistern Project ■ Bell Gardens, CA November 19, 2018 ■ Terracon Project No. 60185137



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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

groundwater conditions

earthwork

lateral earth pressures for shoring

percolation rates

liquefaction analysis

pavement design

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.

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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.

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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.

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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.

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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

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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
RFs	2
RF, Total Reduction Factor RF=RFtxRFvxRFs	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.

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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.

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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.

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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

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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.

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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.

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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.

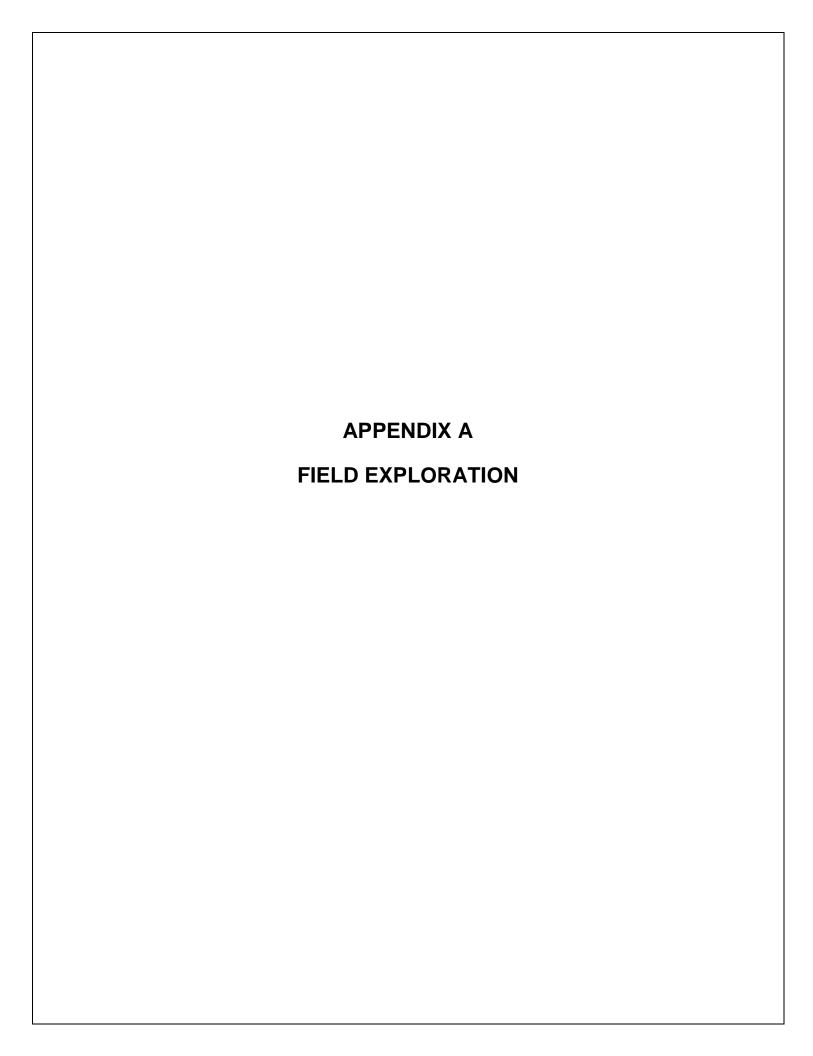
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the 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.

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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.



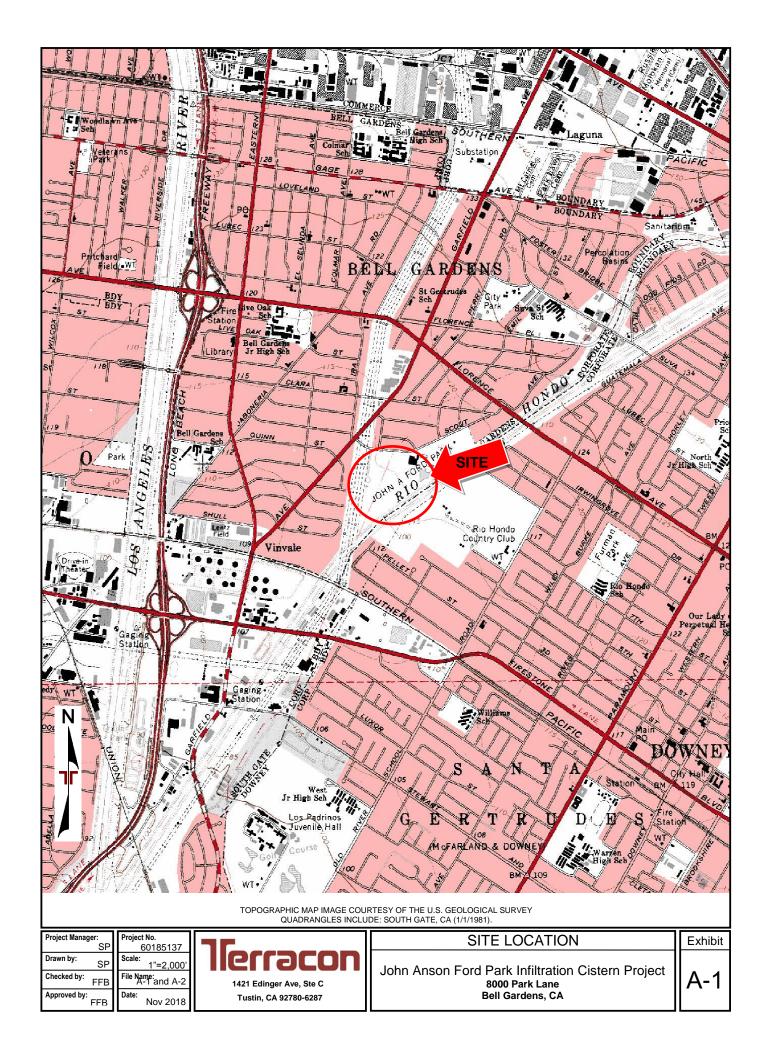




DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

Project Manager: Drawn by: Checked by: FFB

Approved by:

60185137 File Name: A-1 and A-2 Nov 2018



EXPLORATION PLAN

John Anson Ford Park Infiltration Cistern Project 8000 Park Lane Bell Gardens, CA

A-2

Exhibit

			BORING L	1									F	Page 1 of	6
		John Anson Ford Park Infiltrat Project	tion Cistern	CL	JEN	T:	CWE C Fullerto	orp on, CA							
SI	TE:	8000 Park Lane Bell Gardens, CA													
90.	LOCATIO	∖ See Exhibit A-2	1	; Ę	SNC	T T	Ļ. s	s		ENGTH	TEST	(%)	<u>ق</u> _	ATTERBERG LIMITS	U L L
GRAPHIC LOG		.9572° Longitude: -118.1545°	OFPTH (F)	WATERIE	OBSERVATIONS	SAMPLE I YPE	FIELD TEST RESULTS		IESI IYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)	LL-PL-PI	DEBCENT FINES
	DEPTH CLAY	YEY SAND (SC), yellow brown		_						O					
	2.5 SANI	DY LEAN CLAY (CL), yellow brown, very	/ stiff				4-9-1	9				14	112		
	5.0		 5	.]											
	<u>SANI</u>	<u>OY SILT (ML)</u> , brown, medium stiff to sti	ff	,	<u> </u>	$\Big\langle \Big $	6-6-2 N=8								64
	7.5	RLY GRADED SAND (SP), yellow browr	lagge	-									-		
	<u> </u>	<u>KLY GRADED SAND (SP)</u> , yellow blowl	i, ioose	_			6-4-4	1				1			4
	11.0 SANI	DY SILT (ML), brown, medium stiff	1	0-	\ 		1-2-3 N=5								
			1:	_ _ _											
	very :	stiff					5-11-1	13				22	103	34-26-8	6
				_					-		4:-				
	20.0	Parameter A. Davide, M. A. A. Miller	2	<u> </u>		-		Hammer I	ype	e: Autom	atic				
	Stratificati	on lines are approximate. In-situ, the transition man							<i>.</i>						
Hol	Stratification ncement Methology llow Stem Aug	od: ger	sy be gradual. See Exhibit A-3 for desprocedures. See Appendix B for desprocedures and addition	scriptio scriptic onal da	on of I ta (if a	abora ny).	itory	Notes:							
Hol	Stratification Stratification Stem August Au	nod: nod: with cement grout upon completion.	See Exhibit A-3 for des procedures. See Appendix B for de:	scriptio scriptic onal da	on of I ta (if a	abora ny).	itory								
Hol	Stratification Stratification Stem August Au	od: ger nod: with cement grout upon completion.	See Exhibit A-3 for des procedures. See Appendix B for des procedures and addition See Appendix C for expandix	scriptio scriptic onal da	on of I ta (if a ion of	abora iny). symb	ols and		ed:		18	Borir	ng Com	pleted: 10-22-	·2018

	BORIN		1							F	Page 2 of	6
PROJEC	T: John Anson Ford Park Infiltration Ciste Project	rn	CLI	ENT	: CWE Co Fullerto	orp n, CA						
SITE:	8000 Park Lane Bell Gardens, CA											
LOCA Latitude	TION See Exhibit A-2			SE E	⊢	STR	RENGTH T	EST	(%	. જિ	ATTERBERG LIMITS	SH
Latitude	e: 33.9572° Longitude: -118.1545°	DEPTH (Ft.)	, LEV	MAIN ETY	TES	7 PE	SSIVE	(%)	TER ()	TIND TIND		
		DEPT	WATER LEVEL	SAMPLE TYPE	FIELD TEST RESULTS	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pd)	LL-PL-PI	PERCENT FINES
DEPTH	OORLY GRADED SAND WITH SILT (SP-SM), light		> 7	5 0	/		Ö	S				ă.
gr	ay, medium dense			\parallel	4-7-8 N=15							
			+									
			_									
		25	5-									
				\setminus	5-6-8							9
					N=14							
			+									
			_									
30.0												
	ANDY LEAN CLAY (CL), gray, medium stiff	30)-		3-3-4							_
			+	Λ	N=7							5
			_									
da	ark gray, stiff	35	5-		407							
			-	X	4-6-7 N=13							50
			+									
40.0		<u> </u>)_									
Stratifi	ication lines are approximate. In-situ, the transition may be gradual.				ŀ	Hammer Type	e: Automa	atic				
ancement N		A-3 for desc	cription	of field	ı N	otes:						
lollow Stem	See Appendi											
ndonment I		x C for exp										
_		·.										
	ATER LEVEL OBSERVATIONS defilling				Bor	ring Started:	10-22-201	8	Borir	ng Com	pleted: 10-22-	-2018
	ile ile	421 Edinge			Dril	II Rig: CME-7	75		Drille	er: Mart	ini Drilling	
		Tusti	in, CA	J.U U	Pro	ject No.: 601	185137		Exhi	bit:	A-3	

			BORING	LC	OG	NC). B-	1					F	Page 3 of	6
PRO	JECT:	John Anson Ford Park Infiltra Project	ation Cistern		CLIE	NT:	CWE Fuller	Corp rton, C	4						
SITE	:	8000 Park Lane Bell Gardens, CA													
g LO	OCATION	√ See Exhibit A-2		£	/EL	/PE	72	<i>(</i> 0	STF	ENGTH	TEST	(%)	_ اص	ATTERBERG LIMITS	9 0
GRAPH		.9572° Longitude: -118.1545°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	RESULTS	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)	LL-PL-PI	
DE	EPTH LEAN	I CLAY WITH SAND (CL), dark gray, s	tiff			M	3-5 N=	5-6 :11		ō					8
45		I CLAY (CL), dark gray, stiff		45		V	2-3 N:								
							IN-	-9							
50.	50.0 POORLY GRADED SAND (SP), light gray, dense		dense	50 ⁻		X	9-16 N=								
				55											
60	.0			60-	_										
	Stratification	on lines are approximate. In-situ, the transition	may be gradual.					Hamme	r Typ	e: Autom	natic		<u> </u>	l	
Hollow Abandonr	ment Meth Stem Aug ment Meth backfilled	ger	See Exhibit A-3 for oprocedures. See Appendix B for procedures and add See Appendix C for abbreviations.	desc litiona	ription o al data (i	f labo if any)		Notes:							
		R LEVEL OBSERVATIONS						Boring Sta	arted.	10-22-20	118	Rorie	na Com	pleted: 10-22	-201
V V	Vhile drii	lling	- Iler	7				Drill Rig: C						ini Drilling	-010
			1421 Ed	linger ustin	Ave, St	te C		Project No				Exhi	bit:	A-3	

