Appendix G

Geotechnical Investigation Report

Geotechnical Investigation Report

Hellman Gas Plant Expansion – Hellman Properties, LLC
Seal Beach, California
Project # IR18166880

Prepared for:

Hellman Properties, LLC
P.O. Box 2398, Seal Beach, California 90740

July 9, 2018

Geotechnical Investigation Report
Hellman Gas Plant Expansion
Hellman Properties, LLC
Seal Beach, California

July 9, 2018
Project IR18166800

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July 9, 2018

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1.0 Introduction

Wood Environment & Infrastructure Solutions, Inc. (Wood), formerly Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), prepared this geotechnical investigation report for Hellman Properties, LLC (Hellman), for the planned expansion at the Hellman Gas Plant located in Seal Beach, California. The vicinity is shown on Figure 1. Wood performed this geotechnical investigation in accordance with its proposal dated January 29, 2018.

This report has been prepared for Hellman and its project team members, to be used solely in the development of facilities described herein. This report may not contain sufficient information for other uses or the purposes of other parties.

1.1 Proposed Construction

Hellman plans to construct four new compressors and other auxiliary equipment at the plant. The preliminary grading plan dated July 3, 2018 was provided by SPEC Services, Inc., and layout of proposed structures is shown on Figure 2. The current ground elevation in the area of the planned expansion is typically +3 to +4 feet mean sea level (msl). Prior to constructing the planned improvements, a new earth pad will be constructed with a top elevation at 5 feet msl by placing 1 to 2 feet of fill. The compressors and other equipment are planned to be supported typically on individual mat or block type foundations supported on the new earth pad. These mat foundations are anticipated to be lightly loaded. Some of the compressors may be founded on combined large mat foundations depending on other design factors such as settlement potential and vibration performance. We understand a third-party consultant may be performing vibration analyses. There will be above ground pipelines between and around the proposed structures and possibly below ground pipelines. A centralized pipe-rack will also be constructed to accommodate interconnecting piping between the various equipment. The above ground pipelines will be supported by pipe supports with shallow foundations or with cast-in-drilled-hole (CIDH) piles.

1.2 Scope of Work

Our scope of work for the geotechnical investigation consisted of the following:

- Data review for preparation of the field exploration and geotechnical investigation report.
- Preparing a Health and Safety Plan for field exploration.
- Calling Underground Service Alert (USA) before exploration activities to mark buried utilities in the area of the explorations.
- Obtaining well permits for drilling from Orange County Health Care Agency.
- Advancing five Cone Penetrometer Test (CPT) soundings to 60 feet depth or equipment refusal.
- Drilling two mud-rotary borings, to depths 40 feet and 60 feet below ground surface (bgs).
- Drilling two hand-auger holes to 10 feet depth.
- Collecting soil samples for geotechnical and analytical laboratory testing.
- Performing engineering analyses for the proposed expansion, including seismic hazard evaluations.

Preparing a report that summarizes our results and provides recommendations for design and construction of proposed expansion.

2.0 Data Review

As part of this geotechnical investigation and prior to the explorations, Wood reviewed publicly available geologic and groundwater data. Wood also reviewed a geotechnical investigation report prepared by Geomatrix Consultants (Geomatrix, 2004), a Wood legacy company, for a tank farm project located approximately 500 feet to the east of the planned expansion location. A summary of our review is provided below.

Wood reviewed the seismic hazard zone report by the Department of Conservation Division of Mines and Geology (DCDMG, 1998 – Los Alamitos Quadrangle) and Earthquake Zones of Required Investigation Los Alamitos Quadrangle map by California Geological Survey (CGS, 1999). Based on CGS (1999), the planned location for the expansion is within an area/zone identified by the State of California as being potentially susceptible to liquefaction induced ground deformation and within an area encompassing active faults that constitute a potential hazard to structures from surface faulting. Hellman provided a map showing the estimated location of the Newport Inglewood Fault zone per soils report prepared by Medall Aragon, Worswick & Associates dated December 14, 1981, Project No. S1753C. Based on the notes on the map and our communication with Hellman, we understand the subject soils report is in a file with the city engineer of the City of Seal Beach. A copy of the map is included in Appendix A. Based on this map, the proposed location of the expansion is approximately 300 feet away from the estimated location of the fault trace as noted on the map by Mendall Aragon, Worswick & Associates. DCDMG (1998) includes a map of contours showing the depth to historical high groundwater levels. Based on this map, the historically high groundwater depth is 10 feet bgs in the vicinity of the site. Based on our review of topographic information in the vicinity of the site, the expansion location appears to be 3 to 4 feet lower in elevation than where groundwater depth is provided in DCDMG (1998). Therefore, historically high depth to groundwater can be considered to be approximately at 6 feet bgs at the expansion location based on DCDMG (1998) map.

Wood reviewed the geotechnical investigation report (Geomatrix, 2004) prepared for a tank farm approximately 500 feet to the east of the planned expansion location. Based on Geomatrix (2004), subsurface conditions at the tank farm site consisted of approximately 10 feet of surficial fine-grained soils underlain by granular soils. The fine-grained soils encountered were soft and the granular soils between depths of 10 feet and 25 feet below ground surface exhibited liquefaction potential with large seismically induced settlement potential.

3.0 Field Investigation and Laboratory Testing

The field investigation and laboratory testing program included pre-drilling activities, advancing five CPT soundings, drilling two exploratory borings and two hand-auger holes, collecting soil samples, and laboratory testing of soil samples retrieved during exploratory drilling. Field activities were conducted between March 13 and April 16, 2018, under the supervision of a licensed geotechnical engineer. Key aspects of the field program are described below. The results of the field exploration program, including logs of the borings and CPTs are provided in Appendix B of this report. The laboratory testing program and test results are provided in Appendix C.

3.1 Pre-Drilling Activities

Wood obtained well permits from the Orange County Health Care Agency prior to drilling and CPT work. Copies of the permits are included in Appendix D. Wood marked the planned exploration locations in the field for Underground Service Alert (USA) on March 13, 2018. After marking, USA was notified and allowed for two full working days for the providers to identify public utilities in the areas marked. The marked locations were also verified by Hellman's field representative with respect to known underground utility lines in the expansion area.

3.2 Cone Penetrometer Testing

Wood retained Kehoe Testing & Engineering (Kehoe) of Huntington Beach, California to perform CPTs at five locations. The CPTs were performed on April 11, 2018. The CPTs are designated CPT-1 through CPT-5 and the locations of the CPTs are shown on Figure 2. The CPT locations were hand-augered to 5 feet depth prior to advancing the CPT cone. All of the CPTs, except for CPT-3, were advanced to 60 feet depth. CPT-3 encountered equipment refusal at a dense sand layer at 40 feet and was terminated at that depth. Shear wave velocity (Vs) data of subsurface materials was collected in all of the CPT soundings. Upon retrieval of the CPT cone, the holes were backfilled with bentonite chips. The CPT report provided by Kehoe is included in Appendix B.

3.3 Exploratory Borings

Wood retained SoCal Drilling of La Habra, California, to drill 2 mud-rotary borings (B-2 and B-4) and two hand-auger holes (B-1 and B-3) at the approximate locations shown on Figure 2, and to collect soil samples. The drilling work was performed on April 16, 2018. The borings B-2 and B-4, were drilled to 40 feet and 60 feet depth, respectively. Hand-auger holes were drilled to 10 feet depth and were used only to collect samples for environmental testing.

The borings and hand-auger holes were drilled approximately within five feet away from the CPTs, to collect soil samples from specific intervals identified on those CPT logs. The mud-rotary boring locations were hand-augered to 5 feet depth prior to drilling. A boring specific sampling plan was developed for the borings. Soil samples were collected from each boring at selected depth intervals, typically no less than every two and a half feet within the upper 20 feet depth and every five feet thereafter, using a Standard Penetration Test (SPT) sampler, California-Modified sampler, or Shelby Tube. The hammer blow counts required to drive the SPT and California-Modified split spoon samplers to the desired depths were recorded. Bulk samples were collected at each boring and hand-auger-hole location from hand-augering cuttings. Environmental samples were collected from each boring and hand-auger-hole at approximately 2 feet, 5 feet, and 10 feet depth bgs for analytical testing. Earth materials were visually classified in the field in general accordance with the Unified Soil Classification System and ASTM D 2488 by observation of the samples and cutting returns. Soil samples were transported to Wood's laboratory for testing to help characterize subsurface conditions and evaluate engineering properties of encountered materials. Notes

were made of any visual evidence of stains or odors. Wood used a Photoionization detector (PID) to screen soil samples and PID readings are noted on the boring logs. Detailed descriptions of field exploration and sampling procedures, and the boring logs are provided in Appendix B.

Upon completion of drilling, borings were backfilled with cement-bentonite grout and soil cuttings and drilling mud were drummed for analytical testing and disposal. Analytical tests were performed by Eurofins Calscience of Garden Grove, California. Based on the test results, the soil cuttings were characterized as non-hazardous for waste disposal purposes. A copy of the test results is included in Appendix E. Wood retained services of American Integrated Services, Inc. (AIS), for transportation and disposal of the drums. AIS picked up the drums from the site on May 7, 2018.

3.4 Laboratory Testing

Wood performed geotechnical laboratory tests on selected soil samples to help further evaluate engineering properties of the site soils. Tests performed included moisture content and dry density, percent passing No. 200 sieve, Atterberg limits, expansion index, direct shear, consolidation, R-value, compaction, and corrosion. Tests were performed in general conformance with relevant ASTM procedures except for corrosion testing, which was performed in accordance with California Department of Transportation (Caltrans) methods. Wood's Irvine Office testing laboratory and AP Engineering and Testing, Inc., of Pomona, California, performed the tests. A description of the laboratory testing program is included in Appendix C. Results or abbreviations of the laboratory tests are presented on the boring logs in Appendix B, and on laboratory test sheets in Appendix C.

Analytical tests were performed on soil samples collected from the four borings. Soil samples were analyzed for the following constituents for waste characterization evaluation, and soil drill cuttings from the investigation were disposed as a non-hazardous waste.

- Total petroleum hydrocarbon (TPH) using EPA Method 8015M
- Total Recoverable Petroleum Hydrocarbons (TRPH) using EPA Method 418.1
- Volatile organic compounds (VOCs) using EPA Method 5035/8260B
- Title 22 Metals using EPA Method 6010B and 7471A (mercury)

4.0 Discussion of Findings

The following discussion of findings is based on the results of our field exploration and laboratory testing programs and our review of existing geologic and geotechnical data for the area.

4.1 Surface Conditions

The area of the expansion is undeveloped and the ground surface is bare and covered with native vegetation. There are dirt access roads around the planned location and the general area is relatively flat.

4.2 Subsurface Conditions

The subsurface conditions as encountered in the explorations consisted of fine-grained soils to depths of 18 feet to 20 feet bgs. The fine-grained soils are typically classified as medium to high plasticity clays within the upper 7 to 10 feet and underlain with low to medium plasticity silts and clays. The fine-grained soils within the upper 18 to 20 feet bgs were soft to stiff in consistency. The fine-grained soils were underlain by a 5 to 8 foot thick medium dense to dense silty sand to poorly graded sand layer. Below this upper sand layer is an approximately 5-foot thick stiff to very stiff medium plasticity clay layer. This second fine-grained soil layer was underlain by an approximately 10-foot thick dense sand layer to an approximate depth of 38 to 42 feet. This lower dense sand layer was underlain by very stiff to hard low plasticity silt to the depth of termination at 60 feet bgs.

4.3 Engineering Properties

Based on the laboratory test results, the in-situ dry density and moisture content of the upper fine-grained soils (i.e., 18 to 20 feet bgs) vary from about 88 to 98 pounds per cubic foot (pcf), and 28 to 34 percent, respectively. For underlying fine-grained soils, the in-situ dry density and moisture content vary from about 92 to 112 pcf, and 19 to 31 percent, respectively.

A total of 13 Atterberg Limits tests were performed on the fine-grained soil samples collected. The liquid limit (LL) and plasticity index (PI) for the shallow (within upper 7 to 10 feet) relatively plastic clayey soils were 61 and 40 respectively. The LL and PI for the relatively low plasticity silt soils underlying the surficial clay soils within the upper fine-grained soil layer (approximately between 7 and 20 feet bgs) vary from 22 to 33 and 3 to 8, respectively. The LL and PI for the relatively thin fine-grained soil layer in between the dense sand zones were 30 to 48 and 17 to 23, respectively. The LL and PI for the lower fine-grained layer (below approximately 40 feet bgs) consisting of silt soils vary from 31 to 37 and non-plastic (essentially zero plasticity) to 14, respectively.

One direct shear test was performed on a relatively undisturbed sample of the clay native soils near ground surface collected from boring B-2. Based on the direct shear test results, the sample exhibited large displacement friction angle of 12 degrees and cohesion of 157 psf. The upper fine-grained soils are classified as medium to high plasticity as discussed in Section 4.2.

Two consolidation tests were performed on relatively undisturbed samples of the upper clayey soil layer. The samples tested exhibited over-consolidation ratios (OCRs) of approximately 2 to 2.5. The estimated recompression ratios from the tests were 1 and 2 percent.

Expansion index (EI) test was performed on the clayey soils near ground surface. The EI value for the sample was 121, indicating high expansion potential, based on criteria presented in ASMT D 4829.

One R-value test was performed on a composite soil sample from the near surface clay soils collected in borings B-3 and B-4. The R value of the samples tested was 13.

Corrosion suites of tests were performed for pH, resistivity, chloride content, and sulphate content of the near surface clay soils. The corrosion test results are discussed in Section 6.10.

4.4 Groundwater Conditions

Wood could not measure depth to groundwater within the borings drilled because the drilling method uses drilling mud in the hole. Depth to groundwater was measured immediately after removing the CPT cone within the CPT holes and depths ranging between 7 to 9 feet were reported. Several dissipation tests were performed in the CPT soundings. Based on the dissipation test data, the depth to groundwater at the time of CPT soundings were estimated as 4 to 7 feet bgs. As discussed in Section 2.0, the historically high depth to groundwater level was inferred as approximately 6 feet bgs. Based on the dissipation test results, the design groundwater level should be considered as 4 feet bgs which corresponds to -1 feet mean sea level, therefore 6 feet below the top of planned earth fill pad (i.e., 5 feet above mean sea level). The near ground surface soils are relatively high plasticity and exhibit high moisture content and likely near saturation even within the upper 4 feet bgs above the considered groundwater level.

4.5 Analytical Test Results

As discussed in Section 3.4, analytical tests were performed on soil samples collected at specified depths in the four borings and soil drill cuttings from the investigation were disposed of as non-hazardous waste. Below is a summary of the soil analytical results.

- Metals were detected in each soil sample:
  - Metals concentrations were compared to ten times the soluble threshold limit concentration (10 X STLC) and 20 times the total threshold limit concentration (20 X TCLP) equivalents for soil to evaluate if further analysis is needed for waste characterization and profiling as a California hazardous waste or as a Federal hazardous waste. Metals results were below these equivalent levels.
  - Metals concentrations were also compared to US EPA Residential and Industrial Regional Screening Levels (RSLs) (*https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables*). Of these samples, arsenic exceeded the RSLs. The RSLs for arsenic are 0.68 mg/kg and 3 mg/kg for Residential and Industrial, respectively. Arsenic was detected above the RSLs at concentrations of 1.15 to 20.4 mg/kg. Of the arsenic sample results, the 2.5-foot soil sample results at borings B-1, B-2 and B-4 exceeded the upper-bound background concentration of 12 mg/kg for arsenic in soil within Los Angeles County (Department of Toxic Substances Control, 2008).
- Total petroleum hydrocarbons (TPH) were not detected in the soil samples. However, hydrocarbons at TRPH were detected in two soil samples at concentrations of 18 and 15 mg/kg in soil at respective depth of 5.5 and 10 feet in boring B-3. Although TRPH includes a full range of hydrocarbons that may be related to naturally occurring petroleum hydrocarbons or oil field related activities, the concentrations of TRPH in these samples are below the Los Angeles Regional Water Quality Control Board (RWQCB; updated 2004), Maximum Soil Screening Levels (MSSLs) for TPH above drinking water aquifers (for groundwater less than 20 feet, the MSSL for diesel range is 100 mg/kg and for the heavy hydrocarbon range is 1000 mg/kg).

Benzene was detected at 1.2 µg/kg at borehole B-3 at 2.5 feet. This concentration is below the RSLs, but within the range of RWQCB MSSLs for benzene in soil above a drinking water aquifer for sands, silts and clays (1.1 to 4.4 2 µg/kg).

5.0 Seismic Considerations

The proposed expansion is likely to experience strong ground motions as a result of a moderate to large earthquake on nearby or distant active faults. The design of the proposed upgrades should consider these effects. The following sections discuss seismic hazards, including fault rupture, seismically-induced landslides, and liquefaction-related hazards. The 2016 California Building Code (CBC; California Buildings Standards Commission, 2016) seismic design parameters are provided in Section 5.2.

5.1 Surface Fault Rupture

As discussed in Section 2.0, the site is located within an area identified as potentially over a zone encompassing active faults that constitute a potential hazard to structures from surface faulting per DCDMG (1998). As discussed in Section 2.0, Hellman provided a map showing the calculated location of the Newport Inglewood Fault zone per soils report prepared by Medall Aragon, Worswick & Associates dated December 14, 1981, Project No. S1753C, and a copy of the map is included in Appendix A. Based on this map, the proposed location of the expansion is approximately 300 feet northeast of the calculated location of the fault trace.

5.2 Seismic Design Parameters

The following seismic design parameters for the project were developed in accordance with 2016 California Building Code, Chapter 16 Section 1613 (CBC 2016) and ASCE Standard ASCE/SEI 7-10 (ASCE 7-10; ASCE, 2010).

Because of the liquefaction potential at the site as discussed later in Section 5.5, according to ASCE 7-10 Chapter 20 Section 20.3.1, for structures having fundamental periods of vibration longer than 0.5 seconds, the site should be classified as Site Class F and site-specific ground motion procedures should be followed as described in ASCE 7-10 Chapter 21 Section 21.1 which requires site response analyses. Site response analyses are not in the scope of this investigation. If such analyses are needed, Wood should be contacted. For structures with fundamental periods equal to or less than 0.5 seconds, ASCE 7-10 permits the site not to be classified as Site Class F per Section 20.3. Therefore, based on the subsurface conditions encountered in our explorations, the site was classified as Site Class "D". A site location of 33.753155° N and 118.095911° W was used for developing the seismic design parameters. The mapped spectral acceleration parameters for the Risk-Targeted Maximum Considered Earthquake (MCE_R) in the CBC, for risk category I, II, or III, and the site soil conditions are:

- Site Class: D
- Mapped spectral accelerations for short periods S_S: 1.563 g
- Mapped spectral accelerations for a 1-s period S_1: 0.585 g
- Site Coefficient F_a: 1.0
- Site Coefficient F_v: 1.5
- Adjusted MCE_R spectral acceleration for short periods $S_{MS} = F_a S_S$ = 1.563 g
- Adjusted MCE_R spectral acceleration for a 1-s period $S_{M1} = F_v S_1$ = 0.878 g
- Five-percent damped design spectral response acceleration at short periods S_{DS}: 1.042 g
- Five-percent damped design spectral response acceleration at 1-second period S_{D1}: 0.585 g
- Long-period transition period T_L: 8 seconds

Based on the 2016 CBC and ASCE 7-10, for geotechnical analyses (liquefaction, seismic settlement, lateral spreading), the peak ground acceleration (PGA) adjusted for Site Class effects (PGA_M) is 0.603 g. Parameters above and the PGA_M are based on probability of exceedance of 2 percent in 50 years.

5.3 Seismically Induced Landslides

Based on the DCDMG (1998), the project site is not located within a zone classified as having a potential for seismically-induced landslides.

5.4 Earthquake Magnitude

De-aggregation of seismic hazard for PGA using the U.S. Geological Survey 2008 National Seismic Hazard Map source model (USGS, 2008) indicates that the Newport-Inglewood Fault with a modal moment magnitude of M = 7.1 at a site to source distance of 0.16 kilometers (500 feet) contributes the most to the probabilistic ground motion hazard at the site.

5.5 Liquefaction

Liquefaction is a phenomenon in which saturated granular soils transform from a solid to a liquefied state when subjected to large, rapid loadings such as strong ground shaking during an earthquake. The transformation to a liquid state occurs due to the tendency of granular materials to compact, which consequently results in increased pore water pressure accompanied by a significant reduction in the effective stress. The change of state occurs most readily in recently deposited (i.e., geologically young) loose to moderately dense granular soils. The liquefaction susceptibility is highly dependent on the density of the soil, wherein looser soils are generally more susceptible. Furthermore, the consequences of liquefaction are also density dependent. In loose materials, soil liquefaction can result in a significant loss of shear strength, which is often accompanied by large shear deformations. In moderately dense to dense materials, liquefaction may temporarily induce high excess pore water pressures, but the tendency to dilate during shear inhibits major strength loss and large ground deformations.

5.5.1 Liquefaction Susceptibility Criteria

It is widely understood that fine-grained soils are generally less susceptible to soil liquefaction compared to clean sands. Significant new research has developed new liquefaction susceptibility criteria for fine-grained soils. Bray et al. (2006) performed laboratory testing on soils that were and were not observed to have liquefied in Adapazari, Turkey, during the 1999 Kocaeli earthquake, and concluded that the amount of clay minerals best indicates a soil's susceptibility to liquefaction. Hence, Bray et al. (2006) recommended that loose soils meeting the following criteria should be considered susceptible to soil liquefaction: (1) the PI is ≤ 12; and (2) the natural moisture content is > 0.8 times the LL. Boulanger and Idriss (2006) also investigated liquefaction characteristics of fine-grained soils and recommended that the term liquefaction be reserved to describe the development of significant strains or strength loss in soils exhibiting a sand-like behavior, while the term cyclic softening can be used to describe similar phenomena in soils exhibiting clay-like behavior. Boulanger and Idriss (2006) further recommended that for practical purposes, clay-like behavior can be expected for fine-grained soils that have a plasticity index ≥ 7, and the behavior transitions from sand-like to clay-like over the range of PI values between 3 and 8. Both Bray et al. (2006) and Boulanger and Idriss (2006) focus on fine-grained soils having fines content greater than 50% per definition. Boulanger and Idriss (2006) notes that the criteria for fine-grained soils could be applied to soils with fines content between 35% and 50% where the fine-grain matrix controls the soil behavior. Boulanger and Idriss (2006) recommend further evaluation of specific site soils where the decision on "clay-like" behavior is critical on deciding the overall liquefaction susceptibility of the site.

The LL and PI values for various fine-grained soil layers encountered at the site are discussed in Section 4.3. The low plasticity silt soils within the upper fine-grained soil layer (approximately between 7 and 20 feet bgs) exhibit PI values ranging between 3 and 8. The natural moisture content of the silt in this zone is approximately 90 to 100 percent of the corresponding LLs. The fine-grained silty soils below approximately 40 feet depth exhibit PI values ranging between non-plastic (essentially zero) to 14. The natural moisture content of these soils is approximately 74 and 87 percent of the corresponding LLs. The clay layers within the upper 7 to 10 feet and the 5-foot thick clay layer in between the dense sand layers exhibited high plasticity. Based on the liquefaction susceptibility criteria discussed above, the low plasticity silts between 7 to 20 feet depth and below 40 feet depth should be considered as potentially liquefiable with sand-like behavior and the higher plasticity silts and clays should be evaluated for clay-like behavior. Based upon the review of the PI values relative to the CPT logs, a soil behavior index value, Ic, of 2.3 was selected as the approximate cutoff for a PI of 7 for use in liquefaction triggering analysis discussed in Section 5.5.2.

5.5.2 Liquefaction Triggering Analysis

Liquefaction triggering analyses were performed using the CPT data following the procedure outlined in Boulanger and Idriss (2014). The liquefaction induced settlement calculations were performed using the CPT data per Zhang et al (2002). Liquefaction triggering analyses using CPT data was performed using a commercially available software program, CLiq (Geologismiki, 2015). The analysis results are included in Appendix F.

The seismic ground motion parameters used in liquefaction triggering analyses include peak ground acceleration (PGA), moment magnitude of the design earthquake, and the historically high groundwater level. As discussed in Section 5.1, the PGA_M, which corresponds to peak ground acceleration with probability of exceedance of 2 percent in 50 years at the site is 0.603g and the earthquake magnitude as discussed in Section 5.4 is 7.1. The analyses were performed for historic groundwater level at 4 feet bgs and considering the future raising of the site with an earth fill pad for approximately two feet.

The analyses were performed by limiting the liquefaction triggering analyses to Ic values less than 2.3 for sand-like behavior and including the cyclic softening analysis of clay-like behavior soils with Ic greater than 2.3. Based on the analysis results provided in Appendix F, the liquefaction triggering is anticipated only in scattered thin layers of non-plastic silt soils below 40 feet depth and cyclic softening of fine-grained soils are not anticipated.

5.5.3 Seismically Induced Settlement

The estimated settlements, as presented in Appendix F, vary between ½ inch and ¾ inch and the settlements are typically estimated to occur within the deep silt soils. It should be recognized that the uncertainty associated with estimation of seismically-induced settlement is on the order of ±50 percent. In consideration of the uncertainty, the range of seismically induced settlements may be between approximately ¼ inch and 1 inch, and the differential settlements at the ground surface could be up to ½ inch.

5.5.4 Bearing Capacity Failure

One potential consequence of liquefaction is bearing capacity or punching failures of foundations caused by the significant strength reduction in the underlying liquefiable soils during an earthquake. For the spread and mat foundations planned to support the compressors, a bearing capacity or punching failure is unlikely due to the separation between the bottom of the foundation and the top of liquefiable layer(s). If deep foundations are considered for the structures, the deep foundation elements should not be

designed to extend to a tip depth that is less than two pile diameters above the bottom of the dense sand layer. The elevation of the bottom of the dense sand layer varies from -33 feet to -39 feet msl at the site.

6.0 Design Recommendations

Based upon the results of our investigation, the proposed project is considered geotechnically feasible provided the recommendations presented herein are incorporated into the design and construction. If changes in the design of the structures are made, or variations or changed conditions are encountered during construction, Wood should be contacted to evaluate their effects on these recommendations.

6.1 Key Geotechnical Design Considerations

The planned expansion project involves construction of an earth fill pad, mat foundations for structures, and pipe supports. There are several key geotechnical considerations for design of these facilities, which are:

1. Soft, saturated, and highly expansive clay soils are present near ground surface.
2. Static settlements resulting from shallow fine-grained soils and potential seismically induced settlements of deep silt soils.
3. If CIDH piles are preferred as pipe support, the excavation of the piles will encounter saturated soil conditions with potential for caving and special construction considerations will be necessary.

Soft, saturated, and highly expansive clay soils are present near ground surface which should be over-excavated to provide a level uniform subgrade for the earth fill pad and provide adequate separation between the planned structures and the soft clays. Constructing the earth fill pad over the saturated soft clays may also require a stabilization zone. Wood recommends the earth fill pad to consist of a uniform thickness beneath the structures and provide at least three feet of separation between the mat or spread footing foundations and the native soft clays. The clay soils at the bottom of the over-excavation are anticipated to be saturated and soft based on the soil conditions encountered in our borings. Wood recommends placing a stabilization mat over the native soils exposed at the bottom of the over-excavation before constructing the earth fill pad. Over-excavation recommendations are discussed in Section 6.2.2.

The seismically induced settlement potential is discussed in Section 5.5.3. Static settlement potential resulting from the load associated with the earth fill pad itself is discussed in Section 6.3. The estimated settlement resulting from mat foundations and pipe supports are discussed in Section 6.4 and 6.5, respectively. The total settlement potential should be considered in design of the pipelines and associated connections to the compressors and auxiliary structures.

The site soils consist of saturated soils starting from ground surface and transition into low plasticity silts and sands at depth. The construction of CIDH piles will encounter wet drilling conditions for the entire length of the piles and potential for caving of soft clays near ground surface and granular soils at depth. Construction recommendations for CIDH piles are provided in Section 7.4.

6.2 Earthwork

Earthwork for the project is anticipated to consist of over-excavating for the earth fill pad, placement of nonwoven geotextile separator fabric and crushed aggregate stabilization mat, placement of fill for construction of the earth fill pad, and CIDH pile excavations for pipe supports, if selected as the foundation type.

All earthwork, including excavation, backfill and preparation of subgrade, should be performed in accordance with the geotechnical recommendations presented in this report and applicable portions of the grading code of local regulatory agencies. All earthworks should be performed under the observation and testing of a qualified geotechnical engineer.

6.2.1 Site Preparation

The initial site preparation will involve removal of the vegetative cover and over-excavating within the limits of earth fill pad. The excavated materials should be removed from the planned construction area and hauled to a suitable disposal area. The excavated soils are anticipated to be highly expansive and not suitable for use as backfill material.

All active or inactive utility lines within the construction area should be relocated, abandoned, or fully protected during construction. Larger conduits to be abandoned in-place should be filled with sand-cement slurry. If existing utilities are removed, the resulting excavations should be backfilled with properly compacted fill.

The construction area should be cleared of any vegetation and stripped of miscellaneous debris and other deleterious material. Organic matter and other material that may interfere with the completion of the work should be removed from the limits of the construction area. Vegetation, debris, and organic matter should not be incorporated into engineered fill. Organic rich soil may be stockpiled for future landscaping. All objectionable material from clearing and grubbing should be removed from the site and disposed of at a suitable off-site disposal area or landfill.

As discussed in Section 4.5, analytical testing was performed on soil samples collected in our borings. Even though the drill cuttings were classified as non-hazardous for waste disposal purposes and the results were below the screening levels, the analytical results indicate that some constituents were detected in the soil samples. Given the analytical results represent samples collected at four boring locations and at the specified depths, higher or lower concentrations of constituents may be present in soil that will be excavated during construction or over-excavation. Therefore:

- Soil analytical results should be included with the bid-specifications (if one is to be prepared for the project) or in the construction documents.
- Prospective bidders should be advised to evaluate site conditions and identify appropriate safety protocols.
- Additional soil testing may be needed, if soil disposal is required during over excavation or construction.

Also, due to the proximity of the active oil wells in the area, excavation work and construction should consider the potential for methane to be present in the subsurface.

6.2.2 Over-Excavation

Wood recommends the earth fill pad, which will have a top elevation of 5 feet msl, to consist of a uniform thickness beneath the structures and provide at least three feet of separation between the mat or spread footing foundations and the native soft clays. In other words, if the foundations were to bear at 1 foot below the top of earth fill pad, then the over-excavation of the site soils should be made to Elevation 1 foot (i.e., 4 feet below top of the earth fill pad) or lower.

Based on the preliminary grading plan for the expansion, the earth fill pad will be accessed by dirt road on the east side of the pad where there are no structures planned at this time. Wood recommends the same uniform over-excavation for the entire pad if there is potential for construction of future structures in this area. If future structures are not planned for this area, over-excavation should be performed to provide a minimum of 3-foot thick earth fill pad, corresponding to 2 feet msl for the bottom of over-excavation in these areas.

The clays at the bottom of the over-excavation are anticipated to be saturated and soft based on the soil conditions encountered in our borings. Wood recommends placing nonwoven geotextile at the bottom of

the over-excavation as a separator fabric and placing a minimum of 8-inch thick open-graded crushed rock as a stabilization mat to place the compacted earth fill pad on.

6.2.3 Fill Materials and Compaction Criteria

It is anticipated that up to four principal fill types may be used at the site. These are:

- Open-Graded Crushed Rock
- Aggregate Base
- Sand-Cement Slurry
- General Engineered Fill/Backfill

Relative compaction requirements discussed below refer to the percent of the maximum dry density and optimum moisture content as determined by ASTM D 1557 (latest edition).

6.2.3.1 Open-Graded Crushed Rock

Open-graded crushed rock may be used below mat foundations, as a drainage layer, and as the stabilization mat placed over a separator fabric placed over the soft native soils at the bottom of over-excavations for this project. The crushed rock should be an imported material that consists of durable rock and gravel that is free of deleterious material and free from slaking or decomposition under the action of alternate wetting and drying. The crushed rock should conform to ¾-inch gradation as provided in Table 1 and as stipulated in Section 200-1.2 of the latest edition of the Standard Specifications for Public Works Construction (Greenbook). This material should be surrounded by a filter fabric selected to prevent the migration of fines into the gravel.

These materials should have a durability index not less than 40. Crushed rock used for mat foundations should be moistened thoroughly and compacted with a minimum of three passes of plate- or roller-type vibratory compaction equipment, with lifts not thicker than 8 inches before being compacted. Crushed rock does not have a specified relative compaction requirement.

6.2.3.2 Aggregate Base

Imported crushed aggregate base or crushed miscellaneous base material may be used as part of pavement sections. These materials should meet the requirements in the Section 200 of the latest edition Greenbook. When placed beneath pavements, aggregate base should be compacted to a relative compaction of at least 95 percent. The moisture content of the material should be between 1 percent below and 3 percent above the optimum moisture content and the material should be placed in horizontal lifts that do not exceed 8 inches before being compacted.

6.2.3.3 Sand-Cement Slurry

Sand-cement slurry, also known as controlled density fill (CDF), or Controlled Low Strength Material (CLSM) in Section 201 of the Greenbook (latest edition) may be used to backfill localized areas where an alternative fill/backfill material to compacted fill material is needed. Sand-cement slurry should not be used for mass backfilling of the over-excavations. Sand-cement slurry consists of a fluid, workable mixture of aggregate, Portland cement, fly ash, and water. Sand-cement slurry can be batched to flow into irregularities in the bottoms and walls of excavations and trenches. It is an ideal backfill material when adequate room is limited or not available for conventional compaction equipment, or when settlement of the backfill must be minimized. No compaction is required to place sand-cement slurry.

The Greenbook provides broad specifications for the gradation of sand-cement slurry aggregate; however, more restrictive gradation requirements may be desirable to limit the fines content and the size of sand and gravel that may adversely affect (i.e., puncture or tear) the corrosion protection of pipes, for example. We recommend that no more than 15 percent of the aggregate pass through the No. 200 sieve; and the 28-day compressive strength of the CDF be no less than 50 and no more than 110 pounds per square inch (psi).

6.2.3.4 General Engineered Fill/Backfill

General engineered fill/backfill material should be granular soils with less than 30 percent of fines, free of organic material, debris, and other deleterious substances, and not contain fragments greater than 3 inches in maximum dimension. The engineered fill material should have an Expansion Index (EI) less than 50 (i.e., low expansion potential per ASTM D 4829) and an R value greater than 30. All general engineered fill/backfill should be scarified, plowed, disked, and/or bladed until it is uniform in consistency and free of large, unbroken clods of soil.

Before placement of general engineered fill/backfill, the bottom of over-excavation should be prepared in accordance with Section 6.2.2 above. General engineered fill/backfill should be placed in horizontal lifts that do not exceed 8 inches in thickness before compaction and the moisture content of the material should be adjusted to between 0 and 3 percent above the optimum moisture content. General engineered fill/backfill should be compacted with suitable equipment to a relative compaction of at least 90 percent. The final surface of the compacted fill/backfill should be graded to promote good surface drainage, as described in Section 6.2.4.

6.2.3.5 Select Sand

Select sand conforming to the gradation requirements in Table 2 may be used as a bedding material for pipelines as discussed in Section 6.8.2. The select sand should also have a minimum sand equivalent (SE) of 30, as determined by California Test Method 217. The select sand should be moisture conditioned and then compacted to 90 percent of the maximum dry density. Compaction of select sand by jetting may not be used.

6.2.4 Site Drainage

Final site grading should provide surface drainage away from at-grade structures and slabs-on-grade and toward suitable discharge facilities. Ponding of surface water should not be allowed adjacent to structures. The water from any downspouts should be directed in closed pipes to storm drains or other appropriate points of discharge. The contractor should implement drainage provisions during construction to divert rain and construction water away from open excavations.

6.3 Earth Fill Pad Settlement

As discussed earlier, the planned final top Elevation of the earth fill pad is +5 feet msl. The existing ground elevation in the area of the expansion is approximately +3 to +4 feet msl. Following the site preparation and over-excavation recommendations as discussed in Section 6.2.1 and 6.2.2, the estimated settlement resulting from the placement of the earth fill pad is approximately ½ inch. Differential settlement is expected to be one half of the total settlement over a distance of 30 feet. Because the soils near ground surface consist of saturated high plasticity clays, it is anticipated that these settlements will take place relatively slowly and significant portion of them may take place after the construction is completed.

6.4 Lightly Loaded Mat Foundations

It is anticipated that the new compressors and auxiliary equipment will be supported on shallow mat foundations on the earth fill pad. Based on the preliminary grading plan provided and our communications with the project team, typical size of mat foundations for the compressors are approximately 10 feet by 30 feet and they will be lightly loaded. The mat foundations should be founded at a minimum of 1 foot below the adjacent finished grade.

Following site preparation and over-excavation recommendations as discussed in Sections 6.2.1 and 6.2.2, at-grade mat foundations founded on compacted fill at near ground surface may be designed as discussed below.

6.4.1 Bearing Capacity and Settlement

The allowable bearing pressure for the planned mat foundation is controlled by allowable magnitude of settlement and not by bearing capacity. The total static settlement beneath the proposed mat foundations is estimated to be less than ½ inch for allowable net bearing pressure of 500 psf. The allowable bearing value is for the total of dead and sustained live loads. The allowable bearing pressure may be increased by one-third when considering transient loading conditions, including seismic or wind forces. Differential settlement is expected to be one half of the total settlement over a distance of 30 feet. The total static differential settlement should be assessed by incorporating the differential settlement that may result from the settlement of the subsurface soil because of the earth fill pad placement as discussed in Section 6.3.

If design of this mat foundation is based on elastic theory, a modulus of subgrade reaction (k) given by the following equation may be used for design.

$$\mathrm{k} = \frac{k_1}{B} \times \frac{(2L + B)}{3L}$$

where, k_1 (in units of pounds per cubic inch) is coefficient of subgrade reaction of a square foundation measuring one foot by one foot, and B and L are width and length (in units of foot) of the mat, respectively. A value of 100 pci for k_1 may be used for design of mat foundations at this site.

6.4.2 Lateral Load Resistance

Lateral load resistance for the shallow foundations will be developed by passive soil pressure against the sides of the footings below grade and by friction acting at the base of the concrete footings bearing on compacted fill. An allowable passive pressure of 200 psf per foot of depth, beginning from 1 foot below the lowest adjacent grade, may be used for design purposes. An allowable coefficient of friction of 0.30 may be used for dead and sustained live load forces to compute the frictional resistance of the slabs constructed directly on compacted fill. Safety factors of 2.0 and 1.5 have been incorporated in development of allowable passive and frictional resistance values, respectively. Under seismic and wind loading conditions, the passive pressure and frictional resistance may be increased by one-third.

6.5 Pipe Support Foundations

The pipes will either be supported on shallow foundations or CIDH pile foundations. Design recommendations for shallow foundations and CIDH pile foundations for pipe supports are provided in following sections.

6.5.1 Pipe Supports on Shallow Foundations

Based on the information provided by SPEC Services, typical shallow foundations for concrete sleeper type pipe supports consist of strip footings which are typically approximately 4 feet wide and as long as 30 feet long depending on the number of pipes supported. The shallow foundations should be founded at a minimum of 1 foot below the adjacent finished grade. The allowable bearing pressure of the shallow foundations with above dimensions for this project depends on the allowable settlement instead of the bearing capacity similar to the mat foundations discussed in Section 6.4. Following site preparation and over-excavation recommendations as discussed in Section 6.2.1 and 6.2.2, the allowable net bearing pressures for a 4-foot wide pipe support footing are 750 psf and 1,500 psf for ½ inch and 1 inch settlement, respectively. Differential settlement is expected to be one half of the total settlement over a distance of 30 feet.

Lateral load resistance for the shallow foundations will be developed by passive soil pressure against the sides of the footings below grade and by friction acting at the base of the concrete footings bearing on compacted fill. An allowable passive pressure of 200 psf per foot of depth, beginning from 1 foot below the lowest adjacent grade, may be used for design purposes. An allowable coefficient of friction of 0.30 may be used for dead and sustained live load forces to compute the frictional resistance of the slabs constructed directly on compacted fill. Safety factors of 2.0 and 1.5 have been incorporated in development of allowable passive and frictional resistance values, respectively. Under seismic and wind loading conditions, the passive pressure and frictional resistance may be increased by one-third.

6.5.2 Pipe Supports on CIDH Piles

Based on the information provided by SPEC Services, CIDH pile foundation analyses were performed for pile diameters of 24 inches and 30 inches. The construction recommendations for CIDH pies are provided in Section 7.4. The axial and lateral load carrying capacity evaluations are discussed below.

6.5.2.1 Axial Capacity

Wood developed axial compression capacities for 24- and 30-inch diameter CIDH piles using the computer program SHAFT v.6 by Ensoft Inc. (Ensoft, 2007). Figure 3 shows allowable axial compression capacity of CIDH piles in kips. The allowable compressive capacity omits any end bearing contribution. Potential for downdrag forces acting on the piles resulting from settlement of upper high plasticity clay layer was included. The axial capacities provided in Figure 3 are for dead plus live loads with a factor of safety of 2 on frictional resistance and does not rely on tip resistance. We recommend a minimum CIDH pile tip depth of 25 feet below the finished earth fill pad which corresponds to elevation -20 feet msl. The axial capacity provided may be increased by one third for transient loads, such as wind and seismic loads. The anticipated settlement of the pile head under the allowable static axial compression load is about 1 percent of the shaft diameter. It should be noted that pile foundations do not eliminate the potential seismically induced settlements as discussed in Section 5.5.3 and the seismically induced settlements in addition to the static settlements should be considered in design.

6.5.2.2 Lateral Load Capacity

Wood performed lateral load carrying capacity calculations for the CIDH piles using the computer program LPILE v.2016-09.009 by Ensoft, Inc. (Ensoft, 2016). Analyses were performed for 24- and 30-inch diameter CIDH piles. Based on the required minimum pile tip of the CIDH piles at elevation -20 feet msl, the lateral response of the piles installed to greater depths do not change noticeably. For each diameter, analyses were performed for a range of applied pile head shear and moment forces yielding 0.5 inches and 1.0 inch of lateral pile head deflection. The summary of analysis results is provided in Figures 4 and 5

and the plots of pile deflection, and moment and shear demands along the pile length are provided in Appendix G.

6.6 Deep Foundations

As an alternative to the at-grade mat foundations, deep foundation design recommendations are provided in this section. Deep foundations may be desirable if the static settlements resulting from the earth fill pad and the at-grade mat foundation or spread footing foundations are not acceptable. CIDH piles would need to be installed many feet below groundwater and encounter potentially caving excavations, which would require holes to be filled with slurry or cased during construction as discussed in Section 7.4. In our opinion, driven piles are considered to be the most suitable pile type for this project. Based on our experience and judgment from similar projects in Southern California, square precast prestressed concrete (SPPC) piles would be most appropriate to support the anticipated loads. The pile capacity analyses in the following subsection were performed for 12-inch and 14-inch SPPC piles.

The design of the pile foundations needs to consider the depth of the soils with liquefaction and seismic settlement potential. As discussed in Section 5.5, the non-plastic silt soils below the dense sand layer with bottom elevations ranging from -33 feet to -39 feet are susceptible to liquefaction. The driven piles should terminate well above this interface in order not to create a potential for bearing capacity failure of the pile tip upon potential liquefaction triggering. Therefore, axial capacity plots in following section are developed for a maximum tip depth corresponding to an elevation of -29 feet (i.e., 34 feet below top of planned earth fill pad). Additionally, predrilling maybe necessary through the upper medium dense to dense sand layers in order for the pile driving not to encounter early refusal.

6.6.1 Axial Load Capacity

Wood developed axial compression capacities for 12- and 14-inch SPPC piles using the computer program APILE v.5.0 by Ensoft Inc. (Ensoft, 2008). Figure 6 shows allowable axial compression capacity of SPPC piles in kips. Potential for downdrag forces acting on the piles resulting from settlement of upper high plasticity clay layer was included. The provided axial capacities in Figure 6 are for dead plus live loads with a factor of safety of 2 on frictional resistance and 3 for end bearing and may be increased by one third for transient loads, such as wind and seismic loads. We recommend a minimum pile tip depth of 25 feet below the finished earth fill pad which corresponds to elevation -20 feet msl. The anticipated settlement of the pile head under the allowable axial compression load is about 1 percent of the pile size. It should be noted that pile foundations installed to recommended pile tip depths above do not eliminate the potential seismically induced settlements as discussed in Section 5.5.3.

6.6.2 Lateral Load Capacity

Wood performed lateral load carrying capacity calculations for the SPPC piles using the computer program LPILE v.2016-09.009 by Ensoft, Inc. (Ensoft, 2016). Analyses were performed for 12- and 14-inch SPPC piles. Based on the recommended minimum pile tip elevation of -20 feet amsl, the lateral response of the piles installed to greater depths do not change noticeably. For each pile size, analyses were performed for a range of applied pile head shear and moment forces yielding 0.5 inches and 1.0 inch of lateral pile head deflection. The summary of analysis results is provided on Figures 7 and 8, and the plots of pile deflection, and moment and shear demands along the pile length are provided in Appendix H.

6.7 Dynamic Foundation Design Parameters

Shear wave velocity (Vs) measurements obtained from the CPTs and the average Vs profile are shown on Figure 9. In general, Vs increases with depth. From the ground surface to 20 feet bgs, Vs increases from

about 400 feet/sec to about 800 feet/sec. Vs value is approximately 800 feet/sec between depths of 20 feet and 50 feet, and approximately 900 feet below 50 feet depth to the bottom of the measurements at approximately 60 feet.

Dynamic response of foundations and structures depends on the magnitude, frequency, direction, and location of the dynamic loads. A significant parameter in evaluating the dynamic response of any type of motion is the inertia reaction of the foundation.

Significant vibratory loading by mechanical equipment can, in some cases, cause minor densification (settlement) of underlying soils, and excessive motions of foundations or structures. However, densification of the proposed fill pad beneath these structures will not likely be appreciable provided the fills are placed and compacted in accordance with the recommendations of this report.

It is recommended that foundations to support rotating equipment be isolated from the foundations of other structures. Design of rotating equipment foundations should be based on equipment manufacturer's specifications. A unit weight of 118 pcf and density of 3.642 pounds/(foot^2-Sec^2), a shear modulus Gmax equal to 3.642*(Vs)^2 in psf and a damping ratio of 0.997% at small shear strain (i.e., less than 0.0001 percent strain), and a Poisson's ratio of 1/3 may be used in design, where Vs is in feet/sec. At large shear strain, a strain compatible shear modulus G and damping ratio may be used. The strain compatible shear modulus G and damping ratio may be obtained from Table 3, which is based on the Vucetic and Dobry (1991) relationships for clay with a PI of 40.

6.8 Buried Pipelines

Currently, the pipelines are planned to be above ground supported on pipe racks and following foundation recommendations in Section 6.5. The following recommendations are for installing buried pipelines of the project, if needed, for completeness. The following terminology is used in this report for the purpose of presenting design recommendations for pipe trench excavation and backfill.

Bedding Zone - The bedding zone includes the full width of the trench from the bottom of the trench to the bottom of the pipe.

Pipe Zone - The bedding zone includes the full width of the trench from the bottom of the pipe to a horizontal level about 12 inches above the top of the pipe.

Trench Zone - The trench zone is the full width of the trench above the pipe zone to the ground surface.

6.8.1 Bearing Capacity and Settlement

Generally, the pressure imposed by the pipelines will be less than the existing soil overburden pressure at the proposed invert depths. Even though there may be some increase in the overburden pressure associated with the replacement of lighter existing fill with denser engineered fill, significant settlement is not anticipated along the alignment of the pipelines except for within the footprint of the earth fill pad. If buried pipelines are constructed within the footprint of the planned earth fill pad, total settlement of ½ inch and differential settlement of ¼ inch over 30 feet distance should be considered in pipe design as discussed in Section 6.3. Recommendations for bedding material and, if necessary, removal of unsuitable soils, are provided below.

6.8.2 Bedding Material

Pipes should be supported on firm material. Disturbed or loose materials at the bottom of the trenches should be removed to expose competent material prior to placement of bedding material. The bottom of the trenches should be separated by at least 1 foot of competent material. If native soft clay soils are exposed at the bottom of the trenches, the clay soils should be over-excavated for 1 foot and replaced

with open-graded crushed rock wrapped in nonwoven geotextile separator fabric. It is recommended that pipes be bedded on a minimum of 6 inches of crushed rock or select sand (in addition to the 1 foot crushed rock discussed above) meeting the gradation requirements presented in Tables 1 and 2 and Sections 6.2.3.1 and 6.2.3.5. The select sand should also have a minimum sand equivalent (SE) of 30, as determined by California Test Method 217. As an alternative to crushed rock or select sand, sand cement slurry may be considered if it is cost effective and/or it is the preference of the designer/owner. If sand cement slurry is used for bedding, the pipes should be placed on blocks or props that provide enough space underneath the pipe for the sand cement slurry to flow in.

6.8.3 Pipe Zone Material

Backfill to be placed in the pipe zone (the full width of the trench from the bottom to 12 inches above the top of pipe) should consist of crushed rock or select sand conforming to the gradation requirements recommended in Tables 1 and 2 (and Sections 6.2.3.1 and 6.2.3.5), or sand cement slurry as described in Section 6.2.3.3. Native materials are not suitable for use as pipe-zone backfill and import of backfill materials will be necessary.

6.8.4 Trench Backfill

The site subsurface materials generated from trench excavations are not considered suitable to be used as backfill in the trench zone. Import material to be used for earth fill pad should be used as trench backfill material. The material description for this material is described in Section 6.2.3.4.

6.8.5 Backfill Placement and Compaction Requirements

Backfill should be compacted by mechanical or vibratory equipment to achieve the required compaction standard. Flooding or jetting should not be used for compaction purposes.

Backfill should be placed on each side of the pipe simultaneously to avoid unbalanced loads on the pipe. All backfill should be moisture-conditioned to 0 to 3 percent above optimum moisture content and placed in lifts not exceeding 8 inches in thickness, and compacted to at least 90 percent of the maximum dry density in the pipe zone and trench zone. In paved areas, the upper 12 inches of subgrade and all overlying aggregate base rock within the trench zone should be compacted to at least 95 percent of maximum dry density. The maximum density and optimum moisture content for each material used should be determined in accordance with ASTM D 1557.

6.9 Pavement

All pavement areas should be designed to minimize water percolation through the pavement and subsequent saturation of the subgrade. It would be desirable to locate the flow lines away from high traffic areas. Recommendations for flexible asphalt concrete are provided below.

In areas of proposed pavements, the subgrade below the crushed aggregate base course, to a depth of 12 inches, should be moisture conditioned to between 0 and 3 percent above optimum moisture content and compacted to 95 percent of the maximum dry density as determined by ASTM D 1557. If feasible, recompacted sections should extend horizontally at least 2 feet beyond all pavement areas.

Laboratory test result on the near surface clayey soils indicates an R-value of 13. Based on our over-excavation recommendations provided in Section 6.2.2, the subgrade for pavements over the planned earth fill pad will consist of engineered fill. The engineered fill is specified to have a minimum R value of 30 as discussed in Section 6.2.3.4. Recommendations for conventional flexible pavement sections for various Traffic Index (TI) values based on California Department of Transportation Highway Design Manual

(Caltrans, 2012) are summarized in Table 4 based on an R-value of 30. The recommended sections consist of asphalt concrete over crushed aggregate or miscellaneous base and compacted subgrade soils.

Asphalt concrete should conform to Section 203 and 302 of the latest edition of the Standard Specifications for Public Works Construction (Greenbook). Crushed aggregate base or miscellaneous base should conform to Section 200 of the latest edition of the Greenbook. The crushed aggregate or miscellaneous base and subgrade soils should be compacted to at least 95 percent relative compaction.

6.10 Corrosion and Chemical Attack Resistance

Chemical analyses were performed at laboratories of AP Engineering. The chemical analyses included pH, chloride content, sulfate content, and minimum resistivity tests on two samples of shallow soils collected from the borings. Corrosion test results are presented in Appendix C.

The soil pH values were determined to be 9.8 and 9.9, which indicate the soils are strongly alkaline and severely corrosive. Based on correlations in the Navy Design Manual (NAVFAC DM-5, 1979), the sulfate and chloride content results indicate the soils tested are severely to extremely corrosive and the resistivity test results indicate the soils tested are severely corrosive. When in contact with ferrous materials, soils consisting of clay mixtures are considered to be heavily corrosive per NAVFAC DM-5.

The sulfate content test results indicate that injurious sulfate attack on concrete in contact with the soils tested is not a concern, according to American Concrete Institute (ACI) 318-14, Table 19.3.1.1. Refer to ACI-318 for appropriate concrete mix design. ACI makes no special requirements for cement type or water content when sulfate attack potential is negligible.

If ferrous materials are expected to be placed in contact with site soils, it may be desirable to consult a corrosion specialist regarding chosen construction materials, and/or protection design for the proposed facilities.

7.0 Construction Considerations

The following paragraphs discuss key considerations during construction of the proposed facilities.

7.1 Excavation Difficulty

Based on our field exploration program, earthwork can be performed with conventional construction equipment. Low ground pressure equipment may be necessary because of the presence of nearly saturated soft clays which will be exposed at the bottom of the over-excavations.

7.2 Temporary Dewatering

Based on groundwater levels encountered during this investigation, excavations for earthwork and foundation preparation for the at-grade structures are not expected to encounter groundwater. However, near ground surface soils are anticipated to be nearly saturated and wet soil conditions should be anticipated. The pipeline trenches, if excavated below 4 feet depth from the existing ground surface, may encounter groundwater. Also perched water conditions may be encountered during excavations. The need for dewatering limited amount of water may be anticipated.

7.3 Construction Slopes

Excavations during construction should be conducted so that slope failure and excessive ground movement will not occur. The short-term stability of excavation depends on many factors, including slope angle, engineering characteristics of the subsoils, height of the excavation and length of time the excavation remains unsupported and exposed to equipment vibrations, rainfall, and desiccation.

If and where spacing permits, and providing that adjacent facilities are adequately supported, open excavations may be considered. In general, unsupported slopes for temporary construction excavations above groundwater should not be expected to stand at an inclination steeper than 1.5:1 (horizontal: vertical) for the native soils.

Surcharge loads from vehicle parking and travel lanes or stockpiled materials should be kept away from the top of temporary excavations 10 feet or a horizontal distance equal to at least one-half the depth of excavation, whichever is greater. Surface drainage should be controlled along the top of temporary excavations to preclude wetting of the soils and erosion of the excavation faces. Even with the implementation of the above recommendations, sloughing of the surface of the temporary excavations may still occur, and workmen should be adequately protected from such sloughing.

7.4 CIDH Pile Installation

Proper installation of CIDH piles is important. Drilled holes should be inspected and approved by the geotechnical engineer before installation of reinforcement. Care must be taken during drilling to prevent disturbing the foundation material that will surround the pile. Equipment or methods used for drilling should not cause disturbance or caving of the shaft. The axis of the shaft should not deviate from plumb more than ¼ foot per 25 feet of the shaft length. After drilling, the pile should be constructed expeditiously, to prevent deterioration of the surrounding foundation material from exposure to air or from the presence of water.

During construction, soils encountered in the drilled shafts should be logged and the conditions of shafts should be reviewed and documented before pouring concrete. The bottoms of drilled shafts should be reasonably free of loose cuttings, slough, or debris before reinforcing steel is installed and concrete placed. If minor caving occurs, the loss of depth can be compensated for by increasing the lengths of the piers by subsequently overdrilling to a deeper depth.

The majority of soils anticipated to be encountered at the project site during drilling are fine-grained soils or interbedded layers of granular and fine-grained soils. Caving of the shallow soft fine-grained soils and deep granular soils in the drilled shafts should be anticipated. Installation of steel casings or using drilling mud in the drilled shafts may be required when such caving occurs. To minimize caving, concrete should be poured the same day the shaft is drilled. If casing is required, it should be withdrawn while placing concrete in the shaft. The casing should be removed slowly so that the level of concrete at all times is at least 2 to 3 feet above the bottom of the casing. If drilling mud is used, the mud mix design should be approved by the geotechnical engineer.

Water is anticipated to be present in drilled shaft based on the findings of our investigation. Therefore, concrete placement by the pumping and tremie method will be required. Both concrete mix and concrete placement should be addressed in the specifications. The pile reinforcing cage should be installed and the concrete pumped immediately after drilling is completed. No drilled shaft should be left open overnight. Specifications should require that sufficient space be provided in the pile reinforcing cage during fabrication to allow the insertion of a tremie pipe for concrete placement. The tremie pipe should extend to the bottom of the drilled shaft; be watertight, and fitted with some form of valve at its lower end. During concrete placement, the bottom of the tremie pipe should remain embedded at all times in at least 3 feet of concrete. Water and drilling mud, if used, should be pumped out of the excavation concurrently with the concrete placement operations. If casing is used, it should have an outer diameter equal or exceeding the design shaft diameter and be removed slowly. The casing should extend above ground surface and should always be filled with a sufficient head of concrete before it is completely removed. The tremie pipe should not be removed until clean concrete is observed at the top of the pile. The concrete of the pile should be dense and homogeneous. The methods used to place the concrete should prevent segregation. Concrete placed in dry, or dewatered drilled shafts should not be permitted to fall from a height greater than 5 feet without the use of adjustable length pipes or tubes. Concrete should be vibrated into place.

8.0 Post Investigation Services

It is recommended that final project plans and specifications be reviewed by Wood to determine the extent that the recommendations presented herein have been properly interpreted and incorporated into the contract documents. Following review of plans and specifications, observation and testing should be performed by a geotechnical engineer during construction to confirm that foundation elements are founded on and penetrate the recommended soils, and that suitable engineered fill/backfill soils are placed upon competent materials and properly compacted at the recommended moisture content.

9.0 Closure

The conclusions, recommendations, and opinions presented herein are: (1) based upon our evaluation and interpretation of the data obtained from our field and laboratory programs; (2) based upon an interpolation of soil conditions between and beyond the borings and CPTs; (3) are subject to confirmation of the actual conditions encountered during construction; and, (4) are based upon the assumption that sufficient observation and testing will be provided during construction.

If parties other than Wood are engaged to provide construction geotechnical services, they must be notified that they will be required to assume complete responsibility for the geotechnical phase of the project by concurring with the findings and recommendations in this report or providing alternate recommendations.

If pertinent changes are made in the project plans or conditions are encountered during construction that appear to be different than indicated in this report, please contact this office. Significant variations may necessitate a re-evaluation of the recommendations presented in this report.

10.0 References

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Zhang, G., Robertson. P.K., Brachman, R., 2002, Estimating Liquefaction Induced Ground Settlements from the CPT, Canadian Geotechnical Journal, 39: pp 1168-1180.

Tables

TABLE 1

CRUSHED ROCK GRADATION
Hellman Gas Plant Expansion
Hellman Properties, LLC
Seal Beach, California

U.S. Standard Sieve (ASTM E 11)	Percent Passing by Weight ¾-inch max.	Percent Passing by Weight 1-inch max.
1 inch	100	90-100
3/4 inch	90-100	30-60
1/2 inch	30-60	0-20
3/8 inch	0-20	0-20
No. 4	0-5	0-5
No. 8	0	0

TABLE 2

SELECT SAND GRADATION
Hellman Gas Plant Expansion
Hellman Properties, LLC
Seal Beach, California

U.S. Standard Sieve (ASTM E 11)	Percent Passing by Weight 3/8-inch max.
3/8 inch	100
No. 4	75-100
No. 40	10-50
No. 100	5-20
No. 200	0-15

TABLE 3

STRAIN COMPATIBLE SHEAR MODULUS REDUCTION AND DAMPING RATIO

Hellman Gas Plant Expansion

Hellman Properties, LLC

Seal Beach, California

Shear Strain (%)	G/Gmax	Damping Ratio (%)
0.0001	1	0.997
0.0002	1	1.039
0.0005	1	1.147
0.001	1	1.343
0.002	0.996	1.682
0.005	0.968	2.492
0.01	0.926	3.344
0.02	0.857	4.319
0.05	0.723	5.897
0.1	0.607	7.393
0.2	0.476	9.284
0.5	0.322	12.5
1	0.204	15.135
2	0.113	18.065
5	0.057	20.89
10	0.029	22.8

Notes:

1. G is strain compatible shear modulus.
2. Gmax is shear modulus at small shear strain (i.e., less than 0.0001 percent).

TABLE 4

FLEXIBLE ASPHALT CONCRETE PAVEMENT RECOMMENDATIONS

Hellman Gas Plant Expansion
Hellman Properties, LLC
Seal Beach, California

R-value > 30			
Traffic Index (TI)	**Asphalt Concrete Thickness (inches)**	**Crushed Aggregate Base or Miscellaneous Base Thickness (inches)**	**Compacted Subgrade Soil Thickness (inches)**
5	2.5	7.0	12
6	3.0	9.0	12
7	3.5	11.0	12
8	4.0	13.0	12

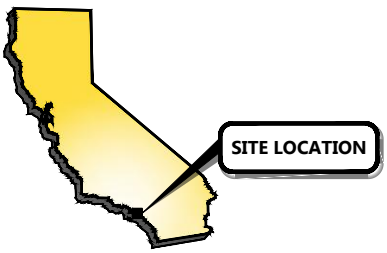
Figures

REFERENCE:

Esri World Street Map sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, OpenStreetMap contributors, and the GIS User Community. Aerial photo from Esri World Imagery: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, dated 7-9-2016.

0 750 1,500

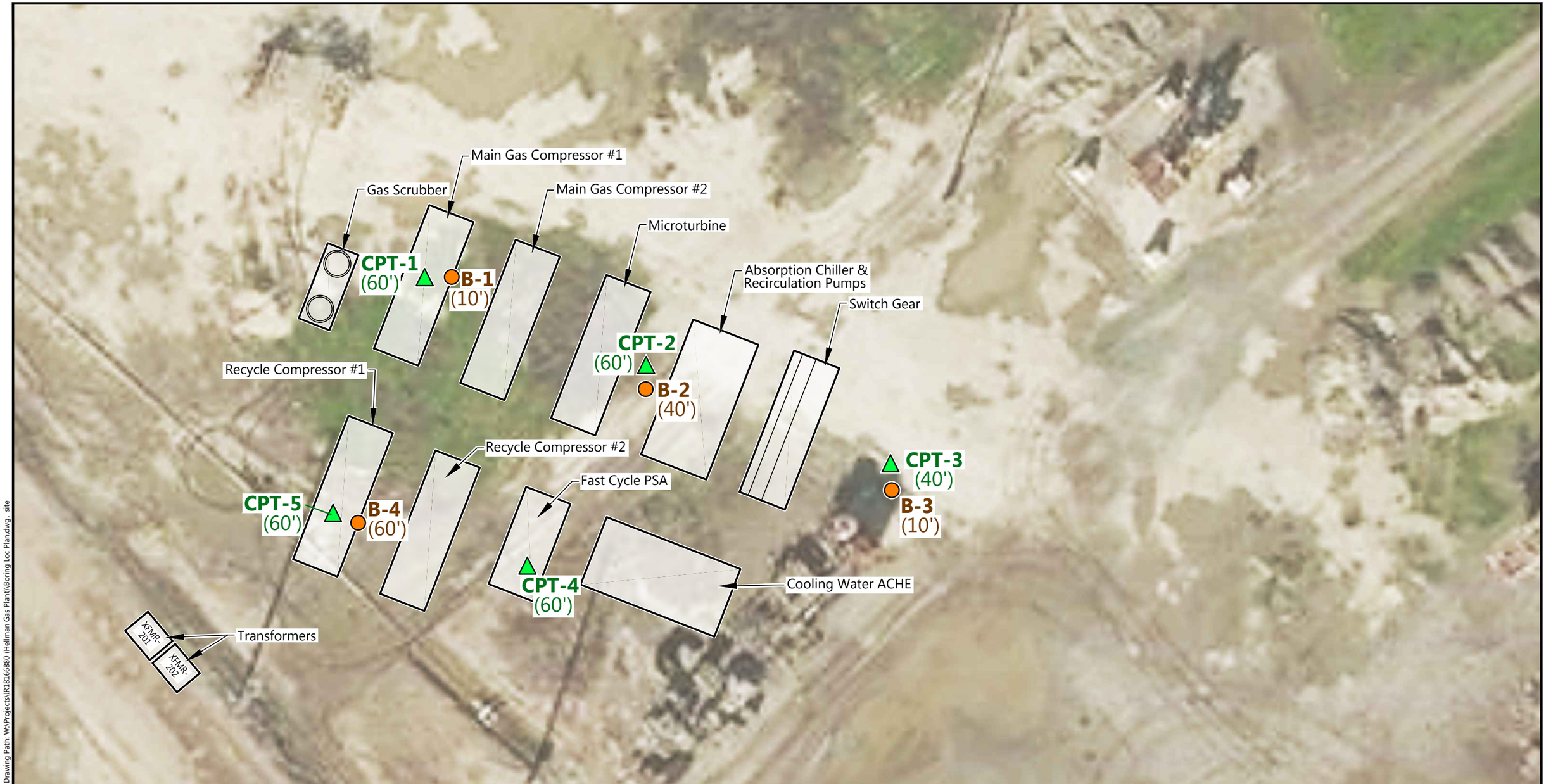
Approximate scale in feet



SITE LOCATION MAP
Hellman Gas Plant Expansion
Hellman Properties, LLC
Seal Beach, California

By: jrw	Date: 07/09/2018	Project No. IR18166880
wood.		Figure 1

Plot Date: 7/03/2018 5:14:11 PM, Plotted by: joanna.worker Drawing Path: W:\Projects\IR18166880 (Hellman Gas Plant)\Site Vicinity.dwg, Site Loc



Explanation

B-4 (40') — Boring location with depth in feet below ground surface (ft bgs)

CPT-5 (60') — Cone penetration test (CPT) location

Note:

All locations are approximate.