		ROKING	L	OG NO. E			B-1					Page 4 of 6			
		John Anson Ford Park Infiltrat	tion Cistern		CLIE	NT:	CWE Fuller	Corp rton, CA	4						
SIT	C .	8000 Park Lane Bell Gardens, CA													
90.	LOCATION	See Exhibit A-2		·:	/EL	/PE	F	<i>"</i>	STR	ENGTH	TEST	(%)	ੂ ੂ	ATTERBERG LIMITS) L
GKAPH		9572° Longitude: -118.1545°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	RESULTS	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)	LL-PL-PI	
	DEPTH POOI gray,	RLY GRADED SAND WITH SILT (SP-SM medium dense	//), dark			X	6-6 N=			0					
				65	_										
	70.0 POOI	70.0 POORLY GRADED SAND (SP), light gray, dense		70-	_	X	11-1 N=								
				75	_										
	80.0 Stratificatio	on lines are approximate. In-situ, the transition ma		80-				Hamme	г Туре	e: Autom	natic				
Hollo	cement Meth ow Stem Aug	er	See Exhibit A-3 for oprocedures. See Appendix B for procedures and add	desc	ription o	of labo if any)).	Notes:							
	onment Meth ng backfilled	od: with cement grout upon completion.	See Appendix C for abbreviations.	expla	anation (ot sym	npois and								
7		R LEVEL OBSERVATIONS	75-					Boring Sta	arted:	10-22-20	18	Borir	ng Com	pleted: 10-22	-201
	While drii	ling] Ter)[Drill Rig: C	CME-7	75		Drille	er: Mart	ini Drilling	
			1421 Ed	linger ustin		te C		Project No	. 601	185137		Exhi	hit:	A-3	

			BORING	LC	OG	NC). B-1]					F	Page 5 of	6
	PR	ROJECT: John Anson Ford Park Infiltra Project	tion Cistern		CLIE	NT:	CWE (Corp ton, CA	\					.	
	SIT	TE: 8000 Park Lane Bell Gardens, CA													
ľ	g	LOCATION See Exhibit A-2		_	H SN	ᆔ			STR	ENGTH	TEST	(§	£	ATTERBERG LIMITS	ES
	GRAPHIC LOG	Latitude: 33.9572° Longitude: -118.1545°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	KESOLIS	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)	LL-PL-PI	PERCENT FINES
		LEAN CLAY (CL), dark gray, very stiff				M	4-12- N=2	-13		ō					
						\triangle	11-2	20							
					-										
				85-	_										
;;;															
0.0001		90.0 POORLY GRADED SAND WITH SILT (SP-S	M), brown	90-											
DOINING		medium dense				X	6-10- N=2	-14 24							
WELL 60 (85) 37 BOKING LOGS, GPJ TERRACOIN_DATATEMPLATE; GDT 11/20/18					_										
O WELL O															
VI EOG-IV				95-											
TAINIS OU															
0.1707					_										
GIINAL NE					_										
70 V					-										
KAIEU -	<u>.:</u> III	Stratification lines are approximate. In-situ, the transition m		100	<u> </u>			Hammer	Туре	e: Autom	natic				
J F SEPA		ncement Method: Ilow Stem Auger	See Exhibit A-3 for oprocedures.	descr	iption o	f field		Notes:							
THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SWART LOG-NO		donment Method:	See Appendix B for procedures and add See Appendix C for abbreviations.	itiona	al data (if any)).								
LOG IS	Bori	ring backfilled with cement grout upon completion. WATER LEVEL OBSERVATIONS	appreviations.					Davis Ci		40.00.00	10	- In .			0040
SING-	V_	While drilling						Boring Star			18			pleted: 10-22-	-2018
S BC			1421 Ed	linger	Ave, S	te C	<u>-</u>	Drill Rig: C						ini Drilling	
프			T	ustin	, CA			Project No.	.: 601	85137		Exhi	bit:	A-3	

			BORING	L()G	NC). B-′	1					F	Page 6 of	<u>6_</u>
PR	OJECT:	John Anson Ford Park Infilt Project	ration Cistern		CLII	ENT	CWE Fuller	Corp ton, C	4						
SIT	ΓE:	8000 Park Lane Bell Gardens, CA													
90.	LOCATIO	N See Exhibit A-2		· ·	ÆL	/PE	<u> </u>		STR	ENGTH	TEST	(%)	ਰੂ _	ATTERBERG LIMITS	NES
GRAPHIC LOG	Latitude: 33	.9572° Longitude: -118.1545°		DEPTH (Ft.)	ER LEV	SAMPLE TYPE	FIELD TEST	SULTS	TYPE	ESSIVE VGTH	(%) N	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)	5. 5.	PERCENT FINES
GRAI				H	WATER LEVEL	SAME	FE	R.	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	CON	DR	LL-PL-PI	PERCE
	POO (cont	RLY GRADED SAND WITH SILT (SP inued)	P-SM), brown				8-11	1-19		0					
	dens 101.5					Λ	N=								
	Stratificati	on lines are approximate. In-situ, the transitio	n may be gradual.					Hamme	г Туре	e: Autom	 natic		<u> </u>		
Hol	cement Metr low Stem Aug lonment Metr ing backfilled	ger	See Exhibit A-3 fo procedures. See Appendix B fo procedures and ac See Appendix C fo abbreviations.	or desc	ription al data	of labo	oratory).	Notes:							
		R LEVEL OBSERVATIONS	76					Boring Sta	arted:	10-22-20)18	Borii	ng Com	pleted: 10-22-	2018
<u> </u>	While dri	lling						Drill Rig: 0				-		ini Drilling	
			1421 E	Edinge Tustir	r Ave, S n, CA	Ste C		Project No	o.: 601	185137		Exhi	bit:	A-3	

		BORING	L	OG	NC). B-2	2				F	Page 1 of	6
	OJECT: John Anson Ford Pa Project FE: 8000 Park Lane	rk Infiltration Cistern		CLIE	ENT:	CWE (Fuller	Corp ton, CA						
<u> </u>	Bell Gardens, CA												
GRAPHIC LOG	LOCATION See Exhibit A-2		£	VEL	YPE	ST	n	TRENGT⊦ ⊎	H TEST	(%)	ıπ pd()	ATTERBERG LIMITS	INES
Į Į	Latitude: 33.9581° Longitude: -118.1547°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	KEOULI TEOT TVDE	RESSINGTH	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pd)	LL-PL-PI	PERCENT FINES
5	DEPTH			WAT	SAM	뿐	F F	COMPRESSIVE STRENGTH	STRA	200	WE		PERC
	CLAYEY SAND (SC), brown												
				1									
				-									
	medium dense			4	M	3-6							
						N=	15						
	5.0		_										
	SILTY SAND (SM), brown, mediu	um dense	5		V	6-13	-19			10	107		
											107		
				-									
ŀ	· loose ·			-	M	1-2							25
				4		N=	4						
			10										
	. brown to light gray		10		M	2-7-	-9			4	94		
				-									
				-									
	15.0	. A	15	<u>;</u> _									
	SANDY LEAN CLAY (CL), browr	i to dark gray, still				2-4 N=						29-22-7	53
					\vdash								
				1									
				+									
<u>//</u>	20.0		20	\vdash									
	Stratification lines are approximate. In-situ, t	the transition may be gradual.		•			Hammer T	ype: Auto	matic	•		•	
	ncement Method: low Stem Auger	See Exhibit A-3 for procedures.	or desc	ription o	f field		Notes:						
	-	See Appendix B for procedures and ac	or deso	cription al data	of labo (if any)	oratory).							
	donment Method: ing backfilled with cement grout upon completion	See Appendix C for											
	WATER LEVEL OBSERVATIONS	· ·					Doring Ct.	d. 10 00 0	0010	D	ng 0:::	nlotod: 40.00	2042
7	While drilling	ller		D (חו	Boring Starte Drill Rig: CM		Δ10 			pleted: 10-23- ini Drilling	∠∪18
			_	r Ave S			Project No.: 6			Exhi		A-4	
			2. 2411	,									

_		BORING L	.00	G I	NC). B-2	2				_	F	Page 2 of	6
PROJE	CT: John Anson Ford Park Infil Project	tration Cistern	С	LIE	NT:	CWE Fuller	Corp ton, C	4						
SITE:	8000 Park Lane Bell Gardens, CA													
ဗ္ဗ LOC <i>i</i>	ATION See Exhibit A-2	1	;	/EL ONS	/PE	T2	(0	STF	RENGTH	TEST	(%)	T od)	ATTERBERG LIMITS	NES
	de: 33.9581° Longitude: -118.1547°	DEDTH (F)		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	RESULTS	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)	LL-PL-PI	PERCENT FINES
DEPT	H <u>SILTY SAND (SM)</u> , brown, medium dense	9				8-16	6-26		8		10	105		17
			_											
	dark gray	2	5-		X	4-6 N=								
			_		/_\									
30.0	SANDY SILT (ML), light gray, very stiff	3	0-		X	8-12	2-16				12	98		50
25.0			_											
35.0	SILT WITH SAND (ML), trace gravel, dark	gray, stiff 3	5 - -		X	4-5 N=								85
			_											
40.0 Strat	ification lines are approximate. In-situ, the transitic	on may be gradual.	0-				Hamme	r Type	e: Autom	natic				
Advancemen					£ . l . l		Notes:							
Hollow Ste	m Auger	See Exhibit A-3 for des procedures. See Appendix B for de procedures and additic See Appendix C for exabbreviations.	script	tion of lata (i	f labo f any)		110085.							
	ATER LEVEL OBSERVATIONS	75					Boring Sta	arted:	10-23-20	18	Borii	ng Com	pleted: 10-23-	-2018
∠ Whi	le drilling						Drill Rig: 0						ini Drilling	
		1421 Eding Tus	ger Av tin, C	ve, St A	e C		Project No	o.: 601	185137	·	Exhi	bit:	A-4	

			BORING L	_C)G	NC). B-	2					F	Page 3 of	6
		John Anson Ford Park Infiltrat Project	ion Cistern		CLIE	NT:	CWE Fuller	Corp rton, C	4						
SIT	E:	8000 Park Lane Bell Gardens, CA													
2		N See Exhibit A-2 .9581° Longitude: -118.1547°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	D TEST	RESULTS	TEST TYPE S	COMPRESSIVE STRENGTH D D H		WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH				WATE	SAMF	E	<u>R</u>	TEST	COMPR STREI (ts	STRAIN (%)	CONS	DR	LL-PL-PI	PERC
	<u>LEAN</u>	I CLAY (CL), dark gray, stiff		-		X	5-{ N=	5-5 =10							
				-											
	45.0 SILT' dense	/ CLAYEY SAND (SC-SM) , dark gray, me e	edium	15- -		X		7-9 -16							3
				-											
				-											
			5	50-											
				-											
				-											
	55.0 POO I	RLY GRADED SAND (SP), light gray, dei	nse 5	55-											
	<u> </u>	<u> (</u>		-		X		6-20 =36							
				-											
				-											
	Stratification	on lines are approximate. In-situ, the transition ma		60-				Hamme	r Typ	e: Autom	natic				
	cement Meth		See Exhibit A-3 for de	escri	ption of	field		Notes:							
Abando	ow Stem Aug onment Meth ng backfilled		procedures. See Appendix B for de procedures and additi See Appendix C for exabbreviations.	escr iona	iption o I data (i	f labo f any)).								
20111		R LEVEL OBSERVATIONS						Boring Sta	arted.	10-23-20	118	Rori	na Com	pleted: 10-23	-2019
∇	While dri		llerr					Drill Rig: 0			. 10			ini Drilling	2010
			1421 Edin Tus	nger stin,	Ave, St CA	e C		Project No	o.: 60	185137		Exhi	bit:	A-4	

			BORING	L(F	Page 4 of	6
		John Anson Ford Park Infilt Project	ration Cistern		CLIE	NT:	CWE Fuller	Corp ton, C	A						
SI	TE:	8000 Park Lane Bell Gardens, CA													
90	LOCATIO	N See Exhibit A-2		÷	EL SNS	PE	–		STF	RENGTH	TEST	(%	. 6	ATTERBERO LIMITS	3 6
GRAPHIC LOG	Latitude: 33	.9581° Longitude: -118.1547°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	RESULTS	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pd)	LL-PL-PI	
9	DEPTH				W OBS	SAI	ш	_	單	COMI	STE	8	_>		
	POO (cont	RLY GRADED SAND (SP) , light gray <i>inued)</i>	, dense		_										
				65	_										
				00		X	11-1 N=								
				70	_										
	75.0														
		/EY SAND (SC) , dark gray, medium	dense	75	_	X	6-12 N=								
					-										
	Stratificati	on lines are approximate. In-situ, the transitio	n may be gradual.	80				Hamme	er Type	e: Autom	natic				
	ncement Meth Ilow Stem Au		See Exhibit A-3 for procedures. See Appendix B for procedures and add	r desc	ription o al data (of labo if any)	oratory).	Notes:							
	donment Meth ring backfilled	nod: with cement grout upon completion.	See Appendix C for abbreviations.	r expl	anation	of sym	nbols and								
$\overline{\nabla}$		R LEVEL OBSERVATIONS	75-					Boring St	arted:	10-23-20	18	Borii	ng Com	pleted: 10-23	3-20
<u> </u>	While dri	ılırıy		_	3 C			Drill Rig:	CME-	75		Drille	er: Mart	ini Drilling	
				dinge Tustir	r Ave, S n, CA	te C		Project N	o.: 60′	185137		Exhi	bit:	A-4	

			BORING L	.0	G	NC). B-2	2					ſ	Page 5 of	6
		John Anson Ford Park Infilt Project	ration Cistern	C	LIE	NT:	CWE Fuller	Corp ton, CA	4						
SIT	· E:	8000 Park Lane Bell Gardens, CA													
90.	LOCATIO	Ŋ See Exhibit A-2		·	/EL ONS	/PE	<u> </u>	,,	STR	ENGTH	TEST	(%)	ੂ ੂ	ATTERBERG LIMITS	3
GRAPHIC LOG	Latitude: 33	.9581° Longitude: -118.1547°	70 PT0 PT0 PT0 PT0 PT0 PT0 PT0 PT0 PT0 PT	ח (דו	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	RESULTS	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pd)	LL-PL-PI	
		<u>/EY SAND (SC)</u> , dark gray, medium o inued)	dense		> ö	S				Ö	S				
				-											
	85.0 POO brow	RLY GRADED SAND WITH SILT (SP. n, dense	- <u>SM)</u> , yellow	5-		V	11-17	7-26							
		,,		_		\bigwedge	N=	43							
				_											
			9	0-	$\overline{}$										
				_											
				-											
			9	5-											
				_											
	100.0		10	- 00-											
	Stratificati	on lines are approximate. In-situ, the transition	n may be gradual.					Hamme	г Туре	e: Autom	natic	<u> </u>	I	l	1
	cement Meth low Stem Au		See Exhibit A-3 for desprocedures. See Appendix B for deprocedures and addition	scrip	tion of	f labo	ratory	Notes:							
		with cement grout upon completion.	See Appendix C for ex abbreviations.												
$\overline{\mathbb{Z}}$	WATE While dri	R LEVEL OBSERVATIONS	Terr					Boring Sta	rted:	10-23-20	18	Borir	ng Com	pleted: 10-23	-201
	011	····· ·	1421 Eding					Drill Rig: 0	CME-7	75		Drille	er: Mart	ini Drilling	
				stin, C				Project No	o.: 601	185137		Exhi	bit:	A-4	

			BORING	L	OG	NC). B-2	2					F	Page 6 of	6_
		John Anson Ford Park Infilt Project	ration Cistern		CLII	ENT:	: CWE Fuller	Corp ton, C	A						
SIT	ſE:	8000 Park Lane Bell Gardens, CA													
90-	LOCATION	See Exhibit A-2		t.)	/EL	/PE	TS	ω.	STR	RENGTH	TEST	(%)	T ocf)	ATTERBERG LIMITS	NES
GRAPHIC LOG		.9581° Longitude: -118.1547°		DEPTH (Ft.)	WATER LEVEL	SAMPLE TYPE	FIELD TEST	RESULT	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)	LL-PL-PI	PERCENT FINES
	DEPTH POOI dense	RLY GRADED SAND (SP), yellow bro	wn, very		_	X	14-20 N=			ō					
	Stratification	on lines are approximate. In-situ, the transition	ı may be gradual.					Hamme	er Type	e: Autom	l natic				
Holl Aband	cement Meth low Stem Aug onment Meth ing backfilled	ger	See Exhibit A-3 fo procedures. See Appendix B fo procedures and ac See Appendix C fo abbreviations.	or desc	ription al data	of labo	oratory).	Notes:							
	_	R LEVEL OBSERVATIONS	+					D		10.05.5	.10	-			00:-
∇	While drii				7			Boring Sta			18	+		pleted: 10-23-	-2018
			1421 F	-dinge	r Ave. S			Drill Rig:						ini Drilling	
				Tustir	n, CA			Project No	o.: 601	185137		Exhi	bit:	A-4	

			BORING L	LC	OG	NC). B-3	3					F	Page 1 of	6
PR	OJECT:	John Anson Ford Park Infiltrati Project	ion Cistern		CLIE	NT:	CWE Fuller	Corp ton, C	4						
SIT	E:	8000 Park Lane Bell Gardens, CA													
GRAPHIC LOG	LOCATIO	N See Exhibit A-2		£	/EL	/PE	To	(0	STF	RENGTH	TEST	(%)	T امرا	ATTERBERG LIMITS	NES
	Latitude: 33	.9591° Longitude: -118.1549°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	SULTS	ΓΥΡΕ	COMPRESSIVE STRENGTH (tsf)	(%) N	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)		PERCENT FINES
				PE	WATE	SAMP	맆	R.	TEST TYPE	STREN (tsi	STRAIN (%)	CON	DR	LL-PL-PI	ERCE
	DEPTH 0.4 ASPI	HALT, 5" thickness			1 0	Ű				8"					п.
	0.8 AGG	REGATE BASE COURSE, 4" thickness		_											
	SILI	Y SAND (SM), brown, loose													
	11			-											
	yello	w brown		-	-	M	3-4	-6				15	100		
				-	4	A									
				_											
				5 -		M	3-3	3-4							17
				-	1	\bigwedge	N=	=7							17
	7.5			-	_										
	7.5 SANI	DY LEAN CLAY (CL), dark gray, stiff				V									
						X	2-5-	-10				22	103		
				-											
	10.0 SILT	Y SAND (SM), dark gray, loose		10-	-										
		<u></u> , g, ,		_		X	4-4 N=							31-25-6	49
				-											
				-											
					4										
	15.0			4 -											
		WITH SAND (ML), brown, very stiff		15-		V	5.0	45				10	100		74
				-		A	5-9-	-15				16	109		74
				-	4										
				_											
				-	1										
	20.0			20-	-										
	Stratificati	on lines are approximate. In-situ, the transition ma	y be gradual.		•			Hamme	r Typ	e: Autom	natic	•			
	cement Meth		See Exhibit A-3 for de	escri	iption of	field		Notes:							
10110	ow Stem Au	procedures. See Appendix B for d	lescr	ription o	f labo	ratory									
	onment Meth	nod:	procedures and additional See Appendix C for e												
Borir	ng backfilled	with cement grout upon completion.	abbreviations.												
7		R LEVEL OBSERVATIONS	75					Boring Sta	arted:	10-24-20	18	Borir	ng Com	pleted: 10-24-	2018
_	While dri	ııııy						Drill Rig: (CME-	75		Drille	er: Marti	ini Drilling	
			1421 Edir Tu	nger ıstin,	Ave, St , CA	e C		Project No	o.: 60	185137		Exhi	bit:	A-5	

			BORING L	OG	ا ز	NC). B-	3					F	Page 2 of	6
		John Anson Ford Park Infiltrat Project	ion Cistern	CL	.IEI	NT:	CWE Fuller	Corp ton, CA	4						
SIT	E:	8000 Park Lane Bell Gardens, CA													
90	LOCATIO	See Exhibit A-2			SNS	ЭĒ	<u> </u>		STR	RENGTH	TEST	(%	ਹ _ਿ .	ATTERBERG LIMITS	ZES
GRAPHIC LOG		.9591° Longitude: -118.1549°	DEPTH (Ft.)	WATER LEV	OBSERVATIONS	SAMPLE TYPE	FIELD TEST	RESULTS	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)	LL-PL-PI	PERCENT FINES
	DEPTH SILT	/ SAND (SM) , brown to light gray, mediu	um dense			X	5-9- N=			O					27
					2	/ \									
	25.0 SILT dens	<u>/ CLAYEY SAND (SC-SM)</u> , dark gray, m	edium 25	5-		V	3-8-	11				21	03		
				-			3-0	-11				21	93		
				-											
	30.0 CLA)	′EY SAND (SC) , dark gray, medium den	se 30)-	Š	X	2-6 N=								39
	35.0 SILT	<u>r SAND (SM)</u> , light gray, medium dense	35	5-		X	7-22	2-30				3	99		25
				_											
	40.0 Stratification	on lines are approximate. In-situ, the transition ma	4(ay be gradual.)-				Hammei	г Туре	e: Autom	atic				
ldvan	cement Meth	od:	I					Notos:							
Holl	ow Stem Aug	ger od:	See Exhibit A-3 for deso procedures. See Appendix B for des procedures and addition See Appendix C for exp abbreviations.	criptional	on of ita (if	laboi any)		Notes:							
Bori		with cement grout upon completion.	appreviations.												
V_	While dri	R LEVEL OBSERVATIONS Viing						Boring Sta			18			pleted: 10-24-	2018
	·		1421 Edinge	er Ave	e, Ste			Drill Rig: C						ini Drilling	
			Tusti	in, CA	, ,,,,,,			Project No	.: 601	185137		Exhi	bit:	A-5	

			BORING L	0	G I	NC). B-	3					F	Page 3 of	6
		John Anson Ford Park Infiltra Project	ation Cistern	С	LIE	NT:	CWE Fuller	Corp ton, CA	4						
SIT	ΓE:	8000 Park Lane Bell Gardens, CA													
90	LOCATIO	N See Exhibit A-2		,	NS NS	PE	-		STR	RENGTH	TEST	(%	. g	ATTERBERG LIMITS	ES S
GRAPHIC LOG	Latitude: 33	.9591° Longitude: -118.1549°	OFPTH (F)		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	RESULTS	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)	LL-PL-PI	PERCENT FINES
		I CLAY WITH SAND (CL) , dark gray, m ff	edium stiff			X	3-3 N=	3-5 =8						38-34-4	76
				_											
	45.0 SILT dens	Y CLAYEY SAND (SC-SM), yellow brov e	vn, medium 4.	5-		X	8-10 N=								
				_		/									
	50.5	LCLAY (CL) dody grovy you stiff	5	0-		V	4-10)-10							
	LEAR	I CLAY (CL) , dark gray, very stiff		-	,	\triangle	N=	20							
				-											
			5	5-											
				_											
	60.0		6	0-											
	Stratification	on lines are approximate. In-situ, the transition n	nay be gradual.					Hamme	r Type	e: Autom	atic				
Hol	ncement Meth low Stem Aug	ger	See Exhibit A-3 for des procedures. See Appendix B for de procedures and additio See Appendix C for ex	script	tion of lata (it	f labo f any)		Notes:							
	ing backfilled	with cement grout upon completion.	abbreviations.									_			
\overline{Z}	WATE While dri	R LEVEL OBSERVATIONS Iling						Boring Sta			18			pleted: 10-24-	-2018
			1421 Eding	jer A	ve, St			Drill Rig: C						ini Drilling	
			Tusi	tin, C	A			Project No	.: 601	185137		Exhi	bit:	A-5	