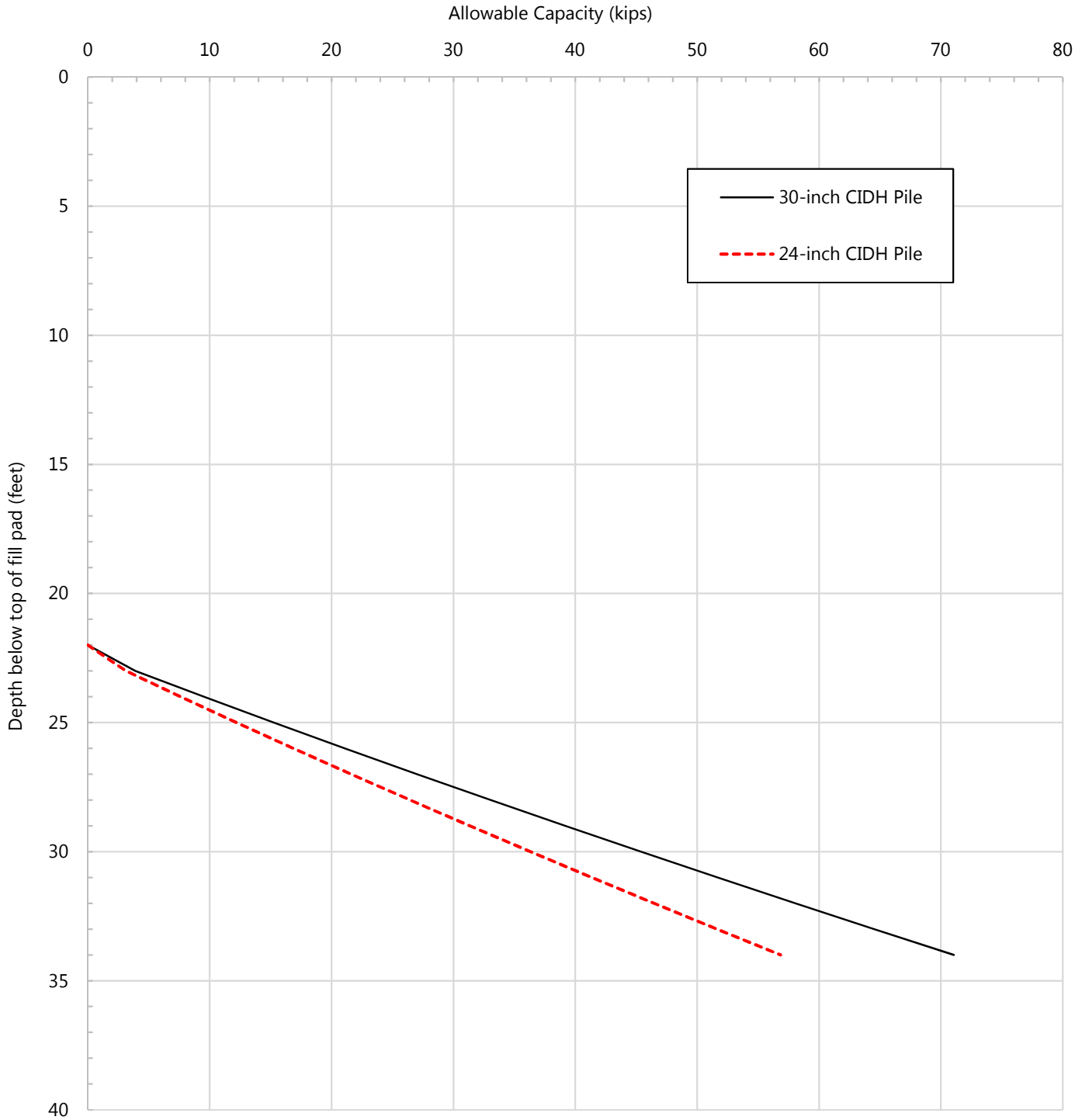
0 10 20
Approximate scale in feet

Basemap modified from a drawing by SPEC Services, Inc., titled: "Preliminary Grading Plan", dated 07/03/18, and an aerial photo from Bing (© HERE).

BORING LOCATION PLAN
Hellman Gas Plant Expansion
Hellman Properties, LLC
Seal Beach, California

By: jrw	Date: 07/09/2018	Project No. IR18166880
wood.		Figure 2

Plot Date: 7/03/2018 5:12:40 PM, Plotted by: joanna.worker Drawing Path: W:\Projects\IR18166880 (Hellman Gas Plant)\Boring Loc Plan.dwg, site



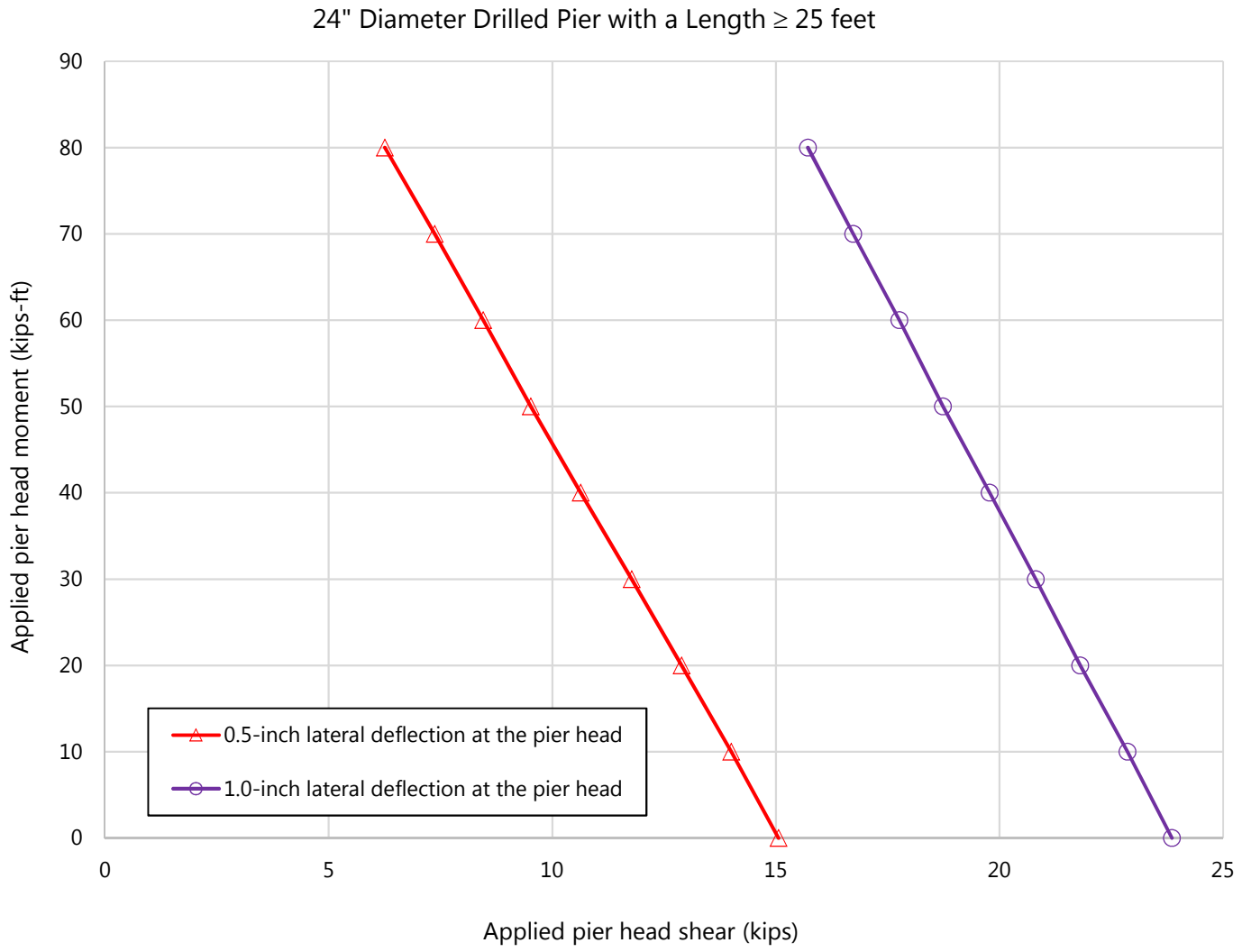
Notes:

1. The allowable capacity incorporated a factor of safety of 2 for skin friction and ignored end bearing.
2. The allowable capacity is for dead plus live loads and may be increased by 33% when considering transient live loads, including seismic and wind loads.

CIDH PILE AXIAL CAPACITY

Hellman Gas Plant Expansion
Hellman Properties, LLC
Seal Beach, California

By: LH	Date: 07/09/2018	Project No.: IR18166880
wood.		Figure 3

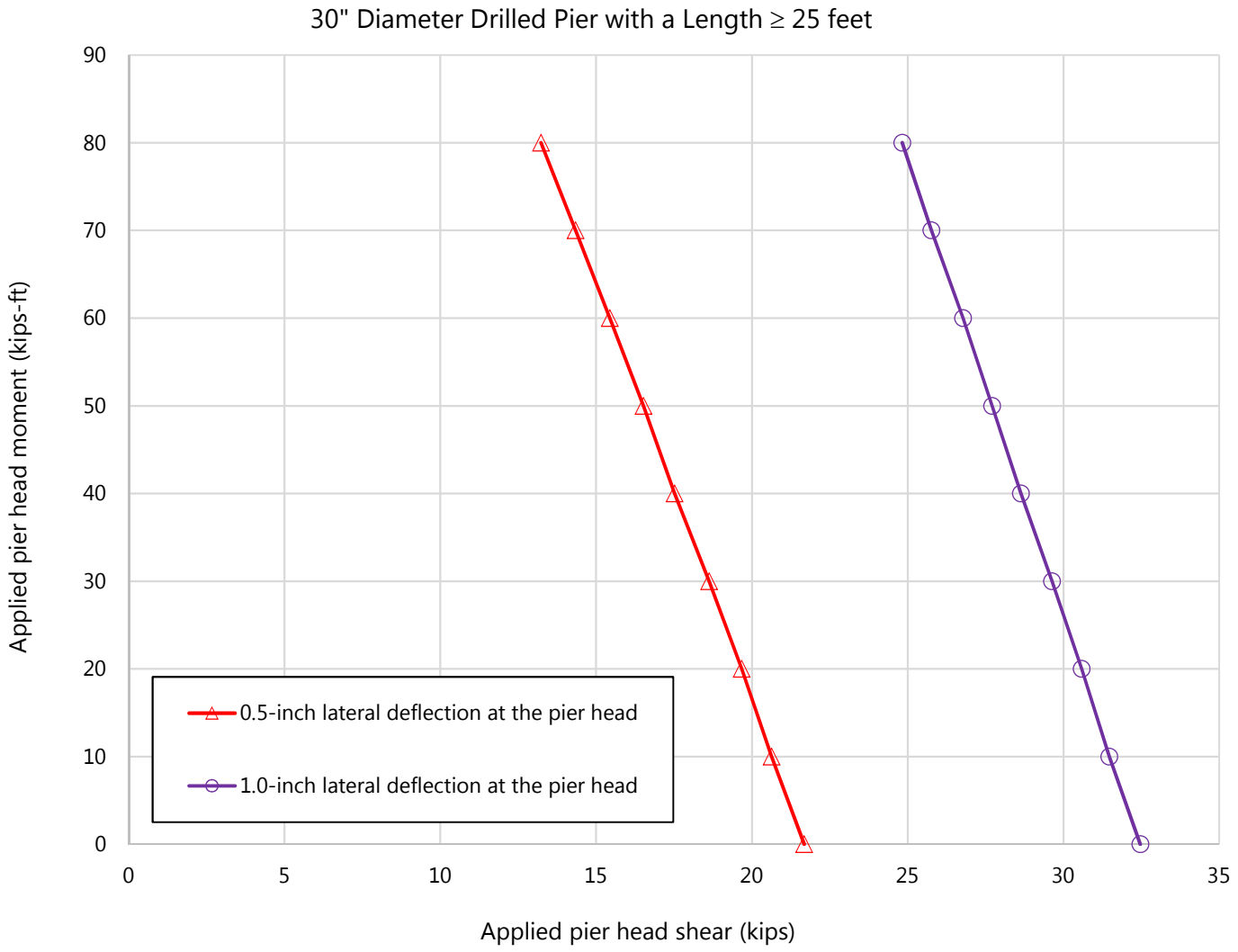


0.5-inch lateral deflection at the pier head									
Loading Case	1	2	3	4	5	6	7	8	9
Applied Pier Head Moment (kips-ft)	0	10	20	30	40	50	60	70	80
Applied Pier Head Shear (kips)	15.1	14.0	12.9	11.8	10.6	9.5	8.5	7.4	6.3
Maximum Moment in Pier (kips-ft)	74	75	77	79	81	84	88	93	97
Depth to Maximum Moment (feet)	9.0	8.5	8.0	7.5	6.8	6.3	5.8	5.3	4.5

1.0-inch lateral deflection at the pier head									
Loading Case	10	11	12	13	14	15	16	17	18
Applied Pier Head Moment (kips-ft)	0	10	20	30	40	50	60	70	80
Applied Pier Head Shear (kips)	23.9	22.9	21.8	20.8	19.8	18.7	17.8	16.7	15.7
Maximum Moment in Pier (kips-ft)	119	119	121	122	124	126	129	132	135
Depth to Maximum Moment (feet)	9.75	9.25	9	7.5	6.75	7.75	7.5	7	6.75

LATERAL LOAD CAPACITIES
FOR 24-INCH DIAMETER CIDH PILES
Storage Tank Expansion Project
Carson Crude Terminal
Carson, California

By: LH	Date: 07/09/2018	Project No.: IR18166900
wood.		Figure 4

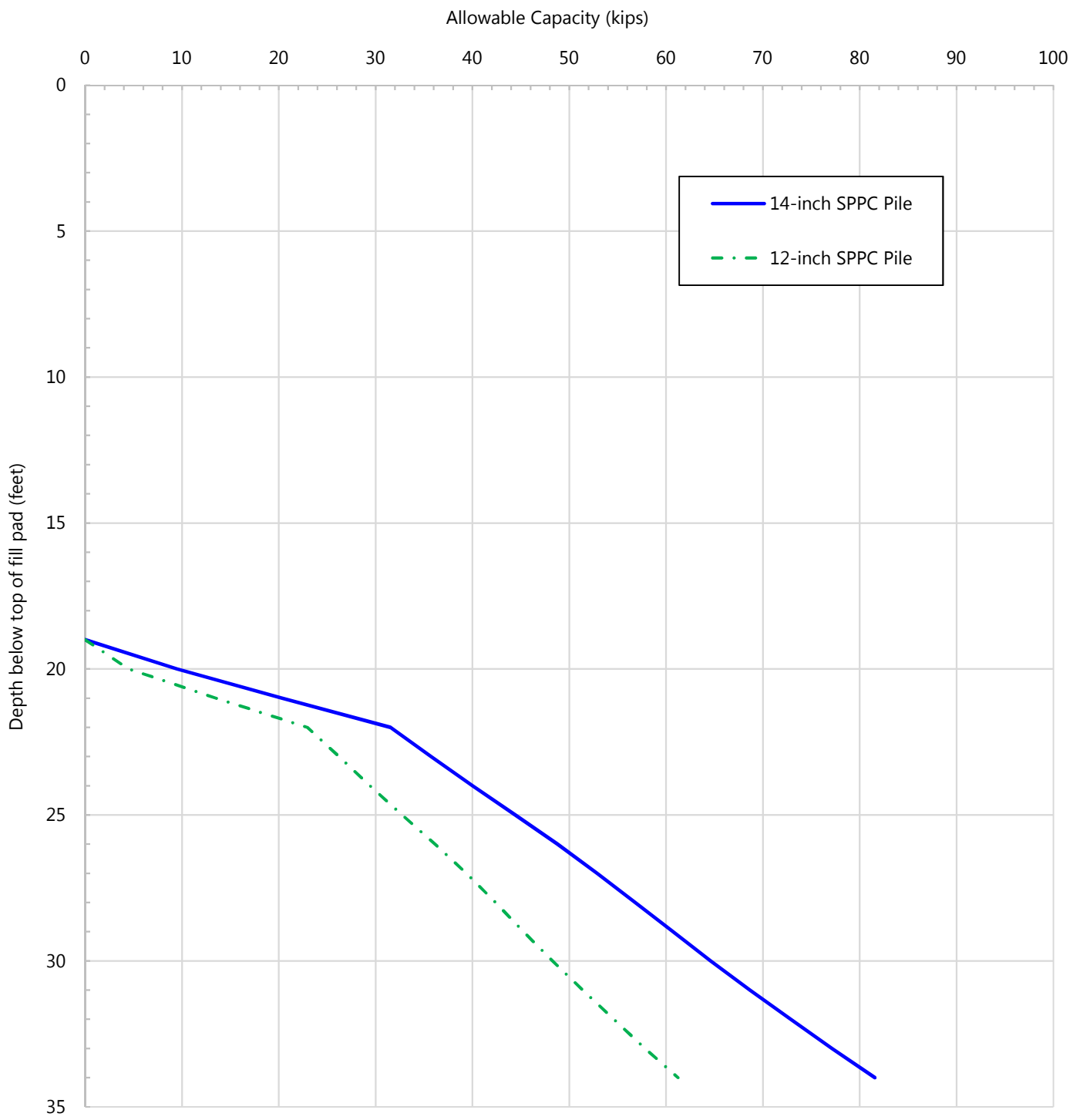


0.5-inch lateral deflection at the pier head									
Loading Case	1	2	3	4	5	6	7	8	9
Applied Pier Head Moment (kips-ft)	0	10	20	30	40	50	60	70	80
Applied Pier Head Shear (kips)	21.7	20.6	19.7	18.6	17.5	16.5	15.4	14.3	13.2
Maximum Moment in Pier (kips-ft)	131	130	131	131	131	133	134	135	137
Depth to Maximum Moment (feet)	11.3	10.8	10.3	10.0	9.5	9.0	8.5	8.0	7.5

1.0-inch lateral deflection at the pier head									
Loading Case	10	11	12	13	14	15	16	17	18
Applied Pier Head Moment (kips-ft)	0	10	20	30	40	50	60	70	80
Applied Pier Head Shear (kips)	32.5	31.5	30.6	29.6	28.6	27.7	26.8	25.8	24.8
Maximum Moment in Pier (kips-ft)	197.4	196.4	196.9	196.9	196.7	197.7	198.7	199.3	201
Depth to Maximum Moment (feet)	12.0	11.8	11.5	10.0	9.5	10.5	10.0	9.8	9.5

LATERAL LOAD CAPACITIES FOR
30-INCH DIAMETER CIDH PILES
Storage Tank Expansion Project
Carson Crude Terminal
Carson, California

By: LH	Date: 07/09/2018	Project No.: IR18166900
wood.		Figure **5**



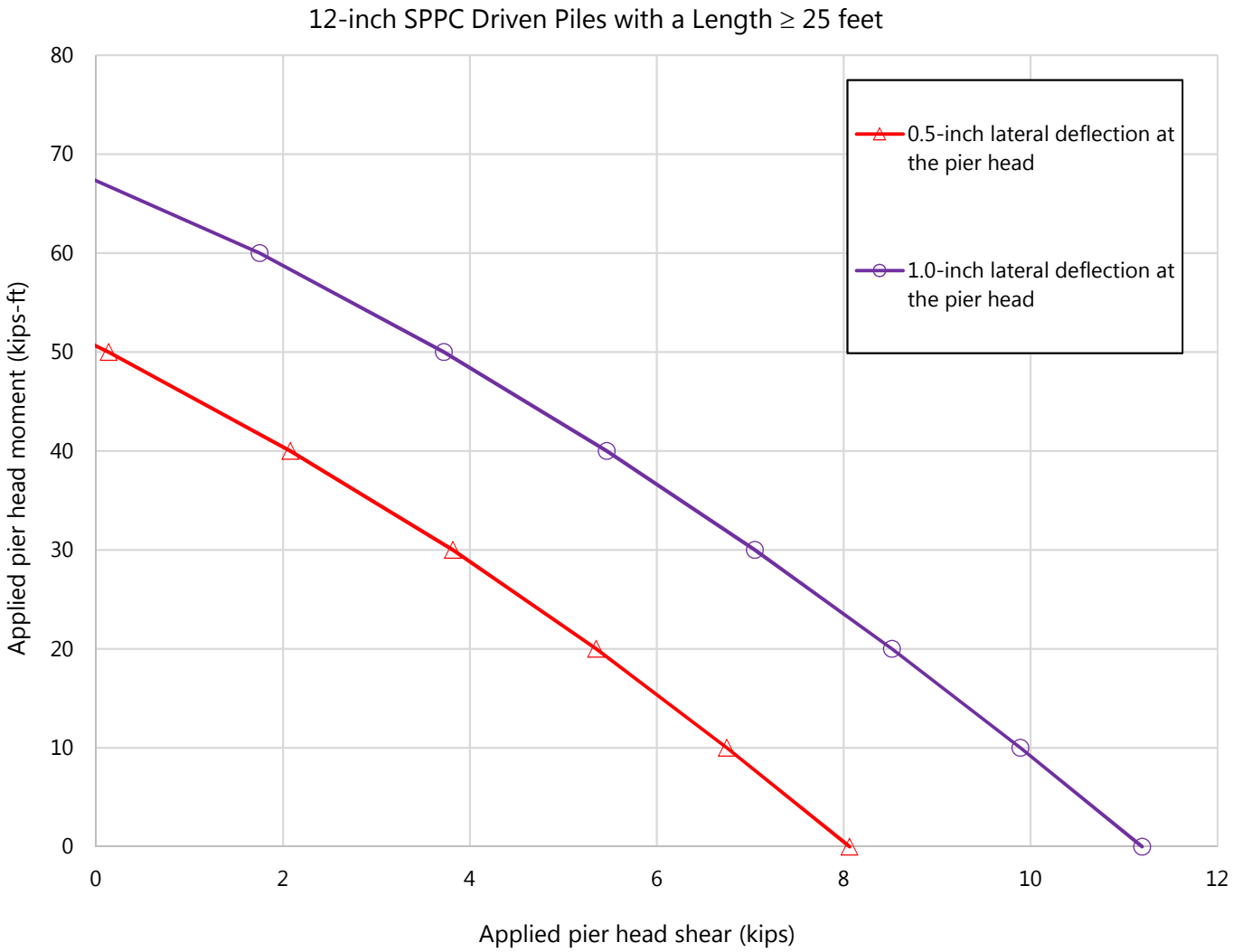
Notes:

1. The allowable capacity incorporates a factor of safety of 2 for skin friction and 3 for end bearing.
2. The allowable capacity is for dead plus live loads and may be increased by 33% when considering transient live loads, including seismic and wind loads.

SPPC PILE AXIAL CAPACITY

Hellman Gas Plant Expansion
Hellman Properties, LLC
Seal Beach, California

By: LH	Date: 07/09/2018	Project No.: IR18166880
wood.		Figure 6

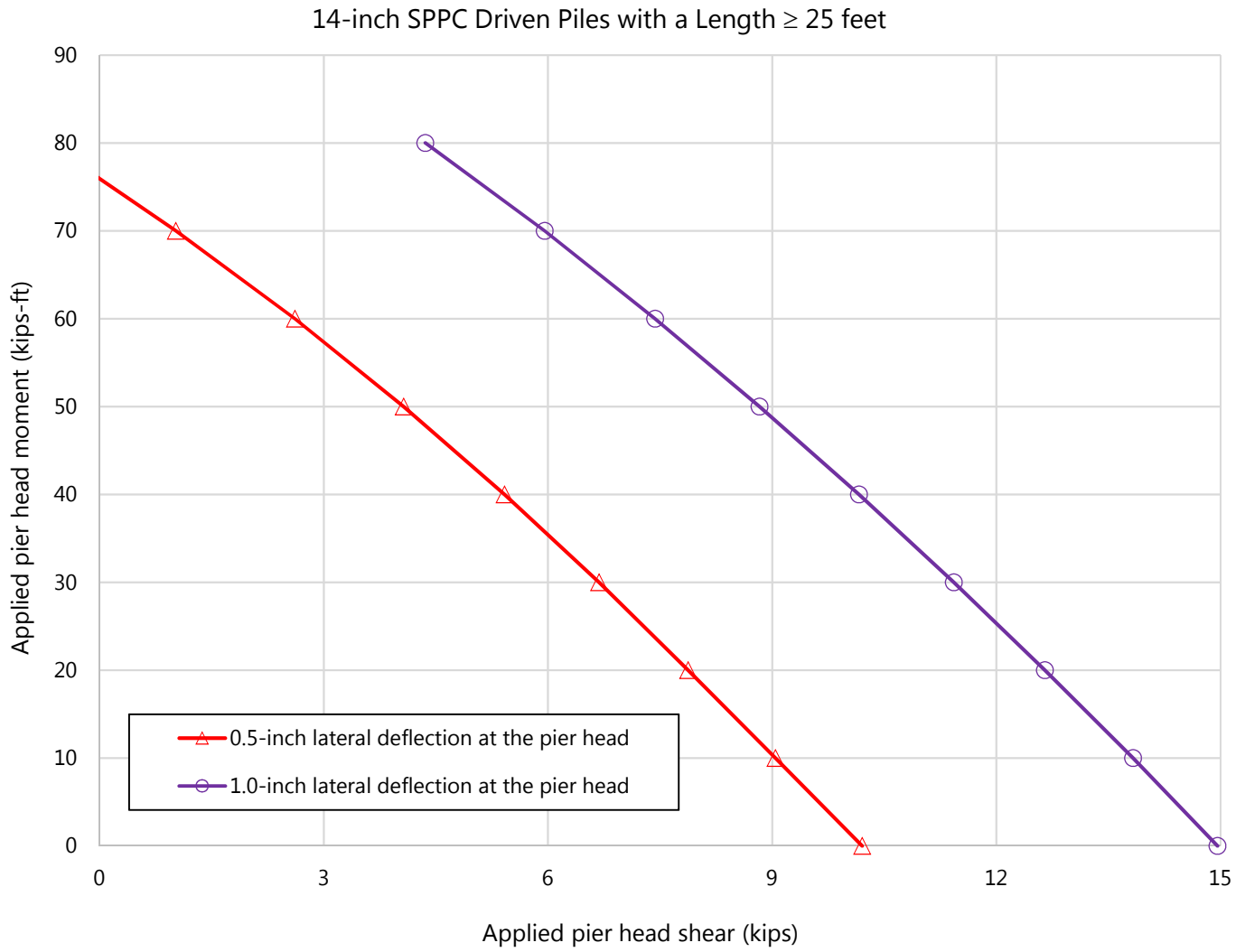


0.5-inch lateral deflection at the pier head									
Loading Case	1	2	3	4	5	6			
Applied Pier Head Moment (kips-ft)	0	10	20	30	40	50			
Applied Pier Head Shear (kips)	8.1	6.7	5.4	3.8	2.1	0.1			
Maximum Moment in Pier (kips-ft)	28	31	34	38	43	50			
Depth to Maximum Moment (feet)	6.5	5.75	4.75	3.5	2.25	0.5			

1.0-inch lateral deflection at the pier head									
Loading Case	10	11	12	13	14	15	16		
Applied Pier Head Moment (kips-ft)	0	10	20	30	40	50	60		
Applied Pier Head Shear (kips)	11.2	9.9	8.5	7.0	5.5	3.7	1.7		
Maximum Moment in Pier (kips-ft)	43	44	46	49	52	57	62		
Depth to Maximum Moment (feet)	7	6.25	5.5	1.75	0.25	2.75	1.75		

LATERAL LOAD CAPACITIES FOR
12-INCH SPPC DRIVEN PILES
Storage Tank Expansion Project
Carson Crude Terminal
Carson, California

By: LH	Date: 07/09/2018	Project No.: IR18166900
wood.		Figure 7



0.5-inch lateral deflection at the pier head									
Loading Case	1	2	3	4	5	6	7	8	
Applied Pier Head Moment (kips-ft)	0	10	20	30	40	50	60	70	
Applied Pier Head Shear (kips)	10.2	9.0	7.9	6.7	5.4	4.1	2.6	1.0	
Maximum Moment in Pier (kips-ft)	41	44	47	50	54	59	64	71	
Depth to Maximum Moment (feet)	7.5	6.75	6	5.25	4.5	3.5	2.75	1.5	

1.0-inch lateral deflection at the pier head									
Loading Case	10	11	12	13	14	15	16	17	18
Applied Pier Head Moment (kips-ft)	0	10	20	30	40	50	60	70	80
Applied Pier Head Shear (kips)	15.0	13.8	12.7	11.4	10.2	8.8	7.4	6.0	4.4
Maximum Moment in Pier (kips-ft)	65	66	68	70	72	75	78	83	88
Depth to Maximum Moment (feet)	8.3	7.8	7.0	4.3	2.8	5.3	4.3	3.5	2.8

LATERAL LOAD CAPACITIES FOR
14-INCH SPPC DRIVEN PILES
Storage Tank Expansion Project
Carson Crude Terminal
Carson, California

By: LH	Date: 07/09/2018	Project No.: IR18166900
wood.		Figure **8**

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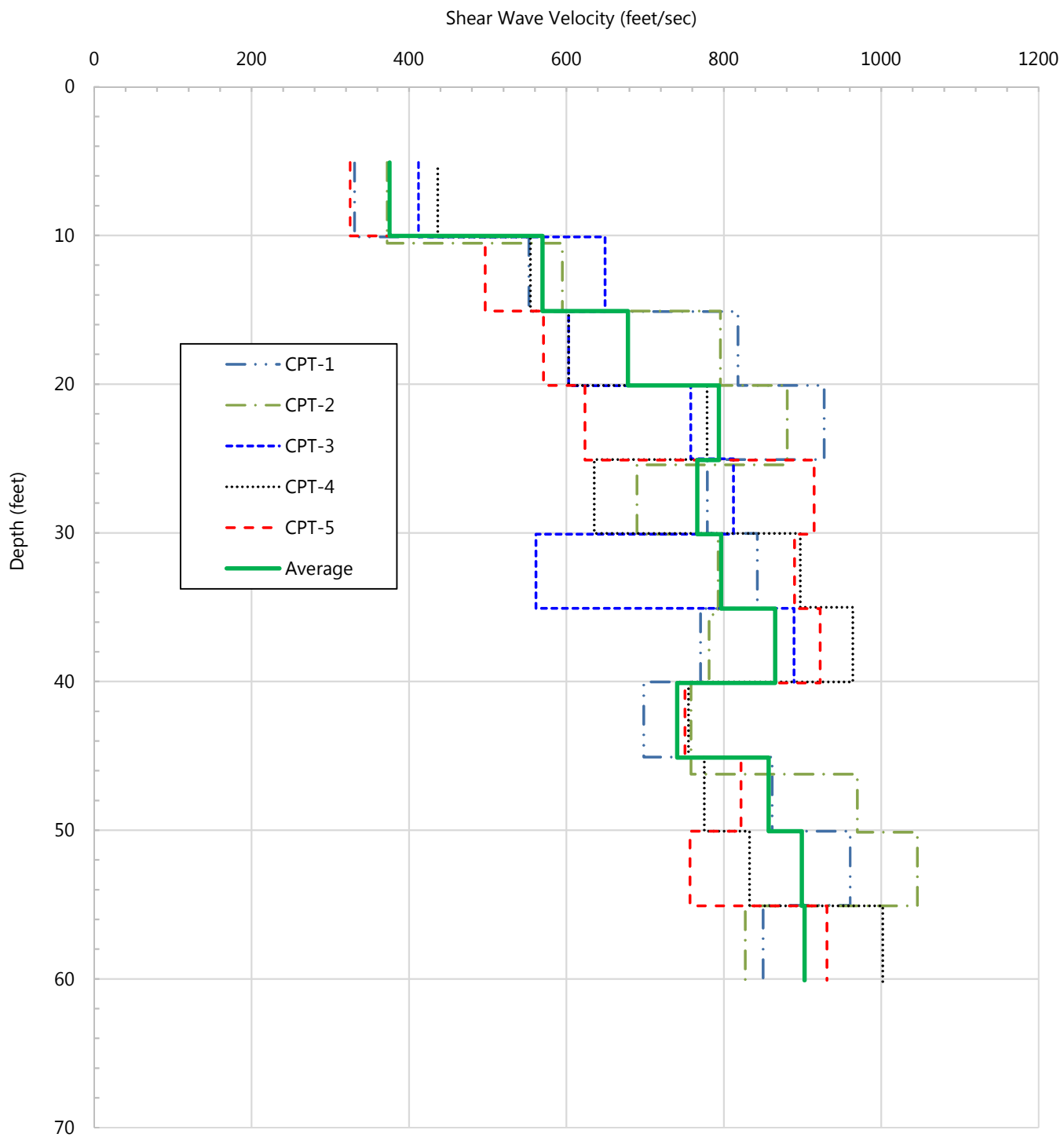

SHEAR WAVE VELOCITY PROFILE

Hellman Gas Plant Expansion

Hellman Properties, LLC

Seal Beach, California

By: LH	Date: 07/09/2018	Project No.: IR18166880
wood.		Figure 9

Appendix A

Fault Location Map provided by Hellman Properties LLC

TENTATIVE PARCEL MAP NO.
IN THE CITY OF SEAL BEACH
BASIS OF BEARINGS
BEARINGS HEREON ARE BASED ON THE CENTERLINE OF BOLSA AVENUE BEING N 89°48'45" W PER TRACT NO. 2590 MM. 82/32-38, RECORDS OF ORANGE COUNTY, STATE OF CALIFORNIA.
DESCRIPTION
ORANGE COUNTY FLOOD CONTROL DISTRICT
SCALE: 1"=80'
PARCEL 1
134.7 AC
PARCEL 2
4.9± AC
PARCEL 3
8.9± AC
PARCEL 4
27.3 AC
PARCEL A
8.8± AC
PARCEL B
.6± AC
PARCEL D
.1 AC
COUNTY OF LOS ANGELES
COUNTY OF ORANGE
PACIFIC COAST HIGHWAY
CITY YARD
CITY POLICE
TRACT NO. 2590 M.M. 82/32-38
TRACT NO. 1817 M.M. 82/26-31
AVALON DRIVE
SEAL BEACH BOULEVARD
LEGEND
ACREAGE SUMMARY
TOTAL
SOILS ENGINEER:
MEDALL, ARAGON, WORSWICK & ASSOC.
2168 S. HATHAWAY STREET
SANTA ANA, CA. 92705
(714) 546-6602
DEVELOPER:
MOLA DEVELOPMENT CORPORATION
8072 ADAMS AVE.
HUNTINGTON BEACH, CA. 92646
(714) 969-1343
SIGNATURE
DATE
Prepared in the office of
Church Engineering, Inc.
Consulting Engineers
Planners
Surveyors
2501 Alton Ave.
Irvine
CA 92714
(714) 660-8600
SIGNATURE
RCE 14488
DATE

Appendix B

Field Exploration Program

Appendix B

Field Exploration Program

Hellman Gas Plant Expansion
Hellman Properties, LLC
Seal Beach, California

The field exploration program described in this appendix was performed between March 13 and April 16, 2018, specifically for the planned expansion at the Hellman Gas Plant located in Seal Beach, California. The field exploration program included pre-drilling activities, drilling 2 mud-rotary borings and 2 hand-auger holes, advancing 5 cone penetration test (CPT) probes, and field screening of soil samples for the presence of organic vapor. The information provided herein depicts subsurface conditions at the specific locations and at the particular times that the explorations were made. Soil and groundwater conditions at these locations may have changed since these explorations were performed.

Pre-Drilling Activities

Wood obtained well permits from the Orange County Health Care Agency prior to drilling and CPT work. Copies of the permits are included in Appendix D. Wood marked the planned exploration locations in the field for Underground Service Alert (USA) on March 13, 2018. After marking, USA was notified and allowed for two full working days for the providers to identify public utilities in the areas marked. The marked locations were also verified by Hellman's field representative with respect to known underground utility lines in the expansion area.

Cone Penetrometer Testing

Wood retained Kehoe Testing & Engineering (Kehoe) of Huntington Beach, California to perform CPTs at five locations. The CPTs were performed on April 11, 2018. The CPTs are designated CPT-1 through CPT-5 and the locations of the CPTs are shown on Figure 2. The CPT locations were hand-augered to 5 feet depth prior to advancing the CPT cone. All of the CPTs, except for CPT-3, were advanced to 60 feet depth. CPT-3 encountered equipment refusal at a dense sand layer at 40 feet and was terminated at that depth. Shear wave velocity (Vs) data of subsurface materials was collected in all of the CPT soundings. Upon retrieval of the CPT cone, the holes were backfilled with bentonite chips. The CPT report provided by Kehoe is included in this appendix.

Mud-Rotary Borings

Wood retained SoCal Drilling of La Habra, California, to drill 2 mud-rotary borings (B-2 and B-4) and two hand-auger holes (B-1 and B-3) at the approximate locations shown on Figure 2, and to collect soil samples. The drilling work was performed on April 16, 2018. The borings B-2 and B-4, were drilled to 40 feet and 60 feet depth, respectively. Hand-auger holes were drilled to 10 feet depth and were used only to collect samples for environmental testing.

The borings and hand-auger holes were drilled approximately within five feet away from the CPTs, to collect soil samples from specific intervals identified on those CPT logs. The mud-rotary boring locations were hand-augered to 5 feet depth prior to drilling. A boring specific sampling plan was developed for the borings. Soil samples were collected from each boring at selected depth intervals, typically no less

than every two and a half feet within the upper 20 feet depth and every five feet thereafter, using a Standard Penetration Test (SPT) sampler, Modified-California sampler, or Shelby Tube. The hammer blow counts required to drive the SPT and Modified-California split spoon samplers to the desired depths were recorded. SPTs were performed in the borings at selected depths.

The SPT consists of driving a standard sampler, as described in the ASTM D1586-84 Standard Method, using a 140-pound automatic-trip hammer falling 30 inches. The SPT sampler had no room for liners inside the barrel and thus no liners were used. The number of blows required to drive the SPT sampler six inches of the sampling interval is recorded on the blow count column of the boring logs.

Depth-discrete engineering soil samples were collected at selected depth intervals from the borings using a 2½-inch inside diameter (I.D.) modified California split-barrel sampler fitted with 12 brass rings of 2 ½ inches in outside diameter (O.D.) and 1-inch in height and one brass liner (2½-inch O.D. by 6 inches long) above the brass rings. The sampler was lowered to the bottom of the boreholes and driven into the soil with the same hammer used for SPT. The number of blows required to drive the sampler six inches of the sampling interval is shown on the blow count column of the boring logs. After removing the sampler from the boreholes, the sampler was opened and the brass rings and liner containing the soil were removed and observed for soil classification. Brass rings containing the soil were placed in polyethylene bags and sealed in plastic canisters to preserve the natural moisture content of the soil.

Bulk samples were collected at each boring and hand-auger-hole location from hand-augering cuttings. Environmental samples were collected from each boring and hand-auger-hole at approximately 2 feet, 5 feet, and 10 feet depth bgs for analytical testing. Earth materials were visually classified in the field in general accordance with the Unified Soil Classification System and ASTM D 2488 by observation of the samples and cutting returns. Soil samples were transported to Wood's laboratory for testing to help characterize subsurface conditions and evaluate engineering properties of encountered materials. Notes were made of any visual evidence of stains or odors. Wood used a Photoionization detector (PID) to screen soil samples and PID readings are noted on the boring logs. Detailed descriptions of field exploration and sampling procedures, and the boring logs are provided in this appendix.

Upon completion of drilling, borings were backfilled with cement-bentonite grout and soil cuttings and drilling mud were drummed for analytical testing and disposal. Analytical tests were performed by Eurofins Calscience of Garden Grove, California. Based on the test results, the soil cuttings were characterized as non-hazardous for waste disposal purposes. A copy of the test results is included in Appendix E. Wood retained services of American Integrated Services, Inc. (AIS), for transportation and disposal of the drums. AIS picked up the drums from the site on May 7, 2018.

Field Screening

Wood field-screened soil samples obtained from the borings for the presence of organic vapors using a portable photo-ionization detector (PID). The PID device is a battery-powered instrument that can detect and indicate concentrations of organic vapor. In general, a portion of each soil sample was placed in a re-sealable bag and allowed to set for several minutes. Then, the tip of the PID probe was inserted into the headspace of the bag and the highest stabilized organic vapor reading in units of parts per million (ppm) was recorded on the soil boring log. Results of the PID screening are presented in the boring logs included in this appendix.

EXPLANATION OF BORING LOGS

Hellman - Gas Plant Expansion
Seal Beach, California

MAJOR DIVISIONS		LTR	DESCRIPTION	MAJOR DIVISIONS		LTR	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL	GW	Well-graded gravels or gravel-sand mixtures, little or no fines	FINE GRAINED SOILS	SILTS AND CLAYS LL<50	ML	Inorganic silts and very fine sand, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
		GP	Poorly-graded gravels or gravel-sand mixture, little or no fines			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		GM	Silty gravels, gravel-sand-silt mixtures			OL	Organic silts and organic silt-clays of low plasticity
		GC	Clayey gravels, gravel-sand-clay mixtures		SILTS AND CLAYS LL>50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	SAND	SW	Well-graded sands or sand with gravel, little or no fines			CH	Inorganic clays of hogh plasticity, fat clays
		SP	Poorly-graded sands or sand with gravel, little or no fines			OH	Organic clays of medium to high plasticity
		SM	Silty sands, sand-silt mixtures				
		SC	Clayey sands, sand-clay mixtures	HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

SAMPLE COLUMN SYMBOLS

- Standard penetration test (SPT) sample
- Modified California split spoon sample
- P Piston sample
- Shelby tube sample
- 6" Brass Liner Sample
- Continuous soil or rock core
- B Bulk sample
- NR No recovery

BLOWS/FOOT - Summation of blow counts for deepest 12 inches is sampling interval
RQD% - Rock quality designation in percent

DESCRIPTION COLUMN SYMBOLS

- Dashed lines separating soil strata represent inferred boundaries between sampled intervals or no recovery intervals and may be distinct or gradual transitions
- Solid lines represent distinct or gradual boundaries observed within sampled intervals
- Description right of bracket symbol represents soil conditions within the depth interval defined by the bracket length
- Description right of arrow symbol represents soil conditions to the next deeper boundary line unless otherwise noted
- Water level at time of drilling
- Water level after at least 12 hours from time of drilling

LABORATORY TEST ABBREVIATIONS

ATT	Atterberg Limits	CORR	Corrosion	SE	Sand Equivalent
COLL	Collapse Potential	DS	Direct Shear	SG	Specific Gravity
COMP	Compaction	EI	Expansion Index	TX	Triaxial Test
CON	Consolidation	S	Grain Size Analysis	UC	Unconfined Compression Test
R	R-Value	PERM	Permeability	#200	No. 200 Wash Sieve Analysis

NOTES

1. Soil descriptions are in accordance with the USCS as set forth by ASTM D2488 "Standard Practice for Description and Identification Soil (Visual-Manual Procedure)."
2. Soil color described according to Munsell Soil Color Chart. Rock color described according to Munsell Rock-Color Chart
3. Soil descriptions in these borings are generalized representations and based upon visual classification of cuttings and/or samples during drilling. Descriptions and related information in these borings depict subsurface conditions at the specific location and at the time of drilling only. Soil conditions at other locations may differ from conditions observed at the boring locations. Also, soil and groundwater conditions may change with time at these locations.

PROJECT: Hellman - Gas Plant Expansion Seal Beach, California			**Log of Boring No. B-1**
BORING LOCATION:			
DATE STARTED: 4/16/18	DATE FINISHED: 4/16/18		NOTES: Drilling Contractor: SoCal Drilling Drilling Equipment: Hand Auger (3-inch diameter) Logged By: K. Howe
DRILLING METHOD: Hand Auger			
HAMMER WEIGHT: NA	DROP: NA		
SAMPLER: Hand Auger			

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6-inch	MATERIAL DESCRIPTION Surface Datum: not surveyed	PID (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
	1				FAT CLAY (CH): light olive brown (2.5Y 5/3), moist, ~90% fines, ~10% fine sand, high plasticity, slow dilatancy, roots present				
	2				grayish brown (2.5Y 5/2), ~95% fines, ~5% fine sand, increased moisture	0.0			
	3								
	4								
	5				LEAN CLAY with SAND (CL): light olive brown (2.5Y 5/3), moist, ~85% fines, ~15% fine sand, medium plasticity, slow dilatancy	0.0			
	6								
	7				LEAN CLAY (CL): grayish brown (2.5Y 5/2), moist, ~95% fines, ~5% fine sand, medium plasticity, no dilatancy, mottled with very dark gray (2.5Y 3/1) and light olive brown (2.5Y 5/6)				
	8								
	9				LEAN CLAY with SAND (CL): olive brown (2.5Y 4/3), wet, ~80% fines, ~20% fine sand, medium plasticity	0.0			
	10				Bottom of boring at 10' bgs. Backfilled with bentonite chips. Environmental samples collected at depths 2-2.5 ft, 5-5.5 ft, and 9.5-10 ft.				
	11								
	12								
	13								
	14								
	15								

GEO3 PID6INCH V4

PROJECT: Hellman - Gas Plant Expansion Seal Beach, California			**Log of Boring No. B-2**
BORING LOCATION:			
DATE STARTED: 4/16/18	DATE FINISHED: 4/16/18		NOTES: Drilling Contractor: SoCal Drilling Drilling Equipment: Mayhew 1000 Logged By: K. Howe
DRILLING METHOD: Mud Rotary			
HAMMER WEIGHT: 140 lb.	DROP: 30 inches		
SAMPLER: Hand Auger, Cal.Mod,SPT, Shelby Tube			

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6-inch	MATERIAL DESCRIPTION Surface Datum: not surveyed	PID (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
	1				FAT CLAY (CH): grayish brown (2.5Y 5/2), moist, ~95% fines, ~5% fine sand, high plasticity, slow dilatancy, roots and drier in upper 1 feet, mottling present, high dry strength				
	2	1	B			0.0			COMP EI LL=61 PI=40
	3								
	4								
	5	2		4 6 8		0.2	28.1	91.0	DS
	6								
	7				SANDY SILT (ML): olive brown (2.5Y 4/4), moist, ~65% fines, ~35% fine sand, trace medium sand, no plasticity, rapid dilatancy with very dark grayish brown (2.5Y 3/2) mottling, high dry strength				
	8	3							
	9		NR				29.5	91.9	#200 CON LL=33 PI=4
	10	4		5 7 9		0.1			
	11						31.8	90.3	LL=32 PI=3
	12				LEAN CLAY (CL): olive brown (2.5Y 4/3), moist, ~95% fines, ~5% fine sand, medium plasticity, slow dilatancy, mottling like above unit				
	13	5		3 4 7		0.0			
	14						26.8	97.7	
	15								

GEO3 PID6INCH V4

PROJECT: Hellman - Gas Plant Expansion
Seal Beach, California

Log of Boring No. B-2 (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ 6-inch	MATERIAL DESCRIPTION	PID (ppm)	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
	16	6		3 4 7	CLAYEY SAND (SC): dark grayish brown (2.5Y 4/2), wet, ~50% fines, ~50% fine to medium sand, trace coarse sand, trace fine gravel, medium plasticity, slow to rapid dilatancy	0.0			#200 LL=22 PI=8
	17				SANDY LEAN CLAY (CL): dark gray (2.5Y 4/1), moist, ~70% fines, ~25% fine to coarse sand, ~5% fine gravel, medium plasticity, slow dilatancy				
	18	7		9 10 12		0.1	18.7	111.6	
	19								
	20	8		7 10 12	POORLY GRADED SAND with SILT (SP-SM): dark gray (2.5Y 4/1), wet, ~85% fine to coarse sand, ~10% fines, ~5% fine gravel	0.0			
	21								
	22				POORLY GRADED SAND with GRAVEL (SP): dark gray (2.5Y 4/1), wet, ~70% fine to coarse sand, ~25% fine gravel, ~5% fines				
	23	9		11 17 18		0.4			
	24								
	25								
	26	10		9 12	LEAN CLAY (CL): gray (5Y 5/1), moist, ~95% fines, ~5% fine sand, medium plasticity, slow to rapid dilatancy, high dry strength, bedding features present		30.8	91.7	LL=48 PI=23
	27		NR	20		0.4			
	28								
	29				LEAN CLAY with SAND (CL): dark greenish gray (4/10B6), moist, ~75% fines, ~25% fine to medium sand, medium plasticity, slow dilatancy, does not form dry strength ball, coarse gravel fragment present (~1.5" diameter)				
	30	11		6 9 12		0.4			LL=30 PI=17
	31								
	32								

GEO3 PID6INCH V4

PROJECT: Hellman - Gas Plant Expansion
Seal Beach, California

Log of Boring No. B-2 (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ 6-inch	MATERIAL DESCRIPTION	PID (ppm)	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
					LEAN CLAY with SAND (CL): continued				
	33				SILTY SAND (SM): gray (2.5Y 5/1), wet, ~75% fine to coarse sand, ~25% low plasticity fines, sand is predominantly fine to medium, trace fine gravel				
	34								
	35	12		15					
				23					
	36			27		0.3			
	37								
	38				CLAYEY SAND with GRAVEL (SC): dark gray (2.5Y 4/1), wet, ~55% fine to coarse sand, ~30% fine to coarse gravel, ~15% medium plasticity fines				
	39								
	40	13							
	41				SANDY SILT (ML): dark gray (2.5Y 4/1), moist, ~65% fines, ~35% fine sand, nonplastic, slow dilatancy	0.2	24.6	101.2	LL=NP PI=NP
	42				Bottom of boring at 41.5 ft bgs. Hand augered to 5 feet depth. Backfilled with bentonite cement grout. Environmental samples collected at depths 2-2.5 ft, 5-5.5 ft, and 10.5-11 ft.				
	43								
	44								
	45								
	46								
	47								
	48								
	49								

GEO3 PID6INCH V4

PROJECT: Hellman - Gas Plant Expansion Seal Beach, California			**Log of Boring No. B-3**
BORING LOCATION:			
DATE STARTED: 4/16/18	DATE FINISHED: 4/16/18		NOTES: Drilling Contractor: SoCal Drilling Drilling Equipment: Hand Auger (3-inch diameter) Logged By: K. Howe
DRILLING METHOD: Hand Auger			
HAMMER WEIGHT: NA	DROP: NA		
SAMPLER: Hand Auger, Cal.Mod,SPT, Shelby Tube			

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6-inch	MATERIAL DESCRIPTION Surface Datum: not surveyed	PID (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
					FAT CLAY (CH): grayish brown (2.5Y 5/2), moist, ~90% fines, ~10% fine to medium sand, high plasticity, no dilatancy				
	1								
	2				~95% fines, ~5% fine sand with some black (2.5Y/1) mottling (organics?)	0.0			COMP EI LL=61 PI=40
	3	1	B						
	4								
	5				LEAN CLAY with SAND (CL): grayish brown (2.5Y 5/2), moist, ~80% fines, ~20% fine sand	0.0			
	6				LEAN CLAY (CL): dark grayish brown (2.5Y 4/2), moist, ~95% fines, ~5% fine sand, medium plasticity, no dilatancy				
	7								
	8				SANDY SILT (ML): dark grayish brown (2.5Y 4/2), wet, ~75% fines, ~25% fine sand, low plasticity, slow dilatancy				
	9				LEAN CLAY with SAND (CL): dark grayish brown (2.5Y 4/2), wet, ~80% fines, ~20% fine sand, medium plasticity, slow dilatancy	0.0			
	10				Bottom of boring at 10 ft bgs. Backfilled with bentonite chips. Environmental samples collected at depths 2-2.5 ft, 5-5.5 ft, and 9.5-10 ft.				
	11								
	12								
	13								
	14								
	15								

GEO3 PID6INCH V4

PROJECT: Hellman - Gas Plant Expansion Seal Beach, California			**Log of Boring No. B-4**
BORING LOCATION:			
DATE STARTED: 4/16/18	DATE FINISHED: 4/16/18		NOTES: Drilling Contractor: SoCal Drilling Drilling Equipment: Mayhew 1000 Logged By: K. Howe
DRILLING METHOD: Mud Rotary			
HAMMER WEIGHT: 140 lb.	DROP: 30 inches		
SAMPLER: Hand Auger, Cal.Mod,SPT, Shelby Tube			

ELEV. (feet)	DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ 6-inch	MATERIAL DESCRIPTION Surface Datum: not surveyed	PID (ppm)	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
	1				LEAN CLAY (CL): grayish brown (2.5Y 3/2), moist, ~90% fines, ~10% fine to medium sand, medium plasticity, slow dilatancy, rootlets (topsoil), high dry strength	0.2			
	2	1	B		@1' more moist, no rootlets, ~95% fines, ~5% sand, some mottling with very dark gray (2.5Y 3/1) and light olive brown (2.5Y 5/6), very dark gray portion possibly organic peat	0.0			
	5	2		3 4 8	grayish brown (2.5Y 3/2) and very dark gray (2.5Y 3/4), ~90% fines, ~10% fine to medium sand	0.0	31.5	90.8	
	7	3	NR	1 0 0	grayish brown (2.5Y 3/2), with some olive brown (2.5Y 5/6) and very dark gray (2.5Y 3/1) ~95% fines, ~5% fine sand				
	10	4		3 4 5	SILTY SAND (SM): dark grayish brown (2.5Y 4/2), moist, ~55% fine sand, ~45% low plasticity fines with some olive brown (2.5Y 4/4), pockets of clay	0.0	33.2	87.8	
	13	5	NR		SILT with SAND (ML): dark greenish gray (4/10GY 4/1), moist, ~85% fines, ~15% fine to medium sand, medium plasticity, slow dilatancy with layers of very dark gray (2.5Y 3/1), wood or organics, high dry strength		33.6	88.2	CON

GEO3 PID6INCH V4

PROJECT: Hellman - Gas Plant Expansion
Seal Beach, California

Log of Boring No. B-4 (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ 6-inch	MATERIAL DESCRIPTION	PID (ppm)	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
	16	6	NR	2 2 2	LEAN CLAY with SAND (CL): continued	0.0			
	17				SANDY LEAN CLAY (CL): dark greenish gray (4/10GY 4/1), moist, ~70% fines, ~30% fine sand, medium plasticity, slow dilatancy, similar organics layers as noted above				
	18	7		3 6 8		0.1	19.9	109.5	
	19								
	20	8		8 14 17	SILTY SAND (SM): dark greenish gray (4/10Y 4/1), wet, ~85% fine to coarse sand, predominantly fine to medium, ~15% low plasticity fines, trace fine gravel	0.2			
	21								
	22								
	23				CLAYEY SAND (SC): dark greenish gray (4/10GY 4/1), moist, ~50% fines, ~50% fine to medium sand, medium plasticity, slow dilatancy, some silt present, medium dry strength				
	24								
	25	9		8 14 15		0.2	13.0	123.0	LL=21 PI=7
	26								
	27								
	28				SILTY SAND (SM): gray (2.5Y 4/1), wet, ~60% fine to coarse sand, ~30% low plasticity fines, fine gravel to coarse gravel, predominantly fine to medium sand				
	29								
	30	10		10 19 21		0.2			
	31								
	32								

GEO3 PID6INCH V4

PROJECT: Hellman - Gas Plant Expansion
Seal Beach, California

Log of Boring No. B-4 (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ 6-inch	MATERIAL DESCRIPTION	PID (ppm)	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
					SILTY SAND (SM): continued				
	33								
	34								
	35	11		12 18 20	~70% fine to medium sand, ~30% fines, trace fine gravel	0.1			
	36								
	37				SILT with SAND (ML): dark greenish gray (4/10GY 4/1), moist, ~80% fines, ~20% fine to medium sand, predominantly fine sand, rapid dilatancy, low to medium plasticity, clay present				
	38								
	39	12							
	40		NR						
	41								
	42				trace coarse sand and fine to coarse gravel				
	43	13		10 12 14	high dry strength	0.1			LL=37 PI=14
	44								
	45				SILT with SAND (ML): dark greenish gray (4/10GY 4/1), moist, ~90% fines, ~10% fine sand, low plasticity, slow dilatancy, some clay present, trace white shell fragments (1/5 of an inch in diameter) and bedding feathers, high dry strength				
	46	14		12 24 28		0.1	21.8	106.0	LL=26 PI=2
	47		NR						
	48								
	49								

GEO3 PID6INCH V4

PROJECT: Hellman - Gas Plant Expansion
Seal Beach, California

Log of Boring No. B-4 (cont'd)

ELEV. (feet)	DEPTH (feet)	SAMPLES Sample No.	Sample	Blows/ 6-inch	MATERIAL DESCRIPTION	PID (ppm)	LABORATORY TESTS Moisture Content (%)	Dry Density (pcf)	Other Tests
					SILT (ML): continued				
	50								
	51	15		12 23 29		0.1	27.8	96.1	LL=NP PI=NP
	52								
	53								
	54								
	55	16		7 10 12	shell fragments up to 1/4" diameter	0.1			LL=32 PI=8
	56								
	57								
	58								
	59								
	60	17		11 24 26	shell fragments up to 1" diameter	0.0	22.8	104.2	LL=31 PI=7
	61								
	62				Bottom of boring at 61.5 ft bgs. Hand-augered to 5 feet depth. Backfilled with bentonite cement grout. Environmental samples collected at dephs 2-2.5 ft, 5-5.5 ft, and 10.5-11 ft.				
	63								
	64								
	65								
	66								

GEO3 PID6INCH V4

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

Hellman Properties
711 1st Street
Seal Beach, CA
April 11, 2018

Prepared for:

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1. **INTRODUCTION**

2. **SUMMARY OF FIELD WORK**

3. **FIELD EQUIPMENT & PROCEDURES**

4. **CONE PENETRATION TEST DATA & INTERPRETATION**

APPENDIX

- CPT Plots
- CPT Classification/Soil Behavior Chart
- Interpretation Output (CPeT-IT)
- Summary of Shear Wave Velocities
- Pore Pressure Dissipation Graphs
- CPeT-IT Calculation Formulas

SUMMARY

OF

CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the Hellman Properties project located at 711 1st Street in Seal Beach, California. The work was performed by Kehoe Testing & Engineering (KTE) on April 11, 2018. The scope of work was performed as directed by Wood Group personnel.

2. SUMMARY OF FIELD WORK

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

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-1	60	Hole open to 6 ft (dry)
CPT-2	60	Groundwater @ 9 ft
CPT-3	40	Refusal, groundwater @ 16 ft
CPT-4	60	Groundwater @ 7 ft
CPT-5	60	Groundwater @ 8 ft

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

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

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

At locations CPT-1, CPT-2, CPT-3, CPT-4 & CPT-5, shear wave measurements were obtained at approximately 5-foot intervals. The shear wave is generated using an air-actuated hammer, which is located inside the front jack of the CPT rig. The cone has a triaxial geophone, which recorded the shear wave signal generated by the air hammer.

The above parameters were recorded and viewed in real time using a laptop computer. Data is stored at the KTE office for up to 2 years for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

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

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

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

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

Sincerely,

KEHOE TESTING & ENGINEERING

Richard W. Koester, Jr.
General Manager

04/23/18-hh-8979

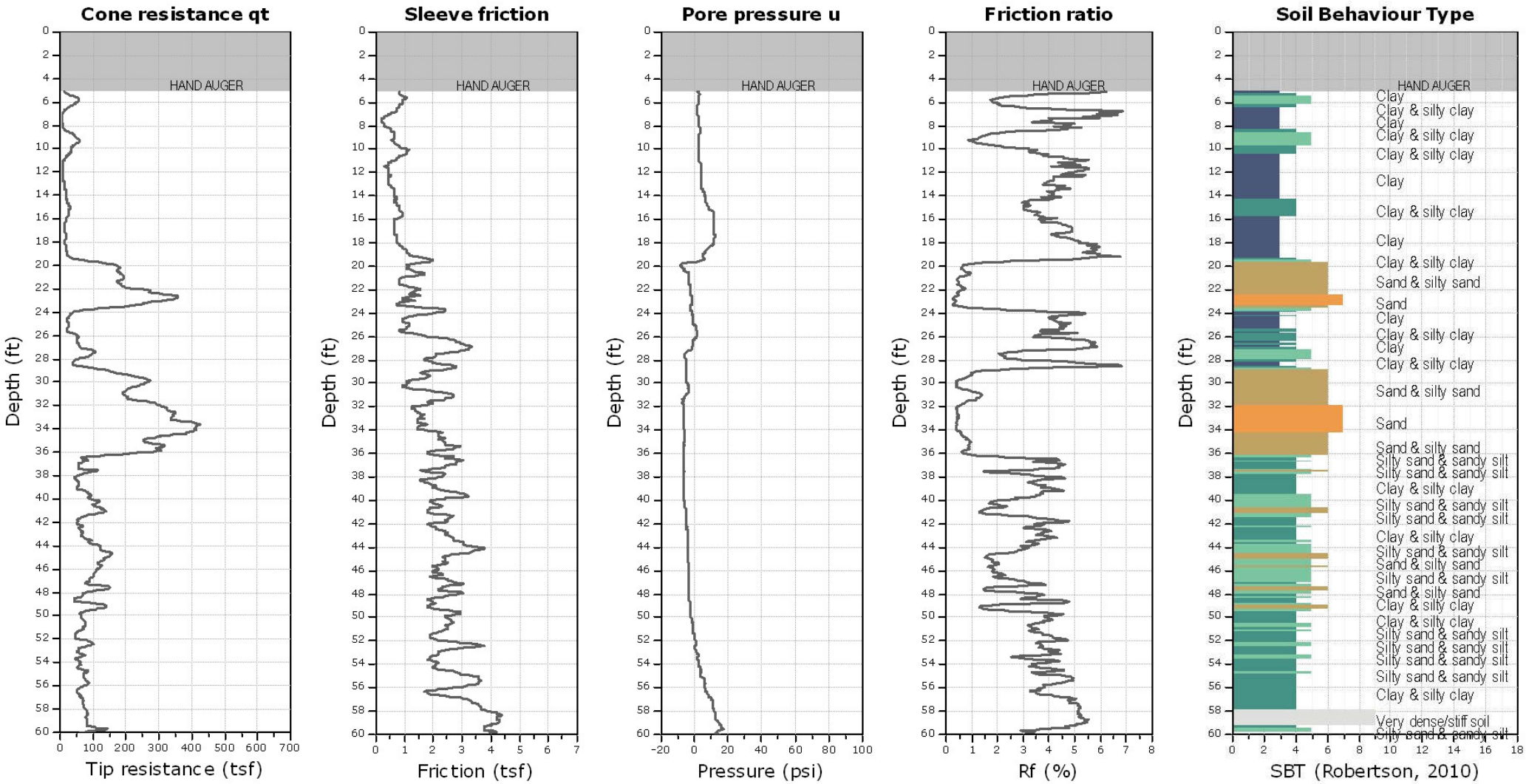
APPENDIX

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

CPT-1

Project: **Wood Group/Hellman Properties**
Location: **711 1st Street Seal Beach, CA**

Total depth: 60.18 ft, Date: 4/11/2018
Cone Type: Vertek

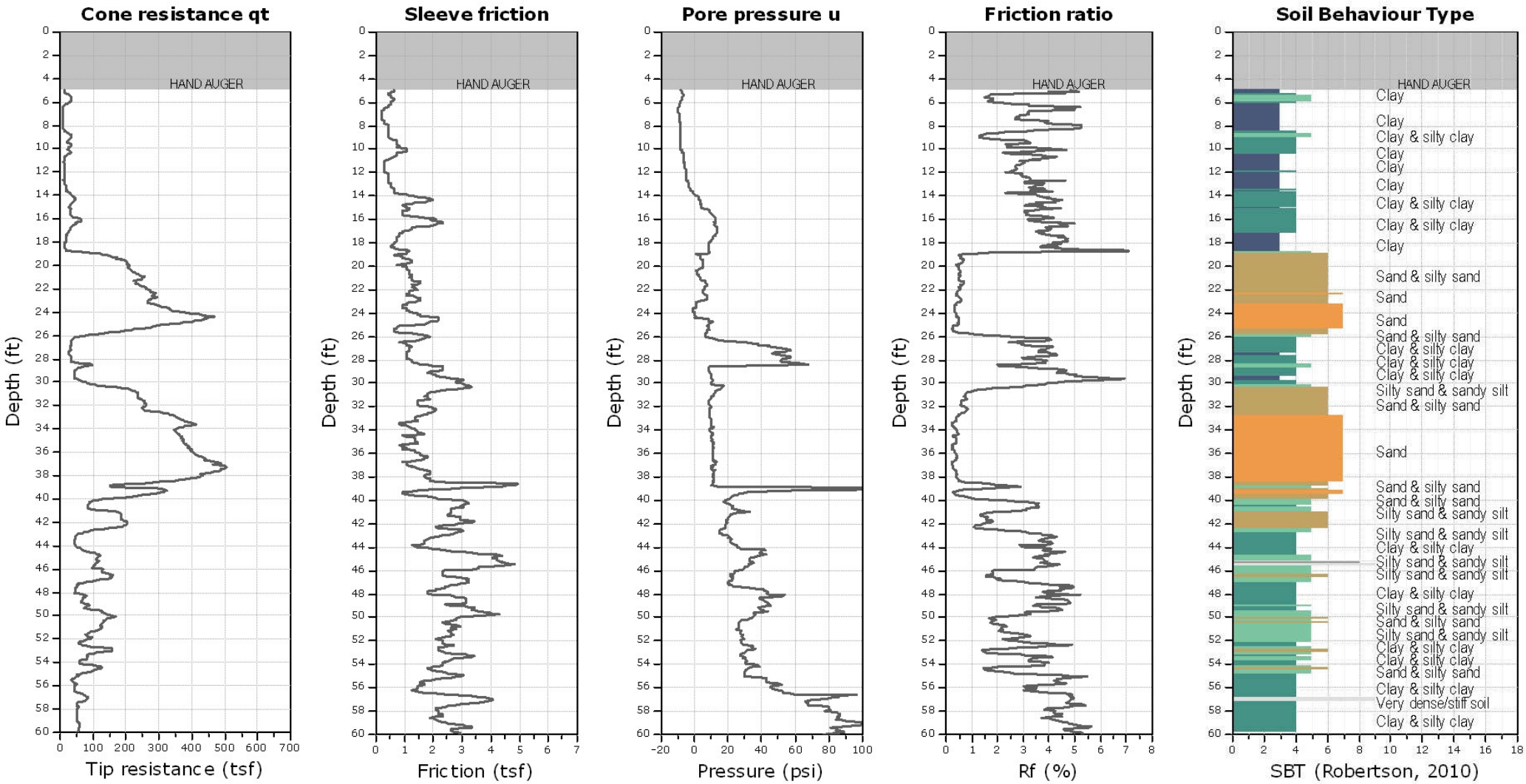


Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT-2

Project: **Wood Group/Hellman Properties**
Location: **711 1st Street Seal Beach, CA**

Total depth: 60.24 ft, Date: 4/11/2018
Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
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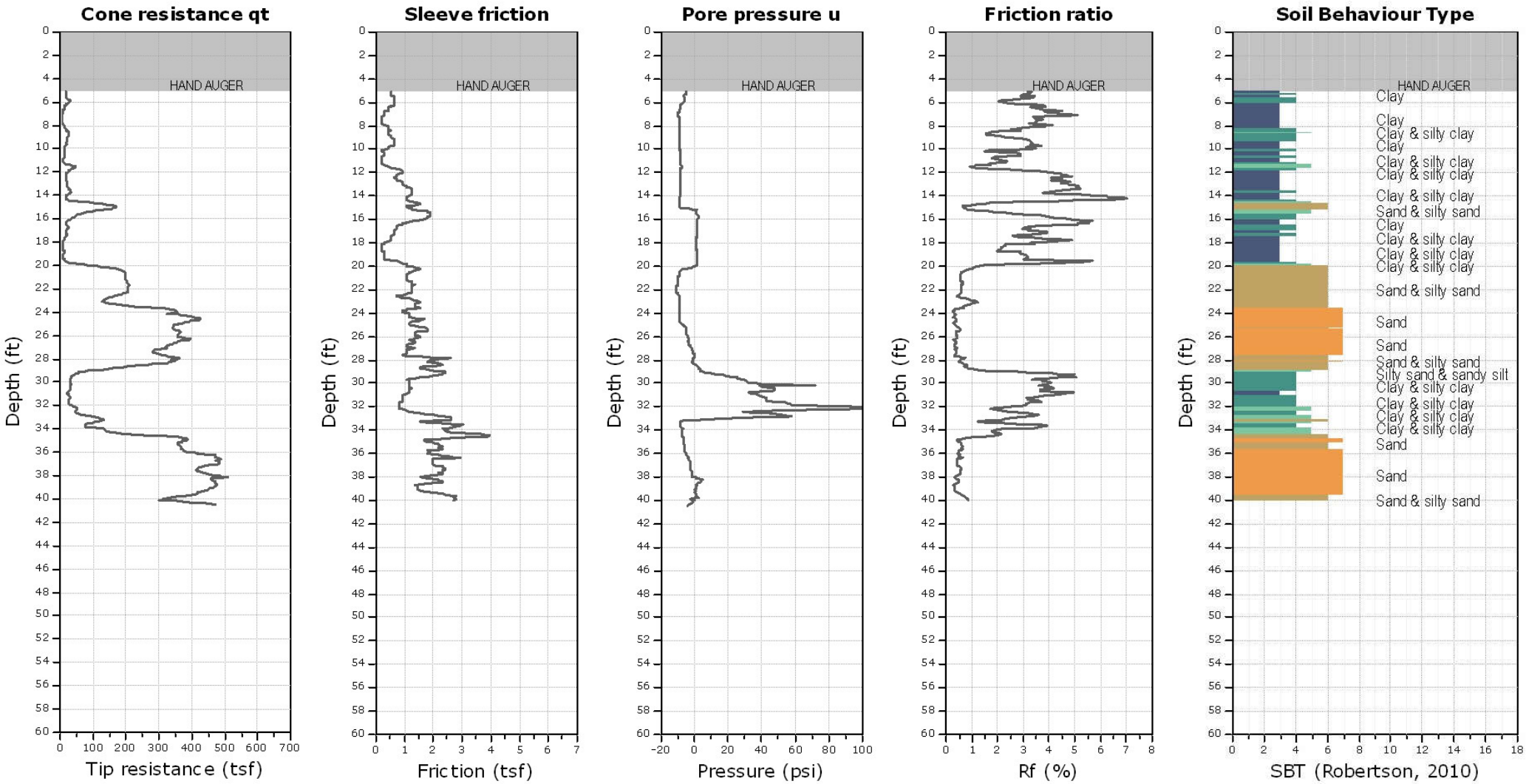
CPT-3

Project: **Wood Group/Hellman Properties**
Location: **711 1st Street Seal Beach, CA**

Total depth: 40.43 ft, Date: 4/11/2018
Cone Type: Vertek



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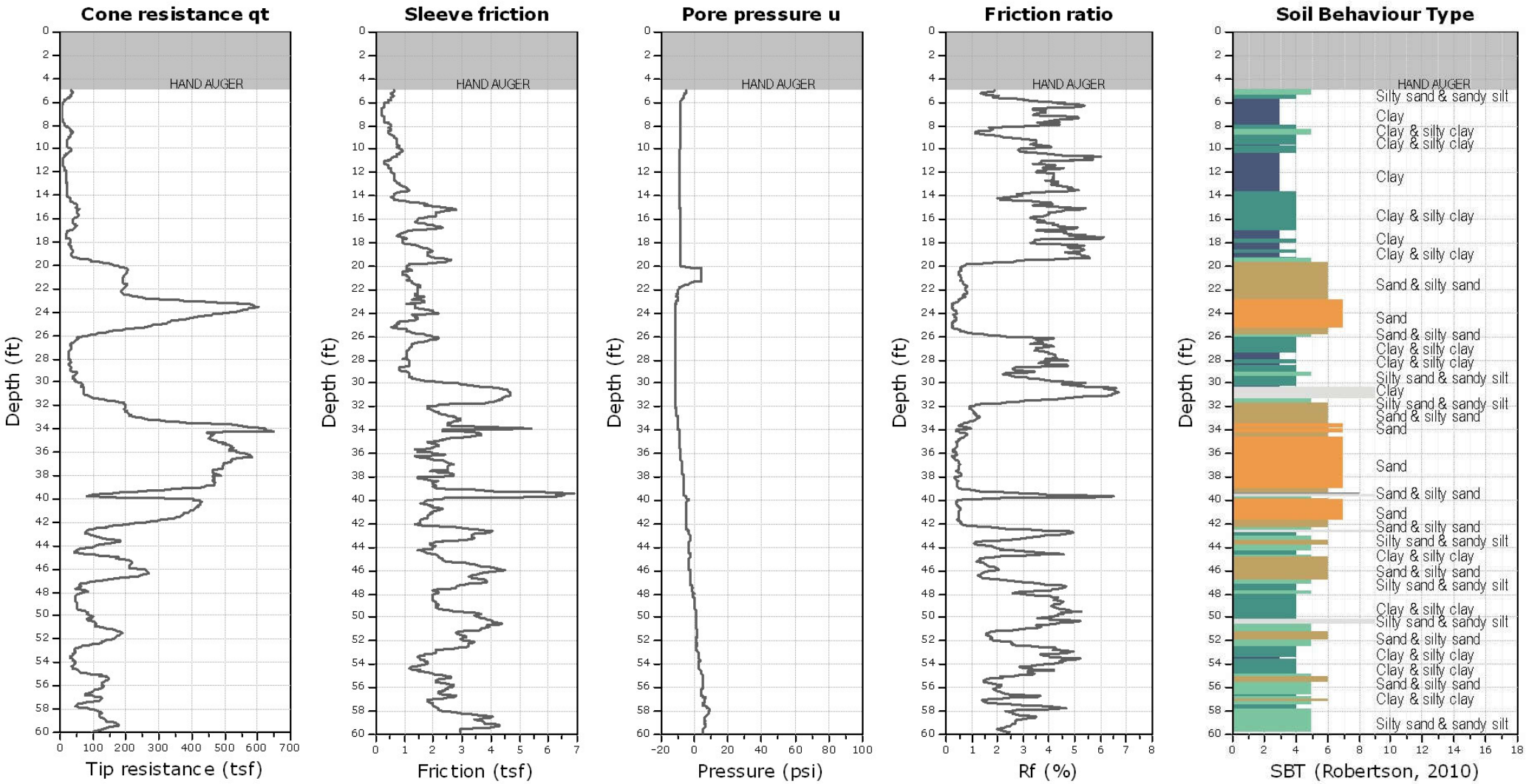
CPT-4

Project: **Wood Group/Hellman Properties**
Location: **711 1st Street Seal Beach, CA**

Total depth: 60.18 ft, Date: 4/11/2018
Cone Type: Vertek



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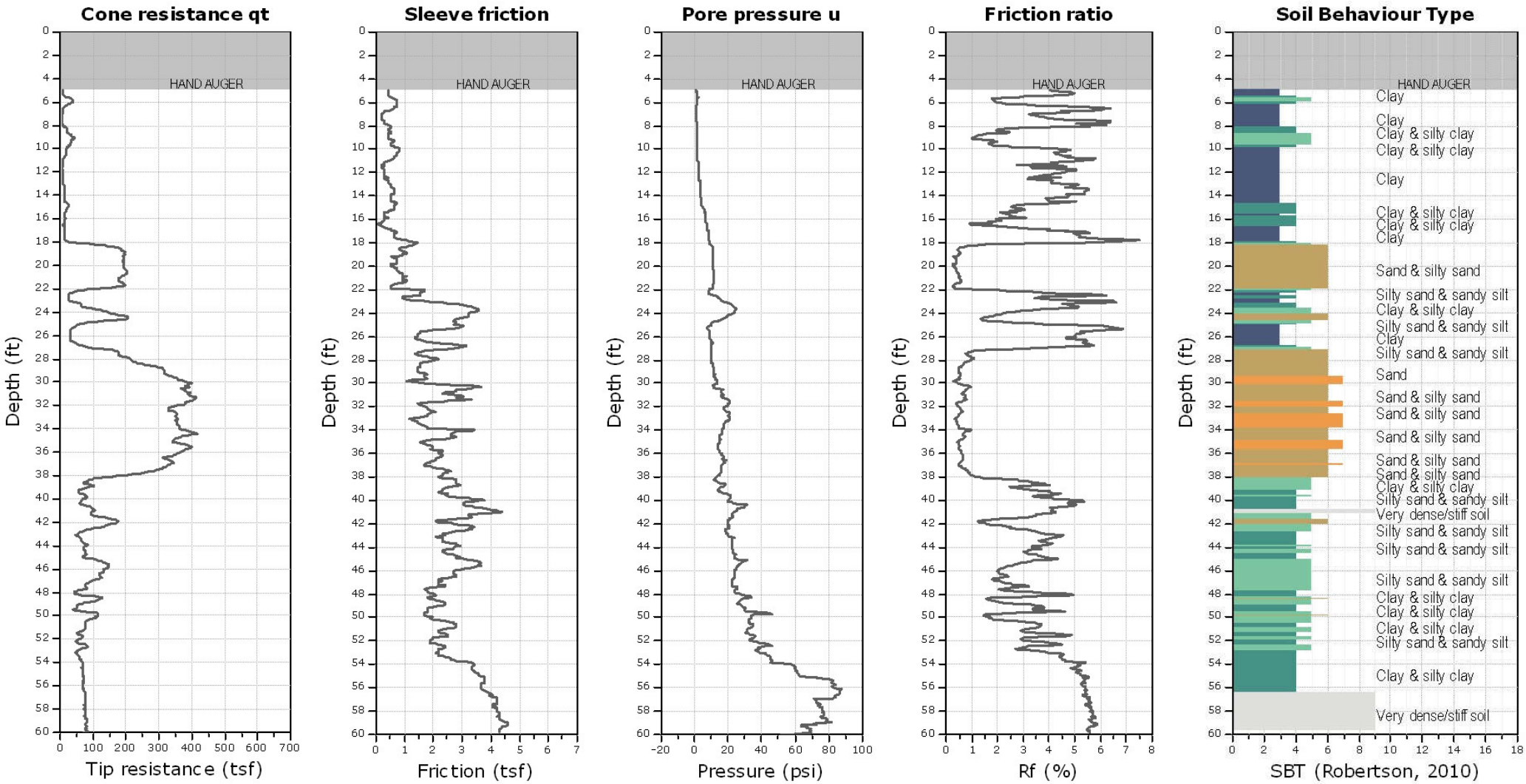
CPT-5

Project: **Wood Group/Hellman Properties**
Location: **711 1st Street Seal Beach, CA**

Total depth: 60.11 ft, Date: 4/11/2018
Cone Type: Vertek



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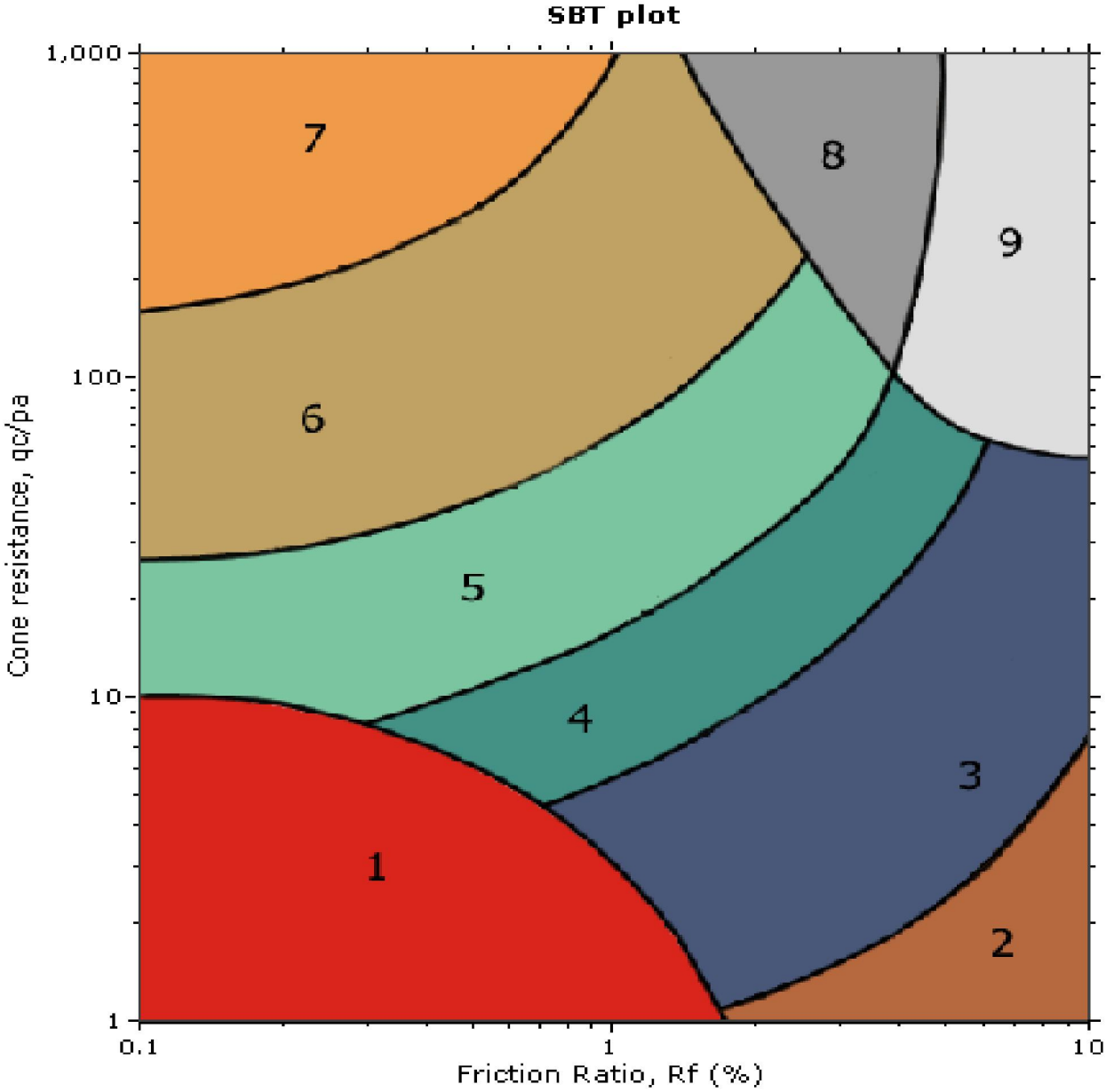


SBT legend

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

	CPT-1	In situ data										Basic output data											
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn	U2	I(B)	Mod. SBTn
1	31.54	0.94	0.77	0.2	31.55	2.98	4	2.62	118.24	0.06	0	0.06	532.27	2.98	0	8	0.64	6.41	2.07	190.67	0.94	31.4	5
2	21.41	0.94	0.59	0.13	21.41	4.39	3	2.85	117.29	0.12	0	0.12	180.73	4.41	0	9	0.76	5.25	2.36	105.64	0.36	21.57	3
3	11.9	0.63	1.17	0.11	11.92	5.26	3	3.1	112.89	0.17	0	0.17	67.45	5.33	0.01	4	0.86	4.68	2.62	51.96	0.49	17.85	3
4	9.71	0.63	1.38	0.07	9.73	6.44	3	3.22	112.4	0.23	0	0.23	41.23	6.6	0.01	3	0.92	4.09	2.79	36.7	0.43	14.96	3
5	14.2	1.04	1.38	0.07	14.22	7.34	3	3.14	117.06	0.29	0	0.29	48.21	7.5	0.01	3	0.92	3.31	2.78	43.64	0.34	13.51	3
6	49.19	0.94	2.06	0.04	49.21	1.91	5	2.35	119.32	0.35	0	0.35	140.15	1.92	0	5	0.67	2.1	2.11	97.19	0.43	41.72	7
7	7.52	0.52	1.73	0.07	7.54	6.92	3	3.33	110.44	0.4	0	0.4	17.67	7.32	0.02	3	1	2.62	3.05	17.67	0.31	13.88	3
8	6.79	0.42	2.71	0.11	6.82	6.12	3	3.33	108.57	0.46	0	0.45	14.04	6.56	0.03	3	1	2.34	3.09	14.04	0.42	14.82	3
9	47.51	0.63	2.67	0.1	47.55	1.32	5	2.26	116.27	0.52	0.01	0.51	92.87	1.33	0	5	0.67	1.64	2.1	72.93	0.36	49.61	7
10	32.37	0.84	2.45	0.11	32.4	2.58	4	2.57	117.44	0.57	0.01	0.56	56.81	2.62	0.01	5	0.8	1.66	2.41	49.9	0.29	29.8	5
11	10.86	0.63	2.51	0.1	10.89	5.75	3	3.16	112.67	0.63	0.02	0.61	16.77	6.11	0.02	3	1	1.73	3.01	16.77	0.26	15.53	3
12	8.56	0.42	3.93	0.09	8.61	4.85	3	3.19	109.14	0.69	0.02	0.66	11.98	5.27	0.03	3	1	1.6	3.08	11.98	0.39	16.51	3
13	10.86	0.52	4.22	0.09	10.91	4.78	3	3.11	111.35	0.74	0.03	0.71	14.28	5.13	0.03	3	1	1.49	3.01	14.28	0.39	16.94	3
14	15.87	0.73	6.08	0.07	15.95	4.58	3	2.97	114.73	0.8	0.03	0.76	19.81	4.83	0.03	3	0.99	1.38	2.89	19.73	0.53	18	3
15	27.67	0.84	7.89	0.07	27.77	3.01	4	2.66	117.06	0.86	0.04	0.82	32.89	3.1	0.02	4	0.88	1.25	2.61	31.91	0.65	24.79	5
16	17.65	0.84	11.31	0.04	17.79	4.7	3	2.94	115.98	0.92	0.04	0.87	19.36	4.95	0.05	3	1	1.21	2.9	19.35	0.88	17.7	3
17	12.84	0.63	11.28	0.04	12.98	4.83	3	3.05	113.1	0.97	0.05	0.92	13.01	5.22	0.06	3	1	1.15	3.05	13.01	0.83	16.69	3
18	14.1	0.84	11.18	0	14.23	5.87	3	3.07	115.43	1.03	0.05	0.98	13.53	6.33	0.06	3	1	1.08	3.09	13.53	0.77	15.12	3
19	19.32	1.36	5.11	-0.07	19.38	7	3	3.02	119.74	1.09	0.06	1.03	17.75	7.42	0.02	3	1	1.03	3.05	17.75	0.3	13.76	3
20	174.39	1.88	-7.67	-0.04	174.3	1.08	6	1.77	127.48	1.15	0.06	1.09	158.91	1.09	0	6	0.58	0.98	1.78	160.88	-0.57	69.85	7
21	194.34	1.46	-3.05	0.04	194.3	0.75	6	1.63	125.9	1.22	0.07	1.15	168.25	0.76	0	6	0.53	0.96	1.65	174.76	-0.25	91.32	7
22	226.29	1.04	-2.55	-0.08	226.26	0.46	6	1.44	123.81	1.28	0.07	1.2	186.76	0.46	0	6	0.47	0.94	1.47	200.16	-0.21	129.01	7
23	314.85	1.57	-1.91	0.01	314.82	0.5	6	1.35	127.58	1.34	0.08	1.26	248.12	0.5	0	6	0.44	0.93	1.38	274.22	-0.17	137.29	7
24	39.68	1.78	-1.61	-0.33	39.66	4.48	4	2.66	123.45	1.4	0.08	1.32	28.98	4.64	-0.01	3	0.96	0.81	2.75	29.23	-0.15	19.08	3
25	25.79	0.94	-0.19	-0.25	25.79	3.64	4	2.74	117.74	1.46	0.09	1.37	17.7	3.86	0	3	1	0.77	2.86	17.7	-0.07	20.02	3
26	52.53	1.67	0.78	-0.2	52.54	3.18	4	2.47	123.69	1.52	0.09	1.43	35.64	3.28	0	4	0.9	0.76	2.58	36.74	-0.03	24.56	5
27	61.4	2.72	-1.7	-0.22	61.38	4.42	4	2.53	127.62	1.59	0.1	1.49	40.13	4.54	0	4	0.93	0.73	2.64	41.15	-0.15	19.91	3
28	58.37	2.3	-5.5	-0.22	58.31	3.94	4	2.51	126.27	1.65	0.1	1.55	36.59	4.05	-0.01	4	0.93	0.7	2.63	37.63	-0.32	21.4	3
29	148.08	2.3	-4.9	-0.11	148.02	1.55	6	1.94	128.55	1.72	0.11	1.61	91	1.57	0	5	0.7	0.75	2.03	103.17	-0.29	48.78	7
30	267.12	1.67	-4.22	-0.04	267.07	0.63	6	1.47	127.66	1.78	0.11	1.67	159.18	0.63	0	6	0.52	0.79	1.55	197.87	-0.25	106.81	7
31	191.21	1.98	-5.29	-0.09	191.14	1.04	6	1.73	128.1	1.84	0.12	1.73	109.69	1.05	0	6	0.63	0.73	1.83	131.42	-0.29	68.07	7
32	305.76	1.88	-7.06	-0.22	305.68	0.61	6	1.43	128.85	1.91	0.12	1.79	170.14	0.62	0	6	0.51	0.77	1.52	219.65	-0.35	111.52	7
33	338.55	1.67	-6.69	-0.24	338.47	0.49	7	1.33	128.23	1.97	0.13	1.84	182.44	0.5	0	6	0.48	0.77	1.42	243.88	-0.33	132.86	7
34	412.49	1.88	-6.28	-0.35	412.41	0.46	7	1.24	129.58	2.04	0.13	1.9	215.49	0.46	0	7	0.45	0.77	1.33	298.31	-0.31	149.2	7
35	255.12	2.51	-5.99	-0.33	255.04	0.98	6	1.63	130.51	2.1	0.14	1.96	128.74	0.99	0	6	0.61	0.69	1.75	164	-0.29	74.84	7
36	264.62	2.72	-6.87	-0.37	264.53	1.03	6	1.63	131.18	2.17	0.14	2.03	129.53	1.03	0	6	0.62	0.67	1.76	166.31	-0.31	72.82	7
37	55.97	2.61	-6.41	-0.28	55.89	4.67	4	2.57	127.11	2.23	0.15	2.08	25.75	4.86	-0.01	3	1	0.51	2.81	25.75	-0.29	18.31	3
38	48.87	2.09	-6.57	-0.33	48.79	4.28	4	2.59	125.14	2.29	0.15	2.14	21.71	4.49	-0.01	3	1	0.49	2.84	21.71	-0.29	18.93	3
39	51.38	2.4	-6.66	-0.55	51.3	4.68	4	2.6	126.29	2.36	0.16	2.2	22.25	4.91	-0.01	3	1	0.48	2.86	22.25	-0.29	18	3
40	90.75	2.72	-6.53	-0.69	90.67	2.99	5	2.29	128.57	2.42	0.16	2.26	39.06	3.08	-0.01	4	0.92	0.5	2.52	41.6	-0.28	26.06	5
41	137.74	2.09	-5.38	-0.71	137.67	1.52	6	1.95	127.67	2.49	0.17	2.32	58.31	1.54	0	5	0.78	0.54	2.15	69.27	-0.24	44.78	7
42	51.27	2.4	-4.9	-0.8	51.21	4.69	4	2.6	126.28	2.55	0.17	2.38	20.48	4.94	-0.01	3	1	0.45	2.88	20.48	-0.22	17.82	3
43	67.15	2.61	-4.61	-0.87	67.09	3.89	4	2.46	127.55	2.61	0.18	2.44	26.48	4.05	-0.01	4	1	0.43	2.74	26.48	-0.21	20.58	3
44	120.2	2.92	-4.32	-0.97	120.14	2.43	5	2.14	129.8	2.68	0.18	2.5	47.07	2.49	0	5	0.88	0.47	2.38	52.36	-0.2	31.13	5
45	144.42	2.3	-4.22	-1	144.37	1.59	6	1.95	128.49	2.74	0.19	2.55	55.44	1.62	0	5	0.8	0.49	2.18	65.95	-0.19	42.91	7
46	112.78	1.98	-3.73	-1.04	112.74	1.76	5	2.06	126.81	2.8	0.19	2.61	42.07	1.8	0	5	0.86	0.46	2.32	47.84	-0.18	36.99	7
47	86.99	2.3	-3.44	-1.08	86.95	2.64	5	2.26	127.25	2.87	0.2	2.67	31.47	2.73	-0.01	4	0.95	0.41	2.56	32.88	-0.17	26.83	5
48	79.57	2.09	-3.5	-1.15	79.53	2.63	5	2.29	126.33	2.93	0.2	2.73	28.06	2.73	-0.01	4	0.97	0.4	2.6	28.82	-0.17	26.13	5
49	124.69	2.3	-2.84	-1.19	124.65	1.84	5	2.04	128.13	3	0.21	2.79	43.61	1.89	0	5	0.87	0.43	2.32	49.65	-0.15	36.43	7
50	63.39	2.82	-2.09	-1.26	63.36	4.45	4	2.52	127.98	3.06	0.21	2.85	21.17	4.68	-0.01	3	1	0.37	2.86	21.17	-0.13	18.45	3
51	69.13	2.19	-0.94	-1.3	69.12	3.17	5	2.39	126.35	3.12	0.22	2.91	22.7	3.32	0	4	1	0.36	2.74	22.7	-0.1	22.49	5
52	57.96	2.19	0.59	-1.39	57.96	3.78	4	2.5	125.92	3.19	0.22	2.96	18.48	4	0	3	1	0.36	2.86	18.48	-0.06	19.78	3
53	52.53	2.51	1.38	-1.47	52.54	4.77	4	2.6	126.66	3.25	0.23	3.02	16.31	5.08	0	3	1	0.35	2.97	16.31	-0.04	17.2	3
54	61.3	2.3	2.41	-1.53	61.33	3.75	4	2.48	126.4	3.31	0.23	3.08	18.83	3.96	0	3	1	0.34	2.85	18.83	-0.02	19.94	3
55	73.2	3.03	3.34	-1.61	73.24	4.13	4	2.46	128.85	3.38	0.24	3.14	22.24	4.33	0	3	1	0.34	2.82	22.24	0	19.38	3
56	71.53	3.13	6	-1.7	71.61	4.38	4	2.48	129.04	3.44	0.24	3.2	21.3	4.6	0	3	1	0.33	2.85	21.3	0.06	18.64	3
57	63.7	2.82	10.07	-1.77	63.82	4.42	4	2.52	127.99	3.51	0.25	3.26	18.5	4.67	0.01	3	1	0.32	2.9	18.5	0.15	18.21	3
58	76.44	3.86	11.75	-1.84	76.58	5.05	9	2.51	130.74	3.57	0.25	3.32	21.99	5.29	0.01	3	1	0.32	2.88	21.99	0.18	17.17	3
59	79.36	4.18	14.69	-1.95	79.54	5.25	9	2.51	131.41	3.64	0.26	3.38	22.45	5.5	0.01	3	1	0.31	2.89	22.45	0.24	16.77	3
60	67.56	0	14.62	-2.02	67.74	0	0	0	87.36	3.68	0.26	3.42	18.73	0	0.01	0	1	0.31	4.06	18.73	0.23	41.05	0

	CPT-2	In situ data										Basic output data											
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn	U2	I(B)	Mod. SBTn
1	30.08	1.25	0.1	-0.05	30.08	4.17	4	2.73	120.22	0.06	0	0.06	499.01	4.17	0	8	0.68	7.11	2.18	201.81	0.12	23.21	5
2	20.89	0.84	-0.1	0.02	20.88	4	3	2.84	116.37	0.12	0	0.12	175.43	4.02	0	9	0.75	5.15	2.34	101.02	-0.06	23.3	5
3	22.56	0.63	-0.41	0.04	22.55	2.78	4	2.71	114.45	0.18	0	0.18	127.54	2.8	0	5	0.73	3.73	2.29	78.82	-0.17	30.55	5
4	25.27	0.52	0.04	0.04	25.27	2.07	4	2.59	113.39	0.23	0	0.23	107.85	2.09	0	5	0.71	2.95	2.24	69.91	0.01	37.03	7
5	13.05	0.73	-8.73	0.07	12.95	5.65	3	3.09	114.22	0.29	0	0.29	43.75	5.78	-0.05	3	0.9	3.23	2.73	38.66	-2.17	16.59	3
6	27.05	0.52	-8.57	0.09	26.94	1.94	4	2.56	113.55	0.35	0	0.35	76.83	1.96	-0.02	5	0.74	2.28	2.29	57.22	-1.78	36.87	7
7	6.79	0.31	-9.54	0.12	6.67	4.7	3	3.27	106.41	0.4	0	0.4	15.7	5	-0.11	3	1	2.65	2.98	15.7	-1.72	17.32	3
8	8.04	0.31	-8.34	0.2	7.94	3.95	3	3.17	106.83	0.45	0	0.45	16.54	4.18	-0.08	3	0.98	2.3	2.91	16.29	-1.33	19.03	3
9	31.95	0.52	-8.34	0.24	31.85	1.64	5	2.45	113.96	0.51	0	0.51	61.5	1.67	-0.02	5	0.74	1.72	2.28	50.92	-1.18	39.35	7
10	25.17	0.73	-8.41	0.26	25.06	2.92	4	2.69	115.84	0.57	0	0.56	43.53	2.98	-0.02	4	0.84	1.7	2.53	39.34	-1.09	26.33	5
11	10.76	0.52	-6.48	0.26	10.68	4.89	3	3.12	111.29	0.62	0.01	0.61	16.39	5.19	-0.05	3	1	1.72	2.97	16.39	-0.78	17.01	3
12	13.89	0.31	-5.15	0.24	13.83	2.27	4	2.83	108.18	0.68	0.01	0.66	19.84	2.38	-0.03	4	0.91	1.53	2.71	19.06	-0.58	25.18	5
13	13.99	0.52	-3.35	0.24	13.95	3.74	3	2.96	111.94	0.73	0.02	0.71	18.52	3.95	-0.02	3	0.97	1.47	2.86	18.33	-0.37	19.89	3
14	36.03	0.84	1.57	0.24	36.05	2.32	4	2.5	117.7	0.79	0.02	0.77	45.93	2.37	0	5	0.81	1.3	2.43	43.24	0.11	30.87	5
15	26.11	1.15	4.02	0.3	26.16	4.39	3	2.79	119.25	0.85	0.03	0.82	30.77	4.54	0.01	4	0.93	1.26	2.74	30.24	0.32	19.41	3
16	57.64	1.15	12.46	0.22	57.8	1.99	5	2.3	121.18	0.91	0.03	0.88	64.78	2.02	0.02	5	0.76	1.15	2.27	61.89	0.98	36.87	7
17	27.05	1.15	13.34	0.21	27.21	4.22	3	2.77	119.34	0.97	0.04	0.93	28.12	4.38	0.04	4	0.94	1.13	2.75	27.92	0.99	19.73	3
18	14.52	0.84	8.54	0.2	14.62	5.71	3	3.06	115.5	1.03	0.04	0.99	13.79	6.15	0.04	3	1	1.07	3.08	13.79	0.58	15.37	3
19	119.67	1.15	1.07	0.17	119.69	0.96	6	1.86	122.96	1.09	0.05	1.04	113.79	0.97	0	6	0.61	1.01	1.86	113.12	0.03	68.56	7
20	207.81	1.25	4.64	0.15	207.87	0.6	6	1.54	124.94	1.15	0.05	1.1	187.95	0.61	0	6	0.49	0.98	1.55	191.66	0.25	108.31	7
21	255.32	1.25	2.86	0.26	255.36	0.49	6	1.42	125.44	1.22	0.06	1.16	219.53	0.49	0	6	0.45	0.96	1.43	230.63	0.13	130.98	7
22	263.05	1.36	5.28	0.2	263.12	0.52	6	1.42	126.1	1.28	0.06	1.22	215.35	0.52	0	6	0.46	0.94	1.45	232.17	0.26	127.21	7
23	267.02	1.25	2.19	0.24	267.05	0.47	6	1.39	125.55	1.34	0.07	1.27	208.63	0.47	0	6	0.45	0.92	1.42	230.93	0.07	134.66	7
24	367.9	1.46	-0.32	0.2	367.89	0.4	7	1.24	127.46	1.41	0.07	1.33	275.05	0.4	0	7	0.4	0.91	1.27	316.05	-0.07	166.29	7
25	347.95	1.67	7.77	-0.32	348.05	0.48	7	1.31	128.3	1.47	0.08	1.39	249.03	0.48	0	6	0.43	0.89	1.35	291.06	0.35	143.14	7
26	69.86	0.84	6.35	-0.5	69.94	1.19	5	2.1	119.32	1.53	0.08	1.45	47.29	1.22	0.01	5	0.75	0.79	2.19	51.07	0.26	46.14	7
27	28.72	1.04	51.37	-0.52	29.35	3.56	4	2.69	118.83	1.59	0.09	1.5	18.49	3.76	0.13	3	1	0.7	2.84	18.49	2.41	20.41	3
28	32.37	1.46	52.08	-0.54	33.01	4.43	4	2.72	121.58	1.65	0.09	1.56	20.14	4.66	0.12	3	1	0.68	2.87	20.14	2.35	18.39	3
29	44.07	2.51	9.02	-0.6	44.18	5.67	3	2.7	126.23	1.71	0.1	1.62	26.29	5.9	0.01	3	1	0.66	2.86	26.29	0.34	16.12	3
30	73.93	2.72	10.11	-0.59	74.06	3.67	4	2.41	128.08	1.78	0.1	1.67	43.17	3.76	0.01	4	0.9	0.66	2.55	45.16	0.37	23.02	5
31	237.57	1.98	11.28	-0.56	237.71	0.83	6	1.6	128.63	1.84	0.11	1.73	136.05	0.84	0	6	0.58	0.75	1.69	167.69	0.41	84.19	7
32	258.25	1.57	9.43	-0.52	258.36	0.61	6	1.48	127.1	1.91	0.11	1.79	143.08	0.61	0	6	0.53	0.75	1.57	182.95	0.32	106.17	7
33	354.43	1.57	9.83	-0.49	354.55	0.44	7	1.28	127.87	1.97	0.12	1.85	190.45	0.44	0	6	0.46	0.77	1.37	257.73	0.32	145.11	7
34	353.9	1.25	8.89	-0.56	354.01	0.35	7	1.22	126.24	2.03	0.12	1.91	184.33	0.36	0	7	0.44	0.77	1.31	256.51	0.27	165.2	7
35	373.12	1.36	11.18	-0.63	373.26	0.36	7	1.21	126.95	2.1	0.13	1.97	188.59	0.37	0	7	0.44	0.76	1.3	266.88	0.34	165.19	7
36	404.13	1.15	10.4	-0.61	404.26	0.28	7	1.11	125.92	2.16	0.13	2.03	198.45	0.29	0	7	0.41	0.77	1.21	291.6	0.3	196.74	7
37	469.19	1.25	10.43	-0.53	469.32	0.27	7	1.05	126.93	2.22	0.14	2.08	224.05	0.27	0	7	0.38	0.77	1.14	340.35	0.29	217.19	7
38	430.66	2.92	11.39	-0.5	430.8	0.68	6	1.36	132.92	2.29	0.14	2.15	199.66	0.68	0	6	0.51	0.7	1.47	282.29	0.32	111.3	7
39	164.37	3.76	169.04	-0.34	166.44	2.26	5	2.02	132.44	2.35	0.15	2.21	74.33	2.29	0.07	5	0.79	0.56	2.2	86.54	5.45	35.99	7
40	138.16	1.98	18.39	-0.31	138.38	1.43	6	1.93	127.31	2.42	0.15	2.27	59.99	1.46	0.01	5	0.77	0.56	2.13	71.61	0.52	46.77	7
41	150.27	2.82	27.69	-0.37	150.61	1.87	6	1.99	130.09	2.48	0.16	2.33	63.67	1.9	0.01	5	0.79	0.53	2.19	74.87	0.79	39.94	7
42	200.92	3.03	18.91	-0.3	201.15	1.51	6	1.84	131.32	2.55	0.16	2.39	83.19	1.52	0.01	6	0.73	0.55	2.02	103.35	0.5	49.8	7
43	56.08	2.51	19.7	-0.3	56.32	4.45	4	2.56	126.83	2.61	0.17	2.45	21.96	4.67	0.02	3	1	0.43	2.85	21.96	0.51	18.53	3
44	46.68	2.51	26.05	-0.35	47	5.33	4	2.67	126.38	2.68	0.17	2.5	17.7	5.65	0.04	3	1	0.42	2.97	17.7	0.68	16.29	3
45	112.47	3.97	33.04	-0.39	112.87	3.52	5	2.28	131.88	2.74	0.18	2.57	42.94	3.6	0.02	4	0.94	0.44	2.54	45.31	0.86	23.71	5
46	127.92	3.45	26.14	-0.4	128.24	2.69	5	2.15	131.16	2.81	0.18	2.63	47.77	2.75	0.01	5	0.89	0.44	2.41	52.68	0.65	29.19	5
47	101.4	2.72	20.09	-0.46	101.64	2.67	5	2.22	128.85	2.87	0.19	2.69	36.78	2.75	0.01	4	0.93	0.42	2.51	39.18	0.47	27.68	5
48	40.31	2.4	44.73	-0.46	40.86	5.88	3	2.74	125.73	2.93	0.19	2.74	13.82	6.33	0.08	3	1	0.39	3.08	13.82	1.1	15.12	3
49	80.93	3.45	44.44	-0.48	81.48	4.23	4	2.43	130.06	3	0.2	2.8	27.99	4.39	0.04	3	1	0.38	2.75	27.99	1.07	19.69	3
50	159.46	3.55	33.95	-0.5	159.88	2.22	5	2.03	131.92	3.07	0.2	2.86	54.74	2.26	0.01	5	0.86	0.42	2.3	62.9	0.78	34.32	7
51	127.82	2.72	25.56	-0.45	128.13	2.12	5	2.08	129.42	3.13	0.21	2.92	42.75	2.17	0.01	5	0.89	0.4	2.37	47.67	0.56	33.23	7
52	82.81	2.4	27.62	-0.48	83.15	2.89	5	2.3	127.46	3.19	0.21	2.98	26.8	3	0.02	4	1	0.35	2.66	26.8	0.6	24.45	5
53	145.36	2.3	29.25	-0.48	145.72	1.58	6	1.94	128.51	3.26	0.22	3.04	46.83	1.61	0.01	5	0.85	0.41	2.24	54.94	0.62	40.95	7
54	60.05	2.4	33.75	-0.48	60.46	3.97	4	2.5	126.69	3.32	0.22	3.1	18.43	4.2	0.04	3	1	0.34	2.87	18.43	0.71	19.28	3
55	59.52	1.98	29.72	-0.55	59.89	3.31	4	2.44	125.27	3.38	0.23	3.16	17.89	3.51	0.03	3	1	0.34	2.83	17.89	0.61	21	3
56	41.46	2.09	45.88	-0.56	42.02	4.97	4	2.68	124.78	3.45	0.23	3.22	11.99	5.41	0.08	3	1	0.33	3.09	11.99	0.96	16.3	3
57	83.02	2.82	74.35	-0.54	83.93	3.36	5	2.35	128.66	3.51	0.24	3.28	24.55	3.51	0.06	4	1	0.32	2.73	24.55	1.56	22.14	5
58	50.65	2.19	79.87	-0.5	51.62	4.25	4	2.57	125.64	3.57	0.24	3.33	14.42	4.56	0.11	3	1	0.32	2.98	14.42	1.65	17.98	3
59	51.06	2.19	101.21	-0.57	52.3	4.19	4	2.56	125.67	3.64	0.25	3.39	14.35	4.51	0.14	3	1	0.31	2.98	14.35	2.08	18.08	3
60	49.71	0	78.42	-0.67	50.67	0	0	0	87.36	3.68	0.25	3.43	13.7	0	0.11	0	1	0.31	4.06	13.7	1.57	33.86	0

	CPT-3	In situ data										Basic output data											
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn	U2	I(B)	Mod. SBTn
1	13.05	0.63	0.04	-0.06	13.05	4.8	3	3.05	113.12	0.06	0	0.06	229.65	4.82	0	9	0.76	9.22	2.37	113.23	0.06	20.01	3
2	27.57	0.73	-0.16	-0.11	27.57	2.65	4	2.63	116.07	0.11	0	0.11	239.41	2.66	0	5	0.68	4.53	2.16	117.5	-0.1	33.3	7
3	30.81	1.15	-0.64	-0.11	30.8	3.73	4	2.69	119.65	0.17	0	0.17	175.66	3.75	0	5	0.73	3.75	2.3	108.67	-0.26	24.85	5
4	27.57	0.94	-1.89	-0.07	27.55	3.41	4	2.7	117.9	0.23	0	0.23	117.06	3.44	0	5	0.76	3.13	2.35	80.88	-0.58	26.09	5
5	18.38	0.73	-3.99	-0.06	18.33	3.99	3	2.88	115.07	0.29	0	0.29	62.01	4.05	-0.02	4	0.83	2.93	2.55	49.97	-0.99	22.01	3
6	28.93	0.52	-6.21	-0.02	28.85	1.81	4	2.51	113.72	0.35	0	0.35	81.95	1.83	-0.02	5	0.72	2.23	2.25	60.18	-1.29	38.94	7
7	7.1	0.31	-10.11	0.02	6.98	4.49	3	3.25	106.52	0.4	0	0.4	16.4	4.76	-0.11	3	0.99	2.62	2.95	16.27	-1.81	17.81	3
8	10.23	0.21	-9.22	0.04	10.12	2.06	3	2.92	104.46	0.45	0	0.45	21.33	2.16	-0.07	4	0.89	2.13	2.68	19.46	-1.47	26.29	4
9	21.83	0.42	-9.33	0	21.71	1.92	4	2.63	111.39	0.51	0	0.51	41.66	1.97	-0.03	5	0.8	1.8	2.44	36.08	-1.32	32.66	7
10	12.11	0.52	-9.22	-0.02	12	4.35	3	3.05	111.58	0.56	0	0.56	20.25	4.57	-0.06	3	0.97	1.84	2.87	19.89	-1.18	18.59	3
11	9.19	0.42	-8.19	-0.09	9.09	4.6	3	3.16	109.27	0.62	0	0.62	13.67	4.93	-0.07	3	1	1.71	3.02	13.67	-0.95	17.23	3
12	22.35	0.73	-8.54	-0.15	22.24	3.29	4	2.76	115.54	0.68	0	0.68	31.84	3.39	-0.03	4	0.89	1.49	2.65	30.34	-0.91	23.34	5
13	19.84	0.94	-8.3	-0.21	19.74	4.76	3	2.9	117.09	0.74	0	0.74	25.83	4.95	-0.03	3	0.96	1.42	2.82	25.44	-0.81	18.1	3
14	17.96	1.36	-8.89	-0.28	17.85	7.6	3	3.07	119.54	0.8	0	0.8	21.44	7.96	-0.04	3	1	1.33	3.01	21.44	-0.8	13.07	3
15	165.52	1.67	-7.21	-0.33	165.43	1.01	6	1.77	126.49	0.86	0	0.86	191.65	1.02	0	6	0.55	1.12	1.74	174.53	-0.6	74.65	7
16	30.81	1.46	1.41	-0.36	30.82	4.74	3	2.76	121.41	0.92	0	0.92	32.52	4.89	0	3	0.94	1.14	2.74	32.23	0.11	18.56	3
17	16.92	0.73	1.28	-0.37	16.93	4.32	3	2.93	114.88	0.98	0	0.97	16.42	4.58	0.01	3	1	1.09	2.94	16.42	0.09	18.19	3
18	9.4	0.42	0.88	-0.39	9.41	4.44	3	3.14	109.35	1.03	0.01	1.02	8.2	4.99	0.01	3	1	1.04	3.2	8.2	0.05	16.41	2
19	10.34	0.42	1.17	-0.42	10.35	4.03	3	3.08	109.58	1.09	0.01	1.07	8.65	4.51	0.01	3	1	0.99	3.15	8.65	0.07	17.11	2
20	97.12	0.94	-0.8	-0.58	97.11	0.97	6	1.93	120.98	1.15	0.02	1.13	85.13	0.98	0	6	0.65	0.96	1.95	87.06	-0.07	62.51	7
21	198.1	1.15	-9.72	-0.65	197.98	0.58	6	1.55	124.18	1.21	0.02	1.18	166.13	0.58	0	6	0.51	0.94	1.57	175.66	-0.61	107.6	7
22	205.62	1.04	-10.5	-0.74	205.49	0.51	6	1.5	123.58	1.27	0.03	1.24	164.51	0.51	0	6	0.49	0.92	1.53	178.41	-0.63	116.86	7
23	129.18	0.94	-9.33	-0.78	129.06	0.73	6	1.76	121.67	1.33	0.03	1.3	98.47	0.74	-0.01	6	0.6	0.89	1.81	106.85	-0.54	78.62	7
24	352.96	1.25	-9.33	-0.9	352.85	0.36	7	1.22	126.23	1.39	0.04	1.36	259.31	0.36	0	7	0.39	0.91	1.26	301.38	-0.52	175.47	7
25	359.65	1.46	-6.89	-1.24	359.56	0.41	7	1.25	127.4	1.46	0.04	1.41	253.22	0.41	0	7	0.41	0.89	1.29	300.49	-0.38	161.15	7
26	359.54	1.36	-4.39	-1.35	359.49	0.38	7	1.23	126.86	1.52	0.05	1.47	243.06	0.38	0	7	0.41	0.87	1.28	295.71	-0.25	167.84	7
27	321.53	1.15	-1.96	-1.37	321.51	0.36	7	1.25	125.37	1.58	0.05	1.53	209.02	0.36	0	7	0.42	0.86	1.31	258.75	-0.13	164.97	7
28	357.25	1.25	-0.68	-1.07	357.24	0.35	7	1.21	126.26	1.65	0.06	1.59	223.83	0.35	0	7	0.41	0.85	1.27	284.46	-0.07	172.96	7
29	91.79	1.36	4.73	-1.5	91.85	1.48	5	2.07	123.53	1.71	0.06	1.65	54.78	1.51	0	5	0.76	0.71	2.19	60.84	0.17	43.83	7
30	28.2	1.04	35.8	-1.5	28.63	3.65	4	2.71	118.77	1.77	0.07	1.7	15.8	3.89	0.09	3	1	0.62	2.9	15.8	1.48	19.63	3
31	22.56	1.04	37.74	-1.5	23.02	4.54	3	2.84	118.24	1.83	0.07	1.75	12.08	4.93	0.12	3	1	0.6	3.06	12.08	1.51	17.05	3
32	34.04	1.15	97.06	-1.53	35.23	3.26	4	2.61	119.97	1.89	0.08	1.81	18.43	3.45	0.21	3	1	0.58	2.82	18.43	3.82	21.3	3
33	107.87	2.19	21.02	-1.62	108.13	2.03	5	2.11	127.44	1.95	0.08	1.87	56.84	2.07	0.01	5	0.8	0.63	2.27	63.63	0.77	36.56	7
34	129.59	2.92	-7.66	-1.65	129.5	2.26	5	2.09	129.98	2.02	0.09	1.93	66.11	2.29	-0.01	5	0.8	0.62	2.25	74.67	-0.33	35.09	7
35	377.61	2.72	-6.86	-1.62	377.52	0.72	6	1.41	132.05	2.08	0.09	1.99	188.72	0.72	0	6	0.52	0.72	1.51	255.31	-0.3	104.19	7
36	406.22	2.19	-5.22	-1.63	406.16	0.54	7	1.3	130.67	2.15	0.1	2.05	197.09	0.54	0	6	0.48	0.73	1.4	277.77	-0.23	130.35	7
37	479.01	2.09	-2.65	-1.46	478.98	0.44	7	1.18	130.71	2.21	0.1	2.11	225.92	0.44	0	7	0.44	0.74	1.28	333.01	-0.14	158.89	7
38	485.38	1.98	1	-1.39	485.39	0.41	7	1.16	130.37	2.28	0.11	2.17	222.58	0.41	0	7	0.43	0.73	1.26	334.46	-0.02	166.12	7
39	467.94	1.88	0.78	-1.41	467.95	0.4	7	1.17	129.88	2.34	0.11	2.23	208.74	0.4	0	7	0.44	0.72	1.27	316.69	-0.03	165.12	7
40	318.29	0	-1.2	-1.48	318.28	0	0	0	87.36	2.39	0.12	2.27	139.2	0	0	0	1	0.47	4.06	139.2	-0.09	213.14	0

	CPT-4	In situ data										Basic output data											
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn	U2	I(B)	Mod. SBTn
1	25.06	1.25	0.68	0.39	25.07	5	3	2.84	119.78	0.06	0	0.06	417.34	5.01	0	9	0.72	7.84	2.27	185.28	0.82	19.56	3
2	14.52	0.73	0.78	0.39	14.52	5.03	3	3.02	114.5	0.12	0	0.12	122.91	5.07	0	9	0.8	5.85	2.48	79.59	0.48	18.91	3
3	11.8	0.63	0.68	0.35	11.81	5.31	3	3.11	112.87	0.17	0	0.17	67.06	5.39	0	4	0.86	4.71	2.62	51.78	0.28	17.71	3
4	20.47	0.63	0.7	0.35	20.48	3.06	4	2.77	114.21	0.23	0	0.23	87.78	3.09	0	5	0.77	3.24	2.4	62.04	0.22	27.5	5
5	33	0.52	-5.19	0.39	32.94	1.59	5	2.43	114.04	0.29	0	0.29	113.47	1.6	-0.01	5	0.68	2.42	2.14	74.55	-1.3	44.68	7
6	8.98	0.42	-8.34	0.43	8.88	4.7	3	3.17	109.21	0.34	0	0.34	24.93	4.89	-0.07	3	0.95	2.92	2.84	23.52	-1.75	18.11	3
7	6.06	0.21	-8.24	0.48	5.96	3.51	3	3.24	103.16	0.39	0	0.39	14.12	3.76	-0.11	3	0.99	2.65	2.94	13.95	-1.51	19.57	3
8	16.92	0.31	-8.12	0.5	16.82	1.86	4	2.71	108.66	0.45	0	0.44	36.93	1.91	-0.04	5	0.82	2.03	2.48	31.45	-1.33	31.84	5
9	26.84	0.52	-8.73	0.46	26.73	1.95	4	2.56	113.53	0.5	0.01	0.5	52.97	1.99	-0.02	5	0.78	1.8	2.37	44.69	-1.29	34.4	7
10	29.87	0.73	-8.7	0.48	29.76	2.46	4	2.58	116.25	0.56	0.01	0.55	53.24	2.5	-0.02	5	0.8	1.69	2.42	46.63	-1.17	30.32	5
11	8.56	0.63	-9.51	0.48	8.45	7.42	3	3.31	112.05	0.62	0.02	0.6	13.06	8	-0.09	3	1	1.76	3.17	13.06	-1.18	13.21	3
12	15.14	0.52	-9.41	0.48	15.03	3.47	3	2.91	112.13	0.68	0.02	0.65	22.05	3.64	-0.05	4	0.94	1.58	2.78	21.43	-1.08	21.24	3
13	20.36	0.84	-9.37	0.5	20.25	4.13	3	2.86	116.29	0.73	0.03	0.7	27.73	4.28	-0.04	4	0.93	1.46	2.75	26.98	-1	19.94	3
14	21.51	1.25	-9.22	0.5	21.4	5.86	3	2.94	119.39	0.79	0.03	0.76	27.16	6.08	-0.03	3	0.98	1.38	2.86	26.94	-0.92	15.8	3
15	49.29	1.88	-8.79	0.52	49.18	3.82	4	2.55	124.39	0.86	0.04	0.82	59.22	3.89	-0.01	4	0.84	1.24	2.49	56.79	-0.82	22.96	5
16	41.04	2.09	-8.5	0.55	40.94	5.1	4	2.69	124.71	0.92	0.04	0.87	45.81	5.22	-0.02	4	0.9	1.19	2.66	44.97	-0.75	18.04	3
17	26.94	1.78	-8.63	0.63	26.84	6.62	3	2.9	122.49	0.98	0.05	0.93	27.81	6.87	-0.03	3	0.99	1.14	2.89	27.79	-0.72	14.49	3
18	28.72	1.36	-8.54	0.61	28.61	4.74	3	2.78	120.69	1.04	0.05	0.99	27.99	4.92	-0.02	3	0.96	1.07	2.78	27.9	-0.68	18.28	3
19	34.04	2.09	-8.63	0.61	33.94	6.15	3	2.81	124.26	1.1	0.06	1.04	31.5	6.36	-0.02	3	0.98	1.01	2.83	31.49	-0.65	15.35	3
20	173.56	1.88	-7.93	0.59	173.46	1.08	6	1.77	127.46	1.17	0.06	1.1	156.45	1.09	0	6	0.58	0.98	1.79	159.08	-0.58	69.42	7
21	191.94	1.15	3.93	0.59	191.99	0.6	6	1.57	124.11	1.23	0.07	1.16	164.66	0.6	0	6	0.51	0.95	1.59	172.14	0.18	104.88	7
22	191.31	1.57	-9.88	0.63	191.19	0.82	6	1.66	126.37	1.29	0.07	1.22	156.06	0.82	0	6	0.55	0.93	1.69	166.17	-0.64	85.08	7
23	371.97	1.67	-10.78	0.62	371.84	0.45	7	1.27	128.46	1.35	0.08	1.28	290.35	0.45	0	7	0.4	0.93	1.3	324.59	-0.67	154.63	7
24	519.42	1.46	-11.79	0.69	519.28	0.28	7	1.03	128.3	1.42	0.08	1.34	387.83	0.28	0	7	0.31	0.93	1.05	454.9	-0.7	234.3	7
25	317.77	1.15	-11.68	0.83	317.63	0.36	7	1.26	125.34	1.48	0.09	1.39	226.94	0.36	0	7	0.41	0.89	1.3	266.75	-0.67	165.8	7
26	82.08	1.25	-11.88	0.98	81.93	1.53	5	2.11	122.67	1.54	0.09	1.45	55.46	1.56	-0.01	5	0.76	0.79	2.21	59.83	-0.65	42.77	7
27	32.69	1.15	-11.78	0.87	32.54	3.53	4	2.66	119.78	1.6	0.1	1.5	20.56	3.71	-0.03	3	0.99	0.71	2.8	20.65	-0.63	20.9	3
28	24.54	0.94	-11.88	0.85	24.39	3.85	4	2.78	117.61	1.66	0.1	1.56	14.59	4.13	-0.04	3	1	0.68	2.95	14.59	-0.61	18.87	3
29	30.18	1.04	-11.97	0.81	30.03	3.48	4	2.68	118.89	1.72	0.11	1.61	17.55	3.69	-0.03	3	1	0.66	2.85	17.55	-0.6	20.45	3
30	52	2.51	-11.97	0.78	51.86	4.83	4	2.61	126.62	1.78	0.11	1.67	29.96	5.01	-0.02	3	0.98	0.64	2.76	30.2	-0.58	18.18	3
31	73.31	4.39	-11.57	0.78	73.17	5.99	9	2.58	131.56	1.85	0.12	1.73	41.17	6.15	-0.01	3	0.97	0.62	2.73	41.74	-0.55	15.84	3
32	197.26	3.34	-11.49	0.76	197.12	1.7	6	1.88	131.99	1.92	0.12	1.79	108.85	1.71	0	6	0.69	0.69	1.99	127.92	-0.53	47.73	7
33	230.47	2.4	-10.34	0.78	230.34	1.04	6	1.68	129.95	1.98	0.13	1.85	123.22	1.05	0	6	0.62	0.71	1.79	152.56	-0.47	70.54	7
34	625	2.72	-9.6	0.78	624.88	0.43	7	1.11	133.28	2.05	0.13	1.92	325.23	0.44	0	7	0.39	0.79	1.17	467.58	-0.43	174.41	7
35	472.95	2.4	-9.11	0.65	472.84	0.51	7	1.24	131.7	2.11	0.14	1.98	238.22	0.51	0	7	0.45	0.76	1.32	336.36	-0.4	143.35	7
36	544.59	1.78	-8.57	0.63	544.48	0.33	7	1.06	129.84	2.18	0.14	2.04	266.35	0.33	0	7	0.38	0.78	1.14	399.66	-0.37	203.98	7
37	496.97	2.3	-7.66	0.54	496.88	0.46	7	1.19	131.5	2.24	0.15	2.1	235.88	0.46	0	7	0.44	0.74	1.29	346.16	-0.33	154.33	7
38	464.28	2.19	-7.05	0.61	464.2	0.47	7	1.22	130.99	2.31	0.15	2.16	214.09	0.47	0	7	0.46	0.72	1.32	315.48	-0.31	148.09	7
39	420.11	3.55	-6.77	0.54	420.03	0.85	6	1.44	134.28	2.38	0.16	2.22	188.16	0.85	0	6	0.55	0.67	1.56	262.94	-0.29	92.99	7
40	385.55	4.91	-4.06	0.72	385.5	1.27	6	1.61	136.43	2.44	0.16	2.28	167.78	1.28	0	6	0.62	0.62	1.74	224.83	-0.2	65.58	7
41	392.54	1.98	-5.29	0.51	392.48	0.51	7	1.29	129.85	2.51	0.17	2.34	166.43	0.51	0	6	0.5	0.67	1.42	247.18	-0.23	131.37	7
42	259.08	2.51	-4.82	0.37	259.02	0.97	6	1.62	130.55	2.58	0.17	2.4	106.7	0.98	0	6	0.64	0.59	1.79	142.79	-0.22	72.91	7
43	87.41	3.34	-2.84	0.35	87.37	3.82	4	2.38	130	2.64	0.18	2.46	34.4	3.94	0	4	0.97	0.44	2.65	35.14	-0.15	21.64	3
44	111.95	2.09	-3.83	0.48	111.9	1.87	5	2.08	127.17	2.7	0.18	2.52	43.29	1.91	0	5	0.86	0.48	2.33	49.04	-0.18	36.05	7
45	173.35	2.72	-3.12	0.58	173.31	1.57	6	1.89	130.15	2.77	0.19	2.58	66.04	1.59	0	5	0.78	0.5	2.11	80.53	-0.16	45.67	7
46	237.57	3.55	-2.84	0.84	237.54	1.49	6	1.79	132.88	2.84	0.19	2.64	88.77	1.51	0	6	0.73	0.51	1.99	113.27	-0.15	51.08	7
47	111.01	2.92	-2.94	1.06	110.97	2.63	5	2.19	129.61	2.9	0.2	2.7	39.97	2.71	0	4	0.92	0.42	2.47	43.1	-0.15	28.45	5
48	69.44	1.98	-1.09	1.11	69.43	2.86	5	2.35	125.63	2.96	0.2	2.76	24.07	2.99	0	4	1	0.38	2.69	24.07	-0.1	24.02	5
49	51.69	2.61	-0.15	1.13	51.69	5.05	4	2.62	126.92	3.03	0.21	2.82	17.26	5.36	0	3	1	0.38	2.96	17.26	-0.08	16.77	3
50	98.58	3.65	0.96	1.06	98.59	3.71	5	2.34	130.95	3.09	0.21	2.88	33.15	3.83	0	4	1	0.37	2.65	33.22	-0.05	21.92	3
51	131.06	3.55	1.17	1.17	131.07	2.71	5	2.15	131.43	3.16	0.22	2.94	43.48	2.78	0	5	0.92	0.39	2.45	47.04	-0.04	28.44	5
52	158.1	2.92	0.94	1.3	158.11	1.85	6	1.97	130.47	3.22	0.22	3	51.59	1.89	0	5	0.85	0.41	2.26	60.19	-0.05	38.23	7
53	45.63	2.3	2.03	1.39	45.66	5.03	4	2.66	125.68	3.29	0.23	3.06	13.85	5.42	0	3	1	0.35	3.04	13.85	-0.03	16.44	3
54	44.9	1.67	2.48	1.43	44.93	3.72	4	2.57	123.31	3.35	0.23	3.12	13.34	4.02	0	3	1	0.34	2.97	13.34	-0.02	18.88	3
55	102.13	1.98	4.95	1.41	102.19	1.94	5	2.12	126.57	3.41	0.24	3.18	31.11	2.01	0	5	0.94	0.35	2.47	33.09	0.04	31.58	5
56	131.79	2.51	4.71	1.45	131.84	1.9	5	2.03	128.9	3.47	0.24	3.23	39.69	1.95	0	5	0.91	0.36	2.37	44.09	0.03	34.65	7
57	122.91	2.51	5.85	1.43	122.98	2.04	5	2.08	128.73	3.54	0.25	3.29	36.26	2.1	0	5	0.93	0.35	2.43	39.15	0.05	32.3	7
58	100.35	2.61	8.05	1.43	100.45	2.6	5	2.21	128.54	3.6	0.25	3.35	28.88	2.7	0	4	1	0.32	2.6	28.91	0.1	26.3	5
59	141.92	3.34	5.99	1.46	141.99	2.35	5	2.08	131.19	3.67	0.26	3.41	40.51	2.42	0	5	0.94	0.33	2.43	43.47	0.05	30.55	5
60	93.98	0	4.9	1.54	94.04	0	0	0	87.36	3.71	0.26	3.45	26.16	0	0	0	1	0.31	4.06	26.16	0.03	51.66	0