PR	OJECT:	John Anson Ford Park Infiltration	n Cistern	С	LIF	NT:	CWE	Corn					<u>'</u>	Page 4 of	<u> </u>
		Project					Fuller	ton, C	4						
SIT	ΓE:	8000 Park Lane Bell Gardens, CA													
GRAPHIC LOG	LOCATIO	N See Exhibit A-2		, _i	ПS NS	PE			STF	RENGTH	TEST	(§	£	ATTERBERG LIMITS	ES ES
	Latitude: 33	s.9591° Longitude: -118.1549°	DEPTH (Ft.)		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	JLTS	ΡE	COMPRESSIVE STRENGTH (tsf)	(%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pd)		I FI
			DEPT		ATEF SER	MPL		RES	TEST TYPE	APRES RENG (tsf)	STRAIN (%)	ONTE	DRY	LL-PL-PI	PERCENT FINES
7.,	DEPTH	DVIENNOLAV (OL)		- 1	>8	/S			<u>"</u>	Sol	S	O	>		H H
////	SANI	DY LEAN CLAY (CL), dark gray, very stiff					5-15 N=								
						$/ \setminus$	IN-	30							
				-											
				4											
			6	5-											
				4											
1															
11/1/				-											
				4											
	70.0		70 m atiff to	_											
	<u>LEAN</u> stiff	N CLAY (CL), trace sand, dark gray, mediu	m stiff to '			\bigvee	2-3								
						\triangle	N=	=8							
				-											
			7	5-											
2															
2															
				-											
	80.0														
<u></u>		on lines are approximate. In-situ, the transition may be	ne gradual)—				Hamme	r Tyn	e: Autom	atic				
	o ii diiii odii	orrando do approximado. In ora, dio dallocador may	oo graaaa							. /					
	cement Meth		ee Exhibit A-3 for des	cripti	ion of	field		Notes:							
		s	ee Appendix B for des rocedures and additio	script nal da	tion of ata (if	f labo f any)	ratory								
	lonment Meth	nod: S	ee Appendix C for expobreviations.												
		. The content grout apoin completion.										-			
<u></u>	WATE While dri	ER LEVEL OBSERVATIONS Illing	There					Boring Sta	arted:	10-24-20	18	Borir	ng Com	pleted: 10-24	-2018
_	411							Drill Rig: (CME-	75		Drille	er: Mart	ini Drilling	
			1421 Eding Tust	in, C	A.	G ()		Project No	o.: 601	185137		Exhi	bit:	A-5	

_			BORING											Page 5 of	6
	ROJECT: TE:	John Anson Ford Park Inf Project 8000 Park Lane	iltration Cistern		CLIE	ENT	CWE Fulle	Corp rton, C	Α						
01	· • ·	Bell Gardens, CA													
90	LOCATIO	N See Exhibit A-2		·	EF.	PE	_		STF	RENGTH	TEST	(%	ਹ ੋ .	ATTERBERO LIMITS	}
GRAPHIC LOG	Latitude: 33	.9591° Longitude: -118.1549°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	TES	RESULTS	YPE	COMPRESSIVE STRENGTH (tsf)	(%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)		
RAP				DEPT	ATER	MPL		RES	TEST TYPE	APRE(TRENC (tsf)	STRAIN (%)	ONTE	DRY	LL-PL-PI	
<u></u>	DEPTH				> 8	Ś			٣	ST	ST	O	>		
	dens	RLY GRADED SAND (SP) , yellow l e	orown, very					25-32							
							IN=	=57							
					-										
	<mark>.</mark>			85	-										
					_										
	į				-										
				90	-		28-5	50/5"							
	·				-				-						
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	<mark>.:</mark>				_										
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	<mark>:</mark>				+										
					_										
	<u>:</u>														
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				100	∍										
	Stratificati	on lines are approximate. In-situ, the transi	tion may be gradual.					Hamm	er Typ	e: Autom	natic				
dvar	ncement Meth	nod:	lo sumas					Notes:							
	low Stem Au		See Exhibit A-3 fo procedures.					Notes.							
			See Appendix B for procedures and according Control of the control	ddition	al data	(if any).								
	donment Meth ing backfilled	nod: I with cement grout upon completion.	See Appendix C for abbreviations.	or expl	anation	ot syn	npois and								
	WATF	R LEVEL OBSERVATIONS	 					D		40.04.5	14.0	<u> </u>	2		66
Z	While dri						חו	Boring St			18			ipleted: 10-24	-20
			1421 E	Edinge	r Ave, S			Drill Rig:						tini Drilling	
				Tustir	n, CA			Project N	lo.: 60	185137		Exhi	bit:	A-5	

PR SIT		John Anson Ford Park Infilit Project 8000 Park Lane	tration Cistern		CLIE	ENT:	: CWE C Fullerto	orp on, CA							
		Bell Gardens, CA												ATTERBERG	
GRAPHIC LOG		N See Exhibit A-2 .9591° Longitude: -118.1549°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS			COMPRESSIVE STRENGTH DI	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIMITS LL-PL-PI	PERCENT FINES
	DEPTH POO dens	RLY GRADED SAND (SP), yellow bro e (continued)	own, very		-	X	19-24- N=53	-29	'	8**	<u> </u>				
	Stratificati	on lines are approximate. In-situ, the transitio	n may be gradual.		-			Hammer 1	Type:	Autom	atic				
Holl band	cement Methow Stem Aug lonment Methong backfilled	ger	See Exhibit A-3 fo procedures. See Appendix B fo procedures and ac See Appendix C fo abbreviations.	or desc	cription o	of labo if any)	oratory).	Notes:							
	WATE	R LEVEL OBSERVATIONS						oring Starte	ed· 1	0-24-20	18	Rorin	na Comi	oleted: 10-24-	.20·
Z	While dri										10				-2U
								orill Rig: CM	ИЕ-75			Drille	er: Marti	ni Drilling	
			1421 E	Edinge Tustir	r Ave, S n, CA	te C	Р	roject No.:	6018	35137		Exhi	oit:	A-5	

		<u> </u>	- <u>-</u> -								Page 1 of	2
ROJECT: John Anson Ford Park Infiltration Cistern Project	n	CLIE	ENT:	CWE Fuller	Corp ton, C	A						
TE: 8000 Park Lane Bell Gardens, CA												
LOCATION See Exhibit A-2	£	/EL	/PE	To	.	STR	RENGTH	TEST	(%)	ر اص	ATTERBERG LIMITS	3 0
Latitude: 33.9574° Longitude: -118.1548°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	RESULTS	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)	LL-PL-PI	
DEPTH CLAYEY SAND (SC), brown		>0	S			-	8%	o	_	<u> </u>		<u> </u>
SANDY SILT (ML), brown 10.0 SILTY CLAYEY SAND (SC-SM), dark brown	— 5· — 10	_ _ _ _										
20.0 Stratification lines are approximate. In-situ, the transition may be gradual.	20		f field		Hamme	ег Туре	e: Autom	natic				
ollow Stem Auger See Exhibit Asprocedures. See Appendix procedures and procedures and some backfilled with cement grout upon completion. See Appendix abbreviations.	B for desc	cription o al data (of labo if any)	ratory).								
					Boring St	arted:	10-22-20)18	Borir	na Com	pleted: 10-22-	2-201
WATER LEVEL OBSERVATIONS												
Groundwater not encountered					Drill Rig:						tini Drilling	

			BORING	L()G	N	O. P-	1					F	Page 2 of	2
		John Anson Ford Park Infilt Project	ration Cistern		CLI	EN	Γ: CWE Fulle	Corp rton, C	4						
SIT	E :	8000 Park Lane Bell Gardens, CA					ĺ						1	LATTEDDEDO	
GRAPHICLOG		N See Exhibit A-2 3.9574° Longitude: -118.1548°		DEPTH (Ft.)	WATER LEVEL	SAMPI F TYPE	FIELD TEST	RESULTS	TEST TYPE ST	COMPRESSIVE STRENGTH DD HT (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
Advan	trace		n may be gradual. See Exhibit A-3 fo procedures. See Appendix B fo		ription			Hamme Notes:	r Typ	e: Autom	natic				
	onment Met	hod: d with cement grout upon completion.	procedures and ac See Appendix C for abbreviations.	ddition	al data	(if ar	ıy).								
		ER LEVEL OBSERVATIONS vater not encountered	75.	<u></u>	7		1	Boring Sta	arted:	10-22-20)18	Borir	ng Com	pleted: 10-22-	-2018
	Croanav	rato. Hot onodantorod	1421 E				חכ	Drill Rig: 0	CME-	75		Drille	er: Mart	ini Drilling	
			1421 E	Tustir	n, CA	Sie C	•	Project No	o.: 60	185137		Exhi	bit:	A-6	

PF	OJECT:	John Anson Ford Park Infiltrati	ion Cistern		CLIE	NT:	CWE	Corp						Page 1 of	
SI	 ΓΕ:	Project 8000 Park Lane					Fulle	rton, CA	4						
<u> </u>	·	Bell Gardens, CA													
.0G	LOCATIO	N See Exhibit A-2		· ·	/EL	'PE	Τ		STF	RENGTH	TEST	(%)	ದೆ)	ATTERBERO LIMITS	
GRAPHIC LOG	Latitude: 33	.958° Longitude: -118.155°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE) TES	RESULTS	YPE	COMPRESSIVE STRENGTH (tsf)	(%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pdf)		
3RAP				DEP.	VATE	AMPI	FIELI	RES	TEST TYPE	MPRE TREN (tsf)	STRAIN (%)	WOO	DRY	LL-PL-PI	
	DEPTH	YEY SAND (SC), yellow brown			> ö	S)			F	Ö	Ś				\perp
	CLA	IET SAND (SC), yellow brown													
				5 -											
				-											
				10-											
	10.5	RLY GRADED SAND (SP), light gray, loo	98	10		M		3-3							
	100	TIET GIABLE GAILE (CIT), light gray, loo					N:	=6							
	<u>.</u>														
	14.0														
П		RLY GRADED SAND WITH SILT (SP-SM), brown												
				15-											
	20.0														
		on lines are approximate. In-situ, the transition ma	v be gradual	20-				Hamme	r Tyn	e: Autom	atic				
	Cadunodu	o are approximate. in situ, tile transition ma	, 20 gradual.					, idillille	yp	o. Auton					
	ncement Meth low Stem Au		See Exhibit A-3 for procedures.	descr	iption of	field		Notes:							
			See Appendix B fo procedures and ad	r desci	ription o al data (i	f labo if any)	oratory).								
	donment Meth	nod: with cement grout upon completion.	See Appendix C for abbreviations.	r expla	anation o	of syn	nbols and								
50															
		R LEVEL OBSERVATIONS vater not encountered	75		9 C			Boring Sta	arted:	10-23-20	18	Borir	ng Com	pleted: 10-23	-20
								Drill Rig: 0	CME-	75		Drille	er: Mart	ini Drilling	
			1421 E	Tustin	Ave, St , CA	ie C		Project No	o.: 60	185137		Exhi	bit:	A-7	