	CPT-5	In situ data										Basic output data											
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn	U2	I(B)	Mod. SBTn
1	29.66	1.15	0.97	0.04	29.67	3.87	4	2.71	119.55	0.06	0	0.06	495.01	3.88	0	8	0.68	6.99	2.16	195.69	1.17	24.81	5
2	27.67	1.25	0.74	0.07	27.68	4.53	3	2.78	120.02	0.12	0	0.12	229.94	4.55	0	9	0.74	5	2.32	130.13	0.44	21.18	3
3	15.35	0.73	0.64	0.13	15.36	4.76	3	2.99	114.64	0.18	0	0.18	85.75	4.81	0	4	0.82	4.35	2.53	62.44	0.26	19.54	3
4	18.38	0.63	1.28	0.15	18.39	3.41	3	2.84	113.95	0.23	0	0.23	77.59	3.45	0.01	4	0.8	3.32	2.46	56.98	0.39	25.12	5
5	10.34	0.84	0.99	0.15	10.35	8.07	3	3.27	114.66	0.29	0	0.29	34.52	8.31	0.01	3	0.97	3.48	2.89	33.1	0.24	12.5	3
6	36.55	0.52	1.25	0.1	36.56	1.43	5	2.37	114.29	0.35	0	0.35	103.89	1.44	0	5	0.67	2.11	2.12	72.29	0.26	47.23	7
7	6.47	0.42	0.88	0.12	6.49	6.44	3	3.36	108.44	0.4	0	0.4	15.1	6.87	0.01	3	1	2.63	3.08	15.1	0.16	14.45	3
8	8.67	0.31	1.49	0.15	8.69	3.61	3	3.11	107.05	0.46	0	0.46	18.04	3.81	0.01	3	0.96	2.25	2.86	17.49	0.24	20.13	3
9	40.1	0.52	1.38	0.15	40.12	1.3	5	2.31	114.52	0.51	0	0.51	77.86	1.32	0	5	0.69	1.66	2.15	62.12	0.19	47.48	7
10	19.42	0.63	1.28	0.15	19.44	3.22	4	2.8	114.09	0.57	0.01	0.56	33.64	3.32	0	4	0.88	1.75	2.63	31.18	0.15	23.73	5
11	8.25	0.52	1.87	0.15	8.27	6.31	3	3.27	110.67	0.63	0.01	0.61	12.51	6.83	0.02	3	1	1.73	3.14	12.51	0.2	14.48	3
12	7	0.31	2.45	0.13	7.03	4.46	3	3.24	106.53	0.68	0.02	0.66	9.62	4.94	0.02	3	1	1.6	3.14	9.62	0.24	16.7	2
13	10.13	0.52	3.44	0.11	10.17	5.13	3	3.15	111.17	0.73	0.02	0.71	13.29	5.53	0.02	3	1	1.49	3.06	13.29	0.31	16.23	3
14	10.86	0.63	3.45	0.08	10.9	5.75	3	3.16	112.68	0.79	0.03	0.76	13.28	6.2	0.02	3	1	1.39	3.09	13.28	0.29	15.29	3
15	22.45	0.52	4.71	0.02	22.51	2.32	4	2.67	113.11	0.85	0.03	0.81	26.63	2.41	0.01	4	0.88	1.26	2.61	25.82	0.38	27.09	5
16	15.66	0.31	6.67	-0.02	15.75	1.99	4	2.75	108.5	0.9	0.04	0.86	17.21	2.11	0.03	4	0.93	1.21	2.72	16.95	0.51	25.48	4
17	13.47	0.42	8.15	-0.05	13.57	3.08	3	2.91	110.24	0.96	0.04	0.91	13.82	3.31	0.04	3	1	1.16	2.91	13.82	0.59	20.57	2
18	38.95	0.84	8.83	-0.15	39.06	2.14	5	2.45	117.89	1.02	0.05	0.97	39.35	2.2	0.02	5	0.83	1.08	2.45	38.74	0.61	31.43	5
19	195.8	0.84	10.46	-0.15	195.93	0.43	6	1.47	121.83	1.08	0.05	1.02	190.48	0.43	0	6	0.46	1.02	1.47	187.03	0.68	131.19	7
20	193.71	0.73	10.41	-0.13	193.84	0.38	6	1.45	120.82	1.14	0.06	1.08	178.68	0.38	0	6	0.45	0.99	1.45	180.55	0.64	137.59	7
21	181.91	0.73	11.18	-0.15	182.05	0.4	6	1.48	120.67	1.2	0.06	1.13	159.49	0.4	0	6	0.48	0.97	1.5	165.39	0.65	128.16	7
22	106.72	0.73	8.96	-0.22	106.83	0.68	6	1.81	119.37	1.26	0.07	1.19	88.81	0.69	0.01	6	0.61	0.93	1.84	92.97	0.49	76.63	7
23	27.57	1.88	17.36	-0.17	27.78	6.77	3	2.9	123	1.32	0.07	1.25	21.25	7.1	0.04	3	1	0.85	2.98	21.25	0.94	14.14	3
24	144.63	3.24	23.31	-0.02	144.92	2.23	5	2.06	131	1.38	0.08	1.31	109.91	2.26	0.01	5	0.71	0.86	2.11	116.71	1.23	38.02	7
25	61.3	2.3	10.01	0.02	61.42	3.74	4	2.48	126.4	1.45	0.08	1.36	43.96	3.83	0.01	4	0.89	0.8	2.56	45.22	0.47	22.7	5
26	28.93	1.88	9.24	-0.02	29.04	6.47	3	2.87	123.11	1.51	0.09	1.42	19.38	6.83	0.02	3	1	0.74	3	19.38	0.41	14.52	3
27	84.69	2.3	10.2	-0.02	84.82	2.71	5	2.28	127.19	1.57	0.09	1.48	56.26	2.76	0.01	5	0.82	0.76	2.37	59.68	0.43	29.69	5
28	212.82	1.57	9.86	0.04	212.94	0.74	6	1.59	126.63	1.64	0.1	1.54	137.4	0.74	0	6	0.56	0.81	1.67	162.13	0.4	90.51	7
29	314.22	1.57	11.28	0.02	314.36	0.5	6	1.35	127.58	1.7	0.1	1.6	195.81	0.5	0	6	0.47	0.83	1.42	243.84	0.44	132.1	7
30	390.77	2.09	12.75	-0.04	390.92	0.53	7	1.31	130.22	1.76	0.11	1.66	234.85	0.54	0	6	0.45	0.82	1.37	300.33	0.49	134.24	7
31	388.89	2.4	16.84	0.13	389.09	0.62	6	1.36	131.23	1.83	0.11	1.72	225.44	0.62	0	6	0.48	0.79	1.43	290.72	0.64	120.14	7
32	353.49	1.78	17.88	0.37	353.7	0.5	7	1.32	128.78	1.9	0.12	1.78	197.95	0.5	0	6	0.47	0.78	1.4	260.87	0.66	134.33	7
33	354.43	1.78	20.44	0.35	354.68	0.5	7	1.32	128.79	1.96	0.12	1.84	192.05	0.5	0	6	0.47	0.77	1.4	256.92	0.73	133.92	7
34	363.72	2.09	16.58	0.35	363.92	0.57	6	1.35	130.04	2.02	0.13	1.9	190.8	0.58	0	6	0.49	0.75	1.44	256.92	0.56	122.29	7
35	343.15	2.3	14.72	0.15	343.33	0.67	6	1.42	130.6	2.09	0.13	1.96	174.35	0.67	0	6	0.52	0.73	1.52	233.96	0.47	107.23	7
36	366.54	1.88	15.79	0.15	366.73	0.51	7	1.32	129.29	2.15	0.14	2.02	180.75	0.52	0	6	0.49	0.73	1.42	251.83	0.5	131.02	7
37	335.21	2.19	15.79	0.28	335.4	0.65	6	1.42	130.2	2.22	0.14	2.08	160.4	0.66	0	6	0.53	0.7	1.53	219.87	0.48	107.06	7
38	176.27	2.61	12.97	0.26	176.43	1.48	6	1.87	129.91	2.28	0.15	2.14	81.49	1.5	0	5	0.72	0.6	2.03	98.88	0.37	49.89	7
39	86.99	2.72	14.72	0.31	87.17	3.11	5	2.31	128.48	2.35	0.15	2.2	38.62	3.2	0.01	4	0.92	0.51	2.54	40.93	0.41	25.34	5
40	71.74	2.92	19.73	0.36	71.98	4.06	4	2.45	128.55	2.41	0.16	2.26	30.84	4.2	0.02	4	0.99	0.47	2.7	31.16	0.56	20.48	3
41	102.13	3.24	23.29	0.39	102.41	3.16	5	2.27	130.16	2.48	0.16	2.32	43.15	3.24	0.02	4	0.91	0.49	2.5	46.19	0.65	25.59	5
42	174.71	2.51	20.12	0.46	174.95	1.43	6	1.86	129.59	2.54	0.17	2.38	72.56	1.45	0.01	5	0.75	0.55	2.05	89.17	0.54	49.68	7
43	52.21	2.72	19.88	0.5	52.46	5.18	4	2.62	127.24	2.61	0.17	2.43	20.48	5.45	0.03	3	1	0.43	2.91	20.48	0.52	16.79	3
44	80.1	2.61	22.1	0.52	80.37	3.25	5	2.35	127.99	2.67	0.18	2.49	31.16	3.36	0.02	4	0.97	0.44	2.63	31.97	0.57	23.66	5
45	68.61	3.03	24.22	0.54	68.91	4.4	4	2.49	128.7	2.73	0.18	2.55	25.92	4.58	0.02	3	1	0.41	2.79	25.92	0.61	19.04	3
46	136.28	3.13	24.12	0.65	136.57	2.29	5	2.08	130.62	2.8	0.19	2.61	51.18	2.34	0.01	5	0.86	0.46	2.33	57.97	0.59	33.03	7
47	99	2.09	21.99	0.67	99.27	2.1	5	2.15	126.87	2.86	0.19	2.67	36.08	2.17	0.01	5	0.91	0.43	2.44	39.37	0.52	31.79	5
48	42.82	1.98	27.21	0.69	43.15	4.6	4	2.65	124.47	2.93	0.2	2.73	14.74	4.93	0.04	3	1	0.39	2.99	14.74	0.65	17.34	3
49	61.09	2.09	28.22	0.72	61.44	3.4	4	2.45	125.7	2.99	0.2	2.79	20.97	3.57	0.03	4	1	0.38	2.79	20.97	0.66	21.37	3
50	113.3	2.09	33.79	0.74	113.72	1.84	5	2.07	127.21	3.05	0.21	2.85	38.88	1.89	0.02	5	0.89	0.42	2.36	43.55	0.78	35.19	7
51	74.77	2.72	31.65	0.78	75.16	3.61	4	2.4	128.12	3.12	0.21	2.91	24.8	3.77	0.03	4	1	0.36	2.74	24.8	0.71	21.29	3
52	57.12	2.4	33.66	0.78	57.53	4.17	4	2.53	126.57	3.18	0.22	2.96	18.34	4.42	0.04	3	1	0.36	2.89	18.34	0.74	18.76	3
53	50.54	2.4	40.38	0.8	51.04	4.71	4	2.6	126.27	3.24	0.22	3.02	15.82	5.03	0.06	3	1	0.35	2.97	15.82	0.89	17.27	3
54	66	3.03	57.71	0.8	66.7	4.54	4	2.51	128.62	3.31	0.23	3.08	20.58	4.78	0.06	3	1	0.34	2.87	20.58	1.28	18.17	3
55	65.79	3.55	62.58	0.8	66.56	5.33	4	2.57	129.78	3.37	0.23	3.14	20.11	5.62	0.07	3	1	0.34	2.93	20.11	1.36	16.45	3
56	66.31	3.86	83.22	0.85	67.33	5.74	4	2.59	130.43	3.44	0.24	3.2	19.96	6.05	0.09	3	1	0.33	2.95	19.96	1.8	15.71	3
57	73.83	4.07	71.62	0.87	74.71	5.45	9	2.54	131.07	3.5	0.24	3.26	21.83	5.72	0.07	3	1	0.32	2.91	21.83	1.51	16.33	3
58	73.31	4.18	77.13	0.92	74.25	5.63	9	2.55	131.24	3.57	0.25	3.32	21.27	5.91	0.08	3	1	0.32	2.92	21.27	1.6	15.98	3
59	80.2	4.28	80.6	0.93	81.19	5.27	9	2.51	131.64	3.63	0.25	3.38	22.92	5.52	0.07	3	1	0.31	2.88	22.92	1.64	16.75	3
60	76.55	0	55.4	0.99	77.22	0	0	0	87.36	3.68	0.26	3.42	21.49	0	0.05	0	1	0.31	4.06	21.49	1.09	44.98	0

711 1st Street
Seal Beach, CA

CPT Shear Wave Measurements

CPT-1	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
	5.12	4.12	6.48	12.72	509.34	
	10.10	9.10	10.38	24.52	423.46	330.88
	15.12	14.12	14.98	32.84	456.12	552.40
	20.08	19.08	19.72	38.64	510.46	818.13
	25.07	24.07	24.58	43.88	560.25	927.40
	30.05	29.05	29.48	50.16	587.66	779.19
	35.10	34.10	34.46	56.08	614.56	842.48
	40.03	39.03	39.35	62.42	630.39	770.40
	45.08	44.08	44.36	69.60	637.39	698.29
	50.07	49.07	49.32	75.36	654.51	861.36
	55.05	54.05	54.28	80.52	674.13	960.60
	60.17	59.17	59.38	86.52	686.33	850.02

CPT-2						
	5.09	4.09	6.46	14.88	434.12	
	10.53	9.53	10.76	26.44	407.04	372.17
	15.09	14.09	14.95	33.48	446.56	595.01
	20.08	19.08	19.72	39.48	499.60	795.57
	25.43	24.43	24.94	45.40	549.26	880.43
	30.09	29.09	29.52	52.04	567.19	689.78
	35.50	34.50	34.86	58.78	593.07	792.86
	40.12	39.12	39.44	64.64	610.12	781.19
	46.23	45.23	45.51	72.64	626.45	758.41
	50.13	49.13	49.38	76.64	644.36	969.56
	55.09	54.09	54.32	81.36	667.66	1045.94
	60.24	59.24	59.45	87.56	678.97	827.42

Shear Wave Source Offset = 5 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

CPT-3

5.09	4.09	6.46	10.80	598.12	
10.10	9.10	10.38	20.32	510.98	412.13
15.12	14.12	14.98	27.40	546.68	649.15
20.11	19.11	19.75	35.32	559.27	602.80
25.03	24.03	24.54	41.64	589.45	758.13
30.09	29.09	29.52	47.76	618.02	812.40
35.07	34.07	34.43	56.52	609.25	561.46
40.06	39.06	39.38	62.08	634.32	889.17

CPT-4

5.51	4.51	6.73	11.96	563.00	
10.10	9.10	10.38	20.32	510.98	436.56
15.09	14.09	14.95	28.56	523.49	554.33
20.08	19.08	19.72	36.48	540.69	602.70
25.07	24.07	24.58	42.72	575.46	778.78
30.05	29.05	29.48	50.42	584.63	635.50
35.01	34.01	34.38	55.88	615.17	897.15
40.03	39.03	39.35	61.04	644.64	963.84
45.08	44.08	44.36	67.68	655.48	755.08
50.07	49.07	49.32	74.08	665.82	775.22
55.09	54.09	54.32	80.08	678.33	832.75
60.24	59.24	59.45	85.20	697.78	1001.96

Shear Wave Source Offset = 5 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

CPT-5

5.09	4.09	6.46	12.28	526.04	
10.04	9.04	10.33	24.18	427.24	325.28
15.09	14.09	14.95	33.48	446.56	496.80
20.08	19.08	19.72	41.84	471.42	570.98
25.10	24.10	24.61	49.68	495.43	623.59
30.09	29.09	29.52	55.04	536.27	914.81
35.10	34.10	34.46	60.60	568.72	889.94
40.09	39.09	39.41	65.96	597.46	922.36
45.11	44.11	44.39	72.60	611.47	750.60
50.07	49.07	49.32	78.60	627.53	821.93
55.09	54.09	54.32	85.20	637.57	757.05
60.10	59.10	59.31	90.56	654.94	931.07

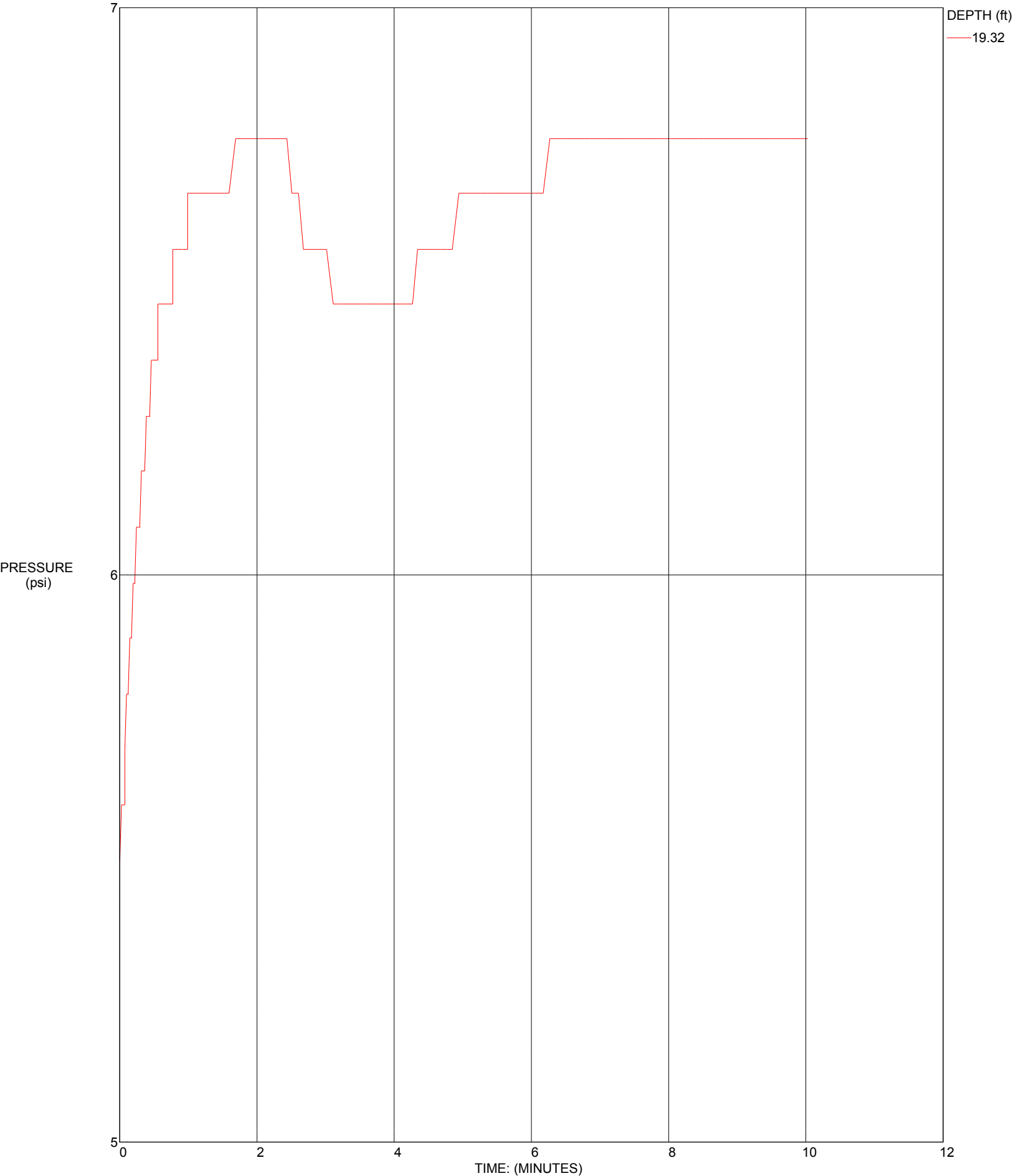
Shear Wave Source Offset = 5 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival

Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

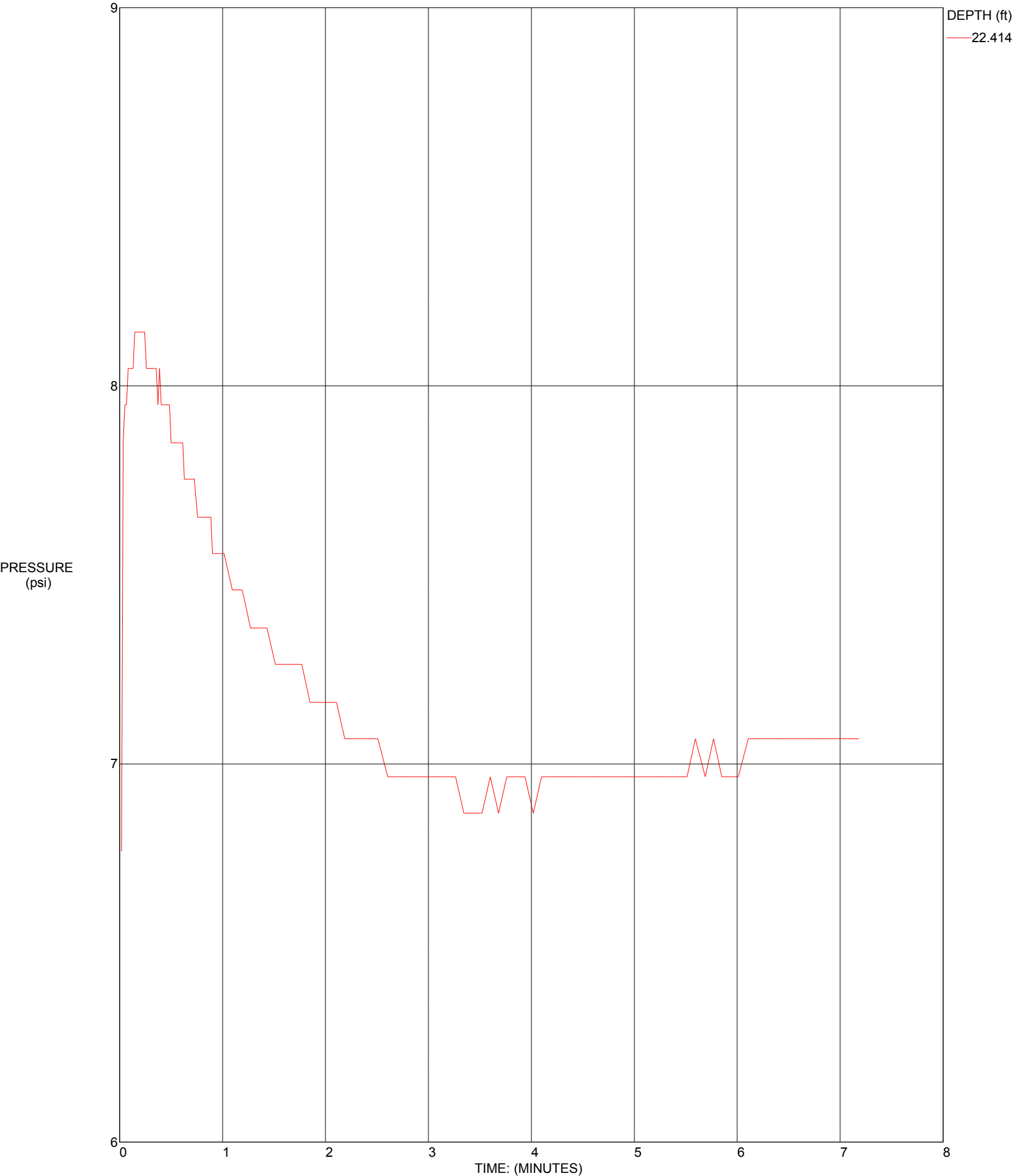
DISSIPATION

TEST ID: CPT-2
LOCATION: SealBeach
TEST DATE: Wed 11/Apr/2018
CLIENT: AMEC



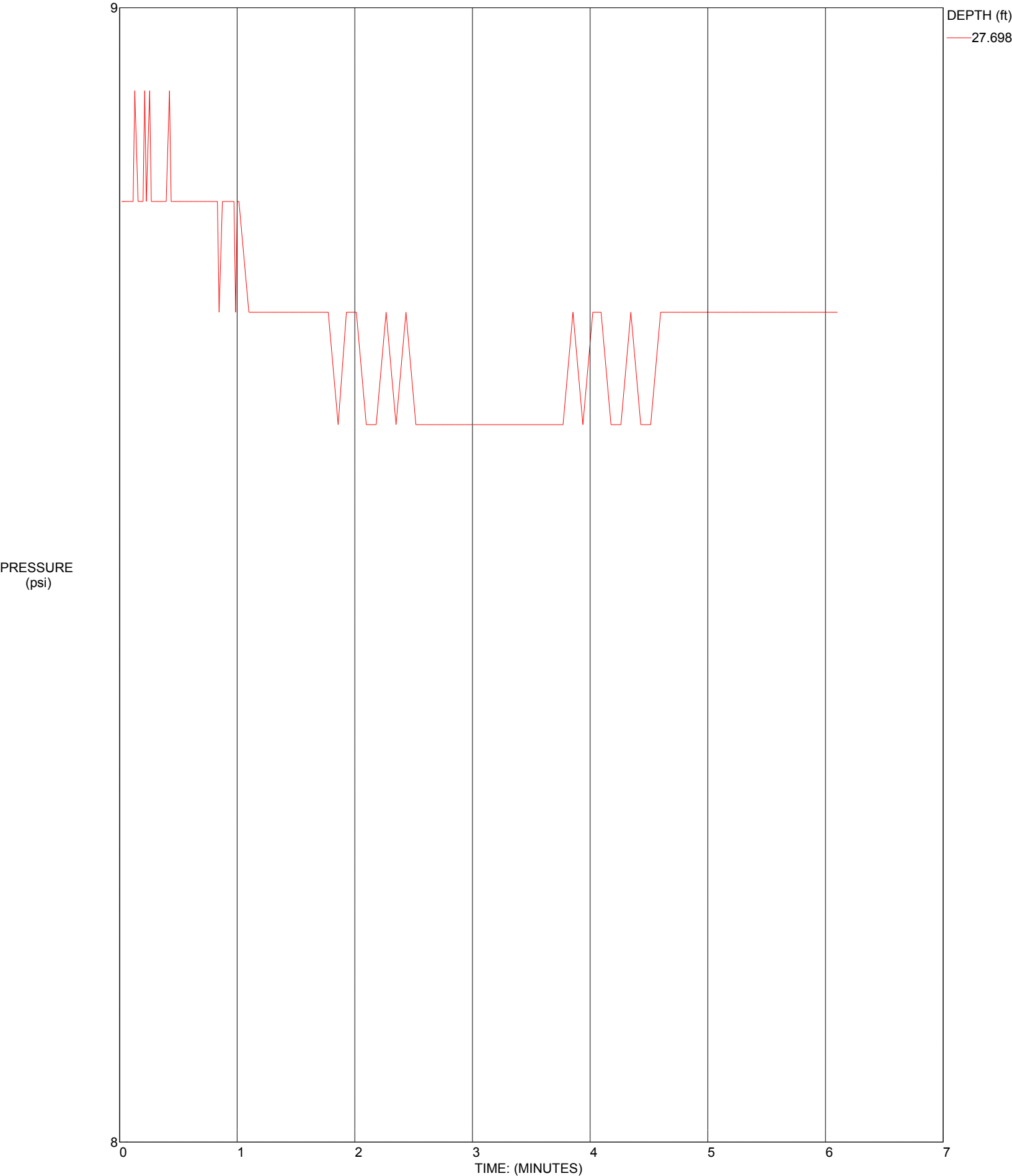
DISSIPATION

TEST ID: CPT-2
LOCATION: SealBeach
TEST DATE: Wed 11/Apr/2018
CLIENT: AMEC



DISSIPATION

TEST ID: CPT-5
LOCATION: SealBeach
TEST DATE: Wed 11/Apr/2018
CLIENT: AMEC



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

:: Unit Weight, g (kN/m³) ::

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

where g_w = water unit weight

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

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

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

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

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

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

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

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

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

:: Relative Density, Dr (%) ::

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

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

:: State Parameter, ψ ::

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

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

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

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

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

If $I_c > 2.20$

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

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

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

If $I_c \leq 2.20$

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

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

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

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

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

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

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

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

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

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

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

:: Overconsolidation Ratio, OCR ::

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

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

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

:: In situ Stress Ratio, Ko ::

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

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

:: Soil Sensitivity, S_t ::

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

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

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

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

(applicable for $0.10 < B_q < 1.00$)

References

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

Appendix C

Laboratory Testing Program

Appendix C

Laboratory Testing Program

Hellman Gas Plant Expansion
Hellman Properties, LLC
Seal Beach, California

Selected soil samples were tested in the laboratory to evaluate their physical characteristics and engineering properties. The following tests were performed in accordance with ASTM standards:

- Moisture content and dry density
- Fines content
- Atterberg limits
- Expansion index
- Direct shear
- Consolidation
- R-value
- Compaction
- Corrosion potential

Wood's Irvine Office testing laboratory performed the tests, except for corrosion potential and R-value. Corrosion potential and R-Value tests were performed by AP Engineering and Testing, Inc. of Pomona, California. Test procedures are described herein. Results of the tests are presented in laboratory data sheets and/or graphs in this appendix. Abbreviations for the above tests and test results of moisture-dry density, fines content, Atterberg limits, expansion index, and R-value are also given at the corresponding sample locations on the boring logs in Appendix B.

Moisture Content and Dry Density

The field moisture contents, as a percentage of the dry weight of the soils, were determined by weighing samples before and after oven drying. The dry density, in pounds per cubic foot (pcf), was also determined for some Shelby-tube samples and all relatively undisturbed ring samples collected. These analyses were performed in accordance with ASTM Methods D2216 and D2937. The results of these determinations are shown on a laboratory data sheet in this appendix and the boring logs in Appendix B.

Fines Content

Fines content (fraction passing the #200 sieve) was determined to assist in classification of the coarse-grained soils. The tests were performed in general accordance with ASTM Test Method D1140. Results of the fines content tests are presented at the corresponding sample location on the boring logs in Appendix B and on a summary laboratory data sheet in this appendix.

Atterberg Limits

Atterberg Limits were performed on representative soil samples to determine the plasticity of fine-grained soils and to assist in their classification. The test procedures were performed in accordance with ASTM D4318. The results are presented on a laboratory test sheet in this appendix and the boring logs in Appendix B.

Expansion Index

An expansion index (EI) test was performed on a representative soil sample to determine the expansion potential of site fine grained soils. A remolded ring specimen prepared in accordance with ASTM D4829 is soaked, and the maximum expansion of the sample under a standard applied pressure is recorded and used to calculate the value of EI. EI test results are shown on a laboratory data sheet in this appendix and the boring logs in Appendix B.

Direct Shear

Direct shear tests were performed on selected relatively undisturbed ring samples in accordance with ASTM Method D3080. The sample was soaked prior to testing. A different normal stress was applied vertically to each soil sample ring, which was then sheared in a horizontal direction. A new ring was used for each load. Each shear test was performed on a single ring with no multiple re-shearing. Ring samples where large gravels were exposed at the surface were not used for the shear tests. For ring samples containing fine gravel, if the fine gravel pieces were visible at the surfaces of the sample during sample preparation, the gravel was removed and patched with finer soil to achieve smooth and flat conditions of the sample surfaces before placing the sample into the test apparatus. Fine gravels inside a sample that were not visible during sample preparation were left in place. The resulting shear strength for the corresponding normal stress was measured at maximum shear stress and at a shear strain of approximately twenty percent. Results of the direct shear tests are shown graphically on laboratory data sheets included in this appendix.

Consolidation

Consolidation tests were performed to assist in evaluating the compressibility of fine grained site soils. The tests were performed in general accordance with ASTM Test Method D 2435. Inundated samples were subjected to successive loading increments. Unloading or rebound was also performed. Test results are plotted graphically to illustrate settlement characteristics of saturated soils under various normal pressures and are presented in this appendix.

R-Value

Representative soil samples were tested to determine the R-value of the subsurface materials. The tests were performed in general accordance with the latest revisions to Caltrans Test Method No. 301. Results of the R-value test are shown on a laboratory data sheet in this appendix and the boring logs in Appendix B.

Compaction

A compaction test establishes the relationship between varying moisture content and dry density when the soil is compacted under standardized conditions. The maximum dry density achievable under these

conditions and the corresponding optimum moisture content are then obtained. Modified proctor compaction tests were performed on selected bulk samples in accordance with ASTM Method D1557. The results of the compaction test are presented graphically in this appendix.

Corrosion Potential

Selected soil samples from the exploratory borings were performed to determine corrosivity of site soils to steel and concrete. The soils were tested for pH and minimum resistivity (Caltrans Test Method 643), soluble sulfate (Caltrans 417), and chloride (Caltrans 422). The results of the corrosion tests are included in this appendix.

wood.

MOISTURE CONTENT AND DRY DENSITY TEST

ASTM D7263 - Method B

Project Name: Hellman Gas Plant Expansion | *Project No.:* IR18166880 | *Phase.Task:* ****

Date: 5/14-5/15/2018 | *Tested By:* LT

Boring No.	Sample No.	Depth (ft)	Wet Soil and Rings (gr)	Number of Rings	Weight of Rings (gr)	Volume of Sample (cc)	Wet Density (pcf)	Wet Soil and Tare (gr)	Dry Soil and Tare (gr)	Tare No.	Tare Weight (gr)	Moisture Content (%)	Dry Density (pcf)	Soil Description
B-2	4	10.5-11.0	937.46	5	221.24	375.63	119.0	186.66	153.80	MC-53	50.41	31.8	90.3	Sandy Silt (ML)
B-2	5	13.5-14.0	773.33	4	176.99	300.50	123.9	197.96	166.70	MC-75	50.23	26.8	97.7	Lean Clay (CL)
B-2	7	18.5-19.0	1018.60	5	221.24	375.63	132.5	228.48	200.45	MC-12	50.95	18.7	111.6	Sandy Lean Clay (CL)
B-2	10	26.5-27.0	943.16	5	221.24	375.63	120.0	188.60	156.02	MC-23	50.41	30.8	91.7	Lean Clay (CL)
B-2	13	41.0-41.5	1175.54	6	265.49	450.75	126.0	186.06	159.47	MC-11	51.34	24.6	101.2	Sandy Silt (ML)
B-4	2	6.0-6.5	751.96	4	176.99	300.50	119.4	175.14	145.42	MC-54	51.21	31.5	90.8	Top: Lean Clay (CL) Bottom: Silty Sand (SM)
B-4	4	11.0-11.5	739.86	4	176.99	300.50	116.9	188.17	153.80	MC-61	50.20	33.2	87.8	Silty Sand (SM)
B-4	7	18.5-19.0	1011.28	5	221.24	375.63	131.3	218.75	190.95	MC-42	51.48	19.9	109.5	Sandy Lean Clay (CL)
B-4	9	26.0-26.5	845.98	4	176.99	300.50	139.0	213.22	194.55	MC-68	50.66	13.0	123.0	Clayey Sand (SC)
B-4	14	46.5-47.0	998.36	5	221.24	375.63	129.2	188.68	164.04	MC-20	51.08	21.8	106.0	Silt with Sand (ML)
B-4	15	52.0-52.5	960.29	5	221.24	375.63	122.8	172.70	146.16	MC-55	50.68	27.8	96.1	Sandy Silt (ML)
B-4	17	61.0-61.5	1189.43	6	265.49	450.75	128.0	180.27	156.37	MC-41	51.56	22.8	104.2	Lean Clay with Sand (CL)

Ring I.D. (in.) = 2.416 Ring Height (in.) = 1.000

Average weight of 1 ring (gr.): 44.248

wood.

MATERIAL IN SOILS FINER THAN No. 200 SIEVE

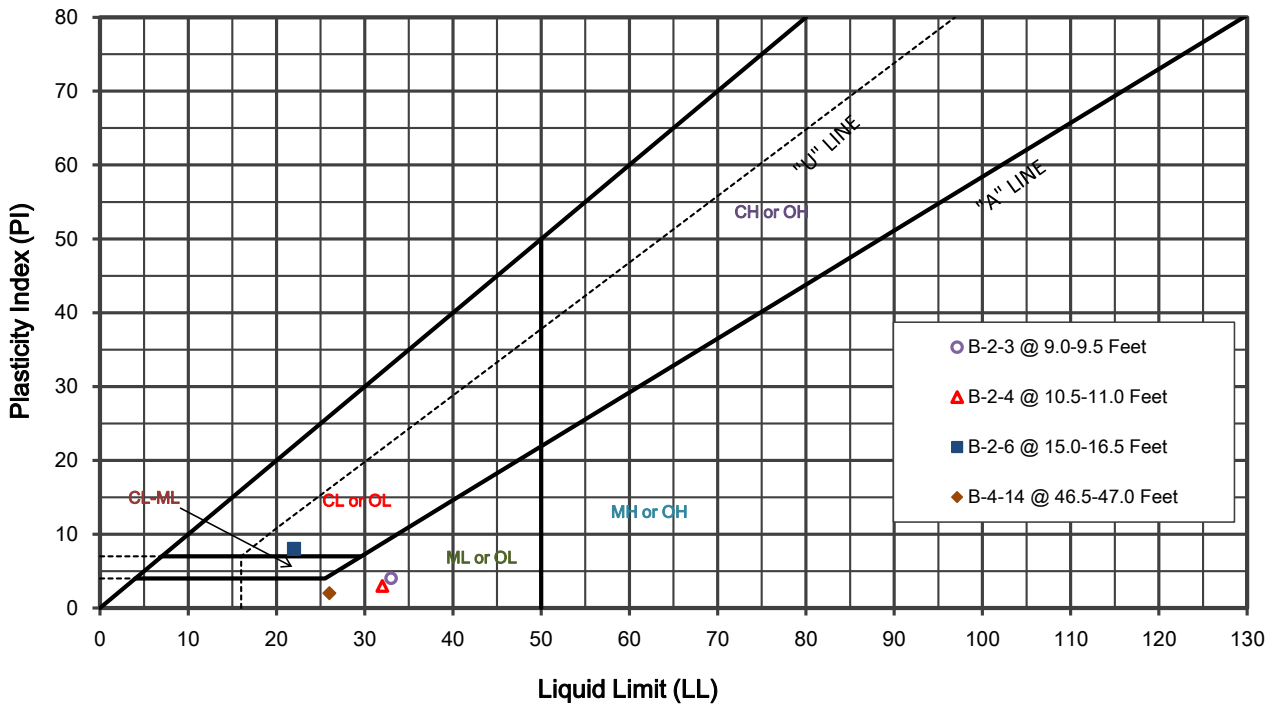
ASTM D 1140

Project Name: Hellman Gas Plant Expansion *Project No.:* IR18166880 *Phase:* ****

Date: 5/01-5/23/2018 *Tested By:* VG, LT

Boring No.	B-2	B-2						
Sample No.	3	6						
Sample Depth (Ft)	9.0-9.5	15.0-16.5						
Tare No.:	8	32						
Total Dry Weight and Tare (g):	398.98	432.80						
Tare Weight (g):	97.08	156.94						
Soaking Started: Date-Time	5/02/2018-10:10	5/22/2018-10:20						
Soaking Ended: Date-Time (*)	5/02/2018-13:15	5/22/2018-13:30						
Total Dry Weight of Sample (g):	301.90	275.86						
Dry Weight of Soil Retained on No. 200 Sieve (g):	111.59	144.02						
Percentage of Material Finer Than No. 200 (75 mm) Sieve (%):	63.0	47.8						
Soil Description	Olive Brown (2.5Y, 4/4) Sandy Silt (ML)	Dark Grayish Brown (2.5Y, 4/2) Clayey Sand (SC)						

(*)*: At least 10 minutes for non-cohesive soils (Method A) or 2 hours for cohesive soils (Method B)*



Sample Identification	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Soil Classification
B-2-3 @ 9.0-9.5 Feet	33	29	4	Sandy Silt (ML)
B-2-4 @ 10.5-11.0 Feet	32	29	3	Sandy Silt (ML)
B-2-6 @ 15.0-16.5 Feet	22	14	8	Clayey Sand (SC)
B-4-14 @ 46.5-47.0 Feet	26	24	2	Silt with Sand (ML)

wood.

PLASTICITY INDEX (PI)

HELLMAN GAS PLANT EXPANSION

Seal Beach, California

Project No.

IR18166880

wood.

PLASTICITY INDEX

ASTM-D 4318

Project Name:	Hellman Gas Plant Expansion	*Project No.:*	IR18166880	*Phase:*	****
Boring No.:	B-2 *Sample No.:* 3	*Depth:*	9.0-9.5 Feet	*Date:*	5/01-5/04/2018
Soil Description:	Olive Brown (2.5Y, 4/4) Sandy Silt (ML)			*Tested by:*	VC, LT

DRYING PAN No.: 36 SOAKING DISH No.: A-12

LIQUID LIMIT (LL)

TARE No.:	C-10	C-33	C-42
NUMBER OF BLOWS	16	27	33
WEIGHT OF WET SOIL + TARE, gr.:	40.55	39.03	35.73
WEIGHT OF DRY SOIL + TARE, gr.:	34.07	33.29	30.76
WEIGHT OF TARE, gr.:	15.96	15.61	15.06
MOISTURE CONTENT, %:	**35.8**	**32.5**	**31.7**

LIQUID LIMIT = **33**

PLASTIC LIMIT (PL)

TARE No.:	C-30	C-71
WEIGHT OF WET SOIL + TARE, gr.:	26.79	26.24
WEIGHT OF DRY SOIL + TARE, gr.:	24.26	23.81
WEIGHT OF TARE, gr.:	15.30	15.42
MOISTURE CONTENT, %:	**28.2**	**29.0**

PLASTIC LIMIT = **29**

PLASTICITY INDEX (PI) = LL - PL = 4

wood.

PLASTICITY INDEX

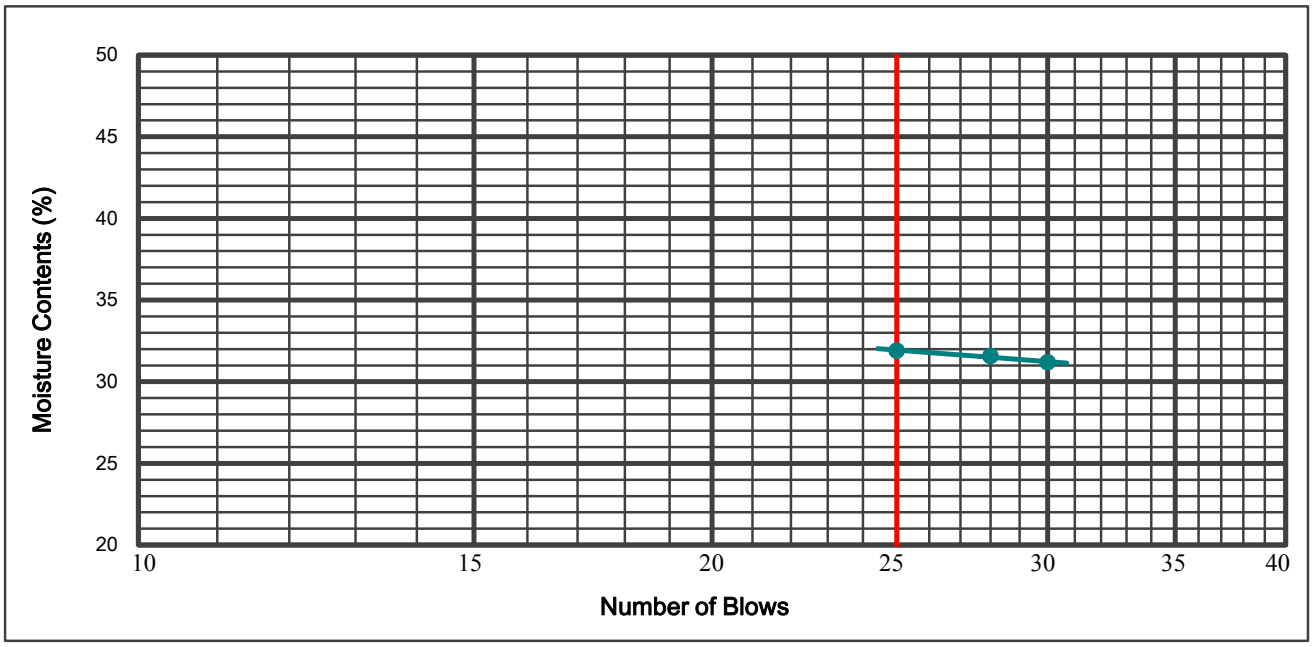
ASTM-D 4318

Project Name:	Hellman Gas Plant Expansion	*Project No.:*	IR18166880	*Phase:*	****
Boring No.:	B-2 *Sample No.:* 4	*Depth:*	10.5-11.0 Feet	*Date:*	5/18-5/23/2018
Soil Description:	Olive Brown (2.5Y, 4/4) Sandy Silt (ML)			*Tested by:*	VC, LT

DRYING PAN No.: 16 SOAKING DISH No.: A-12

LIQUID LIMIT (LL)

TARE No.:	C-64	C-16	C-37
NUMBER OF BLOWS	25	28	30
WEIGHT OF WET SOIL + TARE, gr.:	37.90	39.65	40.85
WEIGHT OF DRY SOIL + TARE, gr.:	32.52	33.93	34.89
WEIGHT OF TARE, gr.:	15.66	15.81	15.78
MOISTURE CONTENT, %:	**31.9**	**31.6**	**31.2**



LIQUID LIMIT = **32**

PLASTIC LIMIT (PL)

TARE No.:	C-18	C-78
WEIGHT OF WET SOIL + TARE, gr.:	25.22	25.80
WEIGHT OF DRY SOIL + TARE, gr.:	23.09	23.50
WEIGHT OF TARE, gr.:	15.70	15.56
MOISTURE CONTENT, %:	**28.8**	**29.0**

PLASTIC LIMIT = **29**

PLASTICITY INDEX (PI) = LL - PL = 3

wood.

PLASTICITY INDEX

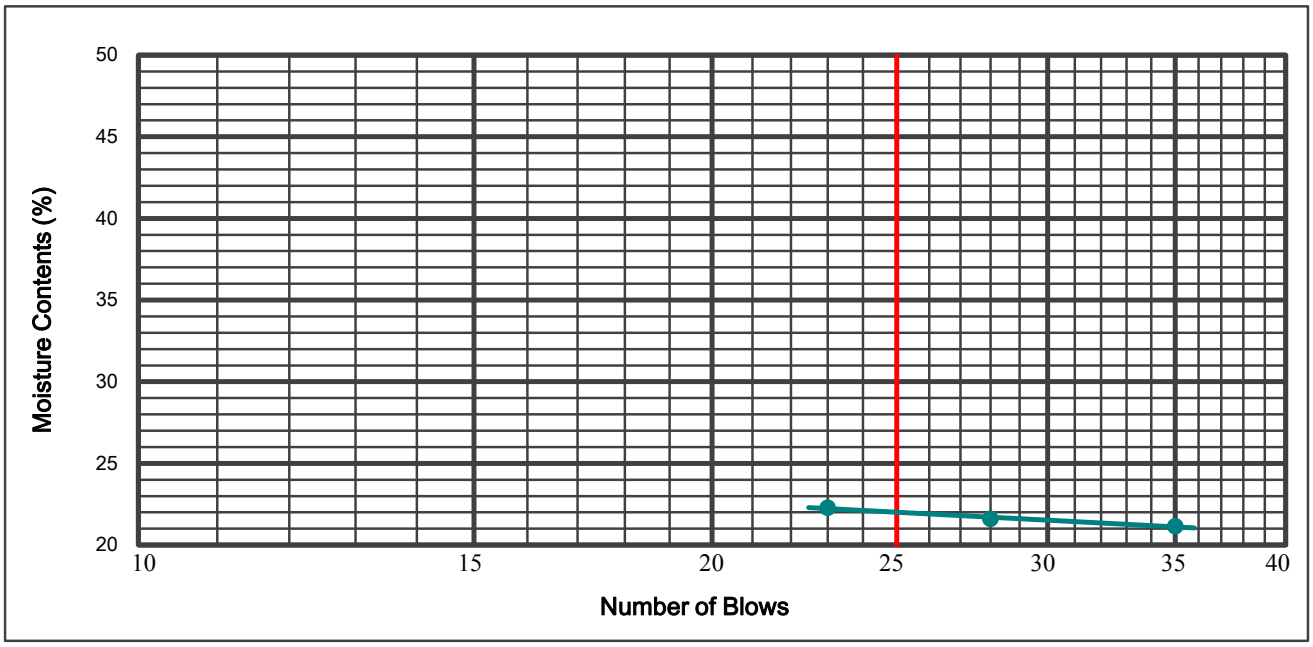
ASTM-D 4318

Project Name:	Hellman Gas Plant Expansion	*Project No.:*	IR18166880	*Phase:*	****
Boring No.:	B-2 *Sample No.:* 6	*Depth:*	15.0-16.5 Feet	*Date:*	5/18-5/23/2018
Soil Description:	Dark Grayish Brown (2.5Y, 4/2) Clayey Sand (SC)			*Tested by:*	VC, LT

DRYING PAN No.: 4 SOAKING DISH No.: A-8

LIQUID LIMIT (LL)

TARE No.:	C-73	C-15	C-25
NUMBER OF BLOWS	23	28	35
WEIGHT OF WET SOIL + TARE, gr.:	39.42	37.39	39.73
WEIGHT OF DRY SOIL + TARE, gr.:	35.11	33.53	35.46
WEIGHT OF TARE, gr.:	15.77	15.66	15.28
MOISTURE CONTENT, %:	**22.3**	**21.6**	**21.2**



LIQUID LIMIT = **22**

PLASTIC LIMIT (PL)

TARE No.:	C-58	C-68
WEIGHT OF WET SOIL + TARE, gr.:	25.80	26.03
WEIGHT OF DRY SOIL + TARE, gr.:	24.54	24.69
WEIGHT OF TARE, gr.:	15.65	15.48
MOISTURE CONTENT, %:	**14.2**	**14.5**

PLASTIC LIMIT = **14**

PLASTICITY INDEX (PI) = LL - PL = 8

wood.

PLASTICITY INDEX

ASTM-D 4318

Project Name:	Hellman Gas Plant Expansion	*Project No.:*	IR18166880	*Phase:*	****
Boring No.:	B-4 *Sample No.:* 14	*Depth:*	46.5-47.0 Feet	*Date:*	5/18-5/23/2018
Soil Description:	Dark Olive Gray (5Y, 3/2) Silt with Sand (ML)			*Tested by:*	VC, LT

DRYING PAN No.: 18 SOAKING DISH No.: A-10

LIQUID LIMIT (LL)

TARE No.:	C-75	C-35	C-11
NUMBER OF BLOWS	20	22	32
WEIGHT OF WET SOIL + TARE, gr.:	38.58	44.59	43.39
WEIGHT OF DRY SOIL + TARE, gr.:	33.59	38.56	37.73
WEIGHT OF TARE, gr.:	15.59	15.88	15.42
MOISTURE CONTENT, %:	**27.7**	**26.6**	**25.4**

LIQUID LIMIT = **26**

PLASTIC LIMIT (PL)

TARE No.:	C-12	C-56
WEIGHT OF WET SOIL + TARE, gr.:	25.83	24.80
WEIGHT OF DRY SOIL + TARE, gr.:	23.95	23.03
WEIGHT OF TARE, gr.:	15.83	15.65
MOISTURE CONTENT, %:	**23.2**	**24.0**

PLASTIC LIMIT = **24**

PLASTICITY INDEX (PI) = LL - PL = **2**

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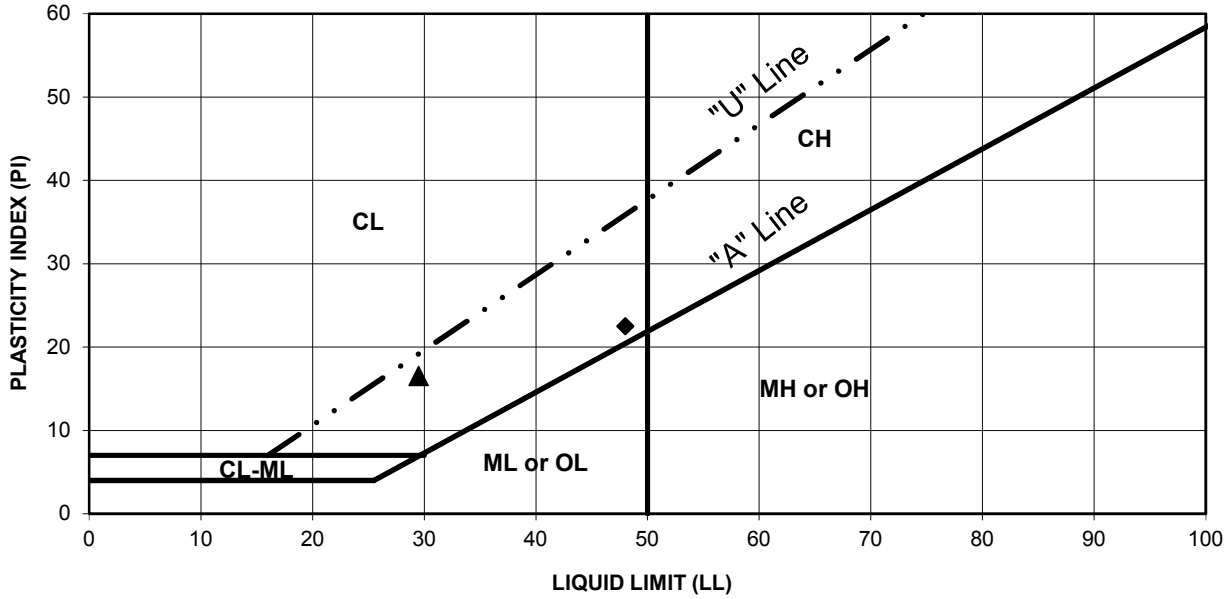
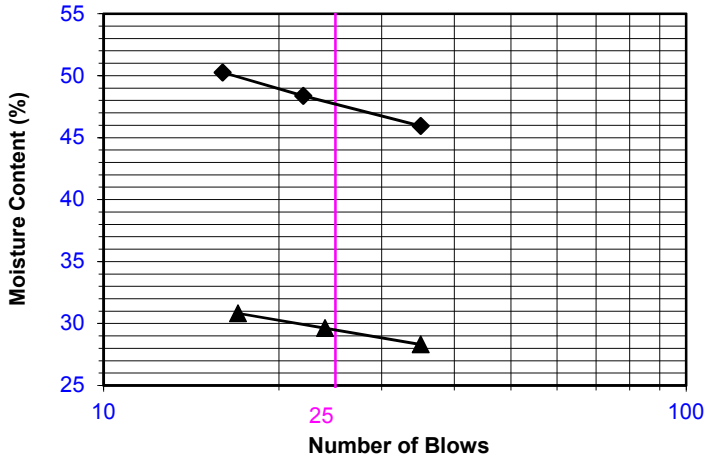
ATTERBERG LIMITS
ASTM D 4318

Project Name: Hellman Gas Plant Expansion **Tested By:** DK Date: 06/08/18
Project No.: IR18166880 **Checked By:** AP Date: 06/09/18



PROCEDURE USED

- [ ] Wet Preparation
- [x] Dry Preparation
- [x] Procedure A Multipoint Test
- [ ] Procedure B One-point Test



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
♦	B-2	-	26.5-27	48	25	23	CL
▲	B-2	-	30-31.5	30	13	17	CL

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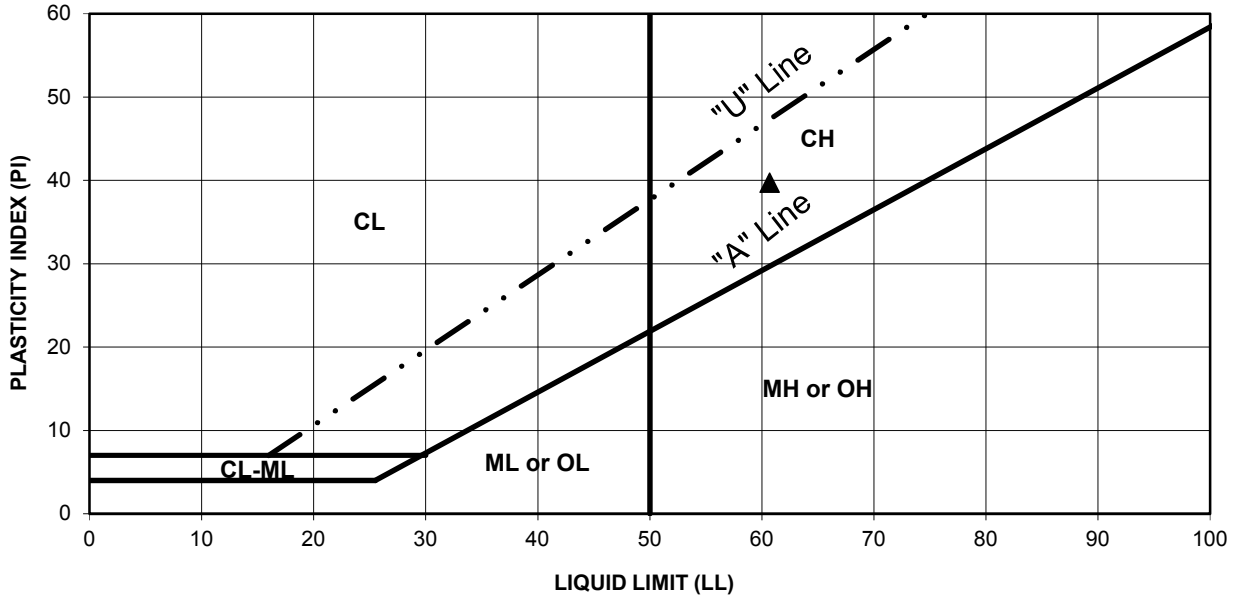
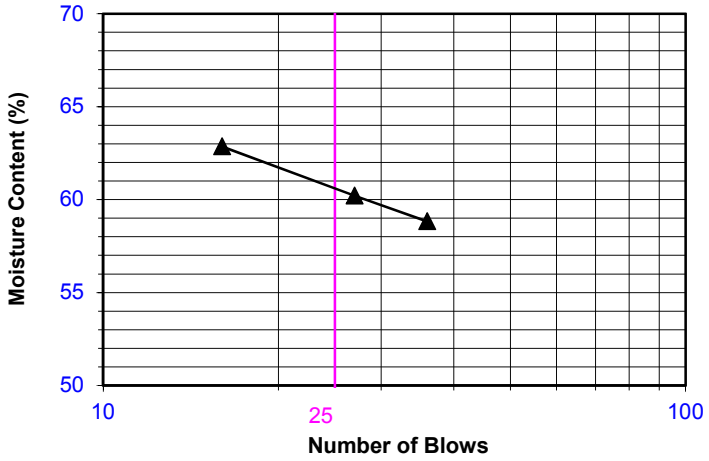


PROCEDURE USED

- [ ] Wet Preparation
- [x] Dry Preparation
- [x] Procedure A Multipoint Test
- [ ] Procedure B One-point Test



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
	B-2	-	41-41.5	NP	NP	NP	
▲	B-2 & B-3	Composite	1-5	61	21	40	CH

* NP denotes "non-plastic"

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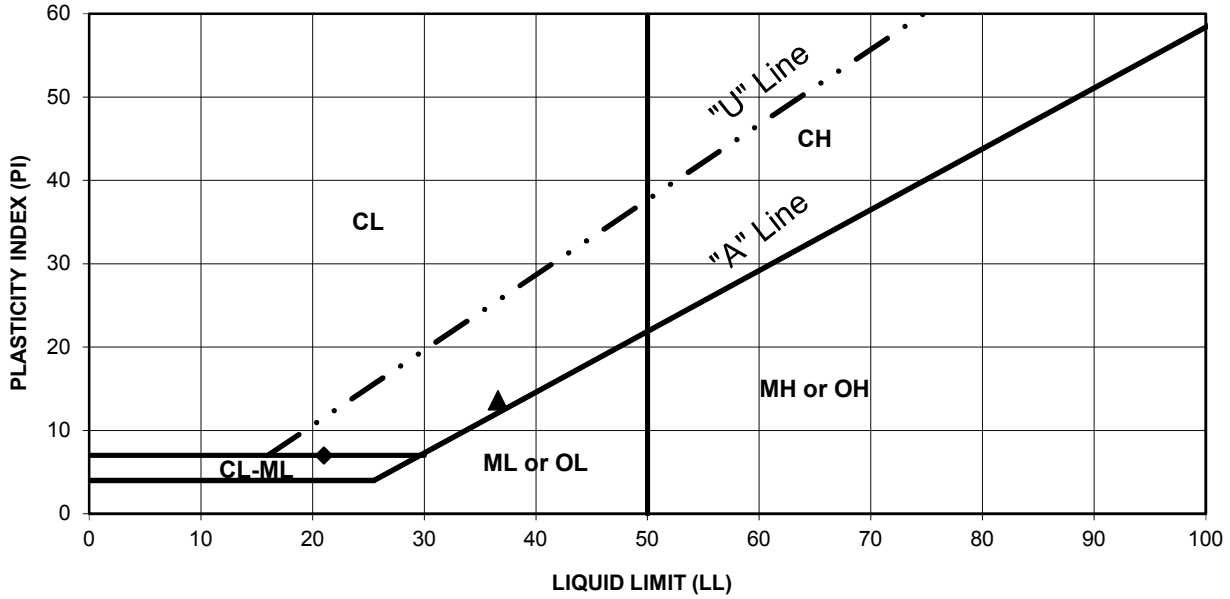
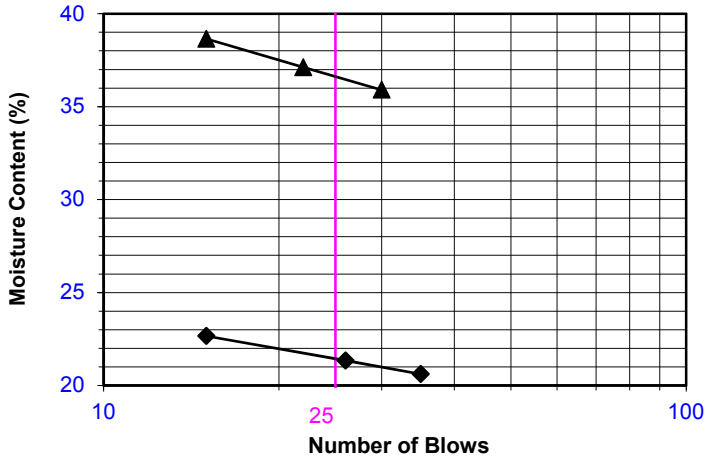
ATTERBERG LIMITS
ASTM D 4318

Project Name: Hellman Gas Plant Expansion **Tested By:** DK Date: 06/08/18
Project No.: IR18166880 **Checked By:** AP Date: 06/09/18



PROCEDURE USED

- [ ] Wet Preparation
- [x] Dry Preparation
- [x] Procedure A Multipoint Test
- [ ] Procedure B One-point Test



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
♦	B-4	-	25-26.5	21	14	7	CL-ML
▲	B-4	-	43-44.5	37	23	14	CL

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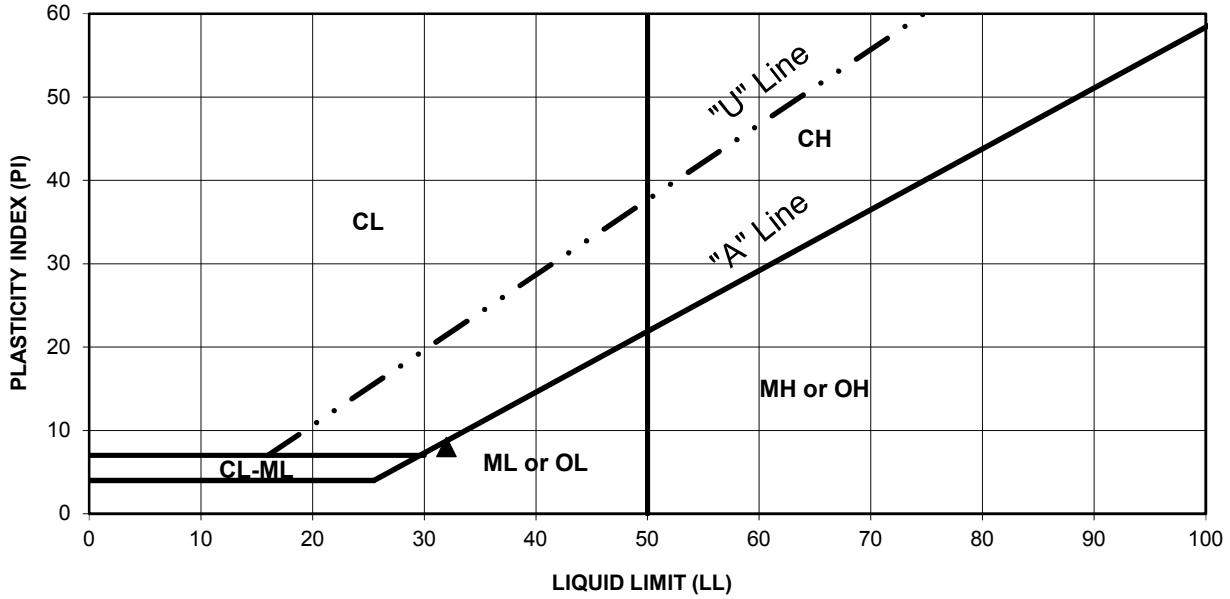
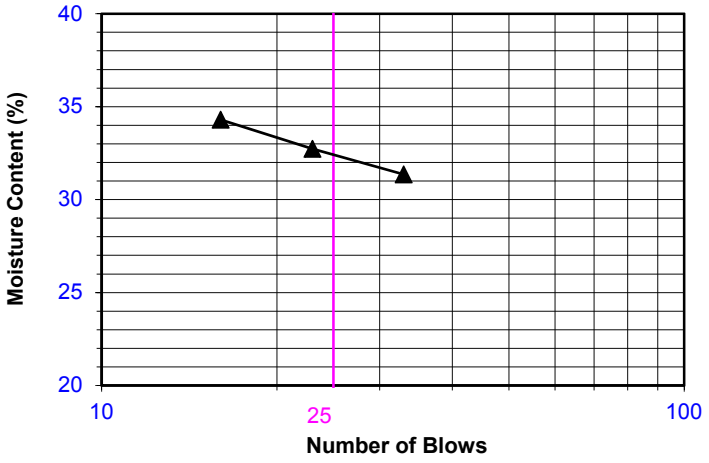
ATTERBERG LIMITS
ASTM D 4318

Project Name: Hellman Gas Plant Expansion **Tested By:** DK Date: 06/08/18
Project No.: IR18166880 **Checked By:** AP Date: 06/09/18



PROCEDURE USED

- [ ] Wet Preparation
- [x] Dry Preparation
- [x] Procedure A Multipoint Test
- [ ] Procedure B One-point Test



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
	B-4	-	52-52.5	NP	NP	NP	
▲	B-4	-	55-56.5	32	24	8	ML

* NP denotes "non-plastic"

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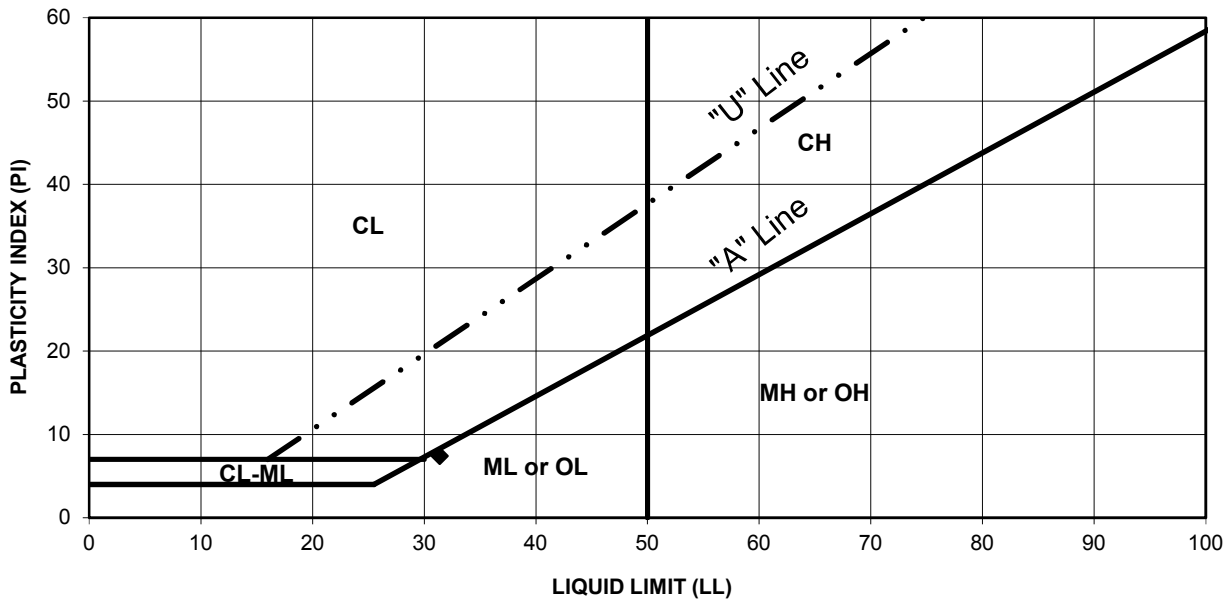
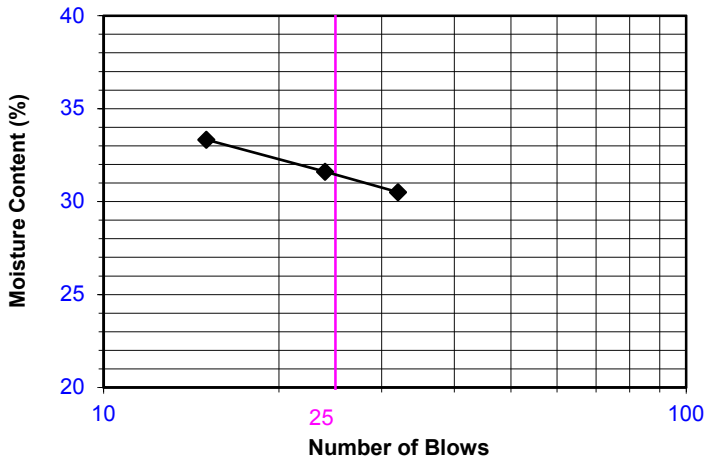
ATTERBERG LIMITS
ASTM D 4318

Project Name: Hellman Gas Plant Expansion **Tested By:** DK Date: 06/08/18
Project No.: IR18166880 **Checked By:** AP Date: 06/09/18



PROCEDURE USED

- [ ] Wet Preparation
- [x] Dry Preparation
- [x] Procedure A Multipoint Test
- [ ] Procedure B One-point Test



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
♦	B-4	-	61-61.5	31	24	7	ML

wood.

EXPANSION INDEX TEST

ASTM D4829

Project Name:	Hellman Gas Plant Expansion	*Project No.:*	IR18166880
Sample ID.:	B-2 @ 1-5 Feet & B-3 @ 1-5 Feet Composite		
Soil Description:	Grayish Brown (2.5Y, 5/2) Lean Clay (CL)		
		Date:	5/30-6/01/2018 *By:* LT

SPECIMEN PREPARATION

WET DENSITY CALCULATION	TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4
RING No.	1	1		
RING AND WET SOIL, gr.	561.1	554.67		
WEIGHT OF RING, gr.	199.32	199.32		
WEIGHT OF WET SOIL, gr.	361.78	355.35		
WET DENSITY, PCF.	109.1	107.2		
MOISTURE CALCULATION				
TARE No.	2	17		
WET SOIL AND TARE, gr.	335.64	298.72		
DRY SOIL AND TARE, gr.	303.21	273.21		
TARE WEIGHT, gr.	98.86	99.82		
MOISTURE CONTENT, %	15.9	14.7		
DRY DENSITY, PCF.	94.2	93.4		
SATURATION DEGREE (S), % (1)	54.52	49.65		

EXPANSION INDEX (EI) CALCULATION

APPARATUS No.:	4
INITIAL SPECIMEN HEIGHT:	1.0000 inch

		HEIGHT CHANGE, in.	DATE	TIME
INITIAL DIAL READING, in.	0.0500	0.0000	5/31/2018	8:48
PERIODIC DIAL READING, in.	0.1708	0.1208	6/1/2018	9:10
------	0.1709	0.1209	6/1/2018	11:28
------	0.1710	0.1210	6/1/2018	12:56

FINAL DIAL READING, in.	0.1710	0.1210	6/1/2018	14:02

EI = 121

FINAL MOISTURE CONTENT, DRY DENSITY AND SATURATION DEGREE

TARE No.	---	MOISTURE CONTENT, %	37.7
WET SOIL AND TARE, gr.	291.24	FINAL VOLUME, cc.	232.00
DRY SOIL AND TARE, gr.	211.53	FINAL DRY DENSITY, PCF.	83.4
TARE WEIGHT, gr.	0.00	FINAL SATURATION, %	99.9

---

(1) $$S = \frac{wG_s\gamma_d}{G_s\gamma_w - \gamma_d}$$ (S must be 50 ± 2%)

wood.

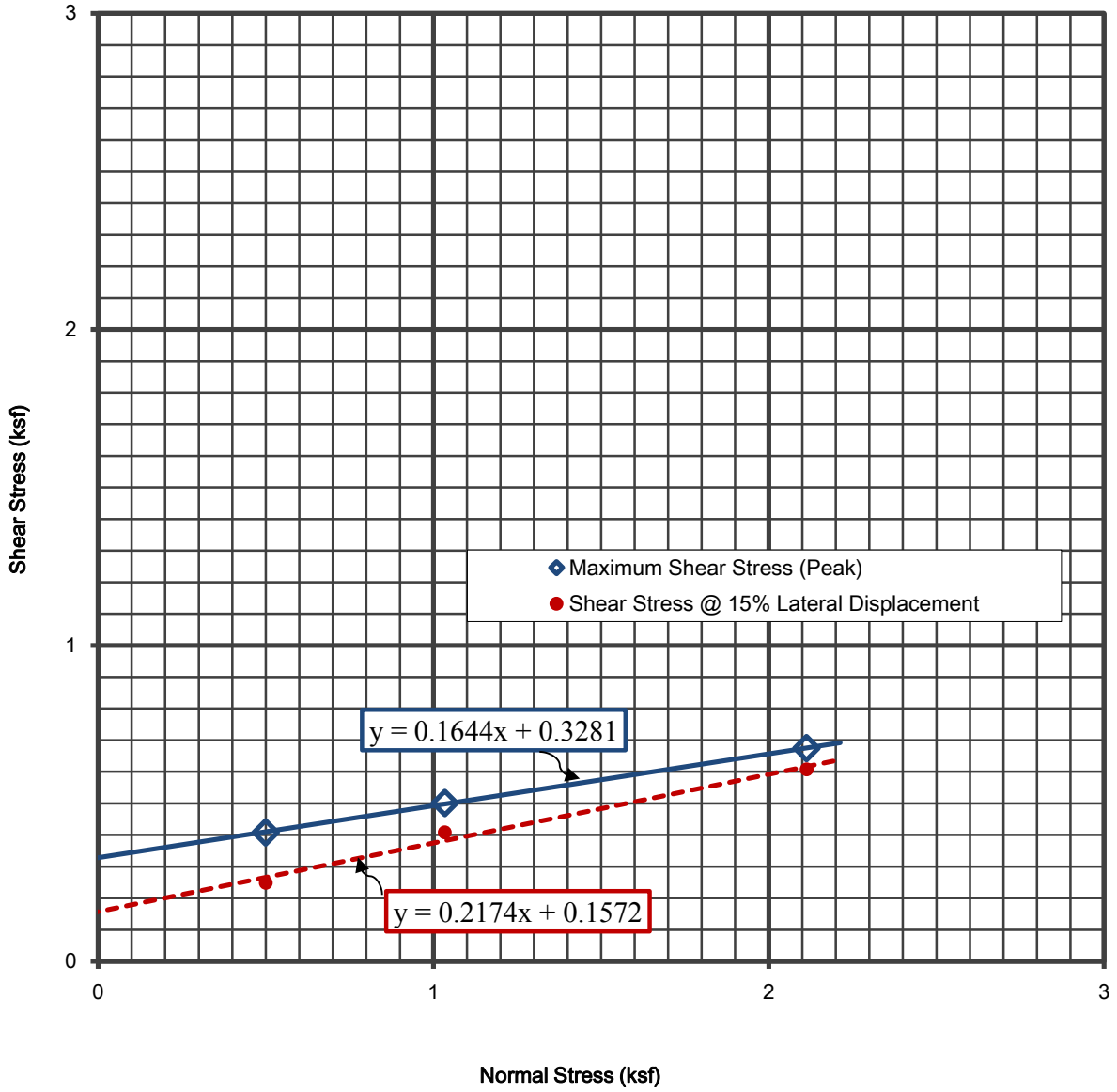
DIRECT SHEAR TEST

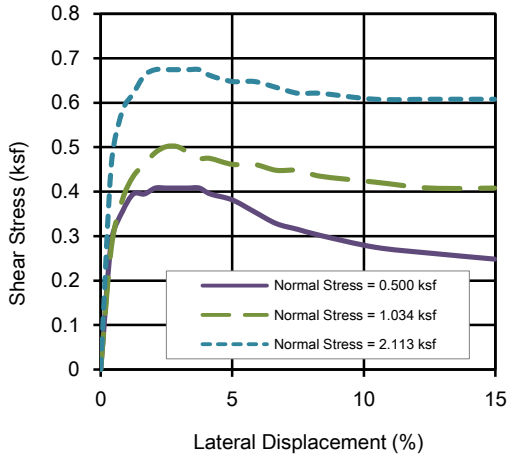
(ASTM-D3080)

Project Name:	Hellman Gas Plant Expansion			*Project No.:*	IR18166880
Boring No.:	B-2	*Sample No.:* 2	*Depth:* 6.0-6.5 Feet	*Date:*	5/16/2018
Soil Description:	Grayish Brown (2.5Y, 5/2) Lean Clay (CL)			*Tested By:*	LT

				Initial	After Consolidation Load 1	Load 2	Load 3
Sample Diameter, in:	2.416	Weight of Wet Soil & Ring, gr:		550.70	---	---	---
Normal Stress, ksf:	0.5, 1, 2	Weight of Ring, gr:		129.85	---	---	---
Over-burdened @, pcf:		Height of Sample, in:		3.00	0.9970	0.9872	0.9748
Shear Rate, in/min:	0.002	Moisture-	Tare No.:	MC-61	---	---	---
Natural Moisture(x):			Wet Weight and Tare, gr:	196.95	141.29	137.82	135.57
Saturated(x):	X		Dry Weight and Tare, gr:	164.77	107.62	105.55	104.49
Intact(x):	X		Tare Weight, gr:	50.18	0.00	0.00	0.00
Remolded to, pcf:			Moisture Content, %:	28.1	31.3	30.6	29.7
@, %:		Wet Density, pcf:		116.6	119.8	120.4	121.1
Notes:		Dry Density, pcf:		91.0	91.3	92.2	93.4
		Saturation %:	S.G. = 2.70 (Assumed)	89.0	99.8	99.7	99.7

Load 1 (KSF): 0.500				Load 2 (KSF): 1.034				Load 3 (KSF): 2.113			
Shear Deflec -tion (in)	Lateral Displace -ment (%)	Load Ring Reading	Shear Stress (KSF)	Shear Deflec -tion (in)	Lateral Displace -ment (%)	Load Ring Reading	Shear Stress (KSF)	Shear Deflec -tion (in)	Lateral Displace -ment (%)	Load Ring Reading	Shear Stress (KSF)
0.010	0.4	0.0017	0.288	0.010	0.4	0.0016	0.275	0.010	0.4	0.0030	0.461
0.020	0.8	0.0022	0.355	0.020	0.8	0.0024	0.382	0.020	0.8	0.0039	0.581
0.030	1.2	0.0025	0.395	0.030	1.2	0.0028	0.435	0.030	1.2	0.0042	0.621
0.040	1.7	0.0025	0.395	0.040	1.7	0.0030	0.461	0.040	1.7	0.0045	0.661
0.050	2.1	0.0026	0.408	0.050	2.1	0.0032	0.488	0.050	2.1	0.0046	0.674
0.060	2.5	0.0026	0.408	0.060	2.5	0.0033	0.501	0.060	2.5	0.0046	0.674
0.070	2.9	0.0026	0.408	0.070	2.9	0.0033	0.501	0.070	2.9	0.0046	0.674
0.080	3.3	0.0026	0.408	0.080	3.3	0.0032	0.488	0.080	3.3	0.0046	0.674
0.091	3.7	0.0026	0.408	0.091	3.7	0.0031	0.475	0.091	3.7	0.0046	0.674
0.101	4.2	0.0025	0.395	0.101	4.2	0.0031	0.475	0.101	4.2	0.0045	0.661
0.121	5.0	0.0024	0.382	0.121	5.0	0.0030	0.461	0.121	5.0	0.0044	0.648
0.141	5.8	0.0022	0.355	0.141	5.8	0.0030	0.461	0.141	5.8	0.0044	0.648
0.161	6.7	0.0020	0.328	0.161	6.7	0.0029	0.448	0.161	6.7	0.0043	0.634
0.181	7.5	0.0019	0.315	0.181	7.5	0.0029	0.448	0.181	7.5	0.0042	0.621
0.202	8.3	0.0018	0.302	0.202	8.3	0.0028	0.435	0.202	8.3	0.0042	0.621
0.252	10.4	0.0016	0.275	0.252	10.4	0.0027	0.421	0.252	10.4	0.0041	0.608
0.303	12.5	0.0015	0.262	0.303	12.5	0.0026	0.408	0.303	12.5	0.0041	0.608
0.362	15.0	0.0014	0.248	0.362	15.0	0.0026	0.408	0.362	15.0	0.0041	0.608
Max. Shear Stress, ksf:			0.408				0.501				0.674
Lat. Displmt@Max Stress,%.:			3.7				2.9				3.7





Boring No.:		B-2
Sample No.:		2
Sample Depth :		6.0-6.5 Feet
Soil Type:		CL
Sample Conditions:		Intact; Saturated
Shear Rate:	0.002	inch/minute
In-Place Dry Density (PCF):		91.0
In-Place Moisture Content (%):		28.1

	◇	●
Cohesion (PSF):	328	157
Friction Angle (Degrees):	9	12

wood.

DIRECT SHEAR TEST

HELLMAN GAS PLANT EXPANSION

Seal Beach, California

Project No.

IR18166880

wood.

CONSOLIDATION TEST

(ASTM-D2435)

Project Name:	Hellman Gas Plant Expansion			*Project No.:*	IR18166880	*Date:*	5/01-5/16/2018
Boring No.:	B-2	*Sample No.:*	3	*Depth:*	9.0-9.5 Feet	*Tested by:*	LT
Soil Description:	Olive Brown (2.5Y, 4/4) Sandy Silt (ML)						

Frame No.: 1

Initial Sample Height:	1.00 in.
Sample Diameter:	2.416 in.
Loads (KSF):	0.25, 0.5, 1, 2, 4, 8, 16, 32
Water Added @ Load (KSF):	0.25
Rebound to Loads:	8, 2, 0.5
Time Reading @ Loads:	1
Notes:	

		Before Test	After Test
Wet Weight of Sample&Ring, gr:		186.49	180.81
Weight of Ring, gr:		43.36	43.36
Moisture -	Tare No.:	8	---
	Wet Weight, gr:	487.97	131.14
	Dry Weight, gr:	398.98	105.47
	Tare Weight, gr:	97.08	0.00
	Moisture Content, (%):	29.5	24.3
Wet Density, pcf:		118.9	126.4
Dry Density, pcf:		91.9	101.6
Volume of Solid, in^3:		2.50	2.50
Equivalent Height of Solid, in:		0.54	0.54
Void Ratio:		0.835	0.659
Degree of Saturation, %: (Gs assumed=2.70)		95.3	99.8

Date	Time	Load (KSF)	Dial Reading (in.)	Deform -ation (in.)	Corrected Dial Reading (in.)	Consoli -dation (%)	Void Ratio	Date	Time	Load (KSF)	Dial Reading (in.)	Deform -ation (in.)	Corrected Dial Reading (in.)	Consoli -dation (%)	Void Ratio
5/1/18	13:59	0.295	0.1200	---	---	**0.00**	0.835	5/4/18	14:46:00	1.099	0.1381	0.0011	0.1370	1.70	0.804
5/2/18	10:53	0.295	0.1267	0.0003	0.1264	**0.64**	0.823		18:46:00	1.099	0.1383	0.0011	0.1372	1.72	0.803
	10:53	Inun-	0.1267	---	---	---	---	5/5/18	10:46:00	1.099	0.1386	0.0011	0.1375	**1.75**	0.803
5/3/18	10:45	dated	0.1262	0.0003	0.1259	**0.59**	0.824		10:46	2.171	0.1386	---	---	---	---
	10:45	0.563	0.1262	---	---	---	---	5/6/18	12:40	2.171	0.1522	0.0017	0.1505	**3.05**	0.779
5/4/18	10:44	0.563	0.1285	0.0005	0.1280	**0.80**	0.820		12:40	4.311	0.1522	---	---	---	---
	10:46:00	1.099	0.1285	---	---	---	---	5/7/18	11:13	4.311	0.1703	0.0026	0.1677	**4.77**	0.747
	10:46:06	1.099	0.1348	0.0011	0.1337	1.37	0.810		11:13	8.587	0.1703	---	---	---	---
	10:46:15	1.099	0.1351	0.0011	0.1340	1.40	0.809	5/8/18	10:31	8.587	0.1904	0.0037	0.1867	**6.67**	0.713
	10:46:30	1.099	0.1355	0.0011	0.1344	1.44	0.808		10:31	17.140	0.1904	---	---	---	---
	10:47:00	1.099	0.1359	0.0011	0.1348	1.48	0.808	5/9/18	10:39	17.140	0.2143	0.0053	0.2090	**8.90**	0.672
	10:48:00	1.099	0.1362	0.0011	0.1351	1.51	0.807		10:39	34.244	0.2143	---	---	---	---
	10:50:00	1.099	0.1365	0.0011	0.1354	1.54	0.807	5/10/18	10:25	34.244	0.2404	0.0074	0.2330	**11.30**	0.628
	10:54:00	1.099	0.1368	0.0011	0.1357	1.57	0.806		10:25	8.587	0.2404	---	---	---	---
	11:01:00	1.099	0.1371	0.0011	0.1360	1.60	0.806	5/11/18	10:49	8.587	0.2337	0.0042	0.2295	**10.95**	0.634
	11:16:00	1.099	0.1373	0.0011	0.1362	1.62	0.805		10:49	2.171	0.2337	---	---	---	---
	11:46:00	1.099	0.1376	0.0011	0.1365	1.65	0.805	5/14/18	9:14	2.171	0.2262	0.0023	0.2239	**10.39**	0.644
	12:46:00	1.099	0.1379	0.0011	0.1368	1.68	0.804		9:14	0.563	0.2262	---	---	---	---

wood.

CONSOLIDATION TEST

(ASTM-D2435)

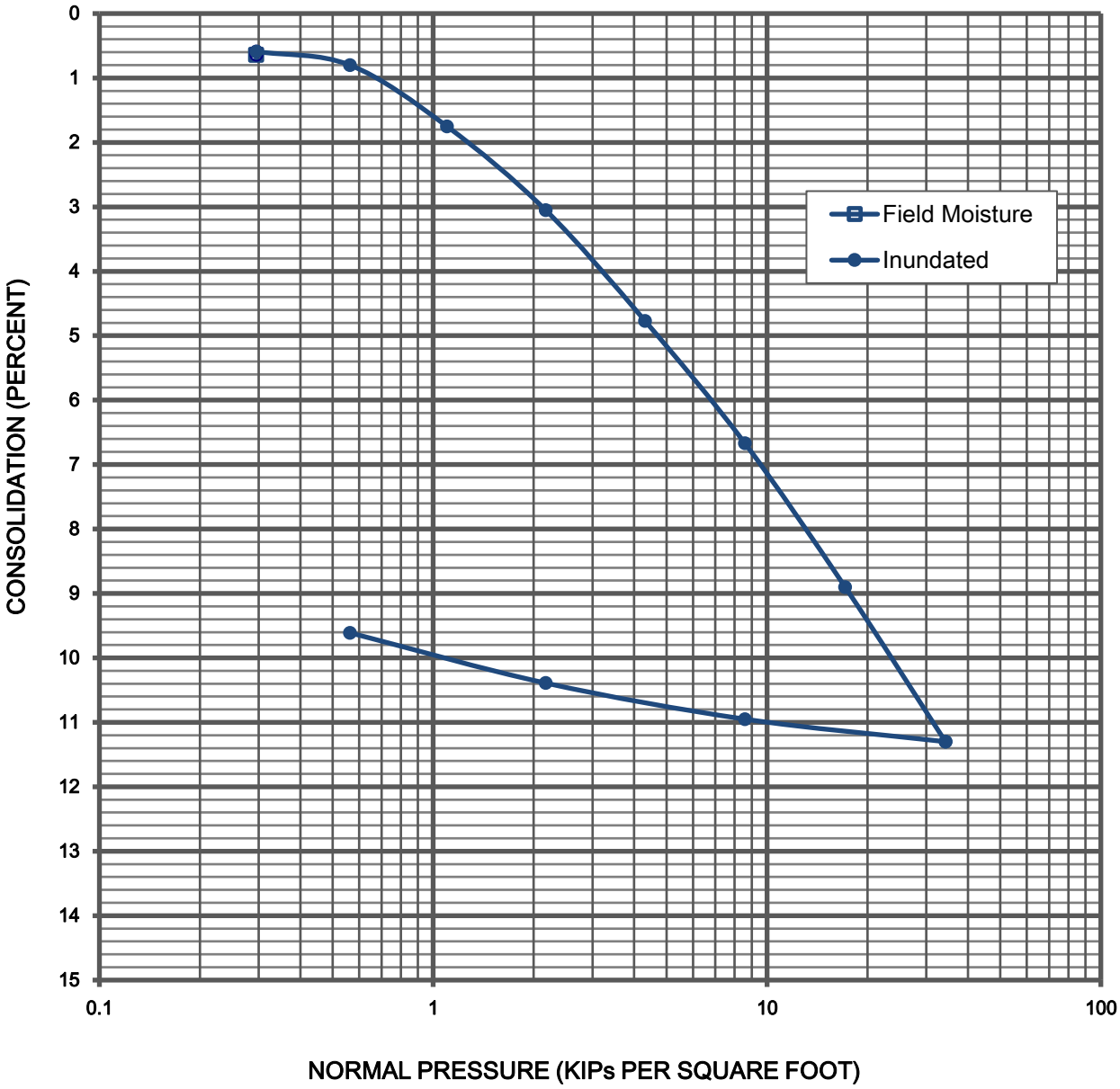
Project Name:	Hellman Gas Plant Expansion			*Project No.:*	IR18166880	*Date:*	5/01-5/16/2018
Boring No.:	B-2	*Sample No.:*	3	*Depth:*	9.0-9.5 Feet	*Tested by:*	LT
Soil Description:	Olive Brown (2.5Y, 4/4) Sandy Silt (ML)						

Frame No.: 1

Initial Sample Height:	1.00 in.
Sample Diameter:	2.416 in.
Loads (KSF):	0.25, 0.5, 1, 2, 4, 8, 16, 32
Water Added @ Load (KSF):	0.25
Rebound to Loads:	8, 2, 0.5
Time Reading @ Loads:	1
Notes:	

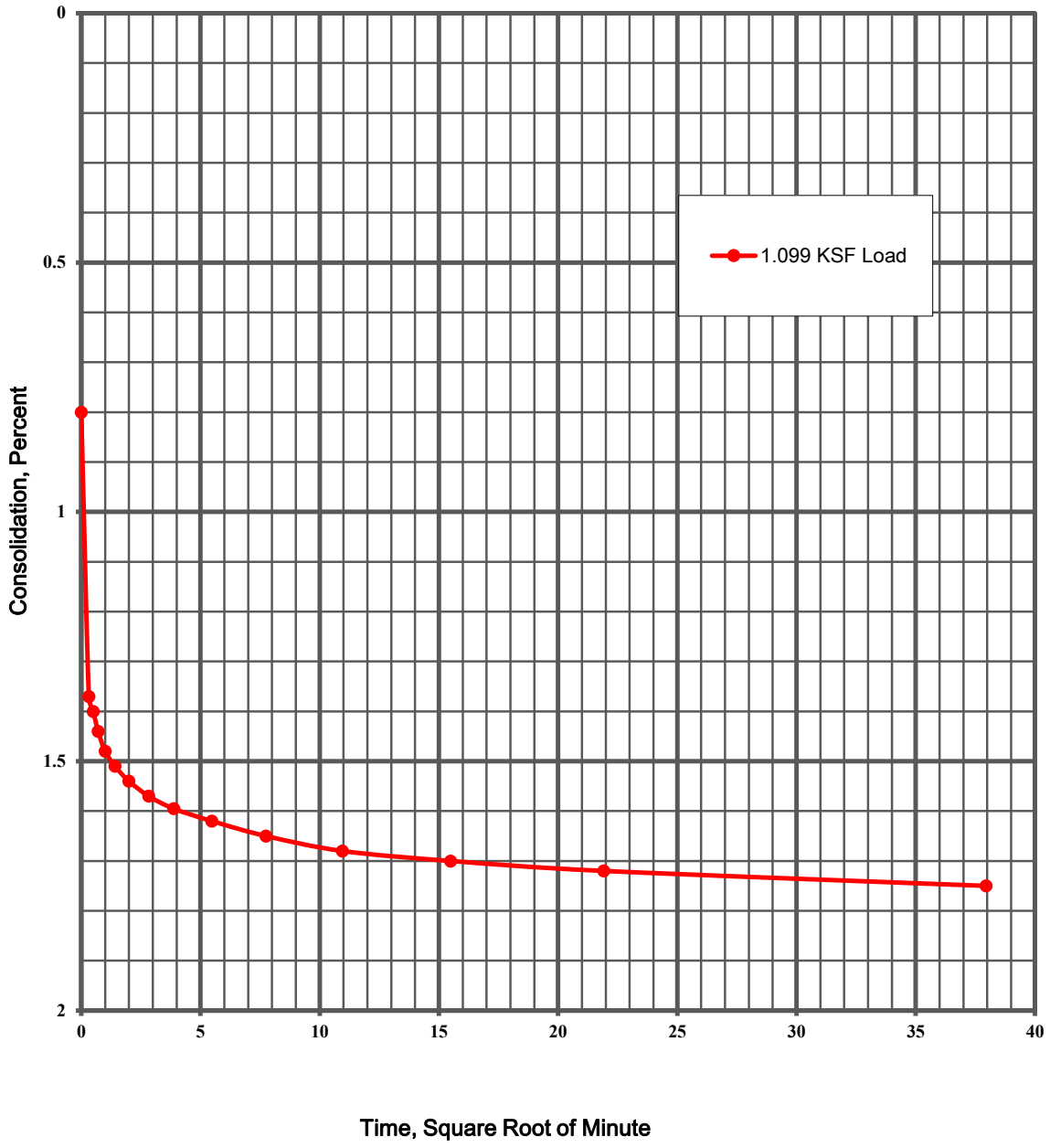
		Before Test	After Test
Wet Weight of Sample&Ring, gr:		186.49	180.81
Weight of Ring, gr:		43.36	43.36
Moisture -	Tare No.:	8	---
	Wet Weight, gr:	487.97	131.14
	Dry Weight, gr:	398.98	105.47
	Tare Weight, gr:	97.08	0.00
	Moisture Content, (%):	29.5	24.3
Wet Density, pcf:		118.9	126.4
Dry Density, pcf:		91.9	101.6
Volume of Solid, in^3:		2.50	2.50
Equivalent Height of Solid, in:		0.54	0.54
Void Ratio:		0.835	0.659
Degree of Saturation, %: (Gs assumed=2.70)		95.3	99.8

Date	Time	Load (KSF)	Dial Reading (in.)	Deform -ation (in.)	Corrected Dial Reading (in.)	Consoli -dation (%)	Void Ratio	Date	Time	Load (KSF)	Dial Reading (in.)	Deform -ation (in.)	Corrected Dial Reading (in.)	Consoli -dation (%)	Void Ratio
5/15/18	10:51	0.563	0.2173	0.0010	0.2163	9.63	0.658								
5/16/18	10:31	0.563	0.2171	0.0010	0.2161	**9.61**	0.659								



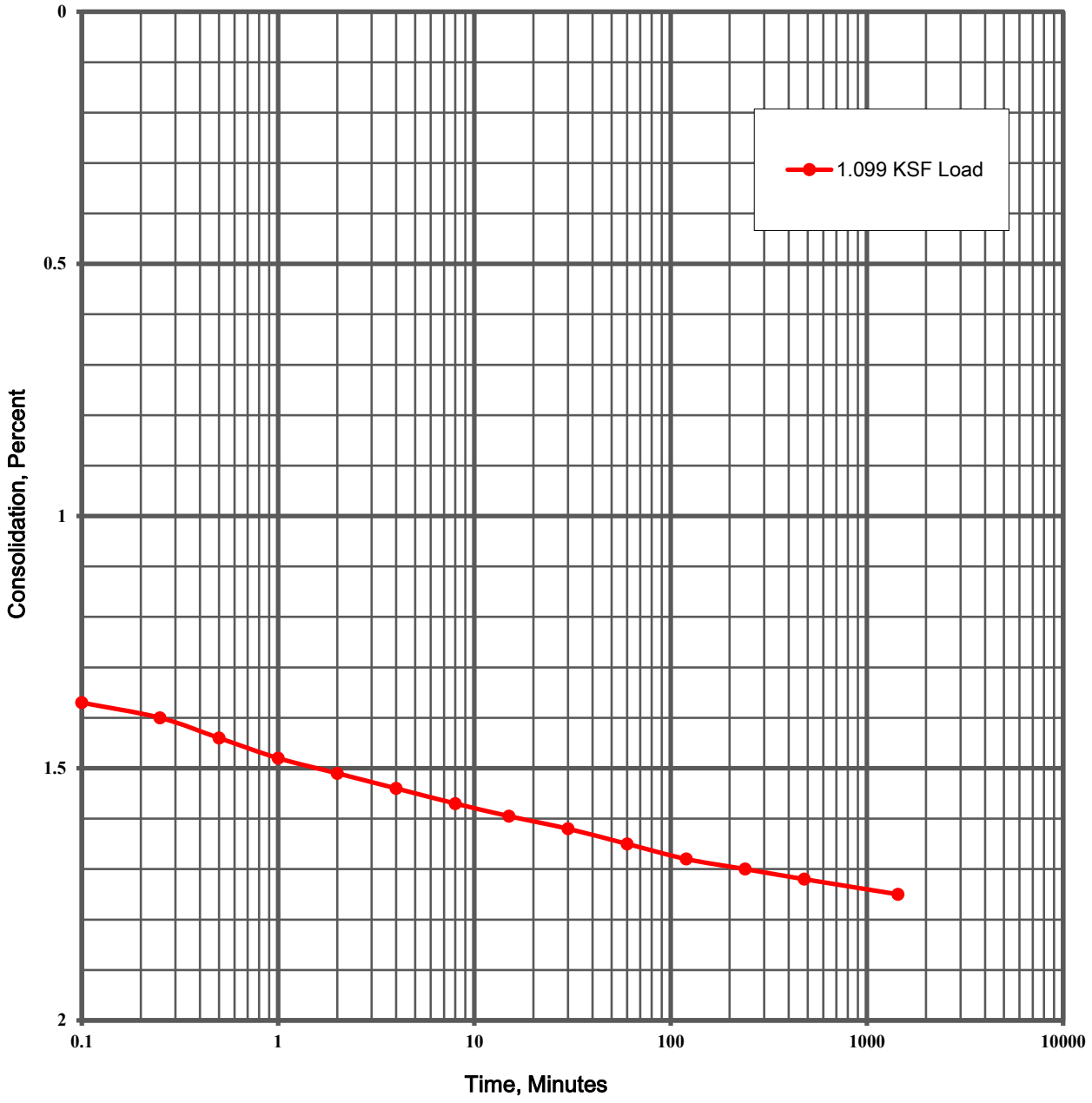
Boring No.:	B-2	In-Place Dry Density (PCF):	91.9
Sample Depth :	9.0-9.5 Feet	In-Place Moisture Content (%):	29.5
Sample Condition:	Intact	Soil Type:	ML

wood.	CONSOLIDATION VS. PRESSURE CURVE HELLMAN GAS PLANT EXPANSION Seal Beach, California	Project No. IR18166880



Boring No.:	B-2	In-Place Dry Density (PCF):	91.9
Sample Depth :	9.0-9.5 Feet	In-Place Moisture Content (%):	29.5
Sample Condition:	Intact	Soil Type:	ML

wood.	CONSOLIDATION VS. TIME CURVE HELLMAN GAS PLANT EXPANSION Seal Beach, California	Project No. IR18166880



Boring No.:	B-2	In-Place Dry Density (PCF):	91.9
Sample Depth :	9.0-9.5 Feet	In-Place Moisture Content (%):	29.5
Sample Condition:	Intact	Soil Type:	ML

wood.	CONSOLIDATION VS. TIME CURVE HELLMAN GAS PLANT EXPANSION Seal Beach, California	Project No. IR18166880

wood.

CONSOLIDATION TEST

(ASTM-D2435)

Project Name:	Hellman Gas Plant Expansion			*Project No.:*	IR18166880	*Date:*	5/01-5/18/2018
Boring No.:	B-4	*Sample No.:*	5	*Depth:*	13.0-13.5 Feet	*Tested by:*	LT
Soil Description:	Very Dark Gray (5Y, 3/1) Silt with Sand (ML)						

Frame No.: 2

Initial Sample Height:	1.00 in.
Sample Diameter:	2.416 in.
Loads (KSF):	0.25, 0.5, 1, 2, 4, 8, 16, 32
Water Added @ Load (KSF):	0.25
Rebound to Loads:	8, 2, 0.5
Time Reading @ Loads:	2
Notes:	

		Before Test	After Test
Wet Weight of Sample&Ring, gr:		184.36	176.56
Weight of Ring, gr:		42.66	42.66
Moisture -	Tare No.:	MC-20	---
	Wet Weight, gr:	294.05	126.51
	Dry Weight, gr:	232.99	100.23
	Tare Weight, gr:	51.07	0.00
	Moisture Content, (%):	33.6	26.2
Wet Density, pcf:		117.8	124.5
Dry Density, pcf:		88.2	98.6
Volume of Solid, in^3:		2.40	2.40
Equivalent Height of Solid, in:		0.52	0.52
Void Ratio:		0.912	0.709
Degree of Saturation, %: (Gs assumed=2.70)		99.4	99.8

Date	Time	Load (KSF)	Dial Reading (in.)	Deform -ation (in.)	Corrected Dial Reading (in.)	Consoli -dation (%)	Void Ratio	Date	Time	Load (KSF)	Dial Reading (in.)	Deform -ation (in.)	Corrected Dial Reading (in.)	Consoli -dation (%)	Void Ratio
5/1/18	14:31	0.250	0.1200	---	---	**0.00**	0.912	5/7/18	10:27:00	1.972	0.1529	0.0028	0.1501	3.01	0.854
5/2/18	10:54	0.250	0.1290	0.0006	0.1284	**0.84**	0.896		10:57:00	1.972	0.1533	0.0028	0.1505	3.05	0.854
	10:54	Inun-	0.1290	---	---	---	---		11:57:00	1.972	0.1538	0.0028	0.1510	3.10	0.853
5/3/18	10:46	dated	0.1267	0.0006	0.1261	**0.61**	0.900		13:57:00	1.972	0.1542	0.0028	0.1514	3.14	0.852
	10:46	0.513	0.1267	---	---	---	---		17:57:00	1.972	0.1546	0.0028	0.1518	3.18	0.851
5/4/18	10:48	0.513	0.1297	0.0013	0.1284	**0.84**	0.896	5/8/18	9:57:00	1.972	0.1552	0.0028	0.1524	**3.24**	0.850
	10:48	0.999	0.1297	---	---	---	---		9:57	3.918	0.1552	---	---	---	---
5/5/18	10:47	0.999	0.1392					5/9/18	10:41	3.918	0.1765	0.0035	0.1730	**5.30**	0.811
5/7/18	9:55	0.999	0.1396	0.0021	0.1375	**1.75**	0.878		10:41	7.810	0.1765	---	---	---	---
	9:57:00	1.972	0.1396	---	---	---	---	5/10/18	10:26	7.810	0.2020	0.0045	0.1975	**7.75**	0.764
	9:57:06	1.972	0.1450	0.0028	0.1422	2.22	0.869		10:26	15.594	0.2020	---	---	---	---
	9:57:15	1.972	0.1467	0.0028	0.1439	2.39	0.866	5/11/18	10:50	15.594	0.2339	0.0059	0.2280	**10.80**	0.705
	9:57:30	1.972	0.1483	0.0028	0.1455	2.55	0.863		10:50	31.161	0.2339	---	---	---	---
	9:58:00	1.972	0.1500	0.0028	0.1472	2.72	0.860	5/14/18	9:15	31.161	0.2695	0.0077	0.2618	**14.18**	0.641
	9:59:00	1.972	0.1509	0.0028	0.1481	2.81	0.858		9:15	7.810	0.2695	---	---	---	---
	10:01:00	1.972	0.1515	0.0028	0.1487	2.87	0.857	5/15/18	10:52	7.810	0.2609	0.0056	0.2553	**13.53**	0.653
	10:05:00	1.972	0.1521	0.0028	0.1493	2.93	0.856		10:52	1.972	0.2609	---	---	---	---
	10:12:00	1.972	0.1525	0.0028	0.1497	2.97	0.855	5/16/18	10:32	1.972	0.2459	0.0034	0.2425	**12.25**	0.678

wood.

CONSOLIDATION TEST

(ASTM-D2435)

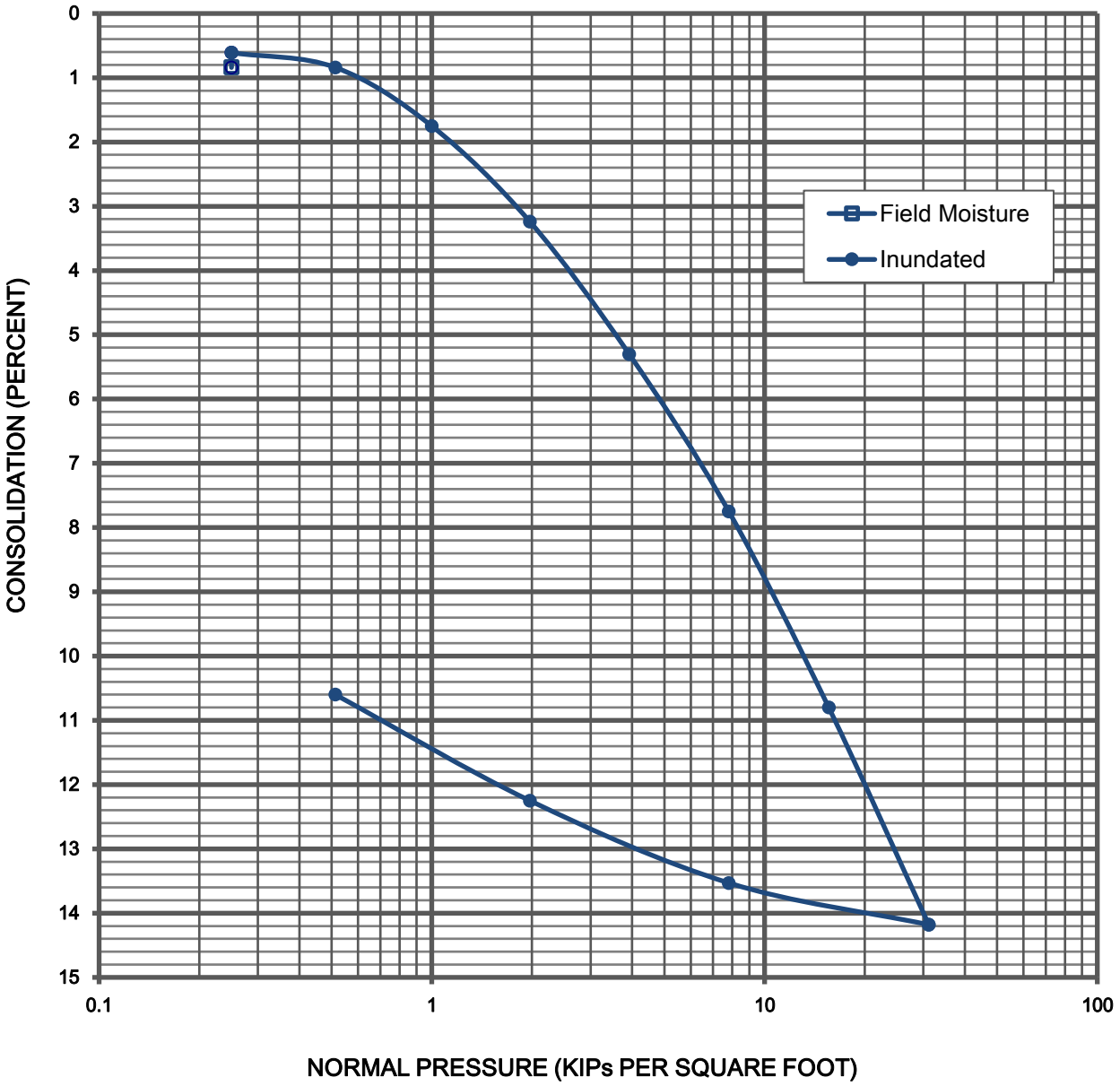
Project Name:	Hellman Gas Plant Expansion			*Project No.:*	IR18166880	*Date:*	5/01-5/18/2018
Boring No.:	B-4	*Sample No.:*	5	*Depth:*	13.0-13.5 Feet	*Tested by:*	LT
Soil Description:	Very Dark Gray (5Y, 3/1) Silt with Sand (ML)						

Frame No.: 2

Initial Sample Height:	1.00 in.
Sample Diameter:	2.416 in.
Loads (KSF):	0.25, 0.5, 1, 2, 4, 8, 16, 32
Water Added @ Load (KSF):	0.25
Rebound to Loads:	8, 2, 0.5
Time Reading @ Loads:	2
Notes:	

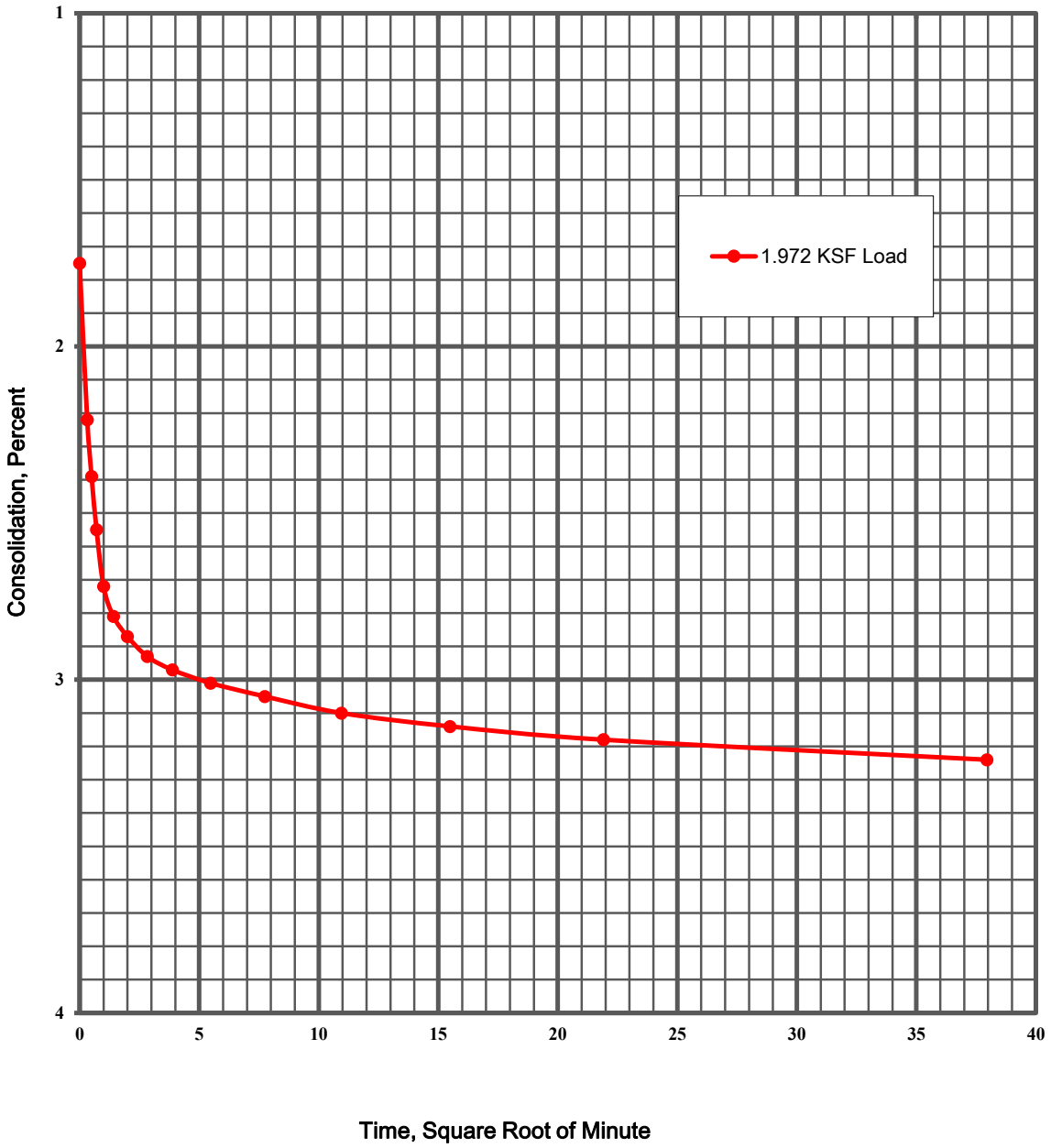
		Before Test	After Test
Wet Weight of Sample&Ring, gr:		184.36	176.56
Weight of Ring, gr:		42.66	42.66
Moisture -	Tare No.:	MC-20	---
	Wet Weight, gr:	294.05	126.51
	Dry Weight, gr:	232.99	100.23
	Tare Weight, gr:	51.07	0.00
	Moisture Content, (%):	33.6	26.2
Wet Density, pcf:		117.8	124.5
Dry Density, pcf:		88.2	98.6
Volume of Solid, in^3:		2.40	2.40
Equivalent Height of Solid, in:		0.52	0.52
Void Ratio:		0.912	0.709
Degree of Saturation, %: (Gs assumed=2.70)		99.4	99.8

Date	Time	Load (KSF)	Dial Reading (in.)	Deform -ation (in.)	Corrected Dial Reading (in.)	Consoli -dation (%)	Void Ratio	Date	Time	Load (KSF)	Dial Reading (in.)	Deform -ation (in.)	Corrected Dial Reading (in.)	Consoli -dation (%)	Void Ratio
5/16/18	10:32	0.513	0.2459	---	---	---	---								
5/17/18	13:00	0.513	0.2282												
5/18/18	11:34	0.513	0.2277	0.0017	0.2260	**10.60**	0.709								



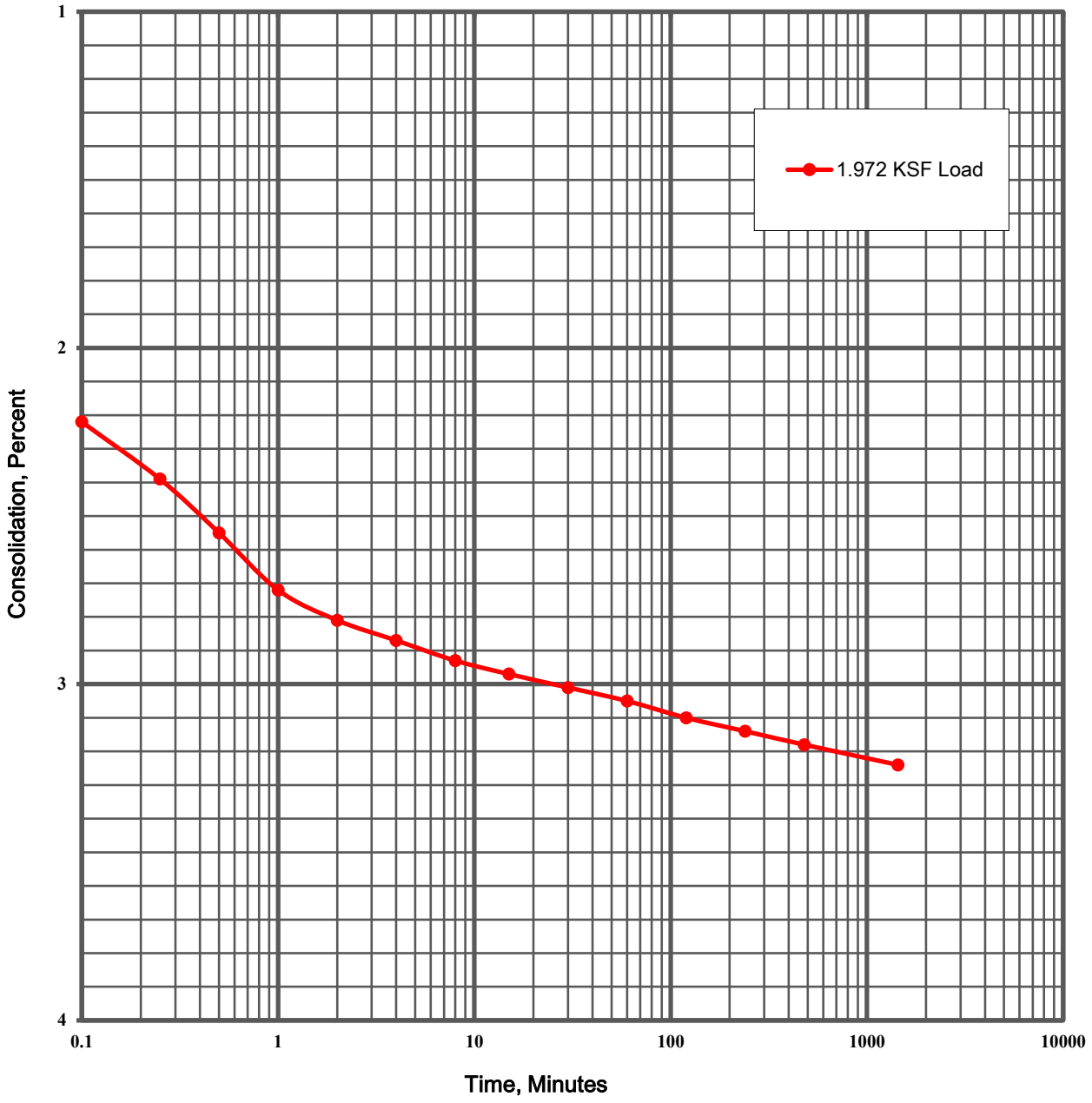
Boring No.:	B-4	In-Place Dry Density (PCF):	88.2
Sample Depth :	13.0-13.5 Feet	In-Place Moisture Content (%):	33.6
Sample Condition:	Intact	Soil Type:	ML

wood.	CONSOLIDATION VS. PRESSURE CURVE HELLMAN GAS PLANT EXPANSION Seal Beach, California	Project No. IR18166880



Boring No.:	B-4	In-Place Dry Density (PCF):	88.2
Sample Depth :	13.0-13.5 Feet	In-Place Moisture Content (%):	33.6
Sample Condition:	Intact	Soil Type:	ML

wood.	CONSOLIDATION VS. TIME CURVE HELLMAN GAS PLANT EXPANSION Seal Beach, California	Project No. IR18166880



Boring No.:	B-4	In-Place Dry Density (PCF):	88.2
Sample Depth :	13.0-13.5 Feet	In-Place Moisture Content (%):	33.6
Sample Condition:	Intact	Soil Type:	ML

wood.	CONSOLIDATION VS. TIME CURVE HELLMAN GAS PLANT EXPANSION Seal Beach, California	Project No. IR18166880

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

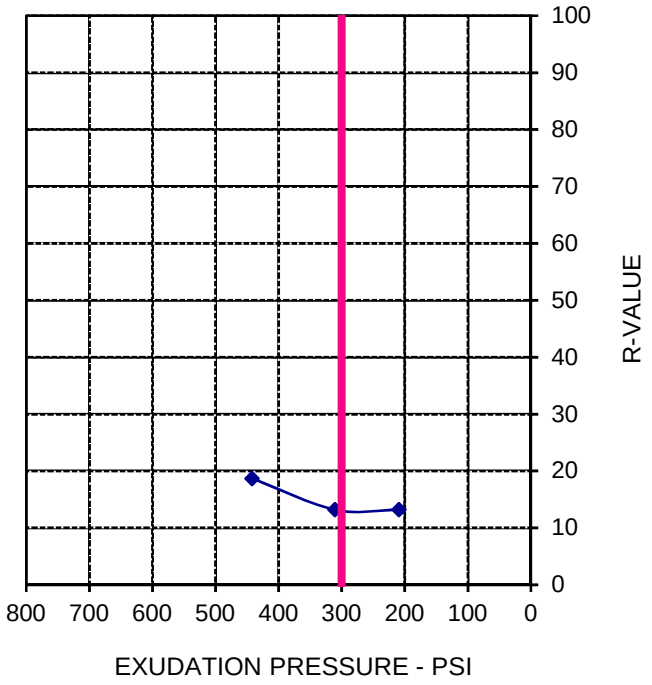
R-VALUE TEST DATA

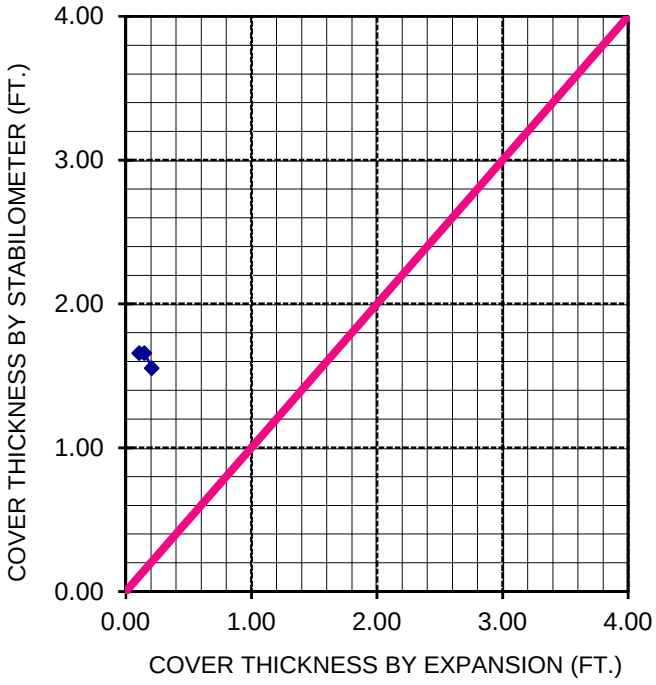
ASTM D2844

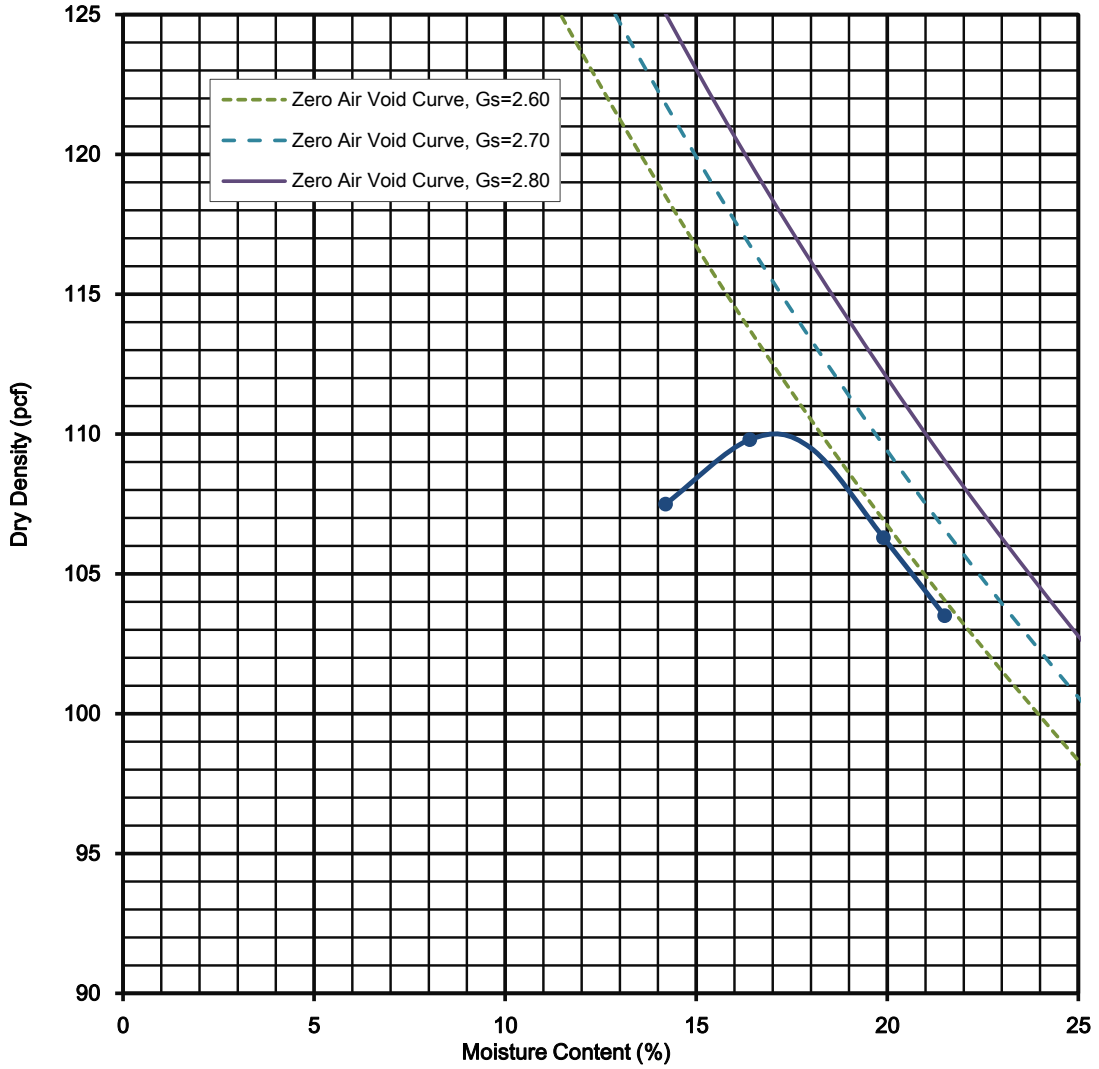
Project Name:	Hellman Gas Plant Expansion	Tested By:	ST	Date:	04/27/18
Project Number:	IR18166880	Computed By:	KM	Date:	05/01/18
Boring No.:	B-3 & B-4	Checked By:	AP	Date:	05/02/18
Sample Type:	Bulk	Depth (ft.):	1-5		
Location:	N/A				
Soil Description:	Clay w/sand				

Mold Number	C	A	B	
Water Added, g	16	34	46	
Compact Moisture(%)	26.5	28.6	30.1	
Compaction Gage Pressure, psi	110	70	60	
Exudation Pressure, psi	442	311	209	
Sample Height, Inches	2.7	2.7	2.7	
Gross Weight Mold, g	3023	3036	3044	
Tare Weight Mold, g	1965	1967	1966	
Net Sample Weight, g	1059	1069	1077	
Expansion, inchesx10^{-4}	62	44	32	
Stability 2,000 (160 psi)	44/120	52/130	61/132	
Turns Displacement	4.15	4.09	3.91	
R-Value Uncorrected	17	12	12	
R-Value Corrected	19	13	13	
Dry Density, pcf	93.9	93.2	92.9	
Traffic Index	8.0	8.0	8.0	
G.E. by Stability	1.55	1.66	1.66	
G.E. by Expansion	0.21	0.15	0.11	

R-VALUE	By Exudation:	13
	By Expansion:	*N/A
	At Equilibrium: (by Exudation)	13
Remarks	Gf = 1.34, and 0.7 % Retained on the ¾" *Not Applicable	







SAMPLE DATA

Sample ID.:	B-2 @ 1-5 Feet & B-3 @ 1-5 Feet Composite		
Soil Description:	Grayish Brown (2.5Y, 5/2) Lean Clay (CL)		
Date:	5/30-5/31/2018	Tested by:	VG, LT

TEST DATA

Standard: ASTM-D1557-B	Mold Volume (ft³):		1/30	Hammer Weight (lb.):		10
Drop Height (Inches): 18	Number of Layers:		5	Blows per Layer:		25
	1	2	3	4	*Oversize Correction*	
Water Added (gr.)	-94	-141	-188	-47	☐Yes	☑No
Weight of Wet Soil & Mold (lb.)	8.69	8.70	8.53	8.63	Coarser (lb.)	Finer (lb.)
Weight of Mold (lb.)	4.44	4.44	4.44	4.44		
Tare No.	9	20	13	3		
Wet Soil & Tare (gr.)	620.88	760.05	647.12	695.75		
Dry Soil & Tare (gr.)	533.92	665.63	579.12	590.43		
Tare Weight (gr.)	96.94	91.03	99.87	100.39		
Moisture Content (%)	19.9	16.4	14.2	21.5		
Dry Density (lb./ft³)	106.3	109.8	107.5	103.5	------	------
	Uncorrected Value			*Corrected Value*		
Maximum Dry Density (lb/ft³)	**110.0**			N/A		
Optimum Moisture Content (%)	**17.0**			N/A		

wood.

MAXIMUM DRY DENSITY - OPTIMUM MOISTURE CONTENT CURVE

HELLMAN GAS PLANT EXPANSION

Seal Beach, California

Project No.

IR18166880

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

CORROSION TEST RESULTS

Client Name: AMEC Foster Wheeler
Project Name: Hellman Gas Plant Expansion
Project No.: IR18166880

AP Job No.: 18-0452
Date: 04/30/18

Boring No.	Sample Type	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
B-2 & B-3	Bulk	1-5	CL	416	9.9	428	614
B-3 & B-4	Bulk	1-5	CL	623	9.8	407	439

NOTES:
Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

Appendix D

Well Permits

APPLICATION FOR WELL CONSTRUCTION PERMIT

ORANGE COUNTY HEALTH CARE AGENCY
ENVIRONMENTAL HEALTH DIVISION
1241 E. DYER ROAD, SUITE 120
SANTA ANA, CA 92705-5611
(714) 433-6000
FAX: (714) 433-6481

WELL PERMIT NUMBER 18-03-24

CITY SEAL BEACH

DATE 3/14/18

WELL LOCATION (ADDRESS IF AVAILABLE)
ENTER AT 711 1ST ST, SEAL BEACH, CA 90740. 2,600 FT NE ON 1ST ST, THEN 1,000 FT EAST TO WELL LOC.

NAME OF WELL OWNER
Hellman Properties LLC

ADDRESS
PO BOX 2398

CITY Seal Beach ZIP 90740 TELEPHONE 562.431.6022

NAME OF CONSULTING FIRM
Amec Foster Wheeler

BUSINESS ADDRESS
121 Innovation Dr. Suite 200

CITY Irvine ZIP 92617 TELEPHONE 949.6420245

NAME OF DRILLING CO. Gregg Drilling
C-57 LICENSE NO. 485165

CITY Signal Hill ZIP 90755 TELEPHONE 562.427.6899

TYPE OF WELL (CHECK)

- PRIVATE DOMESTIC ☐
- PUBLIC DOMESTIC ☐
- IRRIGATION ☐
- CATHODIC ☐
- PROBE SURVEY ☐
- MONITORING ☐
- SOIL BORING ☒
- OTHER _____ ☐
- TOTAL NUMBER 2

A. WELLS – SUBMIT A WELL CONSTRUCTION DIAGRAM (INCLUDE DIMENSIONS)

B. SOIL BORINGS AND PROBES –
TOTAL DEPTH ONE TO 40 FEET, ONE TO 60 FEET
SEALING MATERIAL Cement-Bentonite grout

C. PROPOSED START DATE March 28, 2018

DIAGRAM OF WELL SITE (Use additional sheets and/or attachments)

Attached
Fig 1: Site Vicinity Map
Fig 2: Boring Location Plan

Scope
- One boring to 40 feet, one to 60 feet depth
- Two other borings to 10 feet depth
Is not expected to encounter groundwater or penetrate into confining material bed

☒ SITE PLAN ATTACHED

I hereby agree to comply in every respect with all requirements of the Health Care Agency and with all ordinances and laws of the County of Orange and of the State of California pertaining to well construction, reconstruction and destruction, including the requirements to maintain the integrity of all significant confining zones.

APPLICANT'S SIGNATURE 3/14/18 DATE

BORA BATURAY
PRINT NAME

949.574.7502 PHONE NUMBER 949.642.4474 FAX NUMBER

FOR ACCOUNTING USE ONLY:

HSO NO. 385497 CHECK NO. 721104
DATE 3-21-18 AMOUNT 497
INTL. RG

APPROVAL BY OTHER AGENCIES:

JURISDICTION _____
REMARKS Permit expires on 3.21.2019

AUTHORIZED SIGNATURE _____ DATE _____

DISPOSITION OF PERMIT (DO NOT FILL IN):

☒ **APPROVED** SUBJECT TO THE FOLLOWING CONDITIONS:

A. NOTIFY THIS AGENCY AT LEAST **48 HOURS**
☒ PRIOR TO START. Notify of any changes
☐ PRIOR TO SEALING THE ANNULAR SPACE OR FILLING OF THE CONDUCTOR CASING.

B. ☐ SUBMIT TO THE AGENCY WITHIN 30 DAYS AFTER COMPLETION OF WORK, A WELL COMPLETION REPORT AND/OR DRILLING LOGS. PLEASE REFERENCE PERMIT NO.

C. ☐ SECURE ALL MONITORING WELLS TO PREVENT TAMPERING.

D. ☒ OTHER Notify when all work is complete and include the depth to 1st water

☐ **DENIED** _____

PERMIT ISSUED BY 03.21.2018 DATE

Lionel Brunton 714.433.6288
PRINT NAME PHONE NUMBER

WHEN SIGNED BY ORANGE COUNTY HEALTH CARE AGENCY REPRESENTATIVE, THIS APPLICATION IS A PERMIT.

F272-09.0803 (R11/01)

APPLICATION FOR WELL CONSTRUCTION PERMIT

ORANGE COUNTY HEALTH CARE AGENCY
ENVIRONMENTAL HEALTH DIVISION
1241 E. DYER ROAD, SUITE 120
SANTA ANA, CA 92705-5611
(714) 433-6000
FAX: (714) 433-6481

CITY: SEAL BEACH

DATE: 3/14/18

WELL LOCATION (ADDRESS IF AVAILABLE): ENTER AT 711 1ST ST, SEAL BEACH, CA 90740. 2,600 FEET NE ON 1ST ST, THEN 1,000 FEET EAST TO WELL LOCATION

WELL PERMIT NUMBER: 18-03-25

NAME OF WELL OWNER: Hellman Properties LLC

ADDRESS: PO BOX 2398

CITY: Seal Beach ZIP: 90740 TELEPHONE: 562.431.6022

NAME OF CONSULTING FIRM: Amec Foster Wheeler

BUSINESS ADDRESS: 121 Innovation Dr. Suite 200

CITY: Irvine ZIP: 92617 TELEPHONE: 949.642.0245

NAME OF DRILLING CO.: Kehoe Testing & Engineering C-57 LICENSE NO.: 786163

CITY: Huntington Beach ZIP: 92649 TELEPHONE: 714.901.7270

TYPE OF WELL (CHECK)

- PRIVATE DOMESTIC ☐
- PUBLIC DOMESTIC ☐
- IRRIGATION ☐
- CATHODIC ☐
- PROBE SURVEY ☒
- MONITORING ☐
- SOIL BORING ☐
- OTHER ____ ☐
- TOTAL NUMBER 5

A. WELLS – SUBMIT A WELL CONSTRUCTION DIAGRAM (INCLUDE DIMENSIONS)

B. SOIL BORINGS AND PROBES –
TOTAL DEPTH 5 CPTs to 60 FEET
SEALING MATERIAL Bentonite Chips

C. PROPOSED START DATE March 26, 2018

DIAGRAM OF WELL SITE (Use additional sheets and/or attachments)

Attached
Figure 1: Site Vicinity Map
Figure 2: Boring Location Map
Scope:
- 5 CPT probes to 60 feet depth

☒ SITE PLAN ATTACHED

I hereby agree to comply in every respect with all requirements of the Health Care Agency and with all ordinances and laws of the County of Orange and of the State of California pertaining to well construction, reconstruction and destruction, including the requirements to maintain the integrity of all significant confining zones.

APPLICANT'S SIGNATURE: [signature] DATE: 3/14/18

PRINT NAME: BORA BATURAY

PHONE NUMBER: 949.574.7502 FAX NUMBER: 949.642.4474

FOR ACCOUNTING USE ONLY:

HSO NO. 385497 CHECK NO. 721105

DATE 3-21-18 AMOUNT 372-

INTL. KG

APPROVAL BY OTHER AGENCIES:

JURISDICTION

REMARKS Permit expires on 3.21.2019

AUTHORIZED SIGNATURE DATE

DISPOSITION OF PERMIT (DO NOT FILL IN):

☒ **APPROVED** SUBJECT TO THE FOLLOWING CONDITIONS:

A. NOTIFY THIS AGENCY AT LEAST **48 HOURS**

☒ PRIOR TO START. Notify of any changes

☐ PRIOR TO SEALING THE ANNULAR SPACE OR FILLING OF THE CONDUCTOR CASING.

B. ☐ SUBMIT TO THE AGENCY WITHIN 30 DAYS AFTER COMPLETION OF WORK, A WELL COMPLETION REPORT AND/OR DRILLING LOGS. PLEASE REFERENCE PERMIT NO.

C. ☐ SECURE ALL MONITORING WELLS TO PREVENT TAMPERING.

D. ☒ OTHER Notify when all work is complete and include the depth to 1st water

☐ **DENIED**

PERMIT ISSUED BY: [signature] DATE: 3.21.2018

PRINT NAME: Lionel Brunton PHONE NUMBER: 714.433.6288

WHEN SIGNED BY ORANGE COUNTY HEALTH CARE AGENCY REPRESENTATIVE, THIS APPLICATION IS A PERMIT.

Appendix E

Analytical Test Results

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WORK ORDER NUMBER: 18-04-1355

The difference is service

AIR | SOIL | WATER | MARINE CHEMISTRY

Analytical Report For

Client: Amec Foster Wheeler Environment & Infrastructure,

Client Project Name: Hellman Properties / IR18166880

Attention: Bora Baturay
121 Innovation Drive
Suite 200
Irvine, CA 92617-3094

Approved for release on 04/25/2018 by:
Stephen Nowak
Project Manager

ResultLink

Email your PM

Eurofins Calscience (Calscience) certifies that the test results provided in this report meet all NELAC Institute requirements for parameters for which accreditation is required or available. Any exceptions to NELAC Institute requirements are noted in the case narrative. The original report of subcontracted analyses, if any, is attached to this report. The results in this report are limited to the sample(s) tested and any reproduction thereof must be made in its entirety. The client or recipient of this report is specifically prohibited from making material changes to said report and, to the extent that such changes are made, Calscience is not responsible, legally or otherwise. The client or recipient agrees to indemnify Calscience for any defense to any litigation which may arise.

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Work Order Number: 18-04-1355

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Work Order Narrative

Work Order: 18-04-1355 Page 1 of 1

Condition Upon Receipt:

Samples were received under Chain-of-Custody (COC) on 04/17/18. They were assigned to Work Order 18-04-1355.

Unless otherwise noted on the Sample Receiving forms all samples were received in good condition and within the recommended EPA temperature criteria for the methods noted on the COC. The COC and Sample Receiving Documents are integral elements of the analytical report and are presented at the back of the report.