		BORING	LC	OG	NC). P-2	2					F	Page 2 of	2
	ECT: John Anson Ford Park Infiltra Project	ation Cistern		CLIE	NT:	CWE Fuller	Corp rton, C	A						
SITE:	8000 Park Lane Bell Gardens, CA													
ပ္ပု LOC	CATION See Exhibit A-2		t.)	/EL ONS	rPE	TS		STF	ENGTH	TEST	(%)	T ocf)	ATTERBERG LIMITS	NES
GRAPHIC LOG	ude: 33.958° Longitude: -118.155°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	SULT	TYPE	COMPRESSIVE STRENGTH (tsf)	(%) N	WATER CONTENT (%)	DRY UNIT WEIGHT (pd)		PERCENT FINES
GRAF			PEP	WATE	SAMP	FE	Ä	TEST TYPE	MPRE STREN	STRAIN (%)	CON	DR	LL-PL-PI	ERCE
DEP	TH SANDY SILT (ML), brown, very stiff			-0	0)			_	8"	0)				
Ш	,,,,				X	4-8 N=	-10 :18							70
Ш														
III														
				-										
				-										
25.0			25-											
	SILTY CLAYEY SAND (SC-SM), dark gray		23											
				1										
				-										
	medium dense		30-	-										
				_	X	6-7 N=								45
				-										
35.0	Parties Tampingtod at 25 Foot		35-											
	Boring Terminated at 35 Feet													
Str	atification lines are approximate. In-situ, the transition n	mav be gradual.					Hamme	er Type	e: Autom	natic				
								,, 						
dvanceme Hollow S	nt Method: em Auger	See Exhibit A-3 for oprocedures.					Notes:							
		See Appendix B for procedures and add	itiona	al data (i	f any)									
	nt Method: ckfilled with cement grout upon completion.	See Appendix C for abbreviations.	expla	anation	of sym	nbols and								
	WATER LEVEL OBSERVATIONS	7.					Boring Sta	arted:	10-23-20	18	Borir	ng Com	pleted: 10-23-	-2018
Gr	oundwater not encountered	Teri					Drill Rig: (Drille	er: Mart	ini Drilling	
		1421 Ed T	inger ustin	Ave, St , CA	te C		Project No	o.: 60′	185137		Exhi	bit:	A-7	

LOCATION See Eshibit A-2 Listudes 33 859* Longitude -118 155* Listudes 34 859* Longitudes 34	PR		John Anson Ford Park Infiltra Project 8000 Park Lane Bell Gardens, CA	tion Cistern		CLIE	NT:	CWE Fuller	Corp rton, C	4						
SSEMALT, 4.5° Thickness AGGREGATE BASE COURSE, 3.5° Thickness SILTY SAND (SM), brown 10 2-3-4 N=7 15-5 POORLY GRADED SAND (SP), yellow brown to light gray, medium dense Stratification lines are approximate. In-situ, the transition may be gredual. Henner Type: Automatic Advancement Method: Soe Exhibit A.3 for description of field procedures and additional data (if ent), so the procedures are additional data (if ent), so the Approximate (for explanation of symbols and approximate). Notes:	APHIC LOG		N See Exhibit A-2		ЕРТН (Ft.)	TER LEVEL ERVATIONS	APLE TYPE	ELD TEST	(ESULTS		RESSIVE BASENGTH (tsf)	TEST (%) NIA	WATER NTENT (%)	RY UNIT EIGHT (pcf)	LIMITS	PERCENT FINES
Ioose 10- 2-3-4 N=7 POORLY GRADED SAND (SP), yellow brown to light gray, medium dense Stratification lines are approximate. In-situ, the transition may be gradual. Advancement Method: Hollow Stem Auger See Appendix B for description of field procedures. See Appendix B for description of aboratory procedures and additional data (if any). Abandoment Method: Boring backfilled with cement grout upon completion. See Appendix C for explanation of symbols and abbreviations.		0.4 ASPI 0.7 AGG	REGATE BASE COURSE, 3.5" Thickne	ess /	<u> </u>	WA OBS	SAN		ш.	TES	COMP	STR	00	D ME		PER
Stratification lines are approximate. In-situ, the transition may be gradual. Advancement Method: Hollow Stem Auger See Appendix B for description of field procedures. See Appendix B for description of Jaboratory procedures and additional data (if any). See Appendix C for explanation of symbols and abbreviations. WATER LEVEL DRSERVATIONS					5	- - - -										
Stratification lines are approximate. In-situ, the transition may be gradual. Advancement Method: Hollow Stem Auger Abandonment Method: Boring backfilled with cement grout upon completion. See Appendix B for description of laboratory procedures and additional data (if any). See Appendix C for explanation of symbols and abbreviations. WATER LEVEL OBSERVATIONS		loose			10											
Stratification lines are approximate. In-situ, the transition may be gradual. Advancement Method: Hollow Stem Auger 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. WATER LEVEL OBSERVATIONS		P00		n to light		- - -										
Hollow Stem Auger See Appendix B for description of laboratory procedures and additional data (if any). See Appendix C for explanation of symbols and abbreviations. WATER LEVEL OBSERVATIONS	\ al a a									г Тур	e: Autom	natic				
WATER LEVEL OBSERVATIONS Groundwater not encountered Boring Started: 10-24-2018 Boring Completed: 10-24-2019 Boring Started: 10-24-2018 Boring Completed: 10-24-2019	Holl Aband	low Stem Au	ger	procedures. See Appendix B for procedures and accomposedures and accomposed See Appendix C for several procedures.	or desc	ription o al data (of labo if any)).	Notes:							
				76	' [אר		חו				18			-	-2018

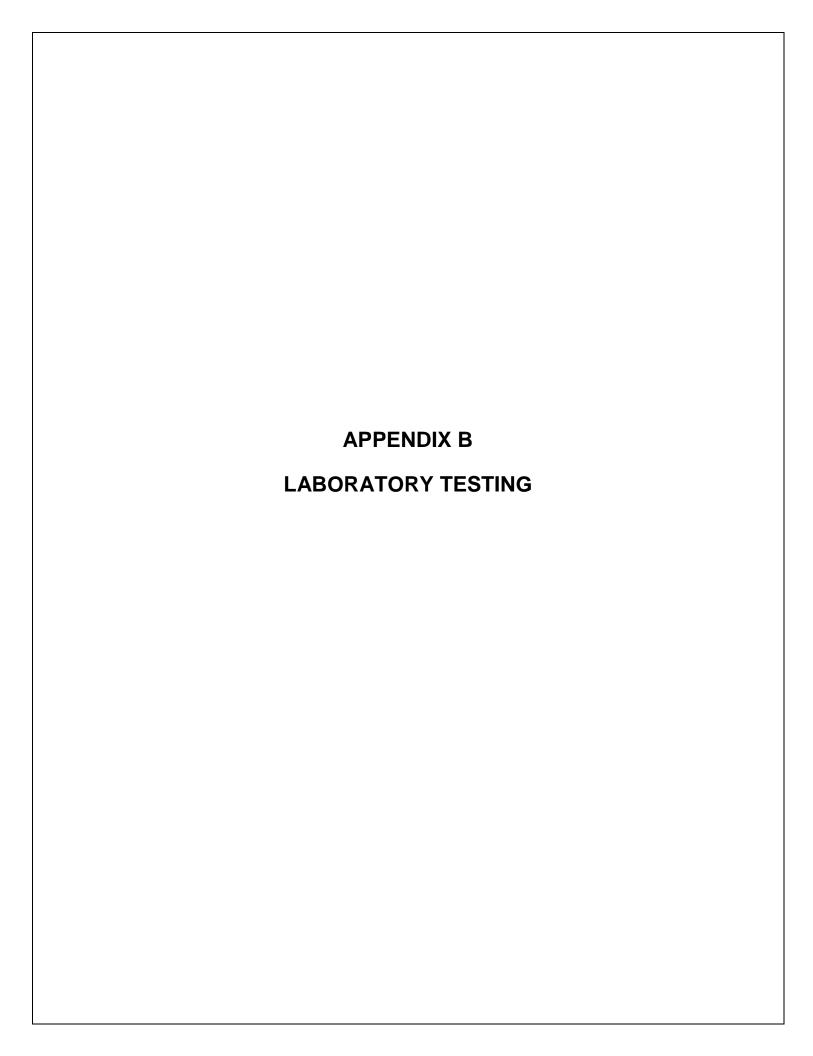
			BORING	L	OG	NC). P-	3					F	Page 2 of 2	2
		John Anson Ford Park Infiltre	ation Cistern		CLIE	NT:	CWE Fuller	Corp ton, C	4						
SIT	Ei	8000 Park Lane Bell Gardens, CA													
GRAPHIC LOG	LOCATIO	N See Exhibit A-2		<u>:</u>	VEL	YPE	ST	ω	STF	RENGTH	1	(%)	bcf)	ATTERBERG LIMITS	INES
<u> </u>	Latitude: 33	3.959° Longitude: -118.155°		DEPTH (Ft.)	ER LE	LE T	FIELD TEST	SULT	TYPE	ESSIV NGTH	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pd)	II DI DI	FNE
5				Ä	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	Ħ	2	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAI	SON	DR	LL-PL-PI	PERCENT FINES
	DEPTH POO	RLY GRADED SAND (SP), yellow brov	vn to light				5-9	0.0		0					_
	gray,	medium dense (continued)			-		N=								
	22.0														
ŀ	SANI	DY SILT (ML), dark gray													
ŀ															
I					-										
ŀ	medi	um stiff		25	_										
	mou	un oun				X	3-3 N=							37-26-11	70
						\vdash									
ŀ															
					-										
ŀ					_										
	30.0			30											
	Borii	ng Terminated at 30 Feet		30											
	Stratificati	on lines are approximate. In-situ, the transition	may be gradual.					Hamme	r Typ	 e: Autom	natic				
	cement Meth	and:						I Nietee.							
	ow Stem Au		See Exhibit A-3 fo procedures. See Appendix B fo				ratory	Notes:							
ممر	onment Meth	and:	procedures and ac See Appendix C fo	ddition	al data (if any)).								
		nod: I with cement grout upon completion.	abbreviations.	or ovhi	anadon	oi Syll	ibois and								
_		R LEVEL OBSERVATIONS	76					Boring Sta	arted:	10-24-20	18	Borir	ng Com	pleted: 10-24-	2018
	Groundw	vater not encountered	lier) [Drill Rig: 0				_		ini Drilling	
			1421 E	Edingei Tustin	r Ave, S ı, CA	te C		Project No	o.: 60	185137		Exhi	bit:	A-8	

DDC :-		Islandana a Paris I Paris	BORING										F	Page 1 of	2
PROJE		John Anson Ford Park Infiltr Project	ation Cistern		CLI	ENI	: CWE Fuller	Corp rton, C	A						
SITE:		000 Park Lane Bell Gardens, CA													
g LOC	CATIONS	See Exhibit A-2			급	E H	_		STF	RENGTH	TEST	(%	£	ATTERBERG LIMITS	j L
ລ໌ ≧ Latit	tude: 33.95	589° Longitude: -118.1538°		DEPTH (Ft.)	WATER LEVEL	SAMPLE TYPE	TES.	RESULTS	ЪЕ	COMPRESSIVE STRENGTH (tsf)	(%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pd)		
LOC Latite				EPTI	TER	MPL	ELD	RESI	TEST TYPE	PRES RENG (tsf)	STRAIN (%)	WA	FS-	LL-PL-PI	
5 DEP	PTH				× 6	SAI S	ш		Œ	COMI	STE	8	>		
0.3	ASPHA	LT, 4" Thickness				T									
0.7		EGATE BASE COURSE, 4" Thickne: SAND (SM), brown	ss		4										
	<u>SILI I (</u>	SAND (SINI), DIOWII													
					1										
					_										
					-										
				5	_										
				Ū											
					+										
					-										
	loose			10	4										
11.0								3-4							
///		CLAY (CL), dark gray, medium stiff					IN:	=7							
					_										
					1										
				15	\dashv										
					-										
18.0															
		Y GRADED SAND (SP), yellow brow	vn to light												
	gray				-										
				00											
Str	atification	lines are approximate. In situ the transition	may be gradual	20				Hamma	or Tyro	e: Autom	notio				
Sur	auncauon	lines are approximate. In-situ, the transition	may be gradual.					пання	, iyb	o. Autoff	iaut				
dvanceme			See Exhibit A-3 for	r desci	ription	of field	<u> </u>	Notes:							
Hollow St	tern Augel		procedures. See Appendix B fo												
			procedures and ad	ldition	al data	(if any	′).								
	ent Method ackfilled w	l: ith cement grout upon completion.	See Appendix C for abbreviations.	л ехрі	ana(10)	ı oı sy	indus and								
,	WATER	LEVEL OBSERVATIONS	+												
		er not encountered	ا ال				חנ	Boring Sta)18	Boriı	ng Com	pleted: 10-24	-201
				_			<i>J</i> 1 [Drill Rig:	CME-	75		Drille	er: Mart	ini Drilling	
			1421 E	dınge: Tustir	ı Ave, ı, CA	sie C		Project No	o.: 601	185137		Exhi	bit:	A-9	