Holding Times:

All samples were analyzed within prescribed holding times (HT) and/or in accordance with the Calscience Sample Acceptance Policy unless otherwise noted in the analytical report and/or comprehensive case narrative, if required.

Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.

Quality Control:

All quality control parameters (QC) were within established control limits except where noted in the QC summary forms or described further within this report.

Subcontractor Information:

Unless otherwise noted below (or on the subcontract form), no samples were subcontracted.

Additional Comments:

Air - Sorbent-extracted air methods (EPA TO-4A, EPA TO-10, EPA TO-13A, EPA TO-17): Analytical results are converted from mass/sample basis to mass/volume basis using client-supplied air volumes.

Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are always reported on a wet weight basis.

DoD Projects:

The test results contained in this report are accredited under the laboratory's ISO/IEC 17025:2005 and DoD-ELAP accreditation issued by the ANSI-ASQ National Accreditation Board. Refer to certificate and scope of accreditation ADE-1864.

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Sample Summary

Client:	Amec Foster Wheeler Environment & Infrastructure, 121 Innovation Drive, Suite 200 Irvine, CA 92617-3094	Work Order:	18-04-1355
		Project Name:	Hellman Properties / IR18166880
		PO Number:	
		Date/Time Received:	04/17/18 13:10
		Number of Containers:	48
Attn:	Bora Baturay		

Sample Identification	Lab Number	Collection Date and Time	Number of Containers	Matrix
B-4-1	18-04-1355-1	04/16/18 07:25	4	Solid
B-4-2	18-04-1355-2	04/16/18 07:45	4	Solid
B-4-4	18-04-1355-3	04/16/18 08:00	4	Solid
B-2-1	18-04-1355-4	04/16/18 11:10	4	Solid
B-2-2	18-04-1355-5	04/16/18 11:20	4	Solid
B-2-4	18-04-1355-6	04/16/18 11:35	4	Solid
B-1-1	18-04-1355-7	04/16/18 13:35	4	Solid
B-1-2	18-04-1355-8	04/16/18 13:40	4	Solid
B-1-3	18-04-1355-9	04/16/18 13:50	4	Solid
B-3-1	18-04-1355-10	04/16/18 14:00	4	Solid
B-3-2	18-04-1355-11	04/16/18 14:10	4	Solid
B-3-3	18-04-1355-12	04/16/18 14:20	4	Solid

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Detections Summary

Client:	Amec Foster Wheeler Environment & Infrastructure, 121 Innovation Drive, Suite 200 Irvine, CA 92617-3094	Work Order:	18-04-1355
		Project Name:	Hellman Properties / IR18166880
		Received:	04/17/18
Attn:	Bora Baturay		

Client SampleID Analyte	Result	Qualifiers	RL	Units	Method	Extraction
B-4-1 (18-04-1355-1)						
Arsenic	14.1		0.728	mg/kg	EPA 6010B	EPA 3050B
Barium	142		0.485	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.763		0.243	mg/kg	EPA 6010B	EPA 3050B
Cadmium	1.06		0.485	mg/kg	EPA 6010B	EPA 3050B
Chromium	25.2		0.243	mg/kg	EPA 6010B	EPA 3050B
Cobalt	13.3		0.243	mg/kg	EPA 6010B	EPA 3050B
Copper	33.0		0.485	mg/kg	EPA 6010B	EPA 3050B
Lead	8.37		0.485	mg/kg	EPA 6010B	EPA 3050B
Molybdenum	0.865		0.243	mg/kg	EPA 6010B	EPA 3050B
Nickel	20.6		0.243	mg/kg	EPA 6010B	EPA 3050B
Vanadium	53.2		0.243	mg/kg	EPA 6010B	EPA 3050B
Zinc	68.6		0.971	mg/kg	EPA 6010B	EPA 3050B
B-4-2 (18-04-1355-2)						
Arsenic	2.47		0.758	mg/kg	EPA 6010B	EPA 3050B
Barium	98.7		0.505	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.922		0.253	mg/kg	EPA 6010B	EPA 3050B
Cadmium	0.757		0.505	mg/kg	EPA 6010B	EPA 3050B
Chromium	28.7		0.253	mg/kg	EPA 6010B	EPA 3050B
Cobalt	16.7		0.253	mg/kg	EPA 6010B	EPA 3050B
Copper	34.0		0.505	mg/kg	EPA 6010B	EPA 3050B
Lead	10.6		0.505	mg/kg	EPA 6010B	EPA 3050B
Nickel	22.8		0.253	mg/kg	EPA 6010B	EPA 3050B
Vanadium	43.5		0.253	mg/kg	EPA 6010B	EPA 3050B
Zinc	79.9		1.01	mg/kg	EPA 6010B	EPA 3050B
B-4-4 (18-04-1355-3)						
Arsenic	1.83		0.735	mg/kg	EPA 6010B	EPA 3050B
Barium	90.4		0.490	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.460		0.245	mg/kg	EPA 6010B	EPA 3050B
Cadmium	0.619		0.490	mg/kg	EPA 6010B	EPA 3050B
Chromium	21.6		0.245	mg/kg	EPA 6010B	EPA 3050B
Cobalt	11.9		0.245	mg/kg	EPA 6010B	EPA 3050B
Copper	25.6		0.490	mg/kg	EPA 6010B	EPA 3050B
Lead	4.70		0.490	mg/kg	EPA 6010B	EPA 3050B
Molybdenum	0.624		0.245	mg/kg	EPA 6010B	EPA 3050B
Nickel	16.1		0.245	mg/kg	EPA 6010B	EPA 3050B
Vanadium	43.6		0.245	mg/kg	EPA 6010B	EPA 3050B
Zinc	62.3		0.980	mg/kg	EPA 6010B	EPA 3050B

* MDL is shown

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Detections Summary

Client:	Amec Foster Wheeler Environment & Infrastructure, 121 Innovation Drive, Suite 200 Irvine, CA 92617-3094	Work Order:	18-04-1355
		Project Name:	Hellman Properties / IR18166880
		Received:	04/17/18
Attn:	Bora Baturay		Page 2 of 5

Client SampleID Analyte	Result	Qualifiers	RL	Units	Method	Extraction
B-2-1 (18-04-1355-4)						
Arsenic	20.4		0.785	mg/kg	EPA 6010B	EPA 3050B
Barium	148		0.524	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.734		0.262	mg/kg	EPA 6010B	EPA 3050B
Cadmium	1.00		0.524	mg/kg	EPA 6010B	EPA 3050B
Chromium	24.0		0.262	mg/kg	EPA 6010B	EPA 3050B
Cobalt	13.6		0.262	mg/kg	EPA 6010B	EPA 3050B
Copper	34.2		0.524	mg/kg	EPA 6010B	EPA 3050B
Lead	8.06		0.524	mg/kg	EPA 6010B	EPA 3050B
Molybdenum	0.807		0.262	mg/kg	EPA 6010B	EPA 3050B
Nickel	21.9		0.262	mg/kg	EPA 6010B	EPA 3050B
Vanadium	53.5		0.262	mg/kg	EPA 6010B	EPA 3050B
Zinc	60.8		1.05	mg/kg	EPA 6010B	EPA 3050B
B-2-2 (18-04-1355-5)						
Arsenic	11.6		0.721	mg/kg	EPA 6010B	EPA 3050B
Barium	234		0.481	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.662		0.240	mg/kg	EPA 6010B	EPA 3050B
Cadmium	0.866		0.481	mg/kg	EPA 6010B	EPA 3050B
Chromium	26.4		0.240	mg/kg	EPA 6010B	EPA 3050B
Cobalt	13.6		0.240	mg/kg	EPA 6010B	EPA 3050B
Copper	40.5		0.481	mg/kg	EPA 6010B	EPA 3050B
Lead	7.27		0.481	mg/kg	EPA 6010B	EPA 3050B
Molybdenum	1.43		0.240	mg/kg	EPA 6010B	EPA 3050B
Nickel	21.1		0.240	mg/kg	EPA 6010B	EPA 3050B
Vanadium	53.7		0.240	mg/kg	EPA 6010B	EPA 3050B
Zinc	66.6		0.962	mg/kg	EPA 6010B	EPA 3050B
B-2-4 (18-04-1355-6)						
Arsenic	7.10		0.746	mg/kg	EPA 6010B	EPA 3050B
Barium	112		0.498	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.611		0.249	mg/kg	EPA 6010B	EPA 3050B
Cadmium	0.742		0.498	mg/kg	EPA 6010B	EPA 3050B
Chromium	24.5		0.249	mg/kg	EPA 6010B	EPA 3050B
Cobalt	14.2		0.249	mg/kg	EPA 6010B	EPA 3050B
Copper	31.5		0.498	mg/kg	EPA 6010B	EPA 3050B
Lead	5.99		0.498	mg/kg	EPA 6010B	EPA 3050B
Molybdenum	3.03		0.249	mg/kg	EPA 6010B	EPA 3050B
Nickel	20.3		0.249	mg/kg	EPA 6010B	EPA 3050B
Vanadium	53.0		0.249	mg/kg	EPA 6010B	EPA 3050B
Zinc	70.8		0.995	mg/kg	EPA 6010B	EPA 3050B

* MDL is shown

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Detections Summary

Client:	Amec Foster Wheeler Environment & Infrastructure, 121 Innovation Drive, Suite 200 Irvine, CA 92617-3094	Work Order:	18-04-1355
		Project Name:	Hellman Properties / IR18166880
		Received:	04/17/18
Attn:	Bora Baturay		

Client SampleID Analyte	Result	Qualifiers	RL	Units	Method	Extraction
B-1-1 (18-04-1355-7)						
Arsenic	17.4		0.746	mg/kg	EPA 6010B	EPA 3050B
Barium	150		0.498	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.808		0.249	mg/kg	EPA 6010B	EPA 3050B
Cadmium	1.06		0.498	mg/kg	EPA 6010B	EPA 3050B
Chromium	27.0		0.249	mg/kg	EPA 6010B	EPA 3050B
Cobalt	14.5		0.249	mg/kg	EPA 6010B	EPA 3050B
Copper	35.0		0.498	mg/kg	EPA 6010B	EPA 3050B
Lead	8.40		0.498	mg/kg	EPA 6010B	EPA 3050B
Molybdenum	2.17		0.249	mg/kg	EPA 6010B	EPA 3050B
Nickel	23.3		0.249	mg/kg	EPA 6010B	EPA 3050B
Vanadium	54.7		0.249	mg/kg	EPA 6010B	EPA 3050B
Zinc	69.3		0.995	mg/kg	EPA 6010B	EPA 3050B
B-1-2 (18-04-1355-8)						
Arsenic	1.15		0.785	mg/kg	EPA 6010B	EPA 3050B
Barium	118		0.524	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.518		0.262	mg/kg	EPA 6010B	EPA 3050B
Cadmium	0.637		0.524	mg/kg	EPA 6010B	EPA 3050B
Chromium	23.3		0.262	mg/kg	EPA 6010B	EPA 3050B
Cobalt	11.5		0.262	mg/kg	EPA 6010B	EPA 3050B
Copper	17.9		0.524	mg/kg	EPA 6010B	EPA 3050B
Lead	4.79		0.524	mg/kg	EPA 6010B	EPA 3050B
Molybdenum	0.279		0.262	mg/kg	EPA 6010B	EPA 3050B
Nickel	18.0		0.262	mg/kg	EPA 6010B	EPA 3050B
Vanadium	43.0		0.262	mg/kg	EPA 6010B	EPA 3050B
Zinc	61.7		1.05	mg/kg	EPA 6010B	EPA 3050B
B-1-3 (18-04-1355-9)						
Arsenic	2.19		0.743	mg/kg	EPA 6010B	EPA 3050B
Barium	63.7		0.495	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.388		0.248	mg/kg	EPA 6010B	EPA 3050B
Chromium	16.0		0.248	mg/kg	EPA 6010B	EPA 3050B
Cobalt	8.85		0.248	mg/kg	EPA 6010B	EPA 3050B
Copper	11.4		0.495	mg/kg	EPA 6010B	EPA 3050B
Lead	3.41		0.495	mg/kg	EPA 6010B	EPA 3050B
Molybdenum	1.09		0.248	mg/kg	EPA 6010B	EPA 3050B
Nickel	12.7		0.248	mg/kg	EPA 6010B	EPA 3050B
Vanadium	34.2		0.248	mg/kg	EPA 6010B	EPA 3050B
Zinc	45.6		0.990	mg/kg	EPA 6010B	EPA 3050B

* MDL is shown

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Detections Summary

Client:	Amec Foster Wheeler Environment & Infrastructure, 121 Innovation Drive, Suite 200 Irvine, CA 92617-3094	Work Order:	18-04-1355
		Project Name:	Hellman Properties / IR18166880
		Received:	04/17/18
Attn:	Bora Baturay		

Client SampleID Analyte	Result	Qualifiers	RL	Units	Method	Extraction
B-3-1 (18-04-1355-10)						
Arsenic	7.89		0.746	mg/kg	EPA 6010B	EPA 3050B
Barium	194		0.498	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.748		0.249	mg/kg	EPA 6010B	EPA 3050B
Cadmium	1.16		0.498	mg/kg	EPA 6010B	EPA 3050B
Chromium	27.2		0.249	mg/kg	EPA 6010B	EPA 3050B
Cobalt	12.9		0.249	mg/kg	EPA 6010B	EPA 3050B
Copper	22.7		0.498	mg/kg	EPA 6010B	EPA 3050B
Lead	6.89		0.498	mg/kg	EPA 6010B	EPA 3050B
Nickel	18.8		0.249	mg/kg	EPA 6010B	EPA 3050B
Vanadium	49.7		0.249	mg/kg	EPA 6010B	EPA 3050B
Zinc	76.6		0.995	mg/kg	EPA 6010B	EPA 3050B
Benzene	1.2		1.0	ug/kg	EPA 8260B	EPA 5035
B-3-2 (18-04-1355-11)						
TRPH	18		10	mg/kg	EPA 418.1M	N/A
Arsenic	5.18		0.754	mg/kg	EPA 6010B	EPA 3050B
Barium	103		0.503	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.606		0.251	mg/kg	EPA 6010B	EPA 3050B
Cadmium	0.553		0.503	mg/kg	EPA 6010B	EPA 3050B
Chromium	21.3		0.251	mg/kg	EPA 6010B	EPA 3050B
Cobalt	11.9		0.251	mg/kg	EPA 6010B	EPA 3050B
Copper	20.1		0.503	mg/kg	EPA 6010B	EPA 3050B
Lead	5.46		0.503	mg/kg	EPA 6010B	EPA 3050B
Molybdenum	0.396		0.251	mg/kg	EPA 6010B	EPA 3050B
Nickel	17.3		0.251	mg/kg	EPA 6010B	EPA 3050B
Vanadium	46.2		0.251	mg/kg	EPA 6010B	EPA 3050B
Zinc	65.5		1.01	mg/kg	EPA 6010B	EPA 3050B

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* MDL is shown

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Detections Summary

Client:	Amec Foster Wheeler Environment & Infrastructure, 121 Innovation Drive, Suite 200 Irvine, CA 92617-3094	Work Order:	18-04-1355
		Project Name:	Hellman Properties / IR18166880
		Received:	04/17/18
Attn:	Bora Baturay		Page 5 of 5

Client SampleID

Analyte	Result	Qualifiers	RL	Units	Method	Extraction
B-3-3 (18-04-1355-12)						
TRPH	15		10	mg/kg	EPA 418.1M	N/A
Arsenic	1.40		0.785	mg/kg	EPA 6010B	EPA 3050B
Barium	98.9		0.524	mg/kg	EPA 6010B	EPA 3050B
Beryllium	0.549		0.262	mg/kg	EPA 6010B	EPA 3050B
Cadmium	0.634		0.524	mg/kg	EPA 6010B	EPA 3050B
Chromium	22.5		0.262	mg/kg	EPA 6010B	EPA 3050B
Cobalt	12.0		0.262	mg/kg	EPA 6010B	EPA 3050B
Copper	20.4		0.524	mg/kg	EPA 6010B	EPA 3050B
Lead	5.59		0.524	mg/kg	EPA 6010B	EPA 3050B
Molybdenum	0.381		0.262	mg/kg	EPA 6010B	EPA 3050B
Nickel	17.5		0.262	mg/kg	EPA 6010B	EPA 3050B
Vanadium	45.2		0.262	mg/kg	EPA 6010B	EPA 3050B
Zinc	62.1		1.05	mg/kg	EPA 6010B	EPA 3050B

Subcontracted analyses, if any, are not included in this summary.

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* MDL is shown

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	N/A
		Method:	EPA 418.1M
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 1 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-4-1	**18-04-1355-1-A**	**04/16/18 07:25**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	ND	10	1.00	

B-4-2	**18-04-1355-2-A**	**04/16/18 07:45**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	ND	10	1.00	

B-4-4	**18-04-1355-3-A**	**04/16/18 08:00**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	ND	10	1.00	

B-2-1	**18-04-1355-4-A**	**04/16/18 11:10**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	ND	10	1.00	

B-2-2	**18-04-1355-5-A**	**04/16/18 11:20**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	ND	10	1.00	

B-2-4	**18-04-1355-6-A**	**04/16/18 11:35**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	ND	10	1.00	

B-1-1	**18-04-1355-7-A**	**04/16/18 13:35**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	ND	10	1.00	

B-1-2	**18-04-1355-8-A**	**04/16/18 13:40**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	ND	10	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	N/A
		Method:	EPA 418.1M
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 2 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-1-3	**18-04-1355-9-A**	**04/16/18 13:50**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	ND	10	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-1	**18-04-1355-10-A**	**04/16/18 14:00**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	ND	10	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-2	**18-04-1355-11-A**	**04/16/18 14:10**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	18	10	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-3	**18-04-1355-12-A**	**04/16/18 14:20**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	15	10	1.00	

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-07-015-2272**	**N/A**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Result	RL	DF	Qualifiers
TRPH	ND	10	1.00	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 1 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-4-1	**18-04-1355-1-A**	**04/16/18 07:25**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 00:36**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	110	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 2 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-4-2	**18-04-1355-2-A**	**04/16/18 07:45**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 00:57**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	110	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 3 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-4-4	**18-04-1355-3-A**	**04/16/18 08:00**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 01:17**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	114	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 4 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-2-1	**18-04-1355-4-A**	**04/16/18 11:10**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 01:38**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	109	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 3550B
	Method:	EPA 8015B (M)
	Units:	mg/kg
Project: Hellman Properties / IR18166880		Page 5 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-2-2	**18-04-1355-5-A**	**04/16/18 11:20**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 01:59**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	115	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 6 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-2-4	**18-04-1355-6-A**	**04/16/18 11:35**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 02:19**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	112	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 7 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-1-1	**18-04-1355-7-A**	**04/16/18 13:35**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 02:40**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	106	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 8 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-1-2	**18-04-1355-8-A**	**04/16/18 13:40**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 03:21**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	107	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 9 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-1-3	**18-04-1355-9-A**	**04/16/18 13:50**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 03:42**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	118	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 10 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-1	**18-04-1355-10-A**	**04/16/18 14:00**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 04:03**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	110	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 11 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-2	**18-04-1355-11-A**	**04/16/18 14:10**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 04:24**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	107	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3550B
		Method:	EPA 8015B (M)
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 12 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-3	**18-04-1355-12-A**	**04/16/18 14:20**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 04:44**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	116	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 3550B
	Method:	EPA 8015B (M)
	Units:	mg/kg
Project: Hellman Properties / IR18166880		Page 13 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**099-15-490-3061**	**N/A**	**Solid**	**GC 48**	**04/19/18**	**04/19/18 23:13**	**180419B01**

Parameter	Result	RL	DF	Qualifiers
C6	ND	5.0	1.00	
C7	ND	5.0	1.00	
C8	ND	5.0	1.00	
C9-C10	ND	5.0	1.00	
C11-C12	ND	5.0	1.00	
C13-C14	ND	5.0	1.00	
C15-C16	ND	5.0	1.00	
C17-C18	ND	5.0	1.00	
C19-C20	ND	5.0	1.00	
C21-C22	ND	5.0	1.00	
C23-C24	ND	5.0	1.00	
C25-C28	ND	5.0	1.00	
C29-C32	ND	5.0	1.00	
C33-C36	ND	5.0	1.00	
C37-C40	ND	5.0	1.00	
C41-C44	ND	5.0	1.00	
C6-C44 Total	ND	5.0	1.00	

Surrogate	Rec. (%)	Control Limits	Qualifiers
n-Octacosane	122	61-145	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 1 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-4-1	**18-04-1355-1-A**	**04/16/18 07:25**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:44**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.728	0.971	
Arsenic	14.1	0.728	0.971	
Barium	142	0.485	0.971	
Beryllium	0.763	0.243	0.971	
Cadmium	1.06	0.485	0.971	
Chromium	25.2	0.243	0.971	
Cobalt	13.3	0.243	0.971	
Copper	33.0	0.485	0.971	
Lead	8.37	0.485	0.971	
Molybdenum	0.865	0.243	0.971	
Nickel	20.6	0.243	0.971	
Selenium	ND	0.728	0.971	
Silver	ND	0.243	0.971	
Thallium	ND	0.728	0.971	
Vanadium	53.2	0.243	0.971	
Zinc	68.6	0.971	0.971	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 2 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-4-2	**18-04-1355-2-A**	**04/16/18 07:45**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:47**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.758	1.01	
Arsenic	2.47	0.758	1.01	
Barium	98.7	0.505	1.01	
Beryllium	0.922	0.253	1.01	
Cadmium	0.757	0.505	1.01	
Chromium	28.7	0.253	1.01	
Cobalt	16.7	0.253	1.01	
Copper	34.0	0.505	1.01	
Lead	10.6	0.505	1.01	
Molybdenum	ND	0.253	1.01	
Nickel	22.8	0.253	1.01	
Selenium	ND	0.758	1.01	
Silver	ND	0.253	1.01	
Thallium	ND	0.758	1.01	
Vanadium	43.5	0.253	1.01	
Zinc	79.9	1.01	1.01	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 3 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-4-4	**18-04-1355-3-A**	**04/16/18 08:00**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:48**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.735	0.980	
Arsenic	1.83	0.735	0.980	
Barium	90.4	0.490	0.980	
Beryllium	0.460	0.245	0.980	
Cadmium	0.619	0.490	0.980	
Chromium	21.6	0.245	0.980	
Cobalt	11.9	0.245	0.980	
Copper	25.6	0.490	0.980	
Lead	4.70	0.490	0.980	
Molybdenum	0.624	0.245	0.980	
Nickel	16.1	0.245	0.980	
Selenium	ND	0.735	0.980	
Silver	ND	0.245	0.980	
Thallium	ND	0.735	0.980	
Vanadium	43.6	0.245	0.980	
Zinc	62.3	0.980	0.980	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 4 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-2-1	**18-04-1355-4-A**	**04/16/18 11:10**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:49**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.785	1.05	
Arsenic	20.4	0.785	1.05	
Barium	148	0.524	1.05	
Beryllium	0.734	0.262	1.05	
Cadmium	1.00	0.524	1.05	
Chromium	24.0	0.262	1.05	
Cobalt	13.6	0.262	1.05	
Copper	34.2	0.524	1.05	
Lead	8.06	0.524	1.05	
Molybdenum	0.807	0.262	1.05	
Nickel	21.9	0.262	1.05	
Selenium	ND	0.785	1.05	
Silver	ND	0.262	1.05	
Thallium	ND	0.785	1.05	
Vanadium	53.5	0.262	1.05	
Zinc	60.8	1.05	1.05	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
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Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-2-2	**18-04-1355-5-A**	**04/16/18 11:20**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:50**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.721	0.962	
Arsenic	11.6	0.721	0.962	
Barium	234	0.481	0.962	
Beryllium	0.662	0.240	0.962	
Cadmium	0.866	0.481	0.962	
Chromium	26.4	0.240	0.962	
Cobalt	13.6	0.240	0.962	
Copper	40.5	0.481	0.962	
Lead	7.27	0.481	0.962	
Molybdenum	1.43	0.240	0.962	
Nickel	21.1	0.240	0.962	
Selenium	ND	0.721	0.962	
Silver	ND	0.240	0.962	
Thallium	ND	0.721	0.962	
Vanadium	53.7	0.240	0.962	
Zinc	66.6	0.962	0.962	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
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Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-2-4	**18-04-1355-6-A**	**04/16/18 11:35**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:51**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.746	0.995	
Arsenic	7.10	0.746	0.995	
Barium	112	0.498	0.995	
Beryllium	0.611	0.249	0.995	
Cadmium	0.742	0.498	0.995	
Chromium	24.5	0.249	0.995	
Cobalt	14.2	0.249	0.995	
Copper	31.5	0.498	0.995	
Lead	5.99	0.498	0.995	
Molybdenum	3.03	0.249	0.995	
Nickel	20.3	0.249	0.995	
Selenium	ND	0.746	0.995	
Silver	ND	0.249	0.995	
Thallium	ND	0.746	0.995	
Vanadium	53.0	0.249	0.995	
Zinc	70.8	0.995	0.995	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
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Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-1-1	**18-04-1355-7-A**	**04/16/18 13:35**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:52**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.746	0.995	
Arsenic	17.4	0.746	0.995	
Barium	150	0.498	0.995	
Beryllium	0.808	0.249	0.995	
Cadmium	1.06	0.498	0.995	
Chromium	27.0	0.249	0.995	
Cobalt	14.5	0.249	0.995	
Copper	35.0	0.498	0.995	
Lead	8.40	0.498	0.995	
Molybdenum	2.17	0.249	0.995	
Nickel	23.3	0.249	0.995	
Selenium	ND	0.746	0.995	
Silver	ND	0.249	0.995	
Thallium	ND	0.746	0.995	
Vanadium	54.7	0.249	0.995	
Zinc	69.3	0.995	0.995	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
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Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-1-2	**18-04-1355-8-A**	**04/16/18 13:40**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:53**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.785	1.05	
Arsenic	1.15	0.785	1.05	
Barium	118	0.524	1.05	
Beryllium	0.518	0.262	1.05	
Cadmium	0.637	0.524	1.05	
Chromium	23.3	0.262	1.05	
Cobalt	11.5	0.262	1.05	
Copper	17.9	0.524	1.05	
Lead	4.79	0.524	1.05	
Molybdenum	0.279	0.262	1.05	
Nickel	18.0	0.262	1.05	
Selenium	ND	0.785	1.05	
Silver	ND	0.262	1.05	
Thallium	ND	0.785	1.05	
Vanadium	43.0	0.262	1.05	
Zinc	61.7	1.05	1.05	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 9 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-1-3	**18-04-1355-9-A**	**04/16/18 13:50**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:55**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.743	0.990	
Arsenic	2.19	0.743	0.990	
Barium	63.7	0.495	0.990	
Beryllium	0.388	0.248	0.990	
Cadmium	ND	0.495	0.990	
Chromium	16.0	0.248	0.990	
Cobalt	8.85	0.248	0.990	
Copper	11.4	0.495	0.990	
Lead	3.41	0.495	0.990	
Molybdenum	1.09	0.248	0.990	
Nickel	12.7	0.248	0.990	
Selenium	ND	0.743	0.990	
Silver	ND	0.248	0.990	
Thallium	ND	0.743	0.990	
Vanadium	34.2	0.248	0.990	
Zinc	45.6	0.990	0.990	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 10 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-1	**18-04-1355-10-A**	**04/16/18 14:00**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:56**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.746	0.995	
Arsenic	7.89	0.746	0.995	
Barium	194	0.498	0.995	
Beryllium	0.748	0.249	0.995	
Cadmium	1.16	0.498	0.995	
Chromium	27.2	0.249	0.995	
Cobalt	12.9	0.249	0.995	
Copper	22.7	0.498	0.995	
Lead	6.89	0.498	0.995	
Molybdenum	ND	0.249	0.995	
Nickel	18.8	0.249	0.995	
Selenium	ND	0.746	0.995	
Silver	ND	0.249	0.995	
Thallium	ND	0.746	0.995	
Vanadium	49.7	0.249	0.995	
Zinc	76.6	0.995	0.995	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 11 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-2	**18-04-1355-11-A**	**04/16/18 14:10**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:57**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.754	1.01	
Arsenic	5.18	0.754	1.01	
Barium	103	0.503	1.01	
Beryllium	0.606	0.251	1.01	
Cadmium	0.553	0.503	1.01	
Chromium	21.3	0.251	1.01	
Cobalt	11.9	0.251	1.01	
Copper	20.1	0.503	1.01	
Lead	5.46	0.503	1.01	
Molybdenum	0.396	0.251	1.01	
Nickel	17.3	0.251	1.01	
Selenium	ND	0.754	1.01	
Silver	ND	0.251	1.01	
Thallium	ND	0.754	1.01	
Vanadium	46.2	0.251	1.01	
Zinc	65.5	1.01	1.01	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 12 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-3	**18-04-1355-12-A**	**04/16/18 14:20**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:58**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.785	1.05	
Arsenic	1.40	0.785	1.05	
Barium	98.9	0.524	1.05	
Beryllium	0.549	0.262	1.05	
Cadmium	0.634	0.524	1.05	
Chromium	22.5	0.262	1.05	
Cobalt	12.0	0.262	1.05	
Copper	20.4	0.524	1.05	
Lead	5.59	0.524	1.05	
Molybdenum	0.381	0.262	1.05	
Nickel	17.5	0.262	1.05	
Selenium	ND	0.785	1.05	
Silver	ND	0.262	1.05	
Thallium	ND	0.785	1.05	
Vanadium	45.2	0.262	1.05	
Zinc	62.1	1.05	1.05	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 3050B
		Method:	EPA 6010B
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 13 of 13

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**097-01-002-26227**	**N/A**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 12:58**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Antimony	ND	0.718	0.957	
Arsenic	ND	0.718	0.957	
Barium	ND	0.478	0.957	
Beryllium	ND	0.239	0.957	
Cadmium	ND	0.478	0.957	
Chromium	ND	0.239	0.957	
Cobalt	ND	0.239	0.957	
Copper	ND	0.478	0.957	
Lead	ND	0.478	0.957	
Molybdenum	ND	0.239	0.957	
Nickel	ND	0.239	0.957	
Selenium	ND	0.718	0.957	
Silver	ND	0.239	0.957	
Thallium	ND	0.718	0.957	
Vanadium	ND	0.239	0.957	
Zinc	ND	0.957	0.957	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 7471A Total
	Method:	EPA 7471A
	Units:	mg/kg
Project: Hellman Properties / IR18166880		Page 1 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-4-1	**18-04-1355-1-A**	**04/16/18 07:25**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 13:53**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0833	1.00	

B-4-2	**18-04-1355-2-A**	**04/16/18 07:45**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 14:00**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0794	1.00	

B-4-4	**18-04-1355-3-A**	**04/16/18 08:00**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 14:03**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0794	1.00	

B-2-1	**18-04-1355-4-A**	**04/16/18 11:10**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 14:05**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0794	1.00	

B-2-2	**18-04-1355-5-A**	**04/16/18 11:20**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 14:07**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0806	1.00	

B-2-4	**18-04-1355-6-A**	**04/16/18 11:35**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 14:14**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0820	1.00	

B-1-1	**18-04-1355-7-A**	**04/16/18 13:35**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 14:16**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0820	1.00	

B-1-2	**18-04-1355-8-A**	**04/16/18 13:40**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 14:19**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0794	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 7471A Total
		Method:	EPA 7471A
		Units:	mg/kg
Project: Hellman Properties / IR18166880			Page 2 of 2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-1-3	**18-04-1355-9-A**	**04/16/18 13:50**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 14:21**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0806	1.00	

B-3-1	**18-04-1355-10-A**	**04/16/18 14:00**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 14:23**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0794	1.00	

B-3-2	**18-04-1355-11-A**	**04/16/18 14:10**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 14:26**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0833	1.00	

B-3-3	**18-04-1355-12-A**	**04/16/18 14:20**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 14:28**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0877	1.00	

Method Blank	**099-16-272-3785**	**N/A**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 13:49**	**180421L03**

Parameter	Result	RL	DF	Qualifiers
Mercury	ND	0.0820	1.00	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 1 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-4-1	**18-04-1355-1-C**	**04/16/18 07:25**	**Solid**	**GC/MS LL**	**04/16/18**	**04/18/18 13:34**	**180418L004**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	52	1.00	
Acetone	ND	52	1.00	
Benzene	ND	1.0	1.00	
Bromobenzene	ND	1.0	1.00	
Bromochloromethane	ND	2.1	1.00	
Bromodichloromethane	ND	1.0	1.00	
Bromoform	ND	5.2	1.00	
Bromomethane	ND	21	1.00	
2-Butanone	ND	21	1.00	
n-Butylbenzene	ND	1.0	1.00	
sec-Butylbenzene	ND	1.0	1.00	
tert-Butylbenzene	ND	1.0	1.00	
Carbon Disulfide	ND	10	1.00	
Carbon Tetrachloride	ND	1.0	1.00	
Chlorobenzene	ND	1.0	1.00	
Chloroethane	ND	2.1	1.00	
Chloroform	ND	1.0	1.00	
Chloromethane	ND	21	1.00	
2-Chlorotoluene	ND	1.0	1.00	
4-Chlorotoluene	ND	1.0	1.00	
Dibromochloromethane	ND	2.1	1.00	
1,2-Dibromo-3-Chloropropane	ND	5.2	1.00	
1,2-Dibromoethane	ND	1.0	1.00	
Dibromomethane	ND	1.0	1.00	
1,2-Dichlorobenzene	ND	1.0	1.00	
1,3-Dichlorobenzene	ND	1.0	1.00	
1,4-Dichlorobenzene	ND	1.0	1.00	
Dichlorodifluoromethane	ND	2.1	1.00	
1,1-Dichloroethane	ND	1.0	1.00	
1,2-Dichloroethane	ND	1.0	1.00	
1,1-Dichloroethene	ND	1.0	1.00	
c-1,2-Dichloroethene	ND	1.0	1.00	
t-1,2-Dichloroethene	ND	1.0	1.00	
1,2-Dichloropropane	ND	1.0	1.00	
1,3-Dichloropropane	ND	1.0	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 2 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	5.2	1.00	
1,1-Dichloropropene	ND	2.1	1.00	
c-1,3-Dichloropropene	ND	1.0	1.00	
t-1,3-Dichloropropene	ND	2.1	1.00	
Ethylbenzene	ND	1.0	1.00	
2-Hexanone	ND	21	1.00	
Isopropylbenzene	ND	1.0	1.00	
p-Isopropyltoluene	ND	1.0	1.00	
Methylene Chloride	ND	10	1.00	
4-Methyl-2-Pentanone	ND	21	1.00	
Naphthalene	ND	10	1.00	
n-Propylbenzene	ND	2.1	1.00	
Styrene	ND	1.0	1.00	
1,1,1,2-Tetrachloroethane	ND	1.0	1.00	
1,1,2,2-Tetrachloroethane	ND	2.1	1.00	
Tetrachloroethene	ND	1.0	1.00	
Toluene	ND	1.0	1.00	
1,2,3-Trichlorobenzene	ND	2.1	1.00	
1,2,4-Trichlorobenzene	ND	2.1	1.00	
1,1,1-Trichloroethane	ND	1.0	1.00	
1,1,2-Trichloroethane	ND	1.0	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	10	1.00	
Trichloroethene	ND	2.1	1.00	
Trichlorofluoromethane	ND	10	1.00	
1,2,3-Trichloropropane	ND	2.1	1.00	
1,2,4-Trimethylbenzene	ND	2.1	1.00	
1,3,5-Trimethylbenzene	ND	2.1	1.00	
Vinyl Acetate	ND	10	1.00	
Vinyl Chloride	ND	1.0	1.00	
p/m-Xylene	ND	2.1	1.00	
o-Xylene	ND	1.0	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	2.1	1.00	
Tert-Butyl Alcohol (TBA)	ND	21	1.00	
Diisopropyl Ether (DIPE)	ND	1.0	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	1.0	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	1.0	1.00	
Ethanol	ND	520	1.00	
Cyclohexanone	ND	52	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 3 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	98	80-120	
Dibromofluoromethane	102	79-133	
1,2-Dichloroethane-d4	120	71-155	
Toluene-d8	100	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 4 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-4-2	**18-04-1355-2-C**	**04/16/18 07:45**	**Solid**	**GC/MS LL**	**04/16/18**	**04/18/18 14:01**	**180418L004**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	45	1.00	
Acetone	ND	45	1.00	
Benzene	ND	0.89	1.00	
Bromobenzene	ND	0.89	1.00	
Bromochloromethane	ND	1.8	1.00	
Bromodichloromethane	ND	0.89	1.00	
Bromoform	ND	4.5	1.00	
Bromomethane	ND	18	1.00	
2-Butanone	ND	18	1.00	
n-Butylbenzene	ND	0.89	1.00	
sec-Butylbenzene	ND	0.89	1.00	
tert-Butylbenzene	ND	0.89	1.00	
Carbon Disulfide	ND	8.9	1.00	
Carbon Tetrachloride	ND	0.89	1.00	
Chlorobenzene	ND	0.89	1.00	
Chloroethane	ND	1.8	1.00	
Chloroform	ND	0.89	1.00	
Chloromethane	ND	18	1.00	
2-Chlorotoluene	ND	0.89	1.00	
4-Chlorotoluene	ND	0.89	1.00	
Dibromochloromethane	ND	1.8	1.00	
1,2-Dibromo-3-Chloropropane	ND	4.5	1.00	
1,2-Dibromoethane	ND	0.89	1.00	
Dibromomethane	ND	0.89	1.00	
1,2-Dichlorobenzene	ND	0.89	1.00	
1,3-Dichlorobenzene	ND	0.89	1.00	
1,4-Dichlorobenzene	ND	0.89	1.00	
Dichlorodifluoromethane	ND	1.8	1.00	
1,1-Dichloroethane	ND	0.89	1.00	
1,2-Dichloroethane	ND	0.89	1.00	
1,1-Dichloroethene	ND	0.89	1.00	
c-1,2-Dichloroethene	ND	0.89	1.00	
t-1,2-Dichloroethene	ND	0.89	1.00	
1,2-Dichloropropane	ND	0.89	1.00	
1,3-Dichloropropane	ND	0.89	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 5 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	4.5	1.00	
1,1-Dichloropropene	ND	1.8	1.00	
c-1,3-Dichloropropene	ND	0.89	1.00	
t-1,3-Dichloropropene	ND	1.8	1.00	
Ethylbenzene	ND	0.89	1.00	
2-Hexanone	ND	18	1.00	
Isopropylbenzene	ND	0.89	1.00	
p-Isopropyltoluene	ND	0.89	1.00	
Methylene Chloride	ND	8.9	1.00	
4-Methyl-2-Pentanone	ND	18	1.00	
Naphthalene	ND	8.9	1.00	
n-Propylbenzene	ND	1.8	1.00	
Styrene	ND	0.89	1.00	
1,1,1,2-Tetrachloroethane	ND	0.89	1.00	
1,1,2,2-Tetrachloroethane	ND	1.8	1.00	
Tetrachloroethene	ND	0.89	1.00	
Toluene	ND	0.89	1.00	
1,2,3-Trichlorobenzene	ND	1.8	1.00	
1,2,4-Trichlorobenzene	ND	1.8	1.00	
1,1,1-Trichloroethane	ND	0.89	1.00	
1,1,2-Trichloroethane	ND	0.89	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	8.9	1.00	
Trichloroethene	ND	1.8	1.00	
Trichlorofluoromethane	ND	8.9	1.00	
1,2,3-Trichloropropane	ND	1.8	1.00	
1,2,4-Trimethylbenzene	ND	1.8	1.00	
1,3,5-Trimethylbenzene	ND	1.8	1.00	
Vinyl Acetate	ND	8.9	1.00	
Vinyl Chloride	ND	0.89	1.00	
p/m-Xylene	ND	1.8	1.00	
o-Xylene	ND	0.89	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	1.8	1.00	
Tert-Butyl Alcohol (TBA)	ND	18	1.00	
Diisopropyl Ether (DIPE)	ND	0.89	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	0.89	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	0.89	1.00	
Ethanol	ND	450	1.00	
Cyclohexanone	ND	45	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 6 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	98	80-120	
Dibromofluoromethane	108	79-133	
1,2-Dichloroethane-d4	112	71-155	
Toluene-d8	101	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 7 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-4-4	**18-04-1355-3-C**	**04/16/18 08:00**	**Solid**	**GC/MS LL**	**04/16/18**	**04/18/18 14:29**	**180418L004**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	46	1.00	
Acetone	ND	46	1.00	
Benzene	ND	0.91	1.00	
Bromobenzene	ND	0.91	1.00	
Bromochloromethane	ND	1.8	1.00	
Bromodichloromethane	ND	0.91	1.00	
Bromoform	ND	4.6	1.00	
Bromomethane	ND	18	1.00	
2-Butanone	ND	18	1.00	
n-Butylbenzene	ND	0.91	1.00	
sec-Butylbenzene	ND	0.91	1.00	
tert-Butylbenzene	ND	0.91	1.00	
Carbon Disulfide	ND	9.1	1.00	
Carbon Tetrachloride	ND	0.91	1.00	
Chlorobenzene	ND	0.91	1.00	
Chloroethane	ND	1.8	1.00	
Chloroform	ND	0.91	1.00	
Chloromethane	ND	18	1.00	
2-Chlorotoluene	ND	0.91	1.00	
4-Chlorotoluene	ND	0.91	1.00	
Dibromochloromethane	ND	1.8	1.00	
1,2-Dibromo-3-Chloropropane	ND	4.6	1.00	
1,2-Dibromoethane	ND	0.91	1.00	
Dibromomethane	ND	0.91	1.00	
1,2-Dichlorobenzene	ND	0.91	1.00	
1,3-Dichlorobenzene	ND	0.91	1.00	
1,4-Dichlorobenzene	ND	0.91	1.00	
Dichlorodifluoromethane	ND	1.8	1.00	
1,1-Dichloroethane	ND	0.91	1.00	
1,2-Dichloroethane	ND	0.91	1.00	
1,1-Dichloroethene	ND	0.91	1.00	
c-1,2-Dichloroethene	ND	0.91	1.00	
t-1,2-Dichloroethene	ND	0.91	1.00	
1,2-Dichloropropane	ND	0.91	1.00	
1,3-Dichloropropane	ND	0.91	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 8 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	4.6	1.00	
1,1-Dichloropropene	ND	1.8	1.00	
c-1,3-Dichloropropene	ND	0.91	1.00	
t-1,3-Dichloropropene	ND	1.8	1.00	
Ethylbenzene	ND	0.91	1.00	
2-Hexanone	ND	18	1.00	
Isopropylbenzene	ND	0.91	1.00	
p-Isopropyltoluene	ND	0.91	1.00	
Methylene Chloride	ND	9.1	1.00	
4-Methyl-2-Pentanone	ND	18	1.00	
Naphthalene	ND	9.1	1.00	
n-Propylbenzene	ND	1.8	1.00	
Styrene	ND	0.91	1.00	
1,1,1,2-Tetrachloroethane	ND	0.91	1.00	
1,1,2,2-Tetrachloroethane	ND	1.8	1.00	
Tetrachloroethene	ND	0.91	1.00	
Toluene	ND	0.91	1.00	
1,2,3-Trichlorobenzene	ND	1.8	1.00	
1,2,4-Trichlorobenzene	ND	1.8	1.00	
1,1,1-Trichloroethane	ND	0.91	1.00	
1,1,2-Trichloroethane	ND	0.91	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	9.1	1.00	
Trichloroethene	ND	1.8	1.00	
Trichlorofluoromethane	ND	9.1	1.00	
1,2,3-Trichloropropane	ND	1.8	1.00	
1,2,4-Trimethylbenzene	ND	1.8	1.00	
1,3,5-Trimethylbenzene	ND	1.8	1.00	
Vinyl Acetate	ND	9.1	1.00	
Vinyl Chloride	ND	0.91	1.00	
p/m-Xylene	ND	1.8	1.00	
o-Xylene	ND	0.91	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	1.8	1.00	
Tert-Butyl Alcohol (TBA)	ND	18	1.00	
Diisopropyl Ether (DIPE)	ND	0.91	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	0.91	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	0.91	1.00	
Ethanol	ND	460	1.00	
Cyclohexanone	ND	46	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 9 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	99	80-120	
Dibromofluoromethane	109	79-133	
1,2-Dichloroethane-d4	112	71-155	
Toluene-d8	102	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 5035
		Method:	EPA 8260B
		Units:	ug/kg
Project: Hellman Properties / IR18166880			Page 10 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-2-1	**18-04-1355-4-C**	**04/16/18 11:10**	**Solid**	**GC/MS LL**	**04/16/18**	**04/18/18 14:56**	**180418L004**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	51	1.00	
Acetone	ND	51	1.00	
Benzene	ND	1.0	1.00	
Bromobenzene	ND	1.0	1.00	
Bromochloromethane	ND	2.0	1.00	
Bromodichloromethane	ND	1.0	1.00	
Bromoform	ND	5.1	1.00	
Bromomethane	ND	20	1.00	
2-Butanone	ND	20	1.00	
n-Butylbenzene	ND	1.0	1.00	
sec-Butylbenzene	ND	1.0	1.00	
tert-Butylbenzene	ND	1.0	1.00	
Carbon Disulfide	ND	10	1.00	
Carbon Tetrachloride	ND	1.0	1.00	
Chlorobenzene	ND	1.0	1.00	
Chloroethane	ND	2.0	1.00	
Chloroform	ND	1.0	1.00	
Chloromethane	ND	20	1.00	
2-Chlorotoluene	ND	1.0	1.00	
4-Chlorotoluene	ND	1.0	1.00	
Dibromochloromethane	ND	2.0	1.00	
1,2-Dibromo-3-Chloropropane	ND	5.1	1.00	
1,2-Dibromoethane	ND	1.0	1.00	
Dibromomethane	ND	1.0	1.00	
1,2-Dichlorobenzene	ND	1.0	1.00	
1,3-Dichlorobenzene	ND	1.0	1.00	
1,4-Dichlorobenzene	ND	1.0	1.00	
Dichlorodifluoromethane	ND	2.0	1.00	
1,1-Dichloroethane	ND	1.0	1.00	
1,2-Dichloroethane	ND	1.0	1.00	
1,1-Dichloroethene	ND	1.0	1.00	
c-1,2-Dichloroethene	ND	1.0	1.00	
t-1,2-Dichloroethene	ND	1.0	1.00	
1,2-Dichloropropane	ND	1.0	1.00	
1,3-Dichloropropane	ND	1.0	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 11 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	5.1	1.00	
1,1-Dichloropropene	ND	2.0	1.00	
c-1,3-Dichloropropene	ND	1.0	1.00	
t-1,3-Dichloropropene	ND	2.0	1.00	
Ethylbenzene	ND	1.0	1.00	
2-Hexanone	ND	20	1.00	
Isopropylbenzene	ND	1.0	1.00	
p-Isopropyltoluene	ND	1.0	1.00	
Methylene Chloride	ND	10	1.00	
4-Methyl-2-Pentanone	ND	20	1.00	
Naphthalene	ND	10	1.00	
n-Propylbenzene	ND	2.0	1.00	
Styrene	ND	1.0	1.00	
1,1,1,2-Tetrachloroethane	ND	1.0	1.00	
1,1,2,2-Tetrachloroethane	ND	2.0	1.00	
Tetrachloroethene	ND	1.0	1.00	
Toluene	ND	1.0	1.00	
1,2,3-Trichlorobenzene	ND	2.0	1.00	
1,2,4-Trichlorobenzene	ND	2.0	1.00	
1,1,1-Trichloroethane	ND	1.0	1.00	
1,1,2-Trichloroethane	ND	1.0	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	10	1.00	
Trichloroethene	ND	2.0	1.00	
Trichlorofluoromethane	ND	10	1.00	
1,2,3-Trichloropropane	ND	2.0	1.00	
1,2,4-Trimethylbenzene	ND	2.0	1.00	
1,3,5-Trimethylbenzene	ND	2.0	1.00	
Vinyl Acetate	ND	10	1.00	
Vinyl Chloride	ND	1.0	1.00	
p/m-Xylene	ND	2.0	1.00	
o-Xylene	ND	1.0	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	2.0	1.00	
Tert-Butyl Alcohol (TBA)	ND	20	1.00	
Diisopropyl Ether (DIPE)	ND	1.0	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	1.0	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	1.0	1.00	
Ethanol	ND	510	1.00	
Cyclohexanone	ND	51	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 12 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	99	80-120	
Dibromofluoromethane	106	79-133	
1,2-Dichloroethane-d4	120	71-155	
Toluene-d8	101	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 13 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-2-2	**18-04-1355-5-C**	**04/16/18 11:20**	**Solid**	**GC/MS LL**	**04/16/18**	**04/18/18 15:41**	**180418L004**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	44	1.00	
Acetone	ND	44	1.00	
Benzene	ND	0.88	1.00	
Bromobenzene	ND	0.88	1.00	
Bromochloromethane	ND	1.8	1.00	
Bromodichloromethane	ND	0.88	1.00	
Bromoform	ND	4.4	1.00	
Bromomethane	ND	18	1.00	
2-Butanone	ND	18	1.00	
n-Butylbenzene	ND	0.88	1.00	
sec-Butylbenzene	ND	0.88	1.00	
tert-Butylbenzene	ND	0.88	1.00	
Carbon Disulfide	ND	8.8	1.00	
Carbon Tetrachloride	ND	0.88	1.00	
Chlorobenzene	ND	0.88	1.00	
Chloroethane	ND	1.8	1.00	
Chloroform	ND	0.88	1.00	
Chloromethane	ND	18	1.00	
2-Chlorotoluene	ND	0.88	1.00	
4-Chlorotoluene	ND	0.88	1.00	
Dibromochloromethane	ND	1.8	1.00	
1,2-Dibromo-3-Chloropropane	ND	4.4	1.00	
1,2-Dibromoethane	ND	0.88	1.00	
Dibromomethane	ND	0.88	1.00	
1,2-Dichlorobenzene	ND	0.88	1.00	
1,3-Dichlorobenzene	ND	0.88	1.00	
1,4-Dichlorobenzene	ND	0.88	1.00	
Dichlorodifluoromethane	ND	1.8	1.00	
1,1-Dichloroethane	ND	0.88	1.00	
1,2-Dichloroethane	ND	0.88	1.00	
1,1-Dichloroethene	ND	0.88	1.00	
c-1,2-Dichloroethene	ND	0.88	1.00	
t-1,2-Dichloroethene	ND	0.88	1.00	
1,2-Dichloropropane	ND	0.88	1.00	
1,3-Dichloropropane	ND	0.88	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 14 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	4.4	1.00	
1,1-Dichloropropene	ND	1.8	1.00	
c-1,3-Dichloropropene	ND	0.88	1.00	
t-1,3-Dichloropropene	ND	1.8	1.00	
Ethylbenzene	ND	0.88	1.00	
2-Hexanone	ND	18	1.00	
Isopropylbenzene	ND	0.88	1.00	
p-Isopropyltoluene	ND	0.88	1.00	
Methylene Chloride	ND	8.8	1.00	
4-Methyl-2-Pentanone	ND	18	1.00	
Naphthalene	ND	8.8	1.00	
n-Propylbenzene	ND	1.8	1.00	
Styrene	ND	0.88	1.00	
1,1,1,2-Tetrachloroethane	ND	0.88	1.00	
1,1,2,2-Tetrachloroethane	ND	1.8	1.00	
Tetrachloroethene	ND	0.88	1.00	
Toluene	ND	0.88	1.00	
1,2,3-Trichlorobenzene	ND	1.8	1.00	
1,2,4-Trichlorobenzene	ND	1.8	1.00	
1,1,1-Trichloroethane	ND	0.88	1.00	
1,1,2-Trichloroethane	ND	0.88	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	8.8	1.00	
Trichloroethene	ND	1.8	1.00	
Trichlorofluoromethane	ND	8.8	1.00	
1,2,3-Trichloropropane	ND	1.8	1.00	
1,2,4-Trimethylbenzene	ND	1.8	1.00	
1,3,5-Trimethylbenzene	ND	1.8	1.00	
Vinyl Acetate	ND	8.8	1.00	
Vinyl Chloride	ND	0.88	1.00	
p/m-Xylene	ND	1.8	1.00	
o-Xylene	ND	0.88	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	1.8	1.00	
Tert-Butyl Alcohol (TBA)	ND	18	1.00	
Diisopropyl Ether (DIPE)	ND	0.88	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	0.88	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	0.88	1.00	
Ethanol	ND	440	1.00	
Cyclohexanone	ND	44	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 15 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	99	80-120	
Dibromofluoromethane	105	79-133	
1,2-Dichloroethane-d4	114	71-155	
Toluene-d8	100	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 16 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-2-4	**18-04-1355-6-C**	**04/16/18 11:35**	**Solid**	**GC/MS LL**	**04/16/18**	**04/19/18 11:57**	**180419L005**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	44	1.00	
Acetone	ND	44	1.00	
Benzene	ND	0.88	1.00	
Bromobenzene	ND	0.88	1.00	
Bromochloromethane	ND	1.8	1.00	
Bromodichloromethane	ND	0.88	1.00	
Bromoform	ND	4.4	1.00	
Bromomethane	ND	18	1.00	
2-Butanone	ND	18	1.00	
n-Butylbenzene	ND	0.88	1.00	
sec-Butylbenzene	ND	0.88	1.00	
tert-Butylbenzene	ND	0.88	1.00	
Carbon Disulfide	ND	8.8	1.00	
Carbon Tetrachloride	ND	0.88	1.00	
Chlorobenzene	ND	0.88	1.00	
Chloroethane	ND	1.8	1.00	
Chloroform	ND	0.88	1.00	
Chloromethane	ND	18	1.00	
2-Chlorotoluene	ND	0.88	1.00	
4-Chlorotoluene	ND	0.88	1.00	
Dibromochloromethane	ND	1.8	1.00	
1,2-Dibromo-3-Chloropropane	ND	4.4	1.00	
1,2-Dibromoethane	ND	0.88	1.00	
Dibromomethane	ND	0.88	1.00	
1,2-Dichlorobenzene	ND	0.88	1.00	
1,3-Dichlorobenzene	ND	0.88	1.00	
1,4-Dichlorobenzene	ND	0.88	1.00	
Dichlorodifluoromethane	ND	1.8	1.00	
1,1-Dichloroethane	ND	0.88	1.00	
1,2-Dichloroethane	ND	0.88	1.00	
1,1-Dichloroethene	ND	0.88	1.00	
c-1,2-Dichloroethene	ND	0.88	1.00	
t-1,2-Dichloroethene	ND	0.88	1.00	
1,2-Dichloropropane	ND	0.88	1.00	
1,3-Dichloropropane	ND	0.88	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 17 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	4.4	1.00	
1,1-Dichloropropene	ND	1.8	1.00	
c-1,3-Dichloropropene	ND	0.88	1.00	
t-1,3-Dichloropropene	ND	1.8	1.00	
Ethylbenzene	ND	0.88	1.00	
2-Hexanone	ND	18	1.00	
Isopropylbenzene	ND	0.88	1.00	
p-Isopropyltoluene	ND	0.88	1.00	
Methylene Chloride	ND	8.8	1.00	
4-Methyl-2-Pentanone	ND	18	1.00	
Naphthalene	ND	8.8	1.00	
n-Propylbenzene	ND	1.8	1.00	
Styrene	ND	0.88	1.00	
1,1,1,2-Tetrachloroethane	ND	0.88	1.00	
1,1,2,2-Tetrachloroethane	ND	1.8	1.00	
Tetrachloroethene	ND	0.88	1.00	
Toluene	ND	0.88	1.00	
1,2,3-Trichlorobenzene	ND	1.8	1.00	
1,2,4-Trichlorobenzene	ND	1.8	1.00	
1,1,1-Trichloroethane	ND	0.88	1.00	
1,1,2-Trichloroethane	ND	0.88	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	8.8	1.00	
Trichloroethene	ND	1.8	1.00	
Trichlorofluoromethane	ND	8.8	1.00	
1,2,3-Trichloropropane	ND	1.8	1.00	
1,2,4-Trimethylbenzene	ND	1.8	1.00	
1,3,5-Trimethylbenzene	ND	1.8	1.00	
Vinyl Acetate	ND	8.8	1.00	
Vinyl Chloride	ND	0.88	1.00	
p/m-Xylene	ND	1.8	1.00	
o-Xylene	ND	0.88	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	1.8	1.00	
Tert-Butyl Alcohol (TBA)	ND	18	1.00	
Diisopropyl Ether (DIPE)	ND	0.88	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	0.88	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	0.88	1.00	
Ethanol	ND	440	1.00	
Cyclohexanone	ND	44	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 18 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	98	80-120	
Dibromofluoromethane	111	79-133	
1,2-Dichloroethane-d4	113	71-155	
Toluene-d8	102	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 19 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-1-1	**18-04-1355-7-C**	**04/16/18 13:35**	**Solid**	**GC/MS LL**	**04/16/18**	**04/19/18 12:24**	**180419L005**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	58	1.00	
Acetone	ND	58	1.00	
Benzene	ND	1.2	1.00	
Bromobenzene	ND	1.2	1.00	
Bromochloromethane	ND	2.3	1.00	
Bromodichloromethane	ND	1.2	1.00	
Bromoform	ND	5.8	1.00	
Bromomethane	ND	23	1.00	
2-Butanone	ND	23	1.00	
n-Butylbenzene	ND	1.2	1.00	
sec-Butylbenzene	ND	1.2	1.00	
tert-Butylbenzene	ND	1.2	1.00	
Carbon Disulfide	ND	12	1.00	
Carbon Tetrachloride	ND	1.2	1.00	
Chlorobenzene	ND	1.2	1.00	
Chloroethane	ND	2.3	1.00	
Chloroform	ND	1.2	1.00	
Chloromethane	ND	23	1.00	
2-Chlorotoluene	ND	1.2	1.00	
4-Chlorotoluene	ND	1.2	1.00	
Dibromochloromethane	ND	2.3	1.00	
1,2-Dibromo-3-Chloropropane	ND	5.8	1.00	
1,2-Dibromoethane	ND	1.2	1.00	
Dibromomethane	ND	1.2	1.00	
1,2-Dichlorobenzene	ND	1.2	1.00	
1,3-Dichlorobenzene	ND	1.2	1.00	
1,4-Dichlorobenzene	ND	1.2	1.00	
Dichlorodifluoromethane	ND	2.3	1.00	
1,1-Dichloroethane	ND	1.2	1.00	
1,2-Dichloroethane	ND	1.2	1.00	
1,1-Dichloroethene	ND	1.2	1.00	
c-1,2-Dichloroethene	ND	1.2	1.00	
t-1,2-Dichloroethene	ND	1.2	1.00	
1,2-Dichloropropane	ND	1.2	1.00	
1,3-Dichloropropane	ND	1.2	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 20 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	5.8	1.00	
1,1-Dichloropropene	ND	2.3	1.00	
c-1,3-Dichloropropene	ND	1.2	1.00	
t-1,3-Dichloropropene	ND	2.3	1.00	
Ethylbenzene	ND	1.2	1.00	
2-Hexanone	ND	23	1.00	
Isopropylbenzene	ND	1.2	1.00	
p-Isopropyltoluene	ND	1.2	1.00	
Methylene Chloride	ND	12	1.00	
4-Methyl-2-Pentanone	ND	23	1.00	
Naphthalene	ND	12	1.00	
n-Propylbenzene	ND	2.3	1.00	
Styrene	ND	1.2	1.00	
1,1,1,2-Tetrachloroethane	ND	1.2	1.00	
1,1,2,2-Tetrachloroethane	ND	2.3	1.00	
Tetrachloroethene	ND	1.2	1.00	
Toluene	ND	1.2	1.00	
1,2,3-Trichlorobenzene	ND	2.3	1.00	
1,2,4-Trichlorobenzene	ND	2.3	1.00	
1,1,1-Trichloroethane	ND	1.2	1.00	
1,1,2-Trichloroethane	ND	1.2	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	12	1.00	
Trichloroethene	ND	2.3	1.00	
Trichlorofluoromethane	ND	12	1.00	
1,2,3-Trichloropropane	ND	2.3	1.00	
1,2,4-Trimethylbenzene	ND	2.3	1.00	
1,3,5-Trimethylbenzene	ND	2.3	1.00	
Vinyl Acetate	ND	12	1.00	
Vinyl Chloride	ND	1.2	1.00	
p/m-Xylene	ND	2.3	1.00	
o-Xylene	ND	1.2	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	2.3	1.00	
Tert-Butyl Alcohol (TBA)	ND	23	1.00	
Diisopropyl Ether (DIPE)	ND	1.2	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	1.2	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	1.2	1.00	
Ethanol	ND	580	1.00	
Cyclohexanone	ND	58	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 21 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	95	80-120	
Dibromofluoromethane	109	79-133	
1,2-Dichloroethane-d4	121	71-155	
Toluene-d8	101	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 5035
		Method:	EPA 8260B
		Units:	ug/kg
Project: Hellman Properties / IR18166880			Page 22 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-1-2	**18-04-1355-8-C**	**04/16/18 13:40**	**Solid**	**GC/MS LL**	**04/16/18**	**04/19/18 12:52**	**180419L005**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	49	1.00	
Acetone	ND	49	1.00	
Benzene	ND	0.97	1.00	
Bromobenzene	ND	0.97	1.00	
Bromochloromethane	ND	1.9	1.00	
Bromodichloromethane	ND	0.97	1.00	
Bromoform	ND	4.9	1.00	
Bromomethane	ND	19	1.00	
2-Butanone	ND	19	1.00	
n-Butylbenzene	ND	0.97	1.00	
sec-Butylbenzene	ND	0.97	1.00	
tert-Butylbenzene	ND	0.97	1.00	
Carbon Disulfide	ND	9.7	1.00	
Carbon Tetrachloride	ND	0.97	1.00	
Chlorobenzene	ND	0.97	1.00	
Chloroethane	ND	1.9	1.00	
Chloroform	ND	0.97	1.00	
Chloromethane	ND	19	1.00	
2-Chlorotoluene	ND	0.97	1.00	
4-Chlorotoluene	ND	0.97	1.00	
Dibromochloromethane	ND	1.9	1.00	
1,2-Dibromo-3-Chloropropane	ND	4.9	1.00	
1,2-Dibromoethane	ND	0.97	1.00	
Dibromomethane	ND	0.97	1.00	
1,2-Dichlorobenzene	ND	0.97	1.00	
1,3-Dichlorobenzene	ND	0.97	1.00	
1,4-Dichlorobenzene	ND	0.97	1.00	
Dichlorodifluoromethane	ND	1.9	1.00	
1,1-Dichloroethane	ND	0.97	1.00	
1,2-Dichloroethane	ND	0.97	1.00	
1,1-Dichloroethene	ND	0.97	1.00	
c-1,2-Dichloroethene	ND	0.97	1.00	
t-1,2-Dichloroethene	ND	0.97	1.00	
1,2-Dichloropropane	ND	0.97	1.00	
1,3-Dichloropropane	ND	0.97	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 23 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	4.9	1.00	
1,1-Dichloropropene	ND	1.9	1.00	
c-1,3-Dichloropropene	ND	0.97	1.00	
t-1,3-Dichloropropene	ND	1.9	1.00	
Ethylbenzene	ND	0.97	1.00	
2-Hexanone	ND	19	1.00	
Isopropylbenzene	ND	0.97	1.00	
p-Isopropyltoluene	ND	0.97	1.00	
Methylene Chloride	ND	9.7	1.00	
4-Methyl-2-Pentanone	ND	19	1.00	
Naphthalene	ND	9.7	1.00	
n-Propylbenzene	ND	1.9	1.00	
Styrene	ND	0.97	1.00	
1,1,1,2-Tetrachloroethane	ND	0.97	1.00	
1,1,2,2-Tetrachloroethane	ND	1.9	1.00	
Tetrachloroethene	ND	0.97	1.00	
Toluene	ND	0.97	1.00	
1,2,3-Trichlorobenzene	ND	1.9	1.00	
1,2,4-Trichlorobenzene	ND	1.9	1.00	
1,1,1-Trichloroethane	ND	0.97	1.00	
1,1,2-Trichloroethane	ND	0.97	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	9.7	1.00	
Trichloroethene	ND	1.9	1.00	
Trichlorofluoromethane	ND	9.7	1.00	
1,2,3-Trichloropropane	ND	1.9	1.00	
1,2,4-Trimethylbenzene	ND	1.9	1.00	
1,3,5-Trimethylbenzene	ND	1.9	1.00	
Vinyl Acetate	ND	9.7	1.00	
Vinyl Chloride	ND	0.97	1.00	
p/m-Xylene	ND	1.9	1.00	
o-Xylene	ND	0.97	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	1.9	1.00	
Tert-Butyl Alcohol (TBA)	ND	19	1.00	
Diisopropyl Ether (DIPE)	ND	0.97	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	0.97	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	0.97	1.00	
Ethanol	ND	490	1.00	
Cyclohexanone	ND	49	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 24 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	96	80-120	
Dibromofluoromethane	108	79-133	
1,2-Dichloroethane-d4	111	71-155	
Toluene-d8	102	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 25 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-1-3	**18-04-1355-9-C**	**04/16/18 13:50**	**Solid**	**GC/MS LL**	**04/16/18**	**04/19/18 13:19**	**180419L005**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	43	1.00	
Acetone	ND	43	1.00	
Benzene	ND	0.87	1.00	
Bromobenzene	ND	0.87	1.00	
Bromochloromethane	ND	1.7	1.00	
Bromodichloromethane	ND	0.87	1.00	
Bromoform	ND	4.3	1.00	
Bromomethane	ND	17	1.00	
2-Butanone	ND	17	1.00	
n-Butylbenzene	ND	0.87	1.00	
sec-Butylbenzene	ND	0.87	1.00	
tert-Butylbenzene	ND	0.87	1.00	
Carbon Disulfide	ND	8.7	1.00	
Carbon Tetrachloride	ND	0.87	1.00	
Chlorobenzene	ND	0.87	1.00	
Chloroethane	ND	1.7	1.00	
Chloroform	ND	0.87	1.00	
Chloromethane	ND	17	1.00	
2-Chlorotoluene	ND	0.87	1.00	
4-Chlorotoluene	ND	0.87	1.00	
Dibromochloromethane	ND	1.7	1.00	
1,2-Dibromo-3-Chloropropane	ND	4.3	1.00	
1,2-Dibromoethane	ND	0.87	1.00	
Dibromomethane	ND	0.87	1.00	
1,2-Dichlorobenzene	ND	0.87	1.00	
1,3-Dichlorobenzene	ND	0.87	1.00	
1,4-Dichlorobenzene	ND	0.87	1.00	
Dichlorodifluoromethane	ND	1.7	1.00	
1,1-Dichloroethane	ND	0.87	1.00	
1,2-Dichloroethane	ND	0.87	1.00	
1,1-Dichloroethene	ND	0.87	1.00	
c-1,2-Dichloroethene	ND	0.87	1.00	
t-1,2-Dichloroethene	ND	0.87	1.00	
1,2-Dichloropropane	ND	0.87	1.00	
1,3-Dichloropropane	ND	0.87	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 26 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	4.3	1.00	
1,1-Dichloropropene	ND	1.7	1.00	
c-1,3-Dichloropropene	ND	0.87	1.00	
t-1,3-Dichloropropene	ND	1.7	1.00	
Ethylbenzene	ND	0.87	1.00	
2-Hexanone	ND	17	1.00	
Isopropylbenzene	ND	0.87	1.00	
p-Isopropyltoluene	ND	0.87	1.00	
Methylene Chloride	ND	8.7	1.00	
4-Methyl-2-Pentanone	ND	17	1.00	
Naphthalene	ND	8.7	1.00	
n-Propylbenzene	ND	1.7	1.00	
Styrene	ND	0.87	1.00	
1,1,1,2-Tetrachloroethane	ND	0.87	1.00	
1,1,2,2-Tetrachloroethane	ND	1.7	1.00	
Tetrachloroethene	ND	0.87	1.00	
Toluene	ND	0.87	1.00	
1,2,3-Trichlorobenzene	ND	1.7	1.00	
1,2,4-Trichlorobenzene	ND	1.7	1.00	
1,1,1-Trichloroethane	ND	0.87	1.00	
1,1,2-Trichloroethane	ND	0.87	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	8.7	1.00	
Trichloroethene	ND	1.7	1.00	
Trichlorofluoromethane	ND	8.7	1.00	
1,2,3-Trichloropropane	ND	1.7	1.00	
1,2,4-Trimethylbenzene	ND	1.7	1.00	
1,3,5-Trimethylbenzene	ND	1.7	1.00	
Vinyl Acetate	ND	8.7	1.00	
Vinyl Chloride	ND	0.87	1.00	
p/m-Xylene	ND	1.7	1.00	
o-Xylene	ND	0.87	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	1.7	1.00	
Tert-Butyl Alcohol (TBA)	ND	17	1.00	
Diisopropyl Ether (DIPE)	ND	0.87	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	0.87	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	0.87	1.00	
Ethanol	ND	430	1.00	
Cyclohexanone	ND	43	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 27 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	96	80-120	
Dibromofluoromethane	110	79-133	
1,2-Dichloroethane-d4	113	71-155	
Toluene-d8	101	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Amec Foster Wheeler Environment & Infrastructure,		Date Received:	04/17/18
121 Innovation Drive, Suite 200		Work Order:	18-04-1355
Irvine, CA 92617-3094		Preparation:	EPA 5035
		Method:	EPA 8260B
		Units:	ug/kg
Project: Hellman Properties / IR18166880			Page 28 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-1	**18-04-1355-10-C**	**04/16/18 14:00**	**Solid**	**GC/MS LL**	**04/16/18**	**04/19/18 13:46**	**180419L005**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	52	1.00	
Acetone	ND	52	1.00	
Benzene	1.2	1.0	1.00	
Bromobenzene	ND	1.0	1.00	
Bromochloromethane	ND	2.1	1.00	
Bromodichloromethane	ND	1.0	1.00	
Bromoform	ND	5.2	1.00	
Bromomethane	ND	21	1.00	
2-Butanone	ND	21	1.00	
n-Butylbenzene	ND	1.0	1.00	
sec-Butylbenzene	ND	1.0	1.00	
tert-Butylbenzene	ND	1.0	1.00	
Carbon Disulfide	ND	10	1.00	
Carbon Tetrachloride	ND	1.0	1.00	
Chlorobenzene	ND	1.0	1.00	
Chloroethane	ND	2.1	1.00	
Chloroform	ND	1.0	1.00	
Chloromethane	ND	21	1.00	
2-Chlorotoluene	ND	1.0	1.00	
4-Chlorotoluene	ND	1.0	1.00	
Dibromochloromethane	ND	2.1	1.00	
1,2-Dibromo-3-Chloropropane	ND	5.2	1.00	
1,2-Dibromoethane	ND	1.0	1.00	
Dibromomethane	ND	1.0	1.00	
1,2-Dichlorobenzene	ND	1.0	1.00	
1,3-Dichlorobenzene	ND	1.0	1.00	
1,4-Dichlorobenzene	ND	1.0	1.00	
Dichlorodifluoromethane	ND	2.1	1.00	
1,1-Dichloroethane	ND	1.0	1.00	
1,2-Dichloroethane	ND	1.0	1.00	
1,1-Dichloroethene	ND	1.0	1.00	
c-1,2-Dichloroethene	ND	1.0	1.00	
t-1,2-Dichloroethene	ND	1.0	1.00	
1,2-Dichloropropane	ND	1.0	1.00	
1,3-Dichloropropane	ND	1.0	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 29 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	5.2	1.00	
1,1-Dichloropropene	ND	2.1	1.00	
c-1,3-Dichloropropene	ND	1.0	1.00	
t-1,3-Dichloropropene	ND	2.1	1.00	
Ethylbenzene	ND	1.0	1.00	
2-Hexanone	ND	21	1.00	
Isopropylbenzene	ND	1.0	1.00	
p-Isopropyltoluene	ND	1.0	1.00	
Methylene Chloride	ND	10	1.00	
4-Methyl-2-Pentanone	ND	21	1.00	
Naphthalene	ND	10	1.00	
n-Propylbenzene	ND	2.1	1.00	
Styrene	ND	1.0	1.00	
1,1,1,2-Tetrachloroethane	ND	1.0	1.00	
1,1,2,2-Tetrachloroethane	ND	2.1	1.00	
Tetrachloroethene	ND	1.0	1.00	
Toluene	ND	1.0	1.00	
1,2,3-Trichlorobenzene	ND	2.1	1.00	
1,2,4-Trichlorobenzene	ND	2.1	1.00	
1,1,1-Trichloroethane	ND	1.0	1.00	
1,1,2-Trichloroethane	ND	1.0	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	10	1.00	
Trichloroethene	ND	2.1	1.00	
Trichlorofluoromethane	ND	10	1.00	
1,2,3-Trichloropropane	ND	2.1	1.00	
1,2,4-Trimethylbenzene	ND	2.1	1.00	
1,3,5-Trimethylbenzene	ND	2.1	1.00	
Vinyl Acetate	ND	10	1.00	
Vinyl Chloride	ND	1.0	1.00	
p/m-Xylene	ND	2.1	1.00	
o-Xylene	ND	1.0	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	2.1	1.00	
Tert-Butyl Alcohol (TBA)	ND	21	1.00	
Diisopropyl Ether (DIPE)	ND	1.0	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	1.0	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	1.0	1.00	
Ethanol	ND	520	1.00	
Cyclohexanone	ND	52	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 30 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	96	80-120	
Dibromofluoromethane	110	79-133	
1,2-Dichloroethane-d4	125	71-155	
Toluene-d8	101	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 31 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-2	**18-04-1355-11-C**	**04/16/18 14:10**	**Solid**	**GC/MS LL**	**04/16/18**	**04/19/18 14:14**	**180419L005**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	45	1.00	
Acetone	ND	45	1.00	
Benzene	ND	0.90	1.00	
Bromobenzene	ND	0.90	1.00	
Bromochloromethane	ND	1.8	1.00	
Bromodichloromethane	ND	0.90	1.00	
Bromoform	ND	4.5	1.00	
Bromomethane	ND	18	1.00	
2-Butanone	ND	18	1.00	
n-Butylbenzene	ND	0.90	1.00	
sec-Butylbenzene	ND	0.90	1.00	
tert-Butylbenzene	ND	0.90	1.00	
Carbon Disulfide	ND	9.0	1.00	
Carbon Tetrachloride	ND	0.90	1.00	
Chlorobenzene	ND	0.90	1.00	
Chloroethane	ND	1.8	1.00	
Chloroform	ND	0.90	1.00	
Chloromethane	ND	18	1.00	
2-Chlorotoluene	ND	0.90	1.00	
4-Chlorotoluene	ND	0.90	1.00	
Dibromochloromethane	ND	1.8	1.00	
1,2-Dibromo-3-Chloropropane	ND	4.5	1.00	
1,2-Dibromoethane	ND	0.90	1.00	
Dibromomethane	ND	0.90	1.00	
1,2-Dichlorobenzene	ND	0.90	1.00	
1,3-Dichlorobenzene	ND	0.90	1.00	
1,4-Dichlorobenzene	ND	0.90	1.00	
Dichlorodifluoromethane	ND	1.8	1.00	
1,1-Dichloroethane	ND	0.90	1.00	
1,2-Dichloroethane	ND	0.90	1.00	
1,1-Dichloroethene	ND	0.90	1.00	
c-1,2-Dichloroethene	ND	0.90	1.00	
t-1,2-Dichloroethene	ND	0.90	1.00	
1,2-Dichloropropane	ND	0.90	1.00	
1,3-Dichloropropane	ND	0.90	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 32 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	4.5	1.00	
1,1-Dichloropropene	ND	1.8	1.00	
c-1,3-Dichloropropene	ND	0.90	1.00	
t-1,3-Dichloropropene	ND	1.8	1.00	
Ethylbenzene	ND	0.90	1.00	
2-Hexanone	ND	18	1.00	
Isopropylbenzene	ND	0.90	1.00	
p-Isopropyltoluene	ND	0.90	1.00	
Methylene Chloride	ND	9.0	1.00	
4-Methyl-2-Pentanone	ND	18	1.00	
Naphthalene	ND	9.0	1.00	
n-Propylbenzene	ND	1.8	1.00	
Styrene	ND	0.90	1.00	
1,1,1,2-Tetrachloroethane	ND	0.90	1.00	
1,1,2,2-Tetrachloroethane	ND	1.8	1.00	
Tetrachloroethene	ND	0.90	1.00	
Toluene	ND	0.90	1.00	
1,2,3-Trichlorobenzene	ND	1.8	1.00	
1,2,4-Trichlorobenzene	ND	1.8	1.00	
1,1,1-Trichloroethane	ND	0.90	1.00	
1,1,2-Trichloroethane	ND	0.90	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	9.0	1.00	
Trichloroethene	ND	1.8	1.00	
Trichlorofluoromethane	ND	9.0	1.00	
1,2,3-Trichloropropane	ND	1.8	1.00	
1,2,4-Trimethylbenzene	ND	1.8	1.00	
1,3,5-Trimethylbenzene	ND	1.8	1.00	
Vinyl Acetate	ND	9.0	1.00	
Vinyl Chloride	ND	0.90	1.00	
p/m-Xylene	ND	1.8	1.00	
o-Xylene	ND	0.90	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	1.8	1.00	
Tert-Butyl Alcohol (TBA)	ND	18	1.00	
Diisopropyl Ether (DIPE)	ND	0.90	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	0.90	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	0.90	1.00	
Ethanol	ND	450	1.00	
Cyclohexanone	ND	45	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 33 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	110	79-133	
1,2-Dichloroethane-d4	115	71-155	
Toluene-d8	102	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 34 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
B-3-3	**18-04-1355-12-C**	**04/16/18 14:20**	**Solid**	**GC/MS LL**	**04/16/18**	**04/19/18 14:41**	**180419L005**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	45	1.00	
Acetone	ND	45	1.00	
Benzene	ND	0.89	1.00	
Bromobenzene	ND	0.89	1.00	
Bromochloromethane	ND	1.8	1.00	
Bromodichloromethane	ND	0.89	1.00	
Bromoform	ND	4.5	1.00	
Bromomethane	ND	18	1.00	
2-Butanone	ND	18	1.00	
n-Butylbenzene	ND	0.89	1.00	
sec-Butylbenzene	ND	0.89	1.00	
tert-Butylbenzene	ND	0.89	1.00	
Carbon Disulfide	ND	8.9	1.00	
Carbon Tetrachloride	ND	0.89	1.00	
Chlorobenzene	ND	0.89	1.00	
Chloroethane	ND	1.8	1.00	
Chloroform	ND	0.89	1.00	
Chloromethane	ND	18	1.00	
2-Chlorotoluene	ND	0.89	1.00	
4-Chlorotoluene	ND	0.89	1.00	
Dibromochloromethane	ND	1.8	1.00	
1,2-Dibromo-3-Chloropropane	ND	4.5	1.00	
1,2-Dibromoethane	ND	0.89	1.00	
Dibromomethane	ND	0.89	1.00	
1,2-Dichlorobenzene	ND	0.89	1.00	
1,3-Dichlorobenzene	ND	0.89	1.00	
1,4-Dichlorobenzene	ND	0.89	1.00	
Dichlorodifluoromethane	ND	1.8	1.00	
1,1-Dichloroethane	ND	0.89	1.00	
1,2-Dichloroethane	ND	0.89	1.00	
1,1-Dichloroethene	ND	0.89	1.00	
c-1,2-Dichloroethene	ND	0.89	1.00	
t-1,2-Dichloroethene	ND	0.89	1.00	
1,2-Dichloropropane	ND	0.89	1.00	
1,3-Dichloropropane	ND	0.89	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 35 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	4.5	1.00	
1,1-Dichloropropene	ND	1.8	1.00	
c-1,3-Dichloropropene	ND	0.89	1.00	
t-1,3-Dichloropropene	ND	1.8	1.00	
Ethylbenzene	ND	0.89	1.00	
2-Hexanone	ND	18	1.00	
Isopropylbenzene	ND	0.89	1.00	
p-Isopropyltoluene	ND	0.89	1.00	
Methylene Chloride	ND	8.9	1.00	
4-Methyl-2-Pentanone	ND	18	1.00	
Naphthalene	ND	8.9	1.00	
n-Propylbenzene	ND	1.8	1.00	
Styrene	ND	0.89	1.00	
1,1,1,2-Tetrachloroethane	ND	0.89	1.00	
1,1,2,2-Tetrachloroethane	ND	1.8	1.00	
Tetrachloroethene	ND	0.89	1.00	
Toluene	ND	0.89	1.00	
1,2,3-Trichlorobenzene	ND	1.8	1.00	
1,2,4-Trichlorobenzene	ND	1.8	1.00	
1,1,1-Trichloroethane	ND	0.89	1.00	
1,1,2-Trichloroethane	ND	0.89	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	8.9	1.00	
Trichloroethene	ND	1.8	1.00	
Trichlorofluoromethane	ND	8.9	1.00	
1,2,3-Trichloropropane	ND	1.8	1.00	
1,2,4-Trimethylbenzene	ND	1.8	1.00	
1,3,5-Trimethylbenzene	ND	1.8	1.00	
Vinyl Acetate	ND	8.9	1.00	
Vinyl Chloride	ND	0.89	1.00	
p/m-Xylene	ND	1.8	1.00	
o-Xylene	ND	0.89	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	1.8	1.00	
Tert-Butyl Alcohol (TBA)	ND	18	1.00	
Diisopropyl Ether (DIPE)	ND	0.89	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	0.89	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	0.89	1.00	
Ethanol	ND	450	1.00	
Cyclohexanone	ND	45	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 36 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	98	80-120	
Dibromofluoromethane	111	79-133	
1,2-Dichloroethane-d4	116	71-155	
Toluene-d8	101	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 37 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**095-01-025-29875**	**N/A**	**Solid**	**GC/MS LL**	**04/18/18**	**04/18/18 10:51**	**180418L004**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	50	1.00	
Acetone	ND	50	1.00	
Benzene	ND	1.0	1.00	
Bromobenzene	ND	1.0	1.00	
Bromochloromethane	ND	2.0	1.00	
Bromodichloromethane	ND	1.0	1.00	
Bromoform	ND	5.0	1.00	
Bromomethane	ND	20	1.00	
2-Butanone	ND	20	1.00	
n-Butylbenzene	ND	1.0	1.00	
sec-Butylbenzene	ND	1.0	1.00	
tert-Butylbenzene	ND	1.0	1.00	
Carbon Disulfide	ND	10	1.00	
Carbon Tetrachloride	ND	1.0	1.00	
Chlorobenzene	ND	1.0	1.00	
Chloroethane	ND	2.0	1.00	
Chloroform	ND	1.0	1.00	
Chloromethane	ND	20	1.00	
2-Chlorotoluene	ND	1.0	1.00	
4-Chlorotoluene	ND	1.0	1.00	
Dibromochloromethane	ND	2.0	1.00	
1,2-Dibromo-3-Chloropropane	ND	5.0	1.00	
1,2-Dibromoethane	ND	1.0	1.00	
Dibromomethane	ND	1.0	1.00	
1,2-Dichlorobenzene	ND	1.0	1.00	
1,3-Dichlorobenzene	ND	1.0	1.00	
1,4-Dichlorobenzene	ND	1.0	1.00	
Dichlorodifluoromethane	ND	2.0	1.00	
1,1-Dichloroethane	ND	1.0	1.00	
1,2-Dichloroethane	ND	1.0	1.00	
1,1-Dichloroethene	ND	1.0	1.00	
c-1,2-Dichloroethene	ND	1.0	1.00	
t-1,2-Dichloroethene	ND	1.0	1.00	
1,2-Dichloropropane	ND	1.0	1.00	
1,3-Dichloropropane	ND	1.0	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 38 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	5.0	1.00	
1,1-Dichloropropene	ND	2.0	1.00	
c-1,3-Dichloropropene	ND	1.0	1.00	
t-1,3-Dichloropropene	ND	2.0	1.00	
Ethylbenzene	ND	1.0	1.00	
2-Hexanone	ND	20	1.00	
Isopropylbenzene	ND	1.0	1.00	
p-Isopropyltoluene	ND	1.0	1.00	
Methylene Chloride	ND	10	1.00	
4-Methyl-2-Pentanone	ND	20	1.00	
Naphthalene	ND	10	1.00	
n-Propylbenzene	ND	2.0	1.00	
Styrene	ND	1.0	1.00	
1,1,1,2-Tetrachloroethane	ND	1.0	1.00	
1,1,2,2-Tetrachloroethane	ND	2.0	1.00	
Tetrachloroethene	ND	1.0	1.00	
Toluene	ND	1.0	1.00	
1,2,3-Trichlorobenzene	ND	2.0	1.00	
1,2,4-Trichlorobenzene	ND	2.0	1.00	
1,1,1-Trichloroethane	ND	1.0	1.00	
1,1,2-Trichloroethane	ND	1.0	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	10	1.00	
Trichloroethene	ND	2.0	1.00	
Trichlorofluoromethane	ND	10	1.00	
1,2,3-Trichloropropane	ND	2.0	1.00	
1,2,4-Trimethylbenzene	ND	2.0	1.00	
1,3,5-Trimethylbenzene	ND	2.0	1.00	
Vinyl Acetate	ND	10	1.00	
Vinyl Chloride	ND	1.0	1.00	
p/m-Xylene	ND	2.0	1.00	
o-Xylene	ND	1.0	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	2.0	1.00	
Tert-Butyl Alcohol (TBA)	ND	20	1.00	
Diisopropyl Ether (DIPE)	ND	1.0	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	1.0	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	1.0	1.00	
Ethanol	ND	500	1.00	
Cyclohexanone	ND	50	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 39 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	95	80-120	
Dibromofluoromethane	103	79-133	
1,2-Dichloroethane-d4	101	71-155	
Toluene-d8	100	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 40 of 42

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
Method Blank	**095-01-025-29879**	**N/A**	**Solid**	**GC/MS LL**	**04/19/18**	**04/19/18 11:03**	**180419L005**

Parameter	Result	RL	DF	Qualifiers
2-Methyl-2-Butanol (TAA)	ND	50	1.00	
Acetone	ND	50	1.00	
Benzene	ND	1.0	1.00	
Bromobenzene	ND	1.0	1.00	
Bromochloromethane	ND	2.0	1.00	
Bromodichloromethane	ND	1.0	1.00	
Bromoform	ND	5.0	1.00	
Bromomethane	ND	20	1.00	
2-Butanone	ND	20	1.00	
n-Butylbenzene	ND	1.0	1.00	
sec-Butylbenzene	ND	1.0	1.00	
tert-Butylbenzene	ND	1.0	1.00	
Carbon Disulfide	ND	10	1.00	
Carbon Tetrachloride	ND	1.0	1.00	
Chlorobenzene	ND	1.0	1.00	
Chloroethane	ND	2.0	1.00	
Chloroform	ND	1.0	1.00	
Chloromethane	ND	20	1.00	
2-Chlorotoluene	ND	1.0	1.00	
4-Chlorotoluene	ND	1.0	1.00	
Dibromochloromethane	ND	2.0	1.00	
1,2-Dibromo-3-Chloropropane	ND	5.0	1.00	
1,2-Dibromoethane	ND	1.0	1.00	
Dibromomethane	ND	1.0	1.00	
1,2-Dichlorobenzene	ND	1.0	1.00	
1,3-Dichlorobenzene	ND	1.0	1.00	
1,4-Dichlorobenzene	ND	1.0	1.00	
Dichlorodifluoromethane	ND	2.0	1.00	
1,1-Dichloroethane	ND	1.0	1.00	
1,2-Dichloroethane	ND	1.0	1.00	
1,1-Dichloroethene	ND	1.0	1.00	
c-1,2-Dichloroethene	ND	1.0	1.00	
t-1,2-Dichloroethene	ND	1.0	1.00	
1,2-Dichloropropane	ND	1.0	1.00	
1,3-Dichloropropane	ND	1.0	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 41 of 42

Parameter	Result	RL	DF	Qualifiers
2,2-Dichloropropane	ND	5.0	1.00	
1,1-Dichloropropene	ND	2.0	1.00	
c-1,3-Dichloropropene	ND	1.0	1.00	
t-1,3-Dichloropropene	ND	2.0	1.00	
Ethylbenzene	ND	1.0	1.00	
2-Hexanone	ND	20	1.00	
Isopropylbenzene	ND	1.0	1.00	
p-Isopropyltoluene	ND	1.0	1.00	
Methylene Chloride	ND	10	1.00	
4-Methyl-2-Pentanone	ND	20	1.00	
Naphthalene	ND	10	1.00	
n-Propylbenzene	ND	2.0	1.00	
Styrene	ND	1.0	1.00	
1,1,1,2-Tetrachloroethane	ND	1.0	1.00	
1,1,2,2-Tetrachloroethane	ND	2.0	1.00	
Tetrachloroethene	ND	1.0	1.00	
Toluene	ND	1.0	1.00	
1,2,3-Trichlorobenzene	ND	2.0	1.00	
1,2,4-Trichlorobenzene	ND	2.0	1.00	
1,1,1-Trichloroethane	ND	1.0	1.00	
1,1,2-Trichloroethane	ND	1.0	1.00	
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	10	1.00	
Trichloroethene	ND	2.0	1.00	
Trichlorofluoromethane	ND	10	1.00	
1,2,3-Trichloropropane	ND	2.0	1.00	
1,2,4-Trimethylbenzene	ND	2.0	1.00	
1,3,5-Trimethylbenzene	ND	2.0	1.00	
Vinyl Acetate	ND	10	1.00	
Vinyl Chloride	ND	1.0	1.00	
p/m-Xylene	ND	2.0	1.00	
o-Xylene	ND	1.0	1.00	
Methyl-t-Butyl Ether (MTBE)	ND	2.0	1.00	
Tert-Butyl Alcohol (TBA)	ND	20	1.00	
Diisopropyl Ether (DIPE)	ND	1.0	1.00	
Ethyl-t-Butyl Ether (ETBE)	ND	1.0	1.00	
Tert-Amyl-Methyl Ether (TAME)	ND	1.0	1.00	
Ethanol	ND	500	1.00	
Cyclohexanone	ND	50	1.00	

RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Analytical Report

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Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
	Units:	ug/kg
Project: Hellman Properties / IR18166880		Page 42 of 42

Surrogate	Rec. (%)	Control Limits	Qualifiers
1,4-Bromofluorobenzene	97	80-120	
Dibromofluoromethane	107	79-133	
1,2-Dichloroethane-d4	106	71-155	
Toluene-d8	101	80-120	

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RL: Reporting Limit. DF: Dilution Factor. MDL: Method Detection Limit.

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Quality Control - Spike/Spike Duplicate

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	N/A
	Method:	EPA 418.1M
Project: Hellman Properties / IR18166880		Page 1 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
18-04-1428-4	**Sample**	**Sediment**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423S01**
18-04-1428-4	**Matrix Spike**	**Sediment**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423S01**
18-04-1428-4	**Matrix Spike Duplicate**	**Sediment**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423S01**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
TRPH	91.47	100.0	249.7	158	244.5	153	55-135	2	0-30	3

RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - Spike/Spike Duplicate

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 3550B
	Method:	EPA 8015B (M)
Project: Hellman Properties / IR18166880		Page 2 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
B-2-1	**Sample**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 01:38**	**180419S01**
B-2-1	**Matrix Spike**	**Solid**	**GC 48**	**04/19/18**	**04/19/18 23:55**	**180419S01**
B-2-1	**Matrix Spike Duplicate**	**Solid**	**GC 48**	**04/19/18**	**04/20/18 00:16**	**180419S01**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
TPH as Diesel	ND	400.0	378.6	95	374.8	94	64-130	1	0-15	

RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - Spike/Spike Duplicate

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 3050B
	Method:	EPA 6010B
Project: Hellman Properties / IR18166880		Page 3 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
B-4-1	**Sample**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:44**	**180421S03**
B-4-1	**Matrix Spike**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:45**	**180421S03**
B-4-1	**Matrix Spike Duplicate**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 13:46**	**180421S03**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Antimony	ND	25.00	0.5850	2	0.1886	1	50-115	102	0-20	3,4
Arsenic	14.07	25.00	39.53	102	36.84	91	75-125	7	0-20	
Barium	141.9	25.00	173.6	4X	166.2	4X	75-125	4X	0-20	Q
Beryllium	0.7627	25.00	26.00	101	24.48	95	75-125	6	0-20	
Cadmium	1.061	25.00	24.07	92	23.12	88	75-125	4	0-20	
Chromium	25.23	25.00	51.99	107	48.06	91	75-125	8	0-20	
Cobalt	13.32	25.00	38.12	99	36.20	92	75-125	5	0-20	
Copper	33.04	25.00	62.13	116	57.51	98	75-125	8	0-20	
Lead	8.368	25.00	33.28	100	31.79	94	75-125	5	0-20	
Molybdenum	0.8646	25.00	21.55	83	20.65	79	75-125	4	0-20	
Nickel	20.65	25.00	45.39	99	43.36	91	75-125	5	0-20	
Selenium	ND	25.00	20.70	83	21.25	85	75-125	3	0-20	
Silver	ND	12.50	13.13	105	12.41	99	75-125	6	0-20	
Thallium	ND	25.00	20.89	84	20.57	82	75-125	2	0-20	
Vanadium	53.25	25.00	82.89	119	76.07	91	75-125	9	0-20	
Zinc	68.60	25.00	95.52	108	91.85	93	75-125	4	0-20	

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RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - Spike/Spike Duplicate

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 7471A Total
	Method:	EPA 7471A
Project: Hellman Properties / IR18166880		Page 4 of 4

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
B-4-1	**Sample**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 13:53**	**180421S03**
B-4-1	**Matrix Spike**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 13:56**	**180421S03**
B-4-1	**Matrix Spike Duplicate**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 13:58**	**180421S03**

Parameter	Sample Conc.	Spike Added	MS Conc.	MS %Rec.	MSD Conc.	MSD %Rec.	%Rec. CL	RPD	RPD CL	Qualifiers
Mercury	ND	0.8350	0.7492	90	0.7625	91	71-137	2	0-14	

RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - LCS

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	N/A
	Method:	EPA 418.1M
Project: Hellman Properties / IR18166880		Page 1 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-07-015-2272	**LCS**	**Solid**	**IR 2**	**04/23/18**	**04/23/18 16:09**	**180423L01**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	Qualifiers
TRPH	20.00	20.52	103	70-130	

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RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - LCS

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 3550B
	Method:	EPA 8015B (M)
Project: Hellman Properties / IR18166880		Page 2 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-15-490-3061	**LCS**	**Solid**	**GC 48**	**04/19/18**	**04/19/18 23:35**	**180419B01**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	Qualifiers
TPH as Diesel	400.0	381.9	95	75-123	

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RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - LCS

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 3050B
	Method:	EPA 6010B
Project: Hellman Properties / IR18166880		Page 3 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
097-01-002-26227	**LCS**	**Solid**	**ICP 7300**	**04/21/18**	**04/22/18 12:59**	**180421L03**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	ME CL	Qualifiers
Antimony	25.00	21.04	84	80-120	73-127	
Arsenic	25.00	23.88	96	80-120	73-127	
Barium	25.00	26.22	105	80-120	73-127	
Beryllium	25.00	24.28	97	80-120	73-127	
Cadmium	25.00	25.27	101	80-120	73-127	
Chromium	25.00	25.39	102	80-120	73-127	
Cobalt	25.00	25.01	100	80-120	73-127	
Copper	25.00	25.15	101	80-120	73-127	
Lead	25.00	25.90	104	80-120	73-127	
Molybdenum	25.00	23.72	95	80-120	73-127	
Nickel	25.00	25.63	103	80-120	73-127	
Selenium	25.00	23.70	95	80-120	73-127	
Silver	12.50	12.61	101	80-120	73-127	
Thallium	25.00	25.23	101	80-120	73-127	
Vanadium	25.00	24.67	99	80-120	73-127	
Zinc	25.00	24.51	98	80-120	73-127	

Total number of LCS compounds: 16
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

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RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - LCS

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 7471A Total
	Method:	EPA 7471A
Project: Hellman Properties / IR18166880		Page 4 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS Batch Number
099-16-272-3785	**LCS**	**Solid**	**Mercury 08**	**04/21/18**	**04/21/18 13:51**	**180421L03**

Parameter	Spike Added	Conc. Recovered	LCS %Rec.	%Rec. CL	Qualifiers
Mercury	0.8350	0.7802	93	85-121	

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RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - LCS/LCSD

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
Project: Hellman Properties / IR18166880		Page 5 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
095-01-025-29875	**LCS**	**Solid**	**GC/MS LL**	**04/18/18**	**04/18/18 09:28**	**180418L004**
095-01-025-29875	**LCSD**	**Solid**	**GC/MS LL**	**04/18/18**	**04/18/18 09:56**	**180418L004**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	ME CL	RPD	RPD CL	Qualifiers
Benzene	50.00	50.42	101	49.62	99	80-120	73-127	2	0-20	
Carbon Tetrachloride	50.00	51.57	103	50.20	100	65-137	53-149	3	0-20	
Chlorobenzene	50.00	51.79	104	51.23	102	80-120	73-127	1	0-20	
1,2-Dibromoethane	50.00	49.93	100	51.51	103	80-120	73-127	3	0-20	
1,2-Dichlorobenzene	50.00	49.90	100	50.14	100	80-120	73-127	0	0-20	
1,2-Dichloroethane	50.00	50.00	100	50.67	101	80-120	73-127	1	0-20	
1,1-Dichloroethene	50.00	53.26	107	51.73	103	68-128	58-138	3	0-20	
Ethylbenzene	50.00	52.78	106	51.74	103	80-120	73-127	2	0-20	
Toluene	50.00	54.16	108	53.29	107	80-120	73-127	2	0-20	
Trichloroethene	50.00	54.83	110	53.13	106	80-120	73-127	3	0-20	
Vinyl Chloride	50.00	58.41	117	55.91	112	67-127	57-137	4	0-20	
p/m-Xylene	100.0	103.2	103	101.4	101	75-125	67-133	2	0-25	
o-Xylene	50.00	49.94	100	49.50	99	75-125	67-133	1	0-25	
Methyl-t-Butyl Ether (MTBE)	50.00	47.39	95	49.37	99	70-124	61-133	4	0-20	
Tert-Butyl Alcohol (TBA)	250.0	247.8	99	244.3	98	73-121	65-129	1	0-20	
Diisopropyl Ether (DIPE)	50.00	48.30	97	49.56	99	69-129	59-139	3	0-20	
Ethyl-t-Butyl Ether (ETBE)	50.00	47.96	96	49.33	99	70-124	61-133	3	0-20	
Tert-Amyl-Methyl Ether (TAME)	50.00	47.33	95	48.20	96	74-122	66-130	2	0-20	
Ethanol	500.0	552.5	111	507.7	102	51-135	37-149	8	0-27	

Total number of LCS compounds: 19
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

RPD: Relative Percent Difference. CL: Control Limits

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Quality Control - LCS/LCSD

Amec Foster Wheeler Environment & Infrastructure,	Date Received:	04/17/18
121 Innovation Drive, Suite 200	Work Order:	18-04-1355
Irvine, CA 92617-3094	Preparation:	EPA 5035
	Method:	EPA 8260B
Project: Hellman Properties / IR18166880		Page 6 of 6

Quality Control Sample ID	Type	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
095-01-025-29879	**LCS**	**Solid**	**GC/MS LL**	**04/19/18**	**04/19/18 09:38**	**180419L005**
095-01-025-29879	**LCSD**	**Solid**	**GC/MS LL**	**04/19/18**	**04/19/18 10:05**	**180419L005**

Parameter	Spike Added	LCS Conc.	LCS %Rec.	LCSD Conc.	LCSD %Rec.	%Rec. CL	ME CL	RPD	RPD CL	Qualifiers
Benzene	50.00	52.33	105	49.89	100	80-120	73-127	5	0-20	
Carbon Tetrachloride	50.00	51.96	104	48.90	98	65-137	53-149	6	0-20	
Chlorobenzene	50.00	52.92	106	50.98	102	80-120	73-127	4	0-20	
1,2-Dibromoethane	50.00	52.22	104	51.47	103	80-120	73-127	1	0-20	
1,2-Dichlorobenzene	50.00	50.90	102	49.88	100	80-120	73-127	2	0-20	
1,2-Dichloroethane	50.00	52.60	105	51.87	104	80-120	73-127	1	0-20	
1,1-Dichloroethene	50.00	56.35	113	52.16	104	68-128	58-138	8	0-20	
Ethylbenzene	50.00	53.93	108	51.33	103	80-120	73-127	5	0-20	
Toluene	50.00	55.65	111	53.27	107	80-120	73-127	4	0-20	
Trichloroethene	50.00	56.73	113	53.38	107	80-120	73-127	6	0-20	
Vinyl Chloride	50.00	59.83	120	57.28	115	67-127	57-137	4	0-20	
p/m-Xylene	100.0	105.6	106	100.6	101	75-125	67-133	5	0-25	
o-Xylene	50.00	51.17	102	49.10	98	75-125	67-133	4	0-25	
Methyl-t-Butyl Ether (MTBE)	50.00	49.64	99	49.59	99	70-124	61-133	0	0-20	
Tert-Butyl Alcohol (TBA)	250.0	240.7	96	240.3	96	73-121	65-129	0	0-20	
Diisopropyl Ether (DIPE)	50.00	51.40	103	50.19	100	69-129	59-139	2	0-20	
Ethyl-t-Butyl Ether (ETBE)	50.00	50.40	101	49.93	100	70-124	61-133	1	0-20	
Tert-Amyl-Methyl Ether (TAME)	50.00	48.38	97	47.94	96	74-122	66-130	1	0-20	
Ethanol	500.0	544.8	109	569.0	114	51-135	37-149	4	0-27	

Total number of LCS compounds: 19
Total number of ME compounds: 0
Total number of ME compounds allowed: 1
LCS ME CL validation result: Pass

RPD: Relative Percent Difference. CL: Control Limits

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Sample Analysis Summary Report

Work Order: 18-04-1355

Method	Extraction	Chemist ID	Instrument	Analytical Location
EPA 418.1M	N/A	605	IR 2	1
EPA 6010B	EPA 3050B	935	ICP 7300	1
EPA 7471A	EPA 7471A Total	868	Mercury 08	1
EPA 8015B (M)	EPA 3550B	682	GC 48	1
EPA 8260B	EPA 5035	867	GC/MS LL	2

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Glossary of Terms and Qualifiers

Work Order: 18-04-1355 Page 1 of 1

Qualifiers	Definition
*	See applicable analysis comment.
<	Less than the indicated value.
>	Greater than the indicated value.
1	Surrogate compound recovery was out of control due to a required sample dilution. Therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to suspected matrix interference. The associated LCS recovery was in control.
4	The MS/MSD RPD was out of control due to suspected matrix interference.
5	The PDS/PDSD or PES/PESD associated with this batch of samples was out of control due to suspected matrix interference.
6	Surrogate recovery below the acceptance limit.
7	Surrogate recovery above the acceptance limit.
B	Analyte was present in the associated method blank.
BU	Sample analyzed after holding time expired.
BV	Sample received after holding time expired.
CI	See case narrative.
E	Concentration exceeds the calibration range.
ET	Sample was extracted past end of recommended max. holding time.
HD	The chromatographic pattern was inconsistent with the profile of the reference fuel standard.
HDH	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but heavier hydrocarbons were also present (or detected).
HDL	The sample chromatographic pattern for TPH matches the chromatographic pattern of the specified standard but lighter hydrocarbons were also present (or detected).
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
JA	Analyte positively identified but quantitation is an estimate.
ME	LCS Recovery Percentage is within Marginal Exceedance (ME) Control Limit range (+/- 4 SD from the mean).
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
SG	The sample extract was subjected to Silica Gel treatment prior to analysis.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.
	Solid - Unless otherwise indicated, solid sample data is reported on a wet weight basis, not corrected for % moisture. All QC results are reported on a wet weight basis.
	Any parameter identified in 40CFR Part 136.3 Table II that is designated as "analyze immediately" with a holding time of <= 15 minutes (40CFR-136.3 Table II, footnote 4), is considered a "field" test and the reported results will be qualified as being received outside of the stated holding time unless received at the laboratory within 15 minutes of the collection time.
	A calculated total result (Example: Total Pesticides) is the summation of each component concentration and/or, if "J" flags are reported, estimated concentration. Component concentrations showing not detected (ND) are summed into the calculated total result as zero concentrations.

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CHAIN-OF-CUSTODY RECORD

NB 26626

PROJECT NAME: Hellman Properties

DATE: 4/16/18 PAGE 1 OF 1

PROJECT NUMBER: JR18166880

RESULTS TO: Bora Baturay

TURNAROUND TIME: Standard

SAMPLE SHIPMENT METHOD: Lab Courier Pickup

LABORATORY NAME: Eurofins Calscience

LABORATORY ADDRESS:

LABORATORY CONTACT: Steve Nowak

LABORATORY PHONE NUMBER:

CLIENT INFORMATION:

REPORTING REQUIREMENTS: 18-04-1355

GEOTRACKER REQUIRED YES NO

SITE SPECIFIC GLOBAL ID NO.

SAMPLERS (SIGNATURE): Katherine Howe

ANALYSES

DATE	TIME	SAMPLE NUMBER		TPH by EPA 8015M	TPH by EPA 418.1	VOCs by EPA 8260B	Metals by EPA 6010B 7471A								CONTAINER TYPE AND SIZE	Soil (S), Water (W), Vapor (V), or Other (O)	Filtered	Preservative Type	Cooled	MS/MSD	No. of Containers	ADDITIONAL COMMENTS
4/16/18	0725	B-4-1	1	X	X	X	X								4oz glass jar + 3 40 ml VOA's	S		Na_2SO_3 + MeOH	X		4	No preservative
	0745	B-4-2	2	X	X	X	X												X		4	Used for glass
	0800	B-4-4	3	X	X	X	X												X		4	jar
	1110	B-2-1	4	X	X	X	X												X		4	
	1120	B-2-2	5	X	X	X	X												X		4	
	1135	B-2-4	6	X	X	X	X												X		4	
	1335	B-1-1	7	X	X	X	X												X		4	
	1340	B-1-2	8	X	X	X	X												X		4	
	1350	B-1-3	9	X	X	X	X												X		4	
	1400	B-3-1	10	X	X	X	X												X		4	
	1410	B-3-2	11	X	X	X	X												X		4	
	1420	B-3-3	12	X	X	X	X												X		4	

TOTAL NUMBER OF CONTAINERS: 48

SAMPLING COMMENTS:

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME
SIGNATURE: Katherine Howe	4/16/18	1055	SIGNATURE: Jeff Chandler	4/17/18	1055
PRINTED NAME: Katherine Howe			PRINTED NAME: Jeff Chandler		
COMPANY: Wood/Amec Foster Wheeler			COMPANY: DCS/ECI		
SIGNATURE: Jeff Chandler	4/17/18	1310	SIGNATURE: [illegible]	4/17/18	1310
PRINTED NAME: Jeff Chandler			PRINTED NAME: Percy Soriano		
COMPANY: DCS/ECI			COMPANY:		
SIGNATURE:			SIGNATURE:		
PRINTED NAME:			PRINTED NAME:		
COMPANY:			COMPANY:		

121 Innovation Drive, Suite 200
Irvine, California 92617-3094
Tel 949.642.0245 Fax 949.642.4474

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WORK ORDER NUMBER: 18-04-1955

SAMPLE RECEIPT CHECKLIST

COOLER 1 OF 1

CLIENT: Amec

DATE: 04/17/2018

TEMPERATURE: (Criteria: 0.0°C – 6.0°C, not frozen except sediment/tissue)

Thermometer ID: SC6 (CF: +0.1°C); Temperature (w/o CF): 2.4 °C (w/ CF): 2.5 °C; ☑ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by: _____)

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling

☐ Sample(s) received at ambient temperature; placed on ice for transport by courier

Ambient Temperature: ☐ Air ☐ Filter Checked by: 1091

CUSTODY SEAL:

Cooler	☐ Present and Intact	☐ Present but Not Intact	☑ Not Present	☐ N/A	Checked by: 1091
Sample(s)	☐ Present and Intact	☐ Present but Not Intact	☑ Not Present	☐ N/A	Checked by: 1140

SAMPLE CONDITION:

	Yes	No	N/A
Chain-of-Custody (COC) document(s) received with samples	☑	☐	☐
COC document(s) received complete	☑	☐	☐
☐ Sampling date ☐ Sampling time ☐ Matrix ☐ Number of containers			
☐ No analysis requested ☐ Not relinquished ☐ No relinquished date ☐ No relinquished time			
Sampler's name indicated on COC	☑	☐	☐
Sample container label(s) consistent with COC	☑	☐	☐
Sample container(s) intact and in good condition	☐	☑	☐
Proper containers for analyses requested	☑	☐	☐
Sufficient volume/mass for analyses requested	☑	☐	☐
Samples received within holding time	☑	☐	☐
Aqueous samples for certain analyses received within 15-minute holding time			
☐ pH ☐ Residual Chlorine ☐ Dissolved Sulfide ☐ Dissolved Oxygen	☐	☐	☑
Proper preservation chemical(s) noted on COC and/or sample container	☑	☐	☐
Unpreserved aqueous sample(s) received for certain analyses			
☐ Volatile Organics ☐ Total Metals ☐ Dissolved Metals			
Acid/base preserved samples - pH within acceptable range	☐	☐	☑
Container(s) for certain analysis free of headspace	☐	☐	☑
☐ Volatile Organics ☐ Dissolved Gases (RSK-175) ☐ Dissolved Oxygen (SM 4500)			
☐ Carbon Dioxide (SM 4500) ☐ Ferrous Iron (SM 3500) ☐ Hydrogen Sulfide (Hach)			
Tedlar™ bag(s) free of condensation	☐	☐	☑

CONTAINER TYPE: (Trip Blank Lot Number: _____)

Aqueous: ☐ VOA ☐ VOAh ☐ VOAna_2 ☐ 100PJ ☐ 100PJna_2 ☐ 125AGB ☐ 125AGBh ☐ 125AGBp ☐ 125PB ☐ 125PBznna (pH__9)

☐ 250AGB ☐ 250CGB ☐ 250CGBs (pH__2) ☐ 250PB ☐ 250PBn (pH__2) ☐ 500AGB ☐ 500AGJ ☐ 500AGJs (pH__2) ☐ 500PB

☐ 1AGB ☐ 1AGBna_2 ☐ 1AGBs (pH__2) ☐ 1AGBs (O&G) ☐ 1PB ☐ 1PBna (pH__12) ☐ _____ ☐ _____ ☐ _____

Solid: ☑ 4ozCGJ ☐ 8ozCGJ ☐ 16ozCGJ ☐ Sleeve (___) ☐ EnCores® (___) ☑ TerraCores® (3) ☐ _____ ☐ _____ ☐ _____

Air: ☐ Tedlar™ ☐ Canister ☐ Sorbent Tube ☐ PUF ☐ _____ **Other Matrix** (_____): ☐ _____ ☐ _____ ☐ _____

Container: **A** = Amber, **B** = Bottle, **C** = Clear, **E** = Envelope, **G** = Glass, **J** = Jar, **P** = Plastic, and **Z** = Ziploc/Resealable Bag

Preservative: **b** = buffered, **f** = filtered, **h** = HCl, **n** = HNO_3, **na** = NaOH, **na_2** = $Na_2S_2O_3$, **p** = H_3PO_4, Labeled/Checked by: 1140

s = H_2SO_4, **u** = ultra-pure, **x** = Na_2SO_3+$NaHSO_4.H_2O$, **znna** = Zn $(CH_3CO_2)_2$ + NaOH Reviewed by: [illegible]

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eurofins | Calscience

WORK ORDER NUMBER: 18-04-1355

SAMPLE ANOMALY REPORT

DATE: 04 / 17 / 2018

SAMPLES, CONTAINERS, AND LABELS:

- ☐ Sample(s) NOT RECEIVED but listed on COC
- ☐ Sample(s) received but NOT LISTED on COC
- ☐ Holding time expired (list client or ECI sample ID and analysis)
- ☐ Insufficient sample amount for requested analysis (list analysis)
- ☐ Improper container(s) used (list analysis)
- ☐ Improper preservative used (list analysis)
- ☐ pH outside acceptable range (list analysis)
- ☐ No preservative noted on COC or label (list analysis and notify lab)
- ☐ Sample container(s) not labeled
- ☐ Client sample label(s) illegible (list container type and analysis)
- ☐ Client sample label(s) do not match COC (comment)
  - ☐ Project information
  - ☐ Client sample ID
  - ☐ Sampling date and/or time
  - ☐ Number of container(s)
  - ☐ Requested analysis
- ☐ Sample container(s) compromised (comment)
  - ☐ Broken
  - ☐ Water present in sample container
- ☐ Air sample container(s) compromised (comment)
  - ☐ Flat
  - ☐ Very low in volume
  - ☐ Leaking (not transferred; duplicate bag submitted)
  - ☐ Leaking (transferred into ECI Tedlar™ bags*)
  - ☐ Leaking (transferred into client's Tedlar™ bags*)

* Transferred at client's request.

Comments

(-2) Received 1 out of 3 terracores dry. (preserved w/ methanol)

MISCELLANEOUS: (Describe)

* Dry sample

Comments

HEADSPACE:

(Containers with bubble > 6 mm or ¼ inch for volatile organic or dissolved gas analysis)

ECI Sample ID	ECI Container ID	Total Number**	ECI Sample ID	ECI Container ID	Total Number**

(Containers with bubble for other analysis)

ECI Sample ID	ECI Container ID	Total Number**	Requested Analysis

Comments:

Reported by: 1140

Reviewed by: 836

** Record the total number of containers (i.e., vials or bottles) for the affected sample.

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Appendix F

Liquefaction and Seismically Induced Settlement Analysis

Wood Environment & Infrastructure Solutions, Inc.
121 Innovation Drive, Suite 200
Irvine, CA 92617

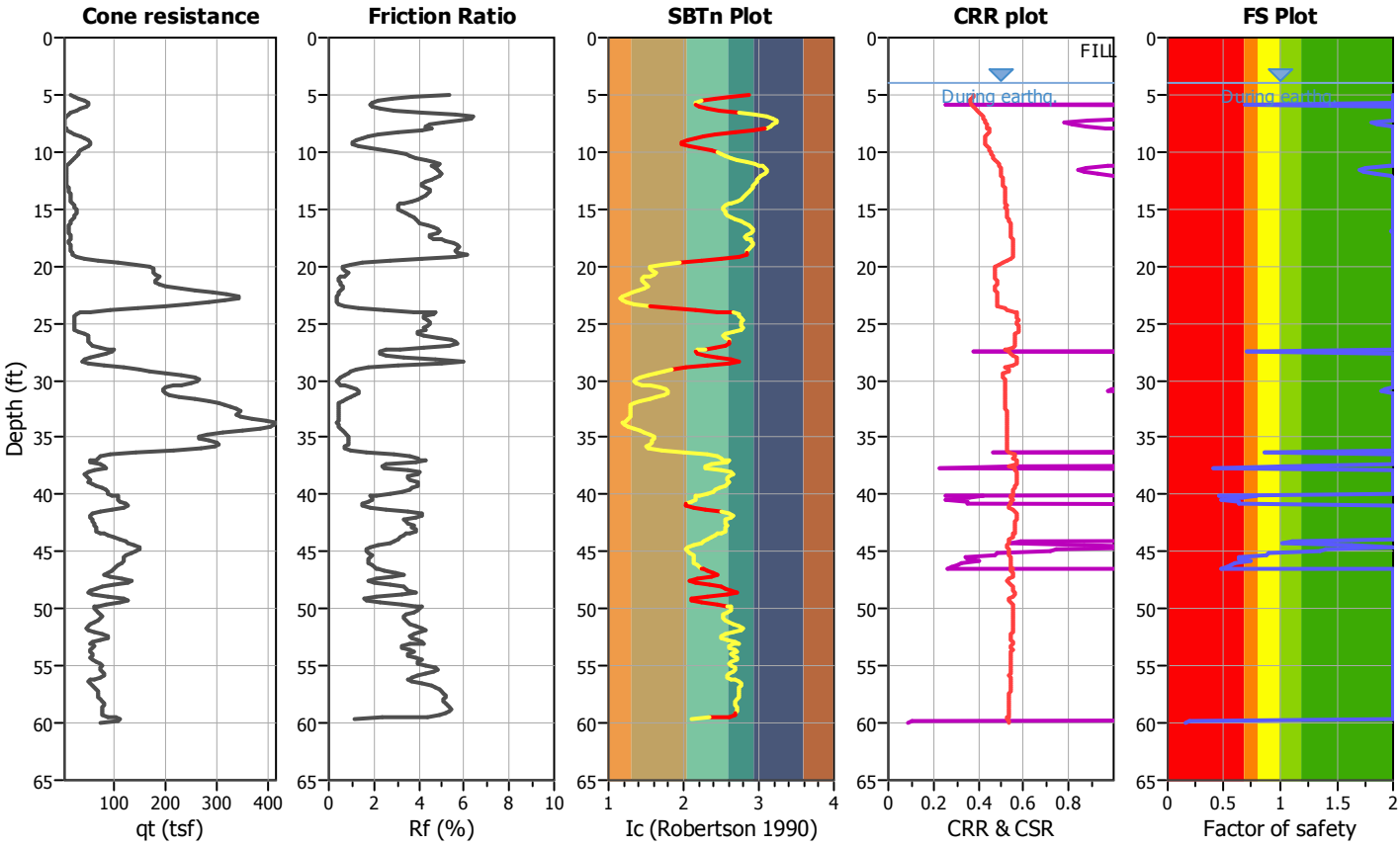
LIQUEFACTION ANALYSIS REPORT

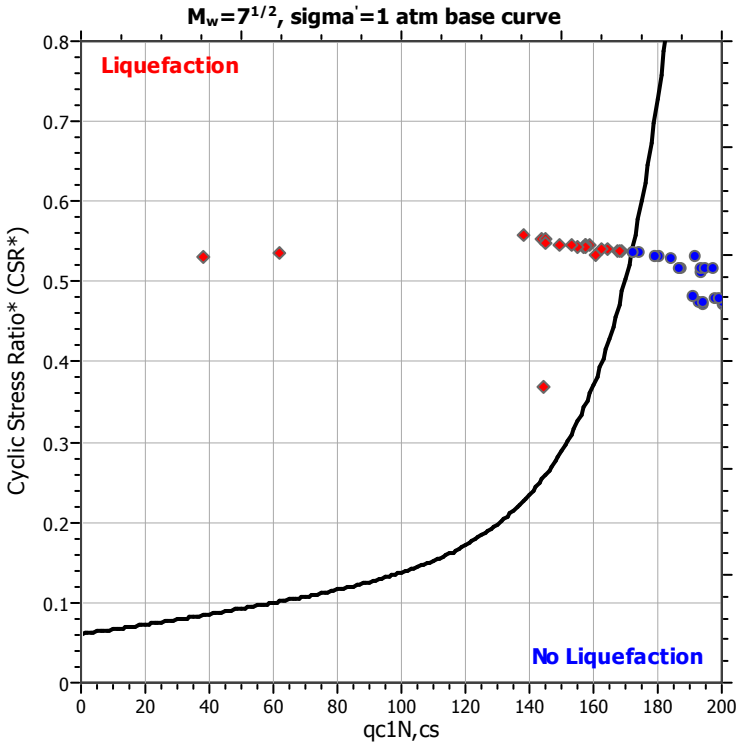
Project title : **Location :**

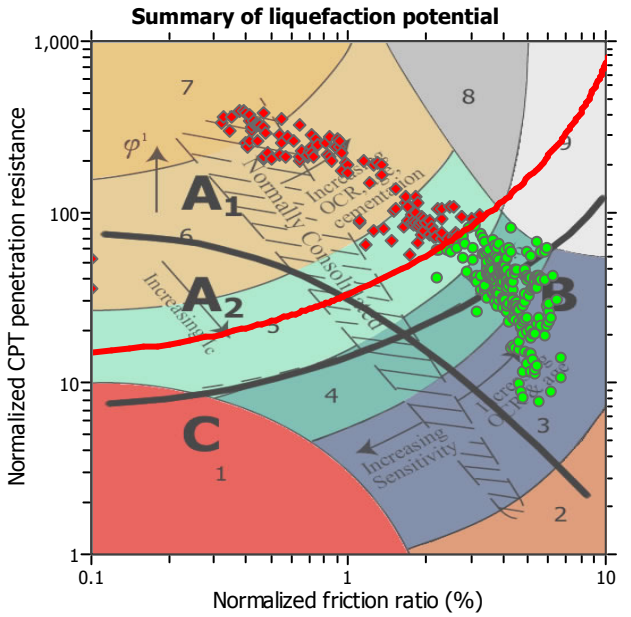
CPT file : CPT-1

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 ft	Use fill:	Yes	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 ft	Fill height:	2.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft³	Limit depth:	N/A
Earthquake magnitude M_w:	7.10	Ic cut-off value:	2.30	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

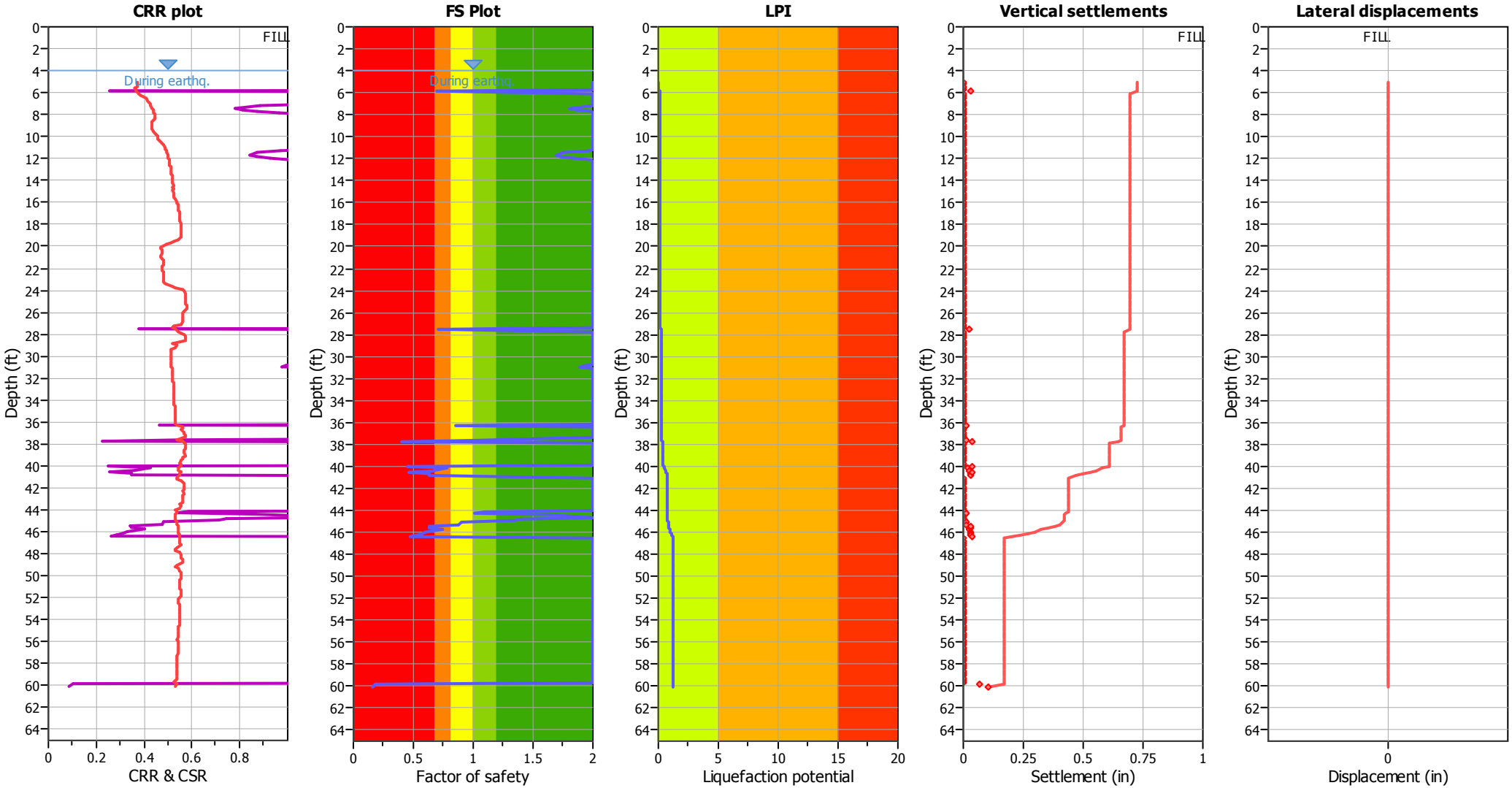






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.00 ft	Fill weight:	125.00 lb/ft³
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.30	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.60	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	2.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Wood Environment & Infrastructure Solutions, Inc.
121 Innovation Drive, Suite 200
Irvine, CA 92617

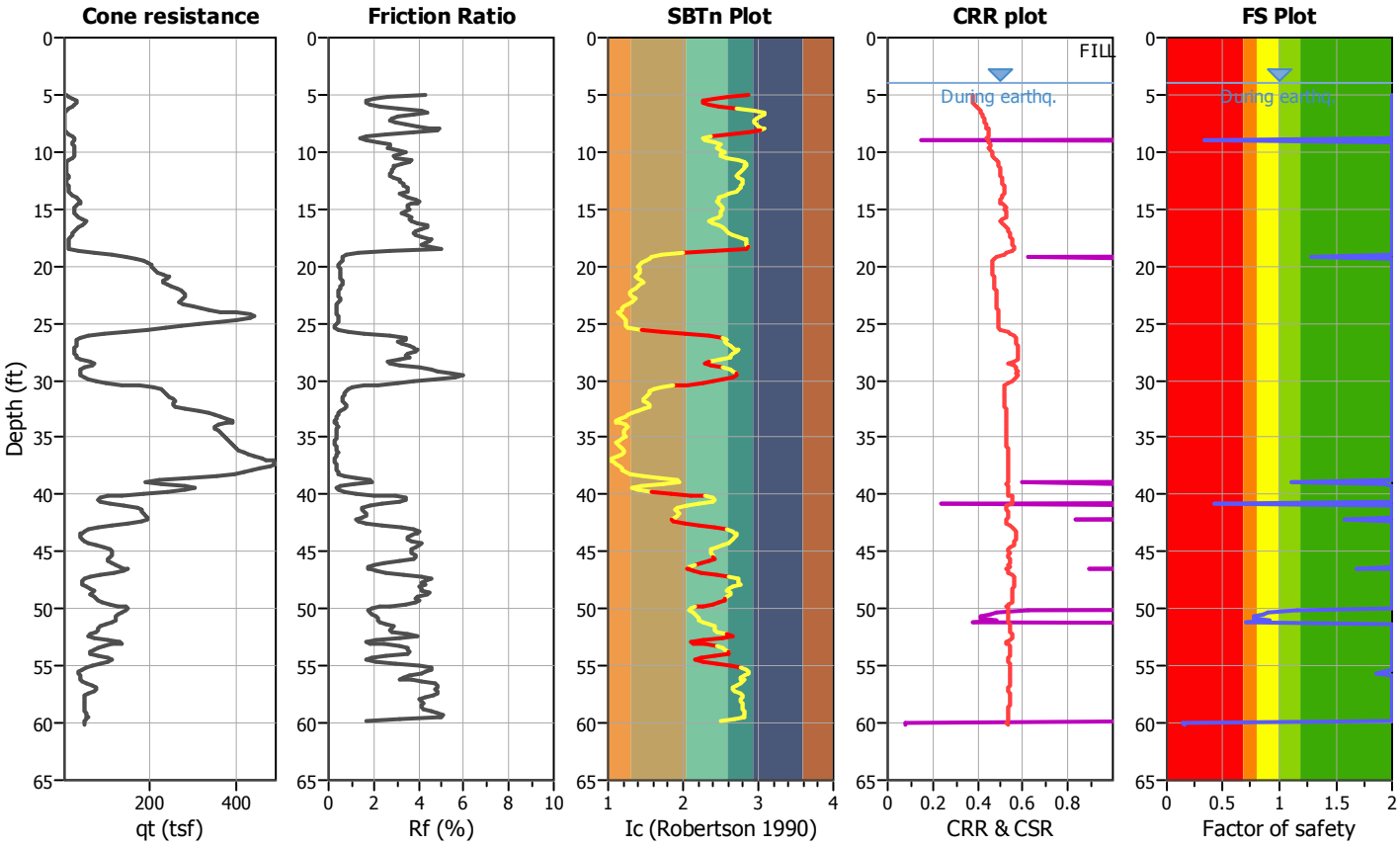
LIQUEFACTION ANALYSIS REPORT

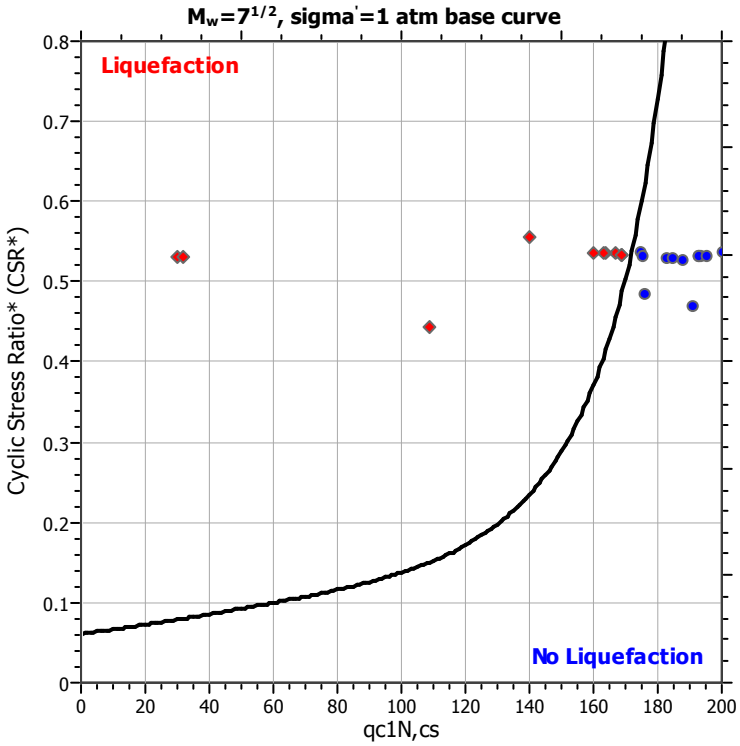
Project title : **Location :**

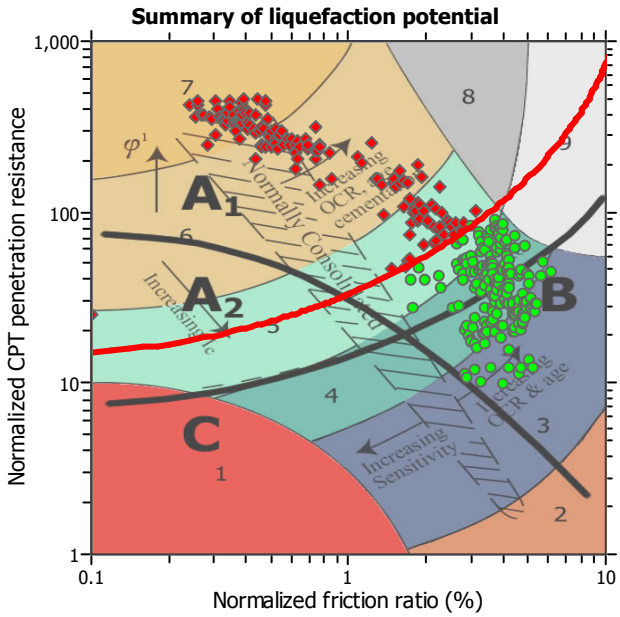
CPT file : CPT-2

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 ft	Use fill:	Yes	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 ft	Fill height:	2.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft³	Limit depth:	N/A
Earthquake magnitude M_w:	7.10	Ic cut-off value:	2.30	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

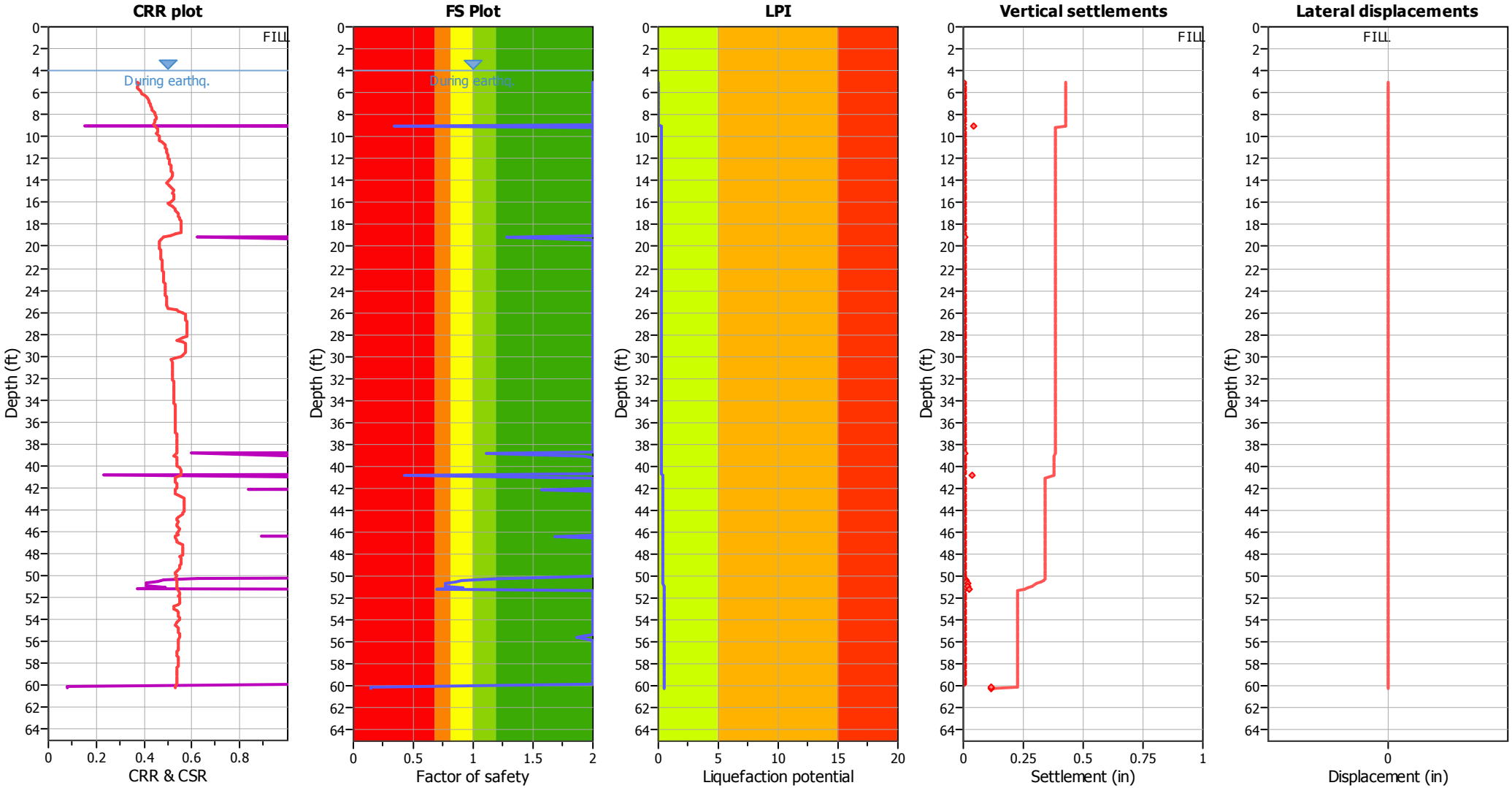






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.00 ft	Fill weight:	125.00 lb/ft³
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.30	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.60	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	2.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Wood Environment & Infrastructure Solutions, Inc.
121 Innovation Drive, Suite 200
Irvine, CA 92617