PROJECT: John Anson Ford Park Infiltration Cistern Project SITE: 8000 Park Lane Bell Gardens, CA DEPTH CLIENT: CWE Corp Fullerton, CA STRENGTH TEST AND LEST LABE STRENGTH TEST Latitude: 33.9589° Longitude: -118.1538° CLIENT: CWE Corp Fullerton, CA STRENGTH TEST AND LEST LABE STRENGTH TEST AND LABE STRENGTH TEST AND LEST LABE STRENGTH TEST AND LABE STRENGTH TEST AND LEST LABE STRENGTH TEST AND LABE STR	(%) 	ATTERBERG ω
Bell Gardens, CA © LOCATION See Exhibit A-2	(%) 	ATTERBERG (0
50 O J O J O J O J O J O J O J O J O J O	 (%) ⊥	ATTERBERG (n
일 Latitude: 33.9589° Longitude: -118.1538° 3.9589° Longitude: -118.1538° 일 시		E LIMITS W
	WATER CONTENT (%) DRY UNIT WEIGHT (bcf)	PERCENT FINES
DEATH OBSIGNED TEST TEST TEST TEST TEST TEST TEST TE	NON NON ME	PERC
POORLY GRADED SAND (SP), yellow brown to light gray (continued) 4-6-9		
medium dense N=15		
22.0 LEAN CLAY (CL), dark gray		
EZAN OZAN (GE), GUNK GIGY		
medium stiff 25		
- X 3-3-4 N=7		88
Boring Terminated at 30 Feet 30		
Stratification lines are approximate. In-situ, the transition may be gradual. Hammer Type: Automatic		
dvancement Method: See Exhibit A-3 for description of field Notes:		
Hollow Stem Auger procedures.		
Procedures. See Appendix B for description of laboratory procedures and additional data (if any).		
Procedures. See Appendix B for description of laboratory procedures and additional data (if any).		
procedures. See Appendix B for description of laboratory procedures and additional data (if any). See Appendix C for explanation of symbols and abbreviations. WATER LEVEL OBSERVATIONS	Boring Cor	mpleted; 10-24-2018
procedures. See Appendix B for description of laboratory procedures and additional data (if any). Abandonment Method: Boring backfilled with cement grout upon completion. See Appendix C for explanation of symbols and abbreviations.	+ -	mpleted: 10-24-2018 artini Drilling

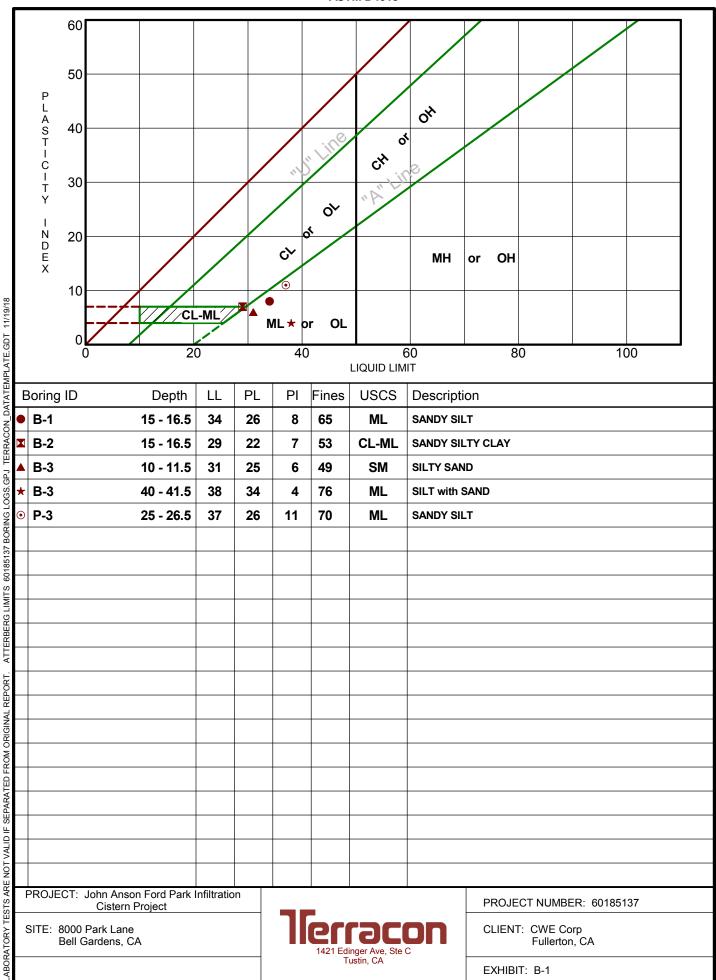
PROJ	ECT:	John Anson Ford Park Infiltration	n Cistern		CLIE	NT:	CWE	Corp						Page 1 of	
SITE:		Project 8000 Park Lane Bell Gardens, CA					Fuller	rton, CA	4						
ن ان	CATION	See Exhibit A-2			_ <u>\</u>	ш			STF	RENGTH	TEST			ATTERBERG LIMITS	S
3		.9571° Longitude: -118.1537°		DEPTH (Ft.)	A LEVEL	E TYP	FIELD TEST	ULTS				TER ENT (%)	DRY UNIT WEIGHT (pdf)	LIIVIITS	PERCENT FINES
				DEPT	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD	RES	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY	LL-PL-PI	PERCE
DEI	SILTY	Y CLAYEY SAND (SC-SM), brown								Ö					
	loose			5 -			2-4	1.4							
					-	A	N=								
10.0		/ CLAY (CL-ML) , brown		10-											
	mediu	um stiff		15			3-3 N=								
St	tratificatio	on lines are approximate. In-situ, the transition may be		20				Hammer	г Тур	e: Autom	atic				
Advancem		106	e Exhibit A-3 for o	descr	iption of	field		Notes:							
Abandonm		pro See pro od: See	cedures. e Appendix B for cedures and add e Appendix C for previations.	desc itiona	ription o al data (i	f labo f any)	ratory								
		R LEVEL OBSERVATIONS	17					Boring Sta	rted:	10-25-20	18	Borir	ng Com	pleted: 10-25	-2018
G	roundw	rater not encountered			90			Drill Rig: C						tini Drilling	
			1421 Ed T	linger ustin	Ave, St	e C		Project No	.: 60°	185137		Exhi	bit:	A-10	

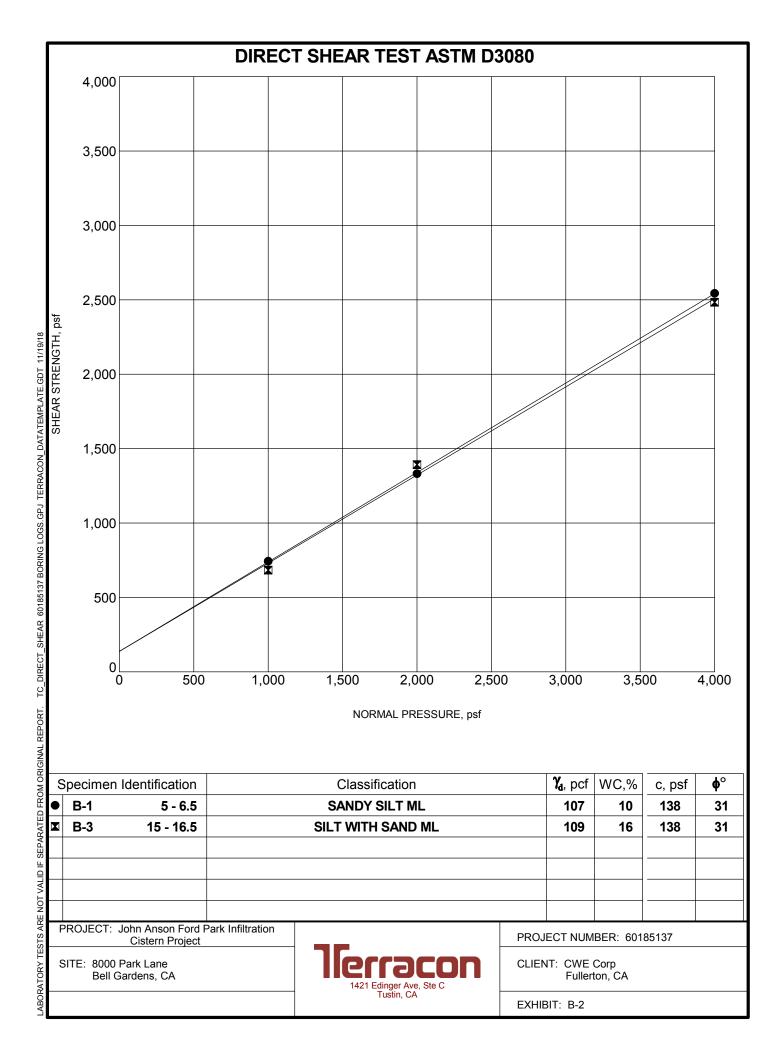
			BORING	L	OG	NC). P-5	5					F	Page 2 of	2
		John Anson Ford Park Infiltra Project	ation Cistern		CLIE	NT:	CWE (Corp ton, CA	١						
SIT	ΓE:	8000 Park Lane Bell Gardens, CA													
P00	LOCATIO	N See Exhibit A-2		·f.	VEL	YPE	ST	n	STR	ENGTH	TEST	(%)	bcf)	ATTERBERG LIMITS	INES
GRAPHIC	Latitude: 33	.9571° Longitude: -118.1537°		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST	ZESUL I	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pd)	LL-PL-PI	PERCENT FINES
<u> </u>	DEPTH				% OB	SA	ш.		Ĕ	COM	STF	S	_>		PE
		Y CLAY (CL-ML), brown <i>(continued)</i>			_ _ _ _										
	25.0 SILT to sti	Y CLAY WITH SAND (CL-ML), brown, r ff	medium stiff	25		X	2-4 N=								78
					_										
	30.0 <u>CLA</u> `	YEY SAND (SC) , dark gray, medium de	nse	30			3-8-	14							
					_ _ _		N=2	22							40
	35.0 Bori i	ng Terminated at 35 Feet		35											
	Stratificati	on lines are approximate. In-situ, the transition r	nay be gradual.					Hammer	Туре	e: Autom	atic				
Hol	ncement Meth low Stem Au donment Meth ing backfilled	ger	See Exhibit A-3 for procedures. See Appendix B for procedures and ad See Appendix C for abbreviations.	r desc Idition	ription o al data (f labo f any)	.	Notes:							
		ER LEVEL OBSERVATIONS	75					Boring Star	rted:	10-25-20	18	Borir	ng Com	pleted: 10-25-	2018
	Groundy	vater not encountered	l .		3 C		ות	Drill Rig: C	ME-7	75		Drille	er: Marti	ini Drilling	
			1421 E	dinge Tustir	r Ave, S n, CA	e C		Project No.	.: 601	185137		Exhil	bit: A	A-10	



ATTERBERG LIMITS RESULTS

ASTM D4318





CHEMICAL LABORATORY TEST REPORT

 Project Number:
 60185137

 Service Date:
 11/02/18

 Report Date:
 11/05/18

 Task:

750 Pilot Road, Suite F Las Vegas, Nevada 89119

(702) 597-9393

Client

Project

CWE Corp

CWE: John Anson Ford Park Infiltration Study

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

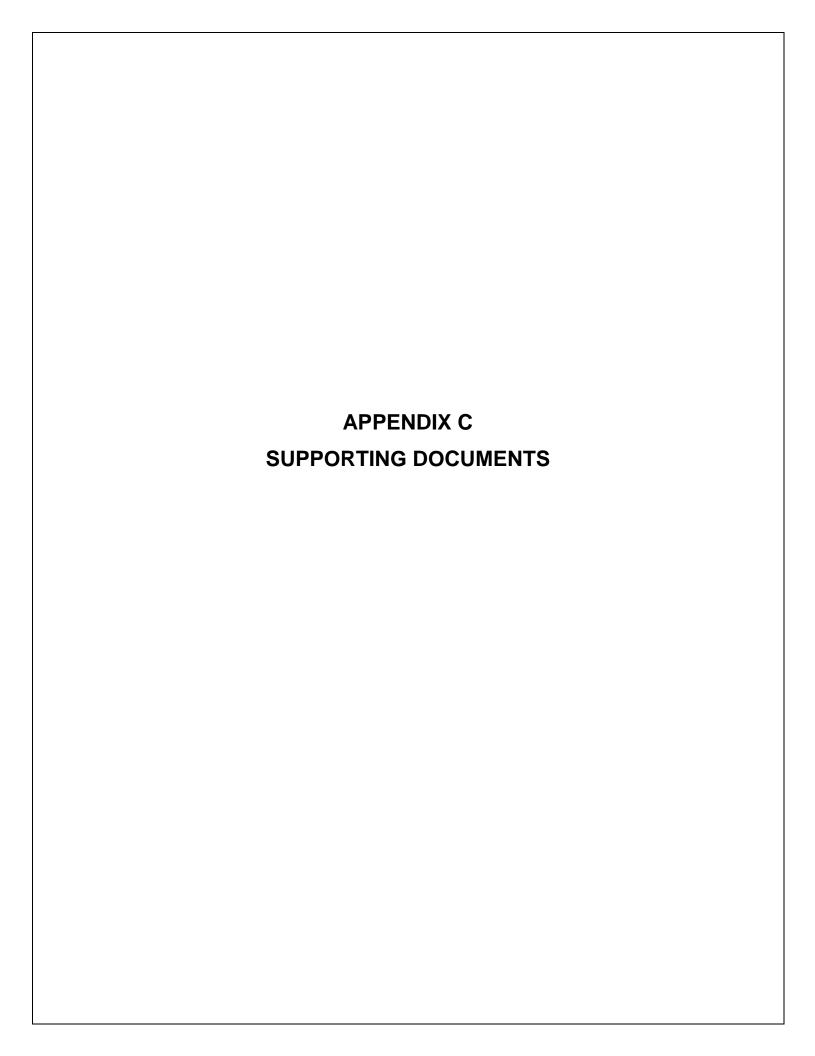
Results of Corrosion Analysis

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

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.



GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

						Water Initially Encountered		(HP)	Hand Penetrometer
	Auger	Shelby Tube	Split Spoon			Water Level After a Specified Period of Time		(T)	Torvane
<u>១</u>	Ш		M	/EL		Water Level After a Specified Period of Time	STS	(b/f)	Standard Penetration Test (blows per foot)
PLIN	Rock Core	Macro Core	Modified California Ring Sampler	R LEVEI		indicated on the soil boring levels measured in the	D TE	N	N value
SAM	m			WATEF	borehole at t	the times indicated. r level variations will occur		(PID)	Photo-Ionization Detector
	Grab	No S	Modified		accurate det	low permeability soils, termination of groundwater		(OVA)	Organic Vapor Analyzer
	Sample		Dames & Moore Ring Sampler		water level o	possible with short term observations.		(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.

	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.			
TERMS	Descriptive Term (Density) Standard Penetration or N-Value Blows/Ft.		Descriptive Term (Consistency)	Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	
뿔	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
STRENGT	Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
ြလ	Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
	Very Dense	> 50	<u>≥</u> 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
				Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term(s)</u>	<u>Percent of</u>	<u>Major Component</u>	Particle Size
of other constituents	<u>Dry Weight</u>	<u>of Sample</u>	
Trace With Modifier	< 15 15 - 29 > 30	Boulders Cobbles Gravel Sand Silt or Clay	Over 12 in. (300 mm) 12 in. to 3 in. (300mm to 75mm) 3 in. to #4 sieve (75mm to 4.75 mm) #4 to #200 sieve (4.75mm to 0.075mm Passing #200 sieve (0.075mm)

GRAIN SIZE TERMINOLOGY

PLASTICITY DESCRIPTION

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight	<u>Term</u>	Plasticity Index	
of other constituents	<u>Dry weight</u>	Non-plastic	0	
Trace	< 5	Low	1 - 10	
With	5 - 12	Medium	11 - 30	
Modifier	> 12	High	> 30	



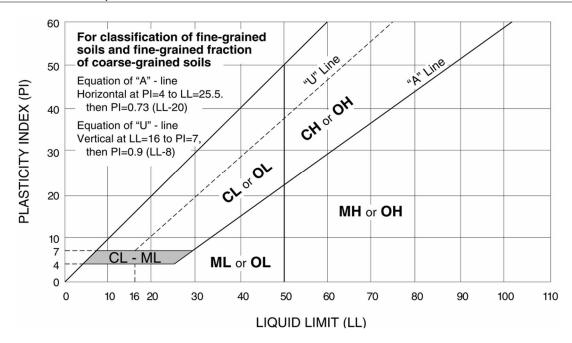
UNIFIED SOIL CLASSIFICATION SYSTEM

		Soil Classification			
Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests A					Group Name ^B
	Gravels:	Clean Gravels:	Cu ≥ 4 and 1 ≤ Cc ≤ 3 ^E	GW	Well-graded gravel F
	More than 50% of	Less than 5% fines ^C	Cu < 4 and/or 1 > Cc > 3 ^E	GP	Poorly graded gravel F
	coarse fraction retained	Gravels with Fines:	Fines classify as ML or MH	GM	Silty gravel F,G,H
Coarse Grained Soils:	on No. 4 sieve	More than 12% fines ^C	Fines classify as CL or CH	GC	Clayey gravel F,G,H
More than 50% retained on No. 200 sieve	Sands:	Clean Sands:	Cu ≥ 6 and 1 ≤ Cc ≤ 3 ^E	SW	Well-graded sand
011110. 200 01010	50% or more of coarse	Less than 5% fines D	Cu < 6 and/or 1 > Cc > 3 ^E	SP	Poorly graded sand I
	fraction passes No. 4 sieve	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
	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	OL	Organic clay K,L,M,N
Fine-Grained Soils: 50% or more passes the			Liquid limit - not dried < 0.75		Organic silt K,L,M,O
No. 200 sieve		Inorgania	PI plots on or above "A" line	СН	Fat clay K,L,M
110. 200 01010	Silts and Clays:	Inorganic:	PI plots below "A" line	MH	Elastic Silt K,L,M
	Liquid limit 50 or more	Organic	Liquid limit - oven dried < 0.75		Organic clay K,L,M,P
	Organic:		Liquid limit - not dried < 0.75		Organic silt K,L,M,Q
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				Peat

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

^E
$$Cu = D_{60}/D_{10}$$
 $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

^Q PI plots below "A" line.





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

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.
 Sands with 5 to 12% fines require dual symbols: SW-SM well-graded

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

 $^{^{\}text{F}}$ If soil contains \geq 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.

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

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.

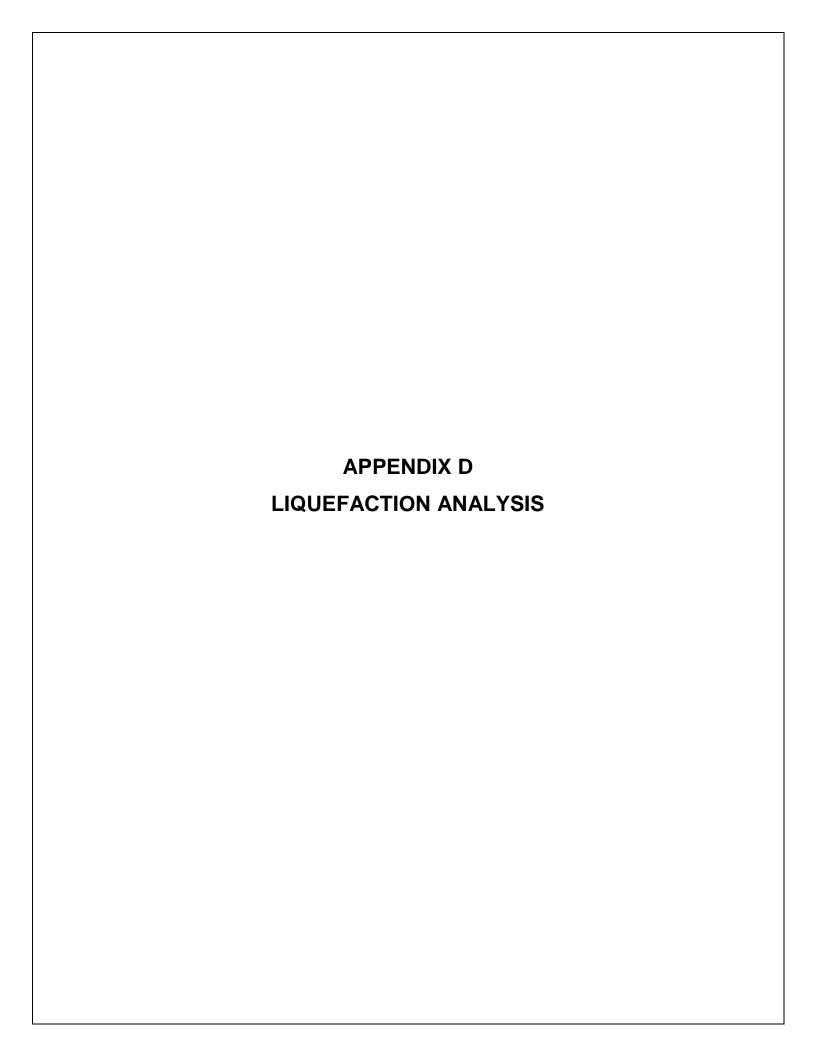
 $^{^{\}text{L}}$ If soil contains \geq 30% plus No. 200 predominantly sand, add "sandy" to group name.

^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.

 $^{^{\}text{O}}$ PI < 4 or plots below "A" line.

P PI plots on or above "A" line.

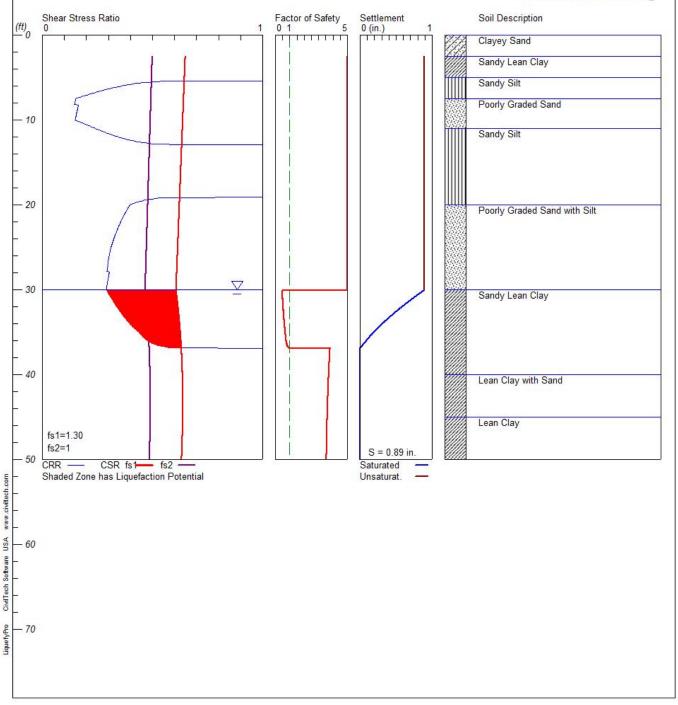


LIQUEFACTION ANALYSIS

John Anson Ford Park Infiltration Cistern Project

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

Magnitude=6.85 Acceleration=0.773g



CivilTech Corporation

60185137

Exhibit D-1

LIQUEFACTION ANALYSIS SUMMARY Copyright by CivilTech Software www.civiltechsoftware.com

Font: Courier New, Regular, Size 8 is recommended for this report. Licensed to , $\frac{11}{19}$ 2018 5: 17: 10 PM

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 Magni tude= 6.85

Input Data:

Surface Elev. = Hole No. =B-1 Depth of Hole=50.00 ft Water Table during Eart

Water Table during Earthquake= 30.00 ft Water Table during In-Situ Testing= 90.00 ft

Max. Acceleration=0.77 g

Earthquake Magni tude=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 = 1.4Cb = 1.15

Borehole Diameter,
 Sampling Method,

CS= 1.13

 User request factor of safety (apply to CSR) , User= 1.3 Plot two CSR (fs1=User, fs2=1)

10. Use Curve Smoothing: Yes*

In-Situ Test Data:

Depth	SPT	gamma	Fines
ft		pcf	%
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 15. 00 20. 00 25. 00	16. 00 15. 00 14. 00	120.00 120.00 120.00 120.00	4.00 65.00 9.00 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 CRRm CSRfs F.S. S_sat. S_dry S_all ft in. in. in. Page 1

^{*} Recommended Options

B1.sum

```
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
                 0.64
        0.16
                          5.00
                                   0.89
                                           0.00
                                                    0.89
9.50
                 0.64
                          5.00
                                   0.89
                                                    0.89
        0.15
                                           0.00
        0.19
                                   0.89
10.50
                 0.64
                          5.00
                                           0.00
                                                    0.89
11.50
        0.29
                 0.64
                          5.00
                                   0.89
                                           0.00
                                                    0.89
                                                    0.89
12.50
        0.42
                                   0.89
                 0.63
                          5.00
                                           0.00
13.50
        2.52
                 0.63
                          5.00
                                   0.89
                                           0.00
                                                    0.89
14.50
        2.52
                          5.00
                                   0.89
                                           0.00
                                                    0.89
                 0.63
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
                          5.00
                                   0.89
                                           0.00
                                                    0.89
                 0.62
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
                                   0.89
                                                    0.89
                 0.61
                          5.00
                                           0.00
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
                          0.49*
        0.30
                 0.61
                                   0.81
                                           0.00
                                                    0.81
31.50
        0.32
                 0.61
                          0.53*
                                   0.66
                                           0.00
                                                    0.66
32.50
                          0.57*
                                           0.00
        0.35
                                   0.51
                                                    0.51
                 0.62
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
                                                    0.00
41.50
                 0.64
                                   0.00
                                           0.00
        2.34
                          3.67
42.50
        2.33
                 0.64
                          3.65
                                   0.00
                                           0.00
                                                    0.00
43.50
        2.32
                                           0.00
                                                    0.00
                 0.64
                          3.63
                                   0.00
44.50
        2.31
                 0.64
                                   0.00
                                           0.00
                                                    0.00
                          3.61
45.50
        2.29
                 0.64
                                   0.00
                                           0.00
                                                    0.00
                          3.60
46.50
        2.28
                 0.64
                          3.58
                                   0.00
                                           0.00
                                                    0.00
47.50
        2.27
                          3.57
                                                    0.00
                 0.64
                                   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)

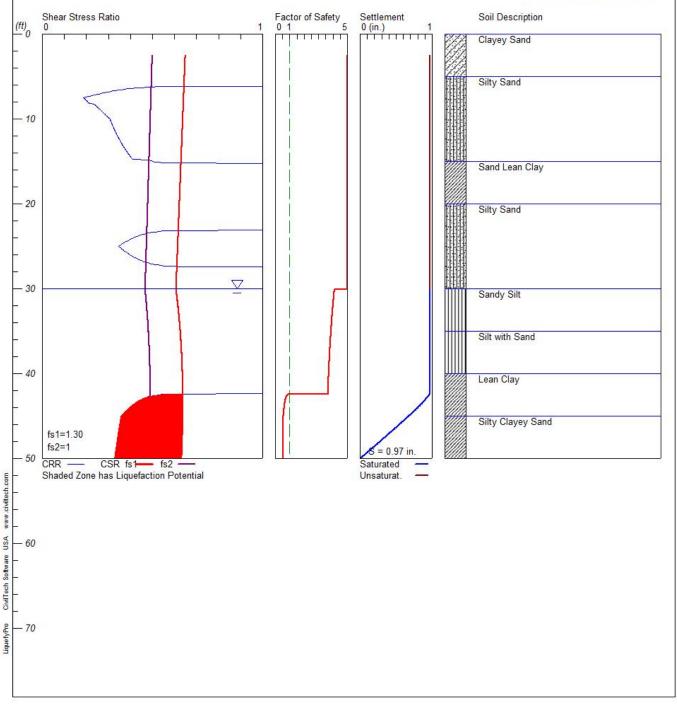
Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

LIQUEFACTION ANALYSIS

John Anson Ford Park Infiltration Cistern Project

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

Magnitude=6.85 Acceleration=0.773g



LIQUEFACTION ANALYSIS SUMMARY

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Input File Name: N:\Projects\2018\60185137\Working Files\Calculations-Analyses\B2.lig

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 Magni tude= 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 Magni tude=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,7. Borehole Diameter,

Ce = 1.4

Cb= 1.15 Cs= 1.2

8. Sampling Method,

9. User request factor of safety (apply to CSR), User= 1.3 Plot two CSR (fs1=User, fs2=1)

10. Use Curve Smoothing: Yes*

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.

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

^{*} Recommended Options

```
B2. sum
2.50
                          5.00
                                  0.97
                                           0.00
                                                    0.97
        2.52
                 0.65
3.50
        2.52
                 0.65
                          5.00
                                  0.97
                                           0.00
                                                    0.97
4.50
        2.52
                 0.65
                          5.00
                                  0.97
                                                    0.97
                                           0.00
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
        0.25
                                  0.97
                                                    0.97
8.50
                 0.64
                          5.00
                                           0.00
9.50
        0.29
                 0.64
                          5.00
                                  0.97
                                           0.00
                                                    0.97
10.50
        0.31
                 0.64
                          5.00
                                   0.97
                                                    0.97
                                           0.00
11.50
                                                    0. 97
                                  0.97
        0.33
                 0.64
                          5.00
                                           0.00
12.50
        0.35
                 0.63
                          5.00
                                  0.97
                                           0.00
                                                    0.97
13.50
                          5.00
                                  0.97
                                                    0.97
        0.37
                 0.63
                                           0.00
14.50
        0.40
                 0.63
                          5.00
                                  0.97
                                           0.00
                                                    0.97
        2.52
15.50
                                  0.97
                                                    0.97
                 0.63
                          5.00
                                           0.00
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
                          5.00
20.50
        2.52
                 0.62
                                  0.97
                                           0.00
                                                    0.97
21.50
                                  0.97
        2.52
                 0.62
                          5.00
                                           0.00
                                                    0.97
22.50
                                                    0.97
        2.52
                          5.00
                                  0.97
                                           0.00
                 0.62
23.50
        0.47
                 0.62
                          5.00
                                   0.97
                                           0.00
                                                    0.97
24.50
                          5.00
                 0.62
                                  0.97
                                                    0.97
        0.38
                                           0.00
25.50
        0.37
                 0.61
                          5.00
                                  0.97
                                           0.00
                                                    0.97
26.50
        0.43
                                  0.97
                                                    0.97
                 0.61
                          5.00
                                           0.00
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
                          4.03
        2.47
                 0.61
                                  0.97
                                           0.00
                                                    0.97
32.50
        2.46
                 0.62
                          3.98
                                   0.97
                                           0.00
                                                    0.97
33.50
                                  0.97
                                                    0.97
        2.45
                          3.93
                 0.62
                                           0.00
34.50
        2.43
                 0.63
                          3.89
                                  0.97
                                           0.00
                                                    0.97
35.50
                          3.85
                                           0.00
                                  0.97
                                                    0.97
        2.42
                 0.63
36.50
        2.41
                 0.63
                          3.81
                                  0.97
                                           0.00
                                                    0.97
37.50
        2.39
                                  0.97
                                                    0.97
                 0.63
                          3.78
                                           0.00
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
                                  0.97
40.50
        2.35
                 0.64
                          3.70
                                           0.00
                                                    0.97
41.50
                                  0.97
                                                    0.97
        2.34
                 0.64
                          3.67
                                           0.00
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
                          0.59*
                                  0.74
        0.37
                                           0.00
                                                    0.74
                 0.64
45.50
        0.35
                 0.64
                          0.55*
                                           0.00
                                                    0.61
                                   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
```

* F.S.<1, Liquefaction Potential Zone

(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

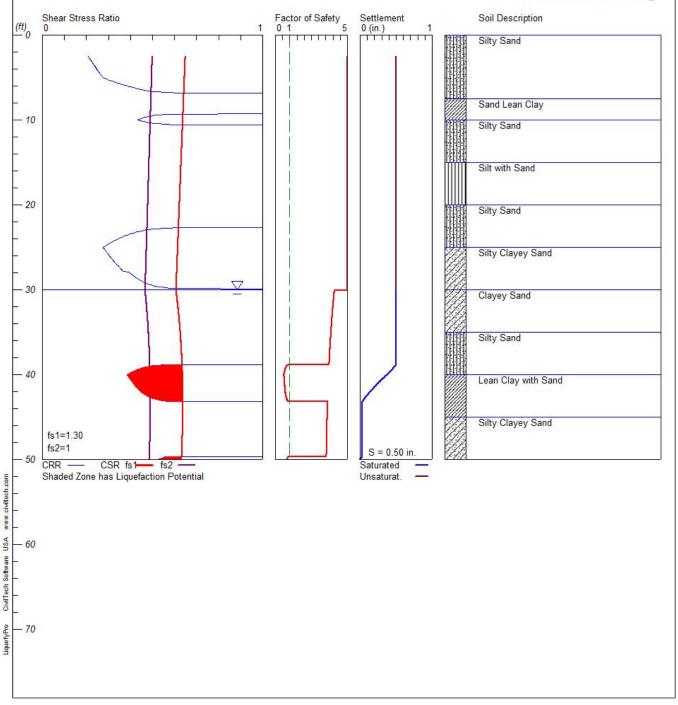
Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

LIQUEFACTION ANALYSIS

John Anson Ford Park Infiltration Cistern Project

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

Magnitude=6.85 Acceleration=0.773g



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 Magni tude= 6.85

Input Data:

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 Magni tude=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,7. Borehole Diameter,

Ce = 1.4

Cb= 1.15 Cs= 1.2

- 8. Sampling Method,
- 9. User request factor of safety (apply to CSR), User= 1.3 Plot two CSR (fs1=User, fs2=1)
- 10. Use Curve Smoothing: Yes*

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.

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

^{*} Recommended Options

```
B3. sum
2.50
                          5.00
                                           0.00
        0.21
                 0.65
                                  0.50
                                                    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
                                                    0.50
                                           0.00
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
                          5.00
13.50
        2.52
                 0.63
                                  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
                          5.00
20.50
        2.52
                 0.62
                                  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
                          5.00
                 0.62
        0.31
                                  0.50
                                           0.00
                                                    0.50
25.50
        0.29
                 0.61
                          5.00
                                   0.50
                                           0.00
                                                    0.50
26.50
        0.32
                                  0.50
                                                    0.50
                 0.61
                          5.00
                                           0.00
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
                          3.93
                                  0.50
                                                    0.50
                 0.62
                                           0.00
34.50
        2.43
                 0.63
                          3.89
                                  0.50
                                           0.00
                                                    0.50
35.50
                          3.85
                                           0.00
                                  0.50
        2.42
                 0.63
                                                    0.50
36.50
        2.41
                 0.63
                          3.81
                                  0.50
                                           0.00
                                                    0.50
37.50
        2.39
                          3.78
                 0.63
                                  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
                          0.62*
        0.40
                 0.64
                                  0.31
                                           0.00
                                                    0.31
41.50
                          0.67*
        0.43
                 0.64
                                  0.19
                                           0.00
                                                    0.19
42.50
                          0.74*
                                  0.09
                 0.64
                                           0.00
        0.47
                                                    0.09
43.50
        2.32
                 0.64
                          3.63
                                   0.03
                                           0.00
                                                    0.03
44.50
                                                    0.03
        2.31
                                           0.00
                 0.64
                          3.61
                                  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
```

* 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.