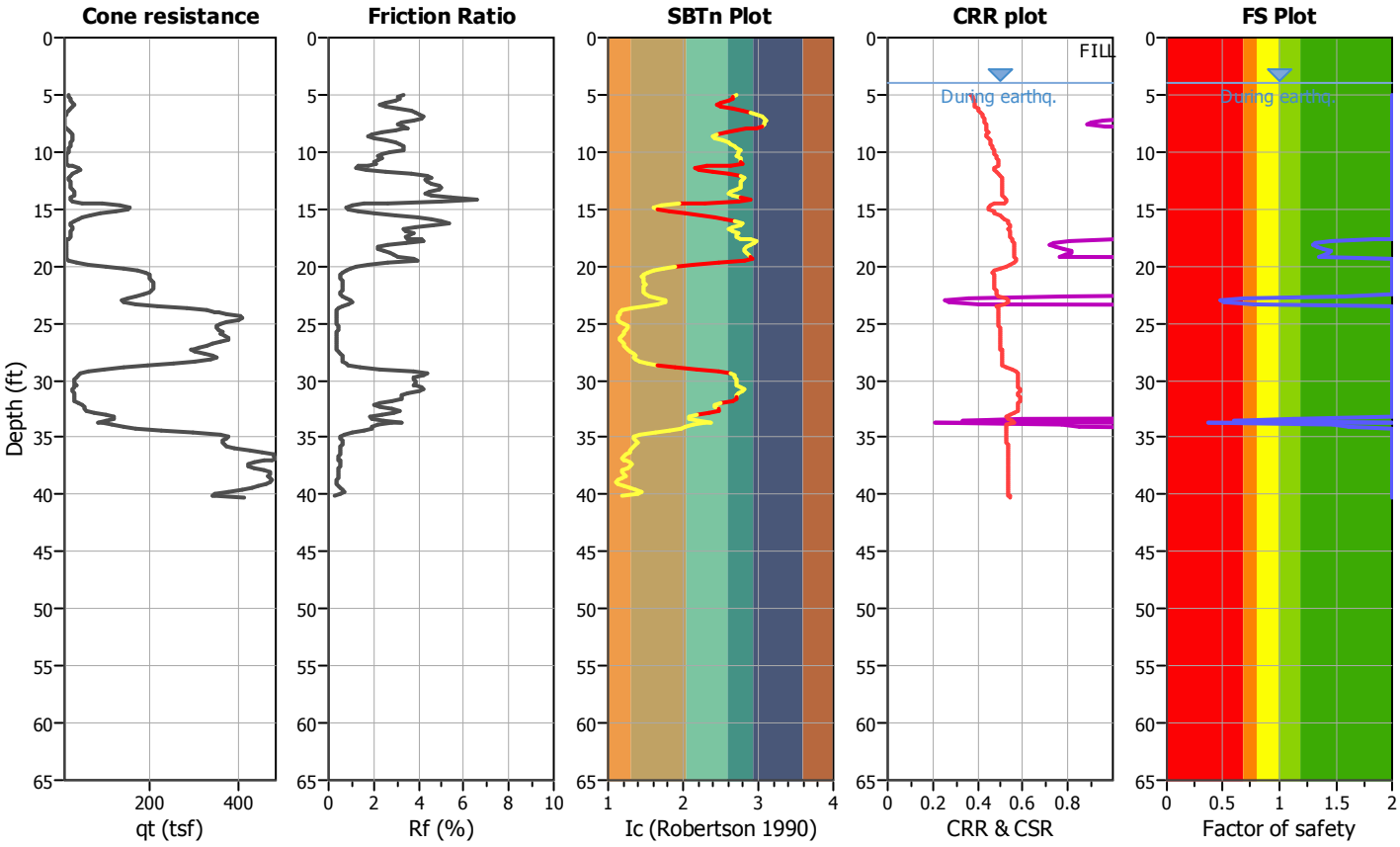
LIQUEFACTION ANALYSIS REPORT

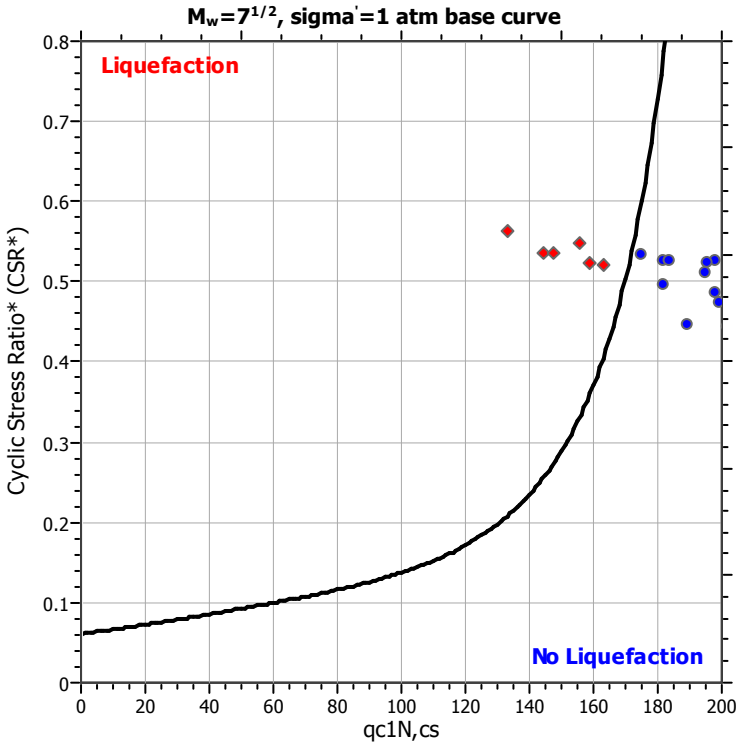
Project title : **Location :**

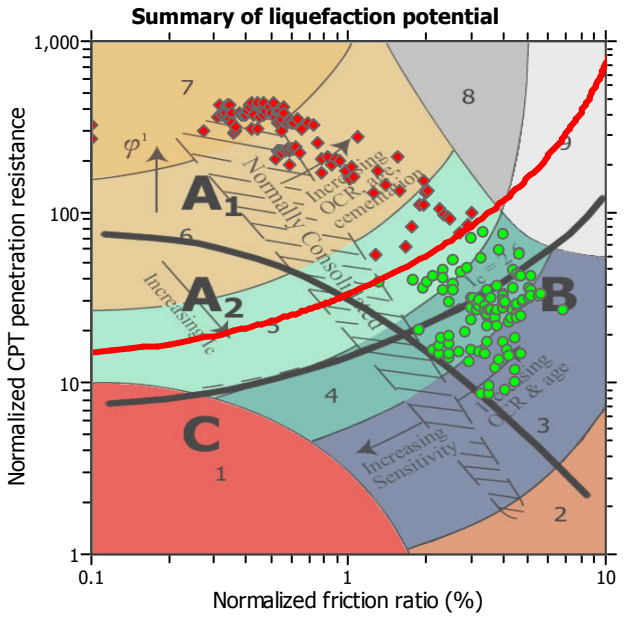
CPT file : CPT-3

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 ft	Use fill:	Yes	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 ft	Fill height:	2.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft³	Limit depth:	N/A
Earthquake magnitude M_w:	7.10	Ic cut-off value:	2.30	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

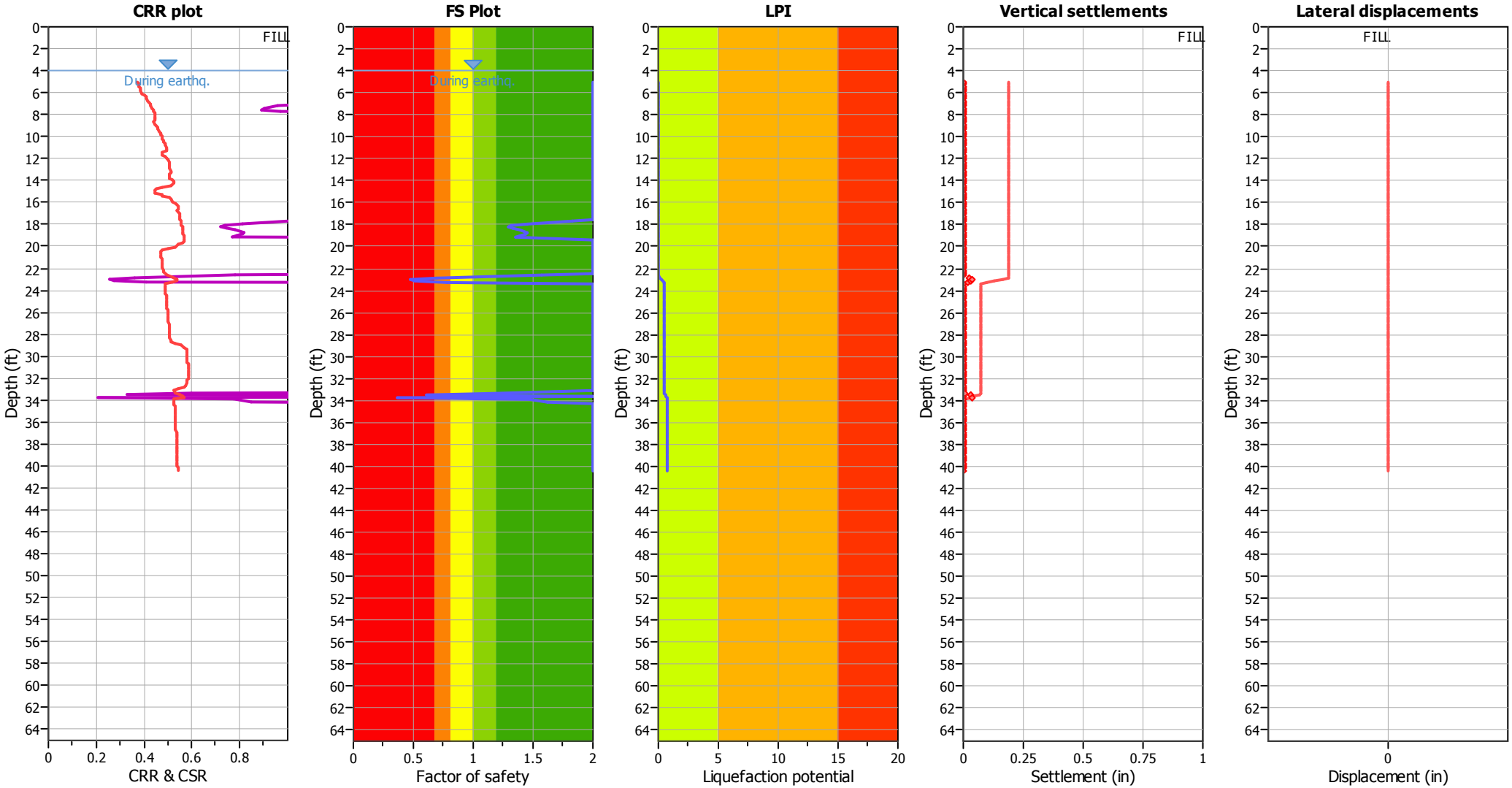






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.00 ft	Fill weight:	125.00 lb/ft³
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.30	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.60	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	2.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Wood Environment & Infrastructure Solutions, Inc.
121 Innovation Drive, Suite 200
Irvine, CA 92617

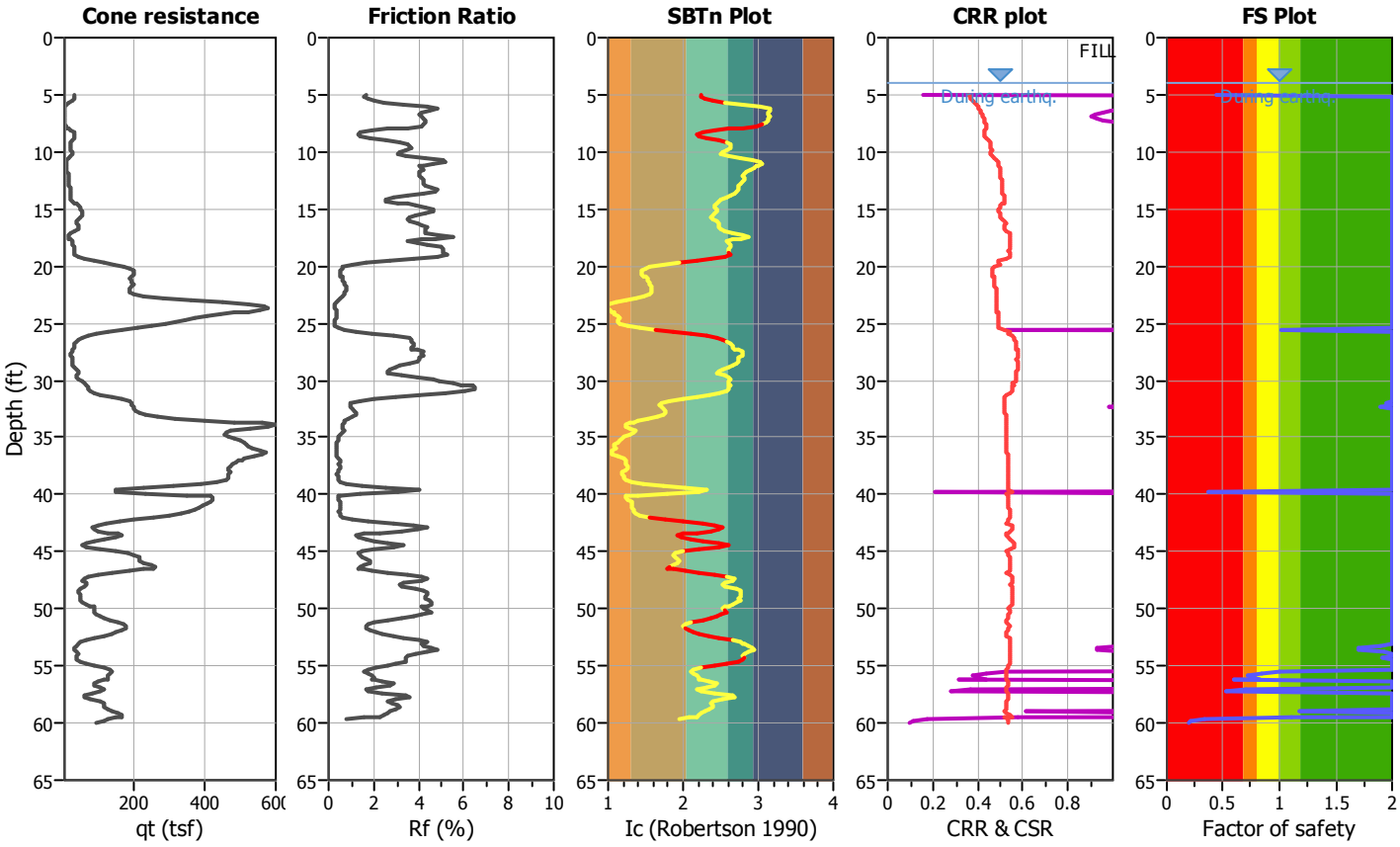
LIQUEFACTION ANALYSIS REPORT

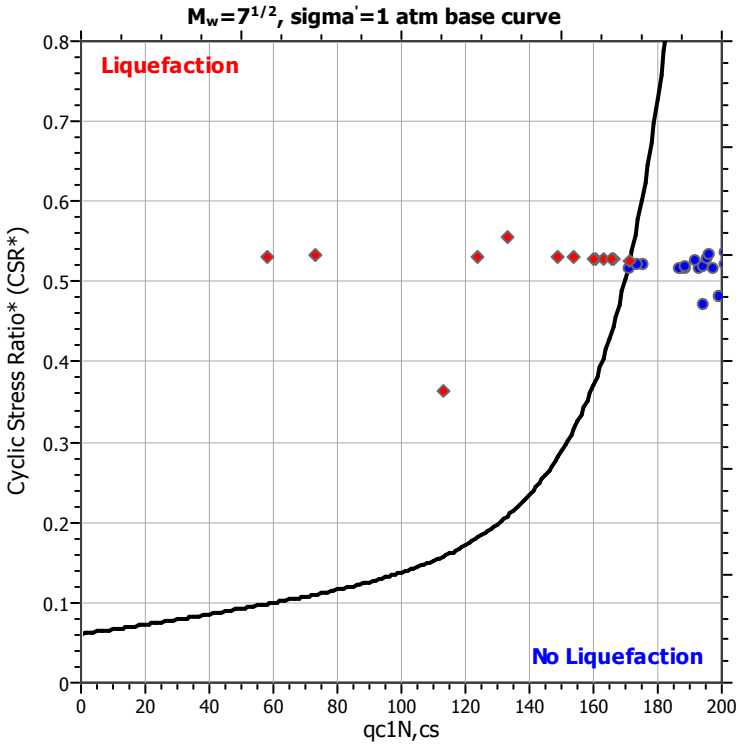
Project title : **Location :**

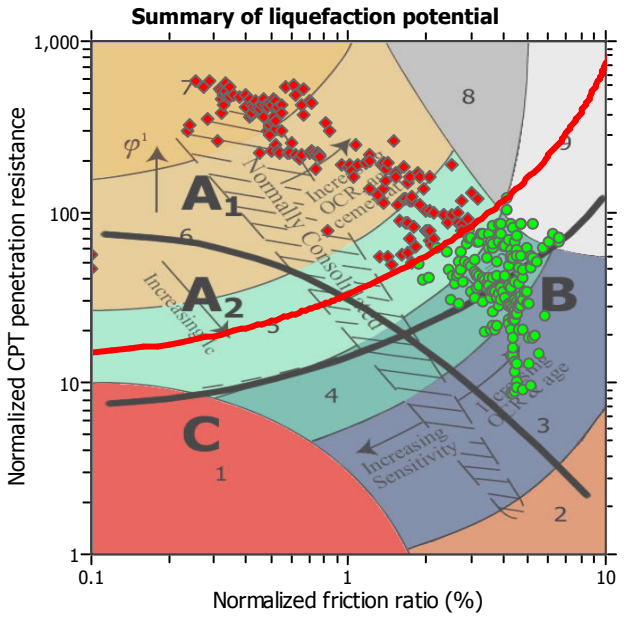
CPT file : CPT-4

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 ft	Use fill:	Yes	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 ft	Fill height:	2.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft³	Limit depth:	N/A
Earthquake magnitude M_w:	7.10	Ic cut-off value:	2.30	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

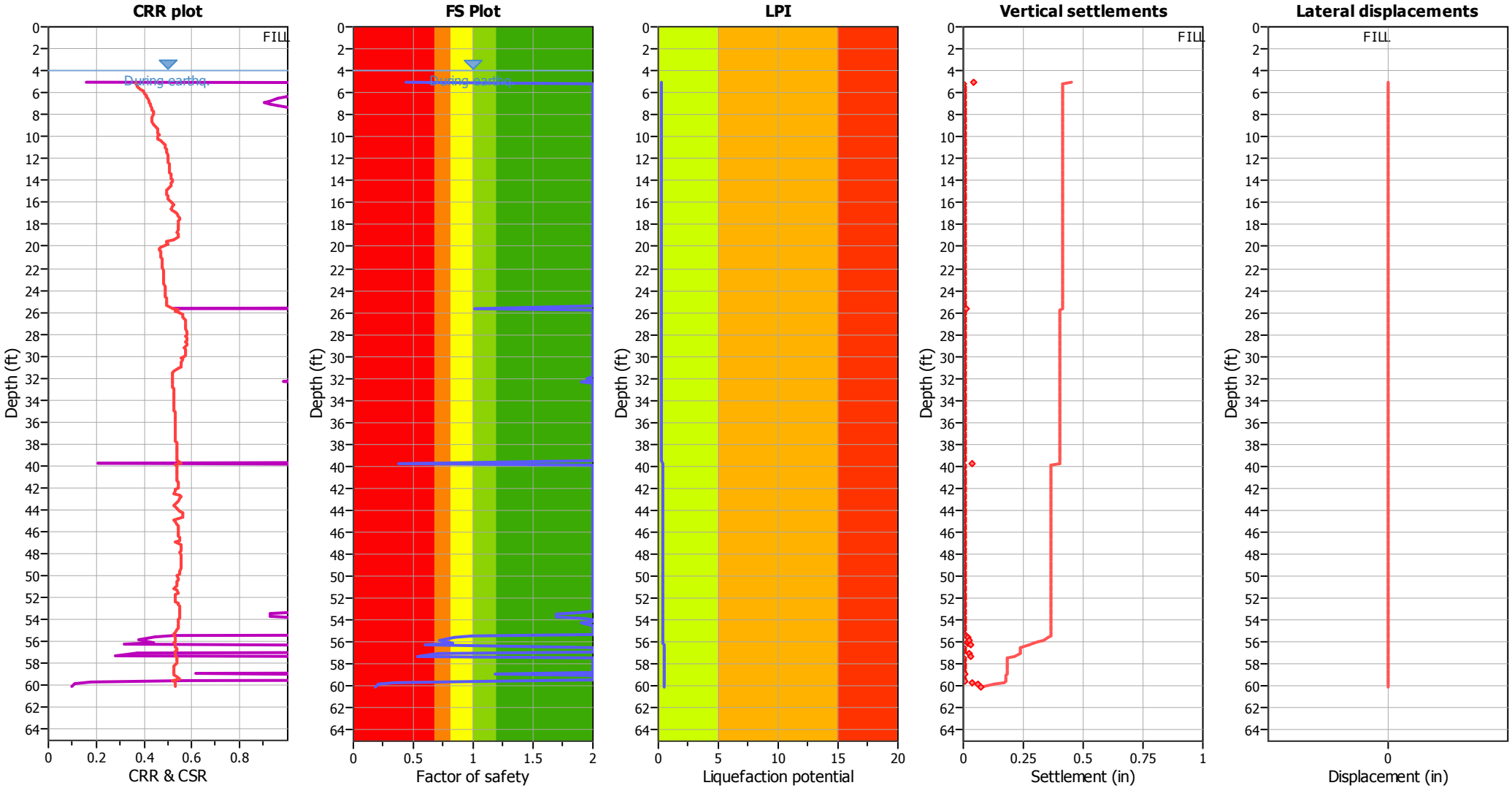






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.00 ft	Fill weight:	125.00 lb/ft³
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.30	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.60	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	2.00 ft	Limit depth:	N/A

F.S. color scheme

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

LPI color scheme

- Very high risk
- High risk
- Low risk

Wood Environment & Infrastructure Solutions, Inc.
121 Innovation Drive, Suite 200
Irvine, CA 92617

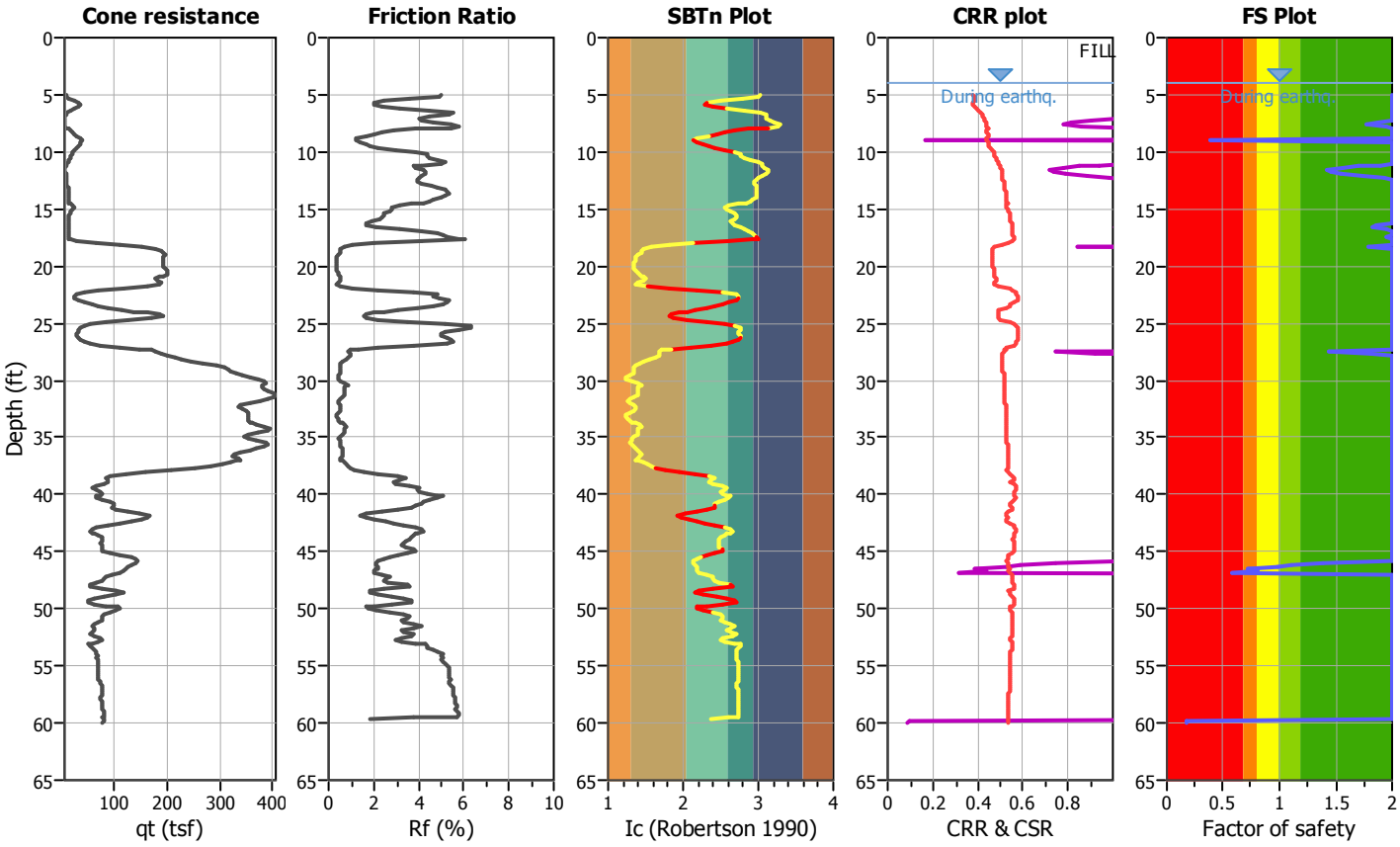
LIQUEFACTION ANALYSIS REPORT

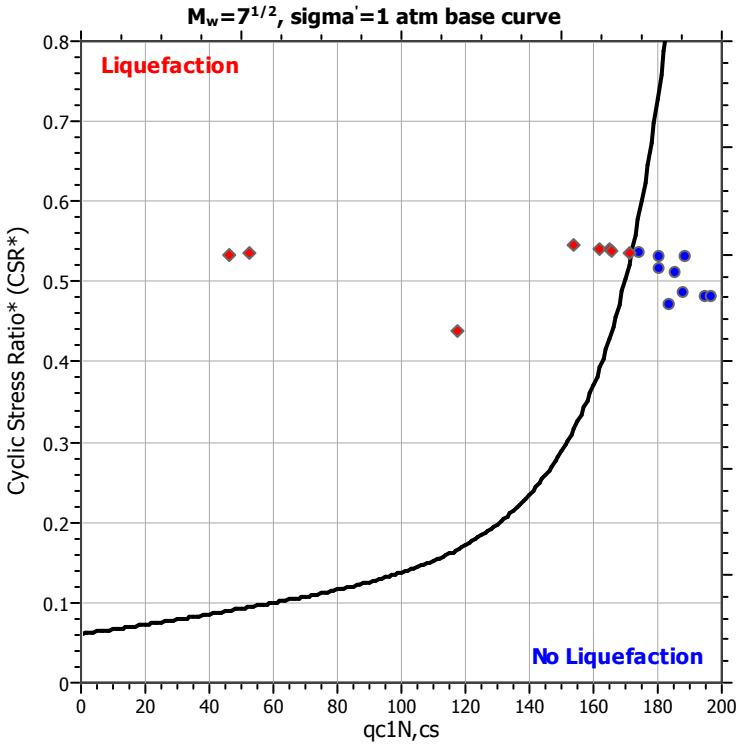
Project title : **Location :**

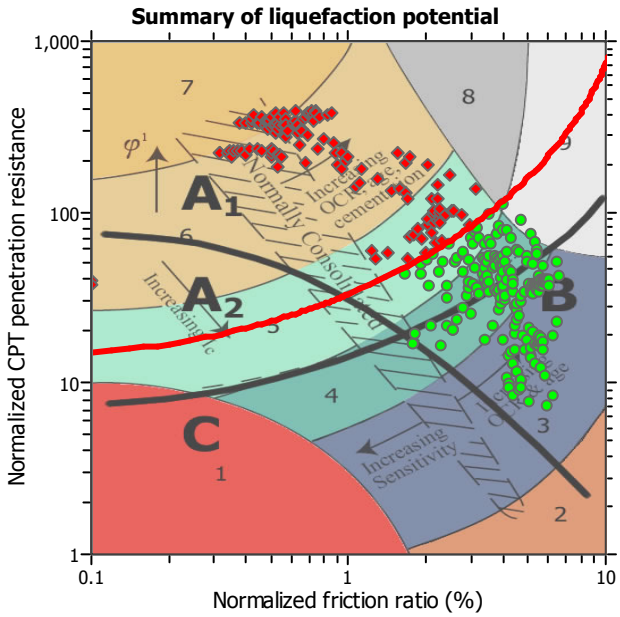
CPT file : CPT-5

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 ft	Use fill:	Yes	Clay like behavior applied:	Sand & Clay
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 ft	Fill height:	2.00 ft	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	125.00 lb/ft³	Limit depth:	N/A
Earthquake magnitude M_w:	7.10	Ic cut-off value:	2.30	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

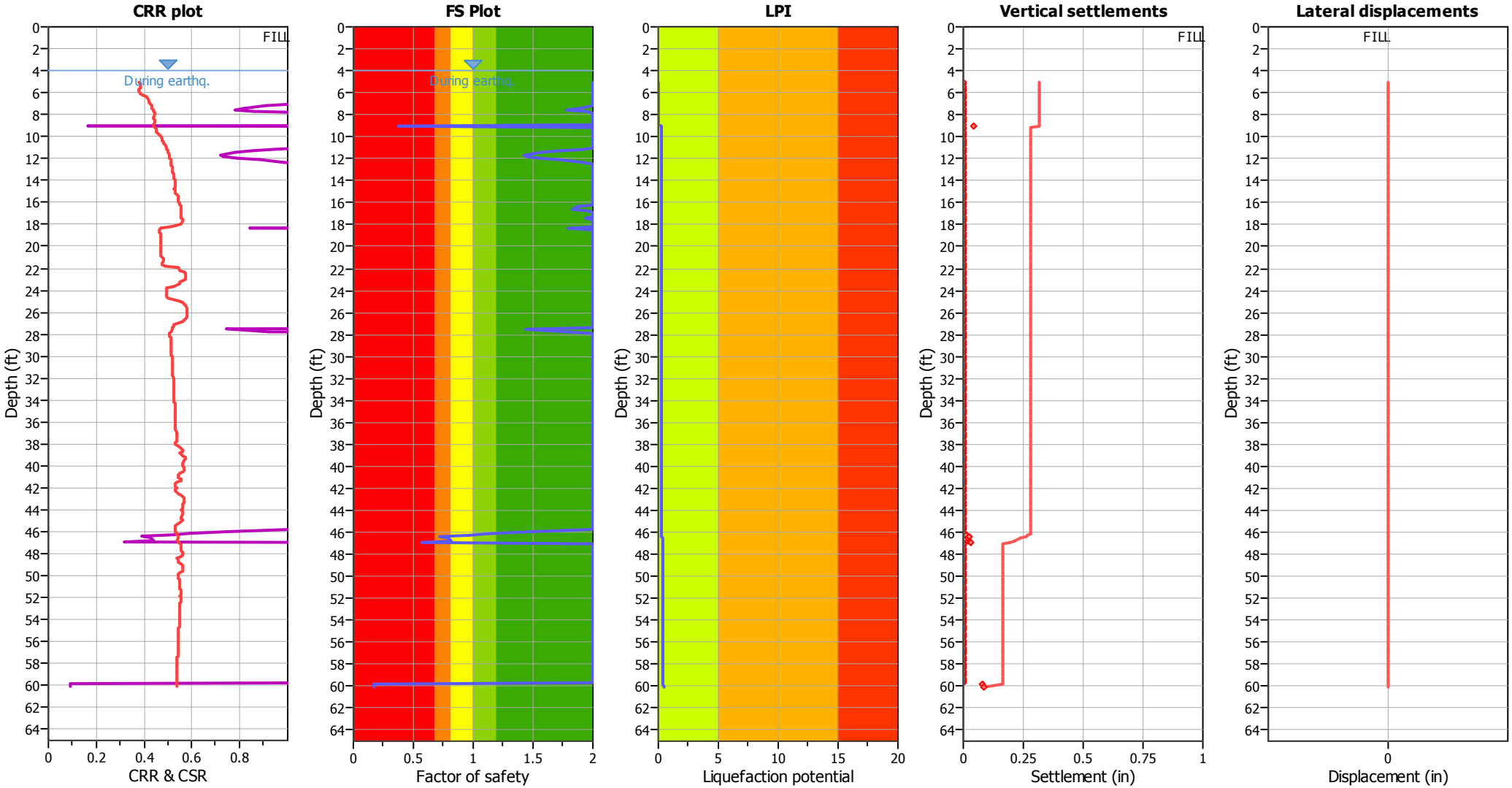






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	6.00 ft	Fill weight:	125.00 lb/ft³
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.30	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.60	Use fill:	Yes	Limit depth applied:	No
Depth to water table (insitu):	4.00 ft	Fill height:	2.00 ft	Limit depth:	N/A

F.S. color scheme

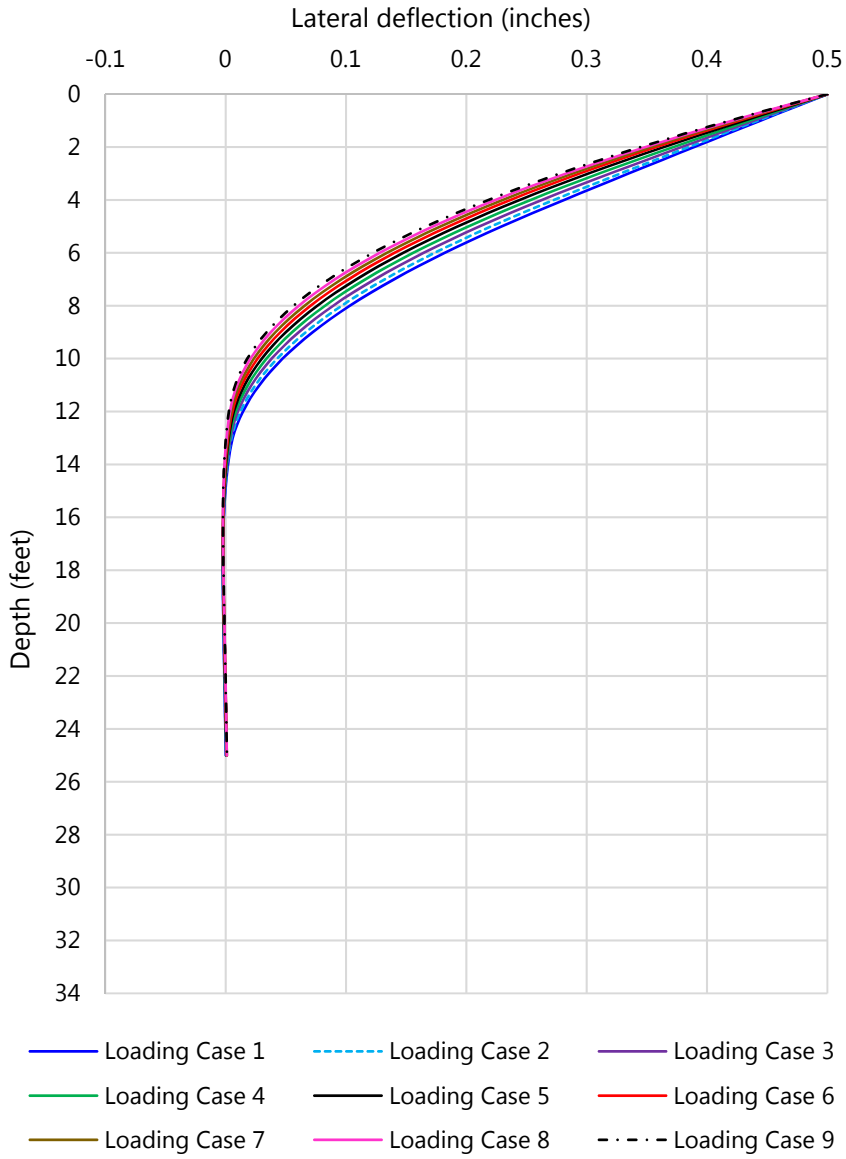
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

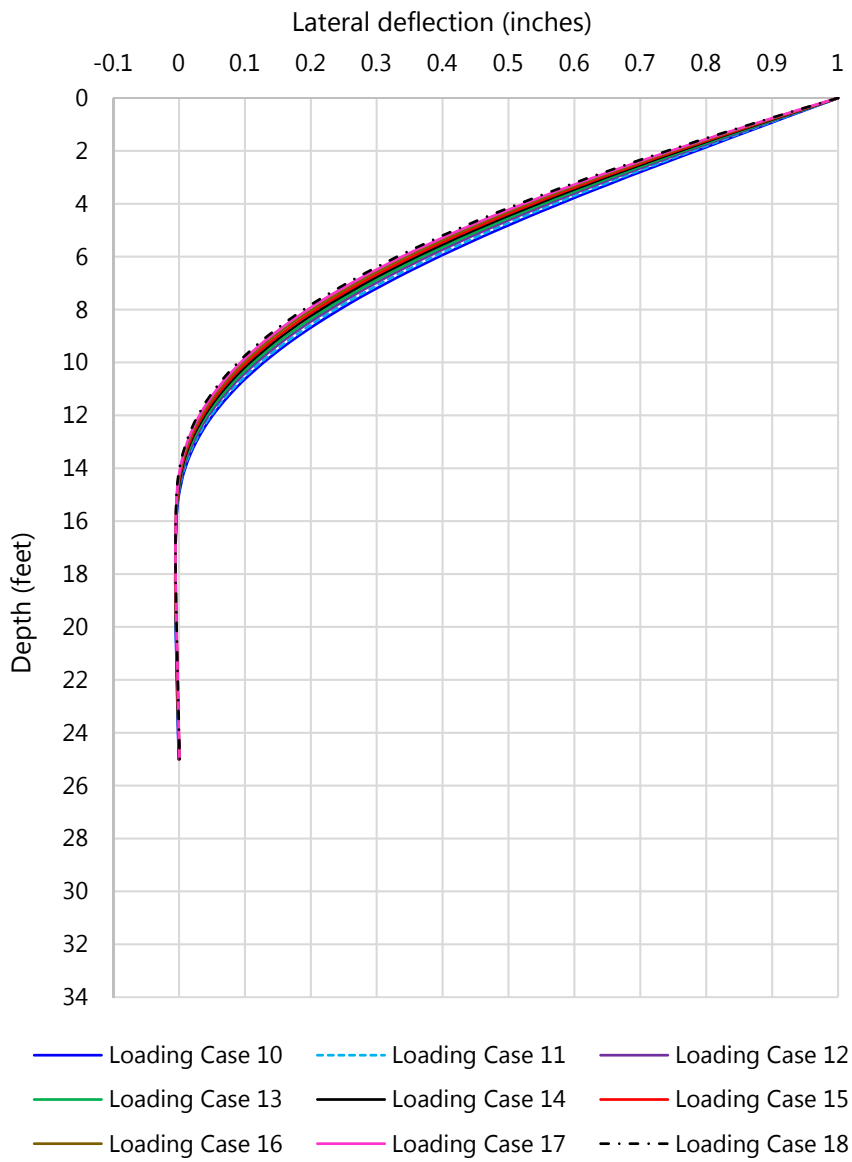
LPI color scheme

- Very high risk
- High risk
- Low risk

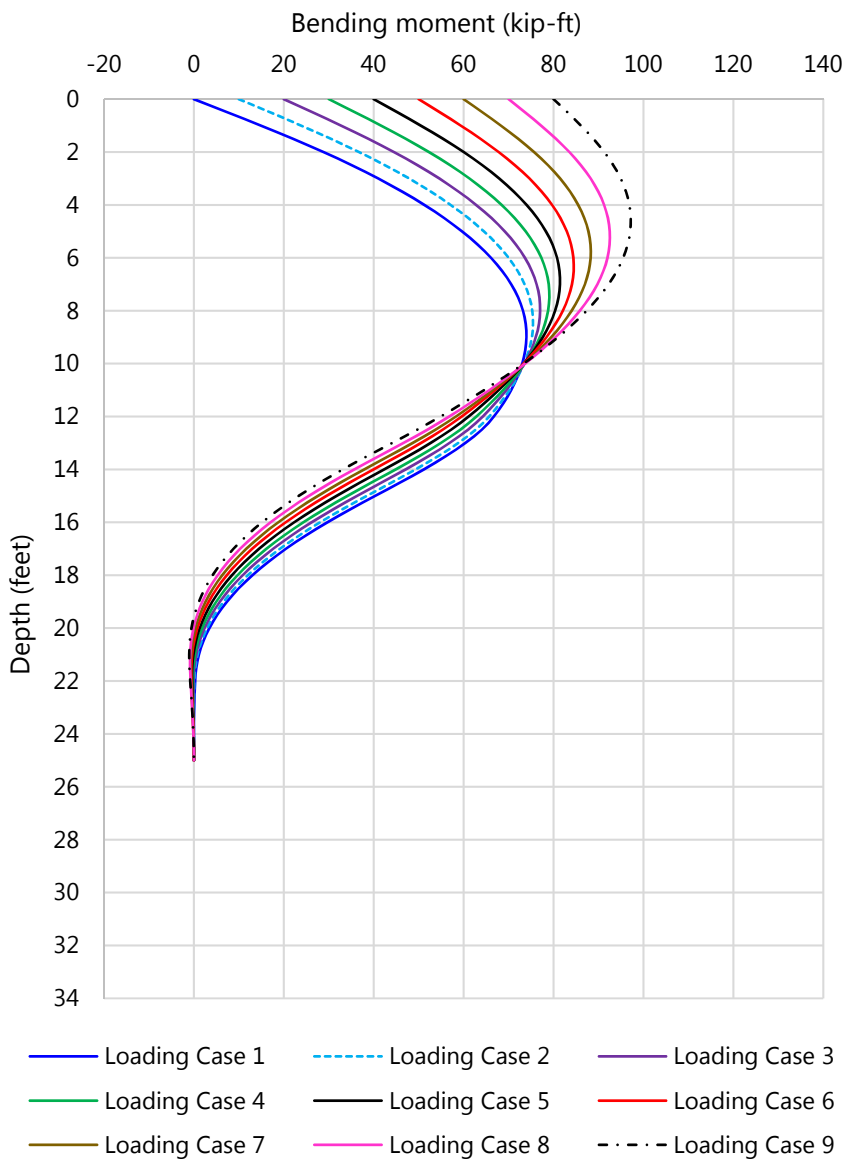
Appendix G

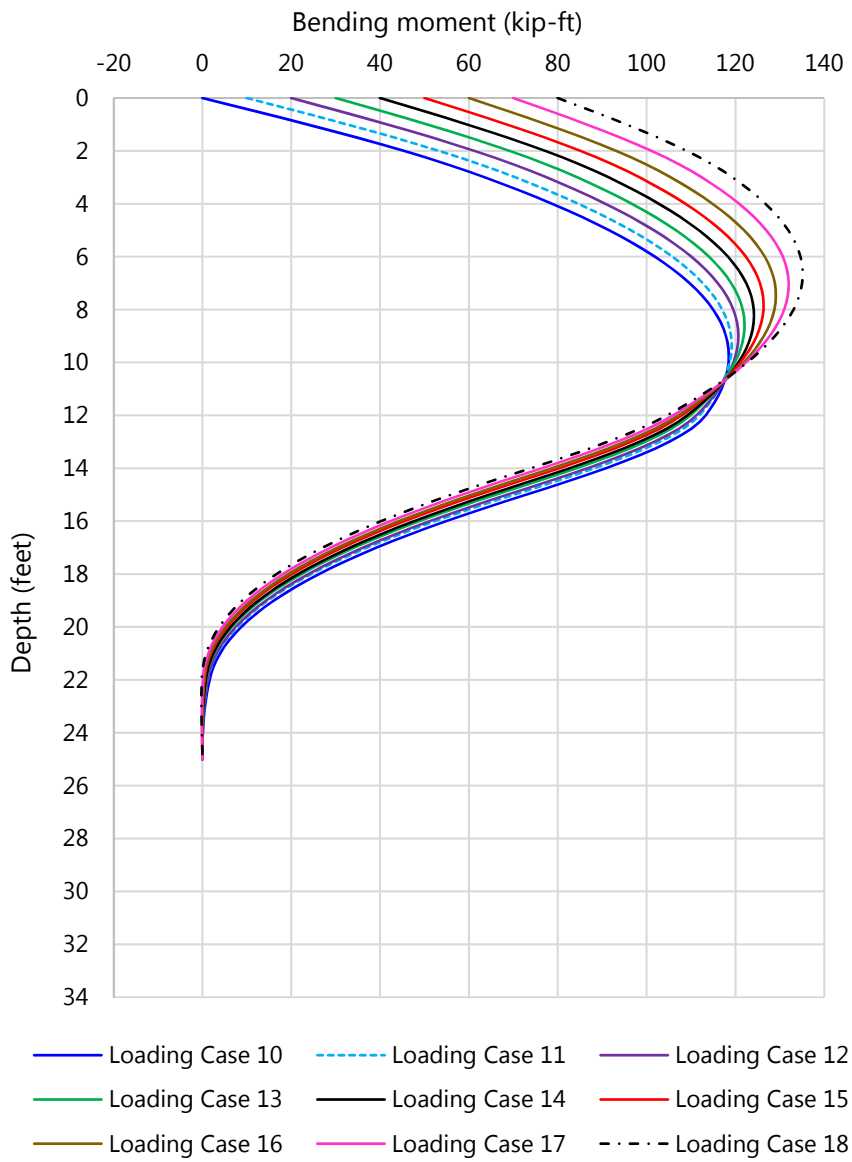
CIDH Piles Lateral Load Analysis Results



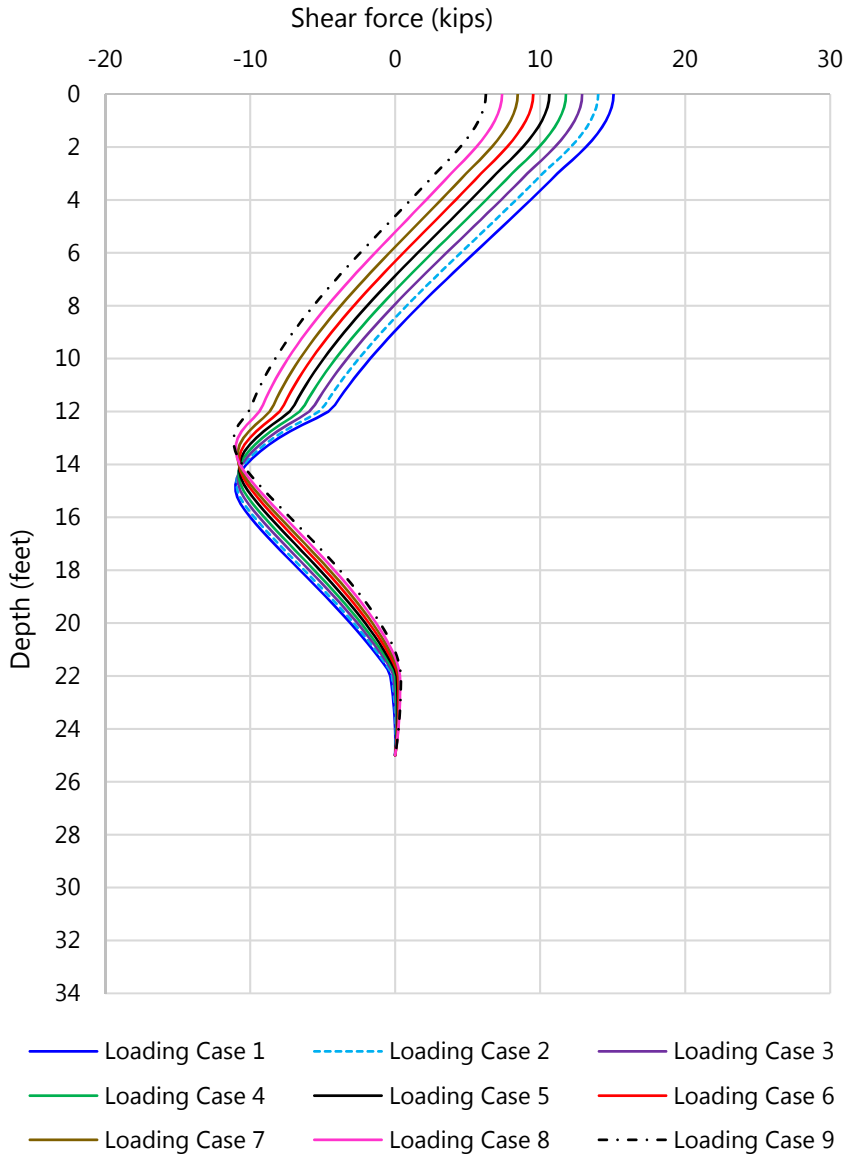


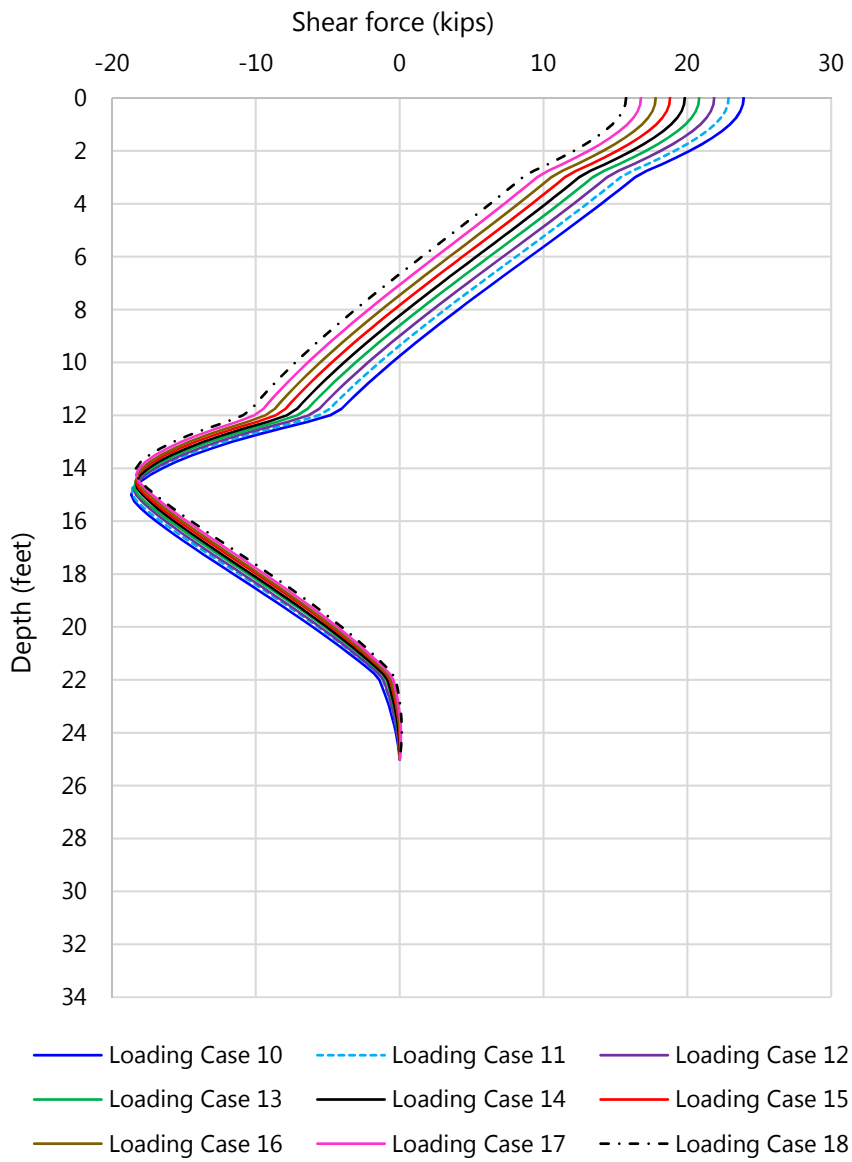
Diameter = 24 in, Length = 25 feet



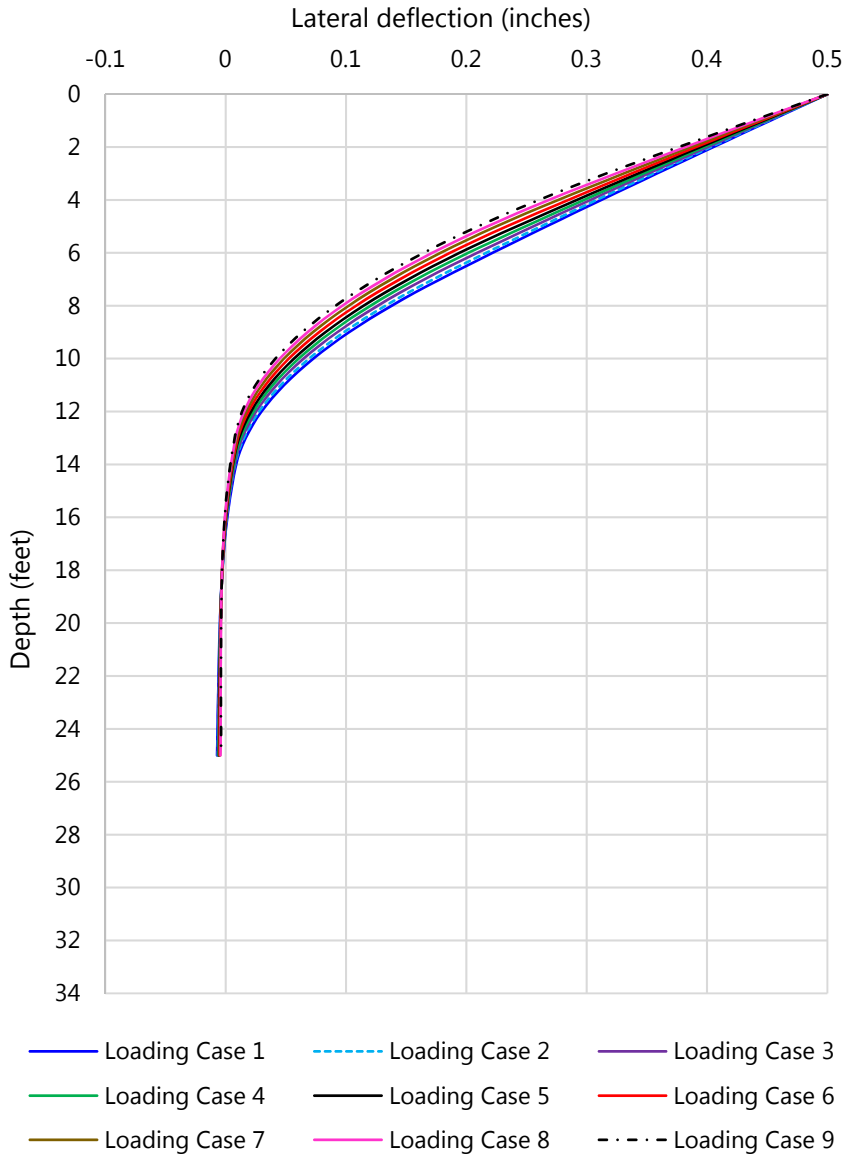


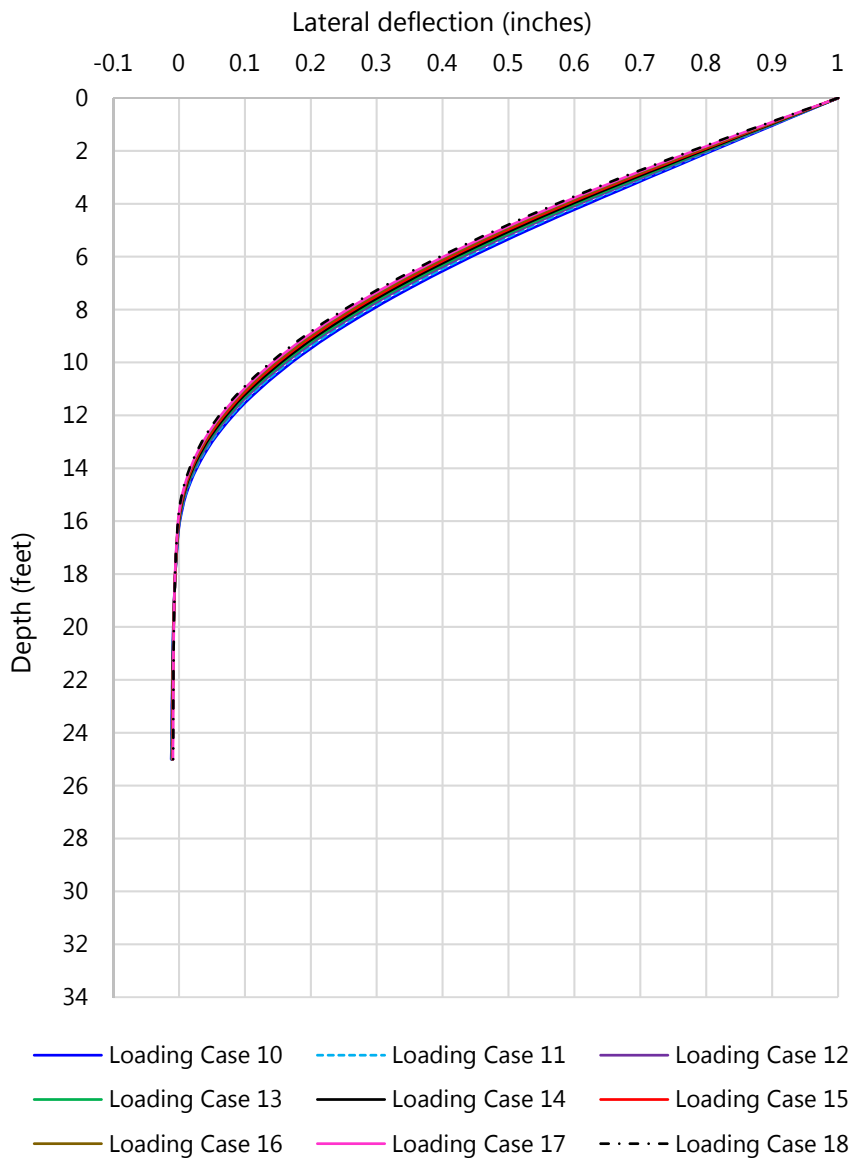
Diameter = 24 in, Length = 25 feet



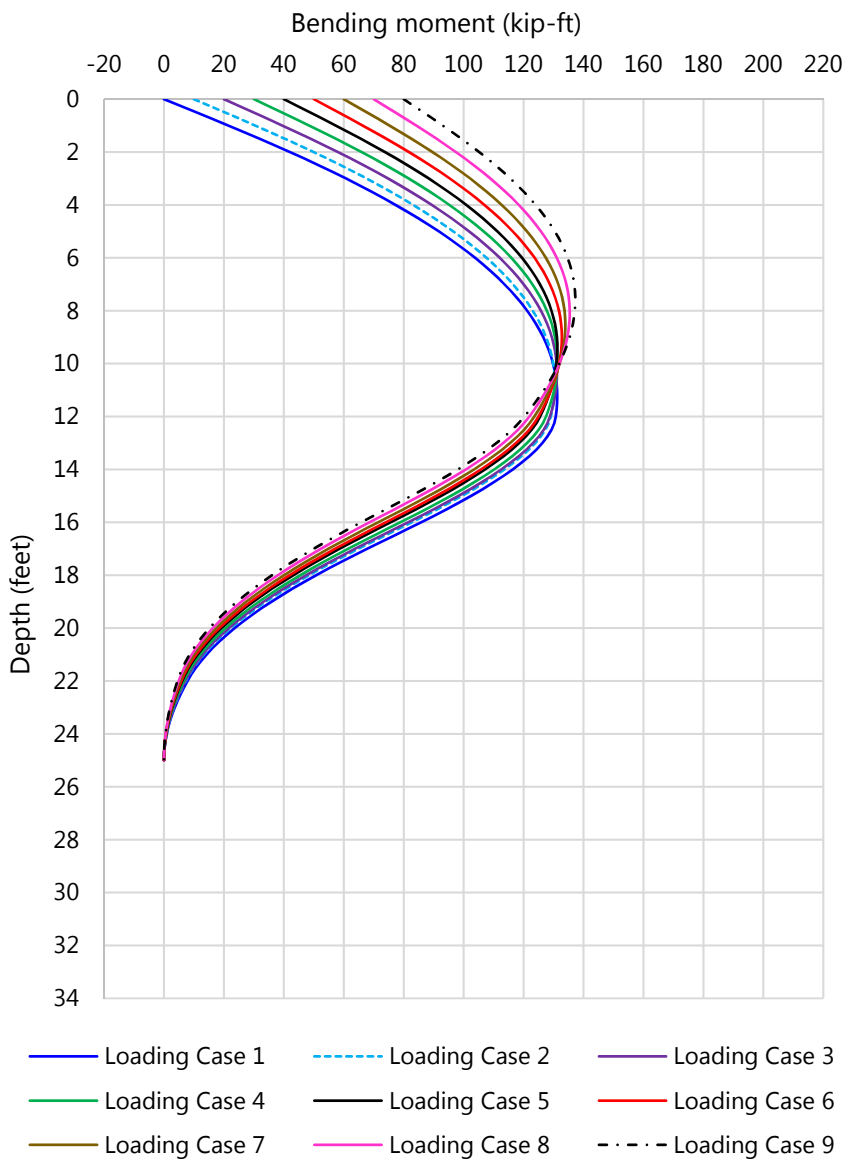


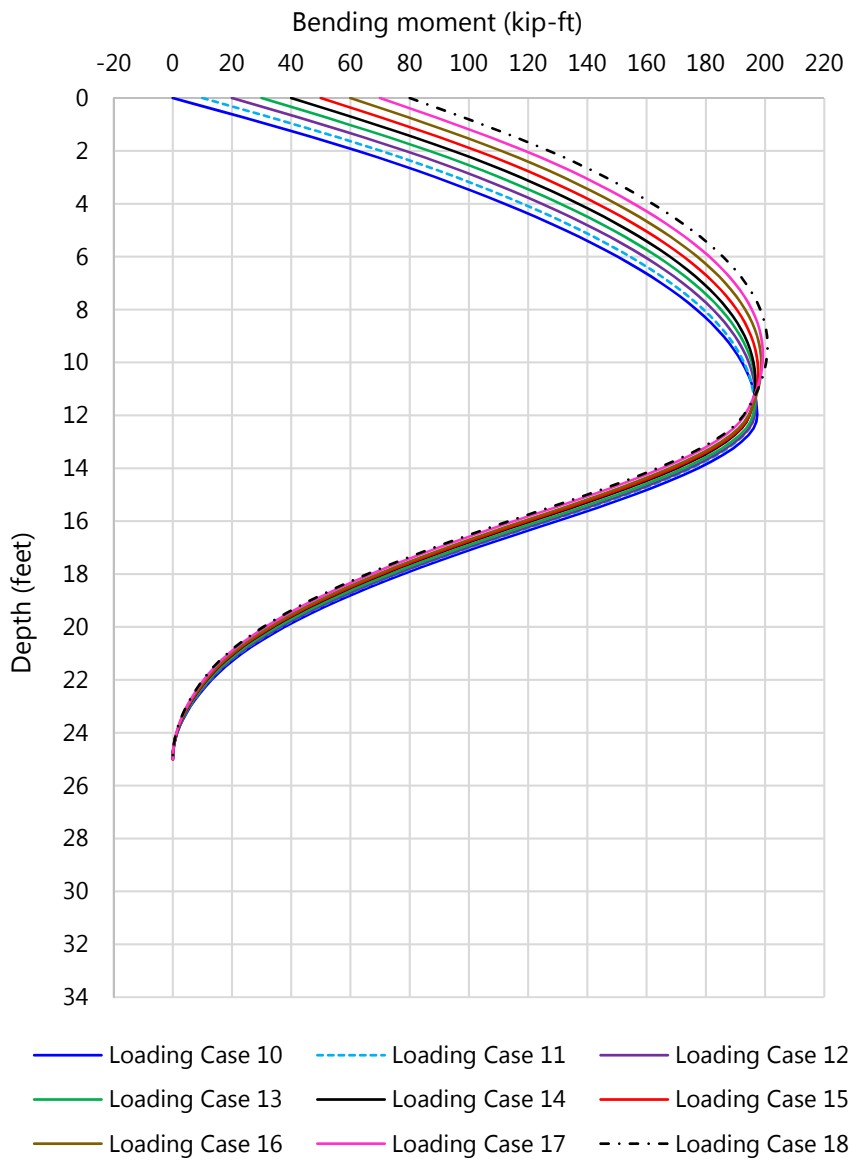
Diameter = 24 in, Length = 25 feet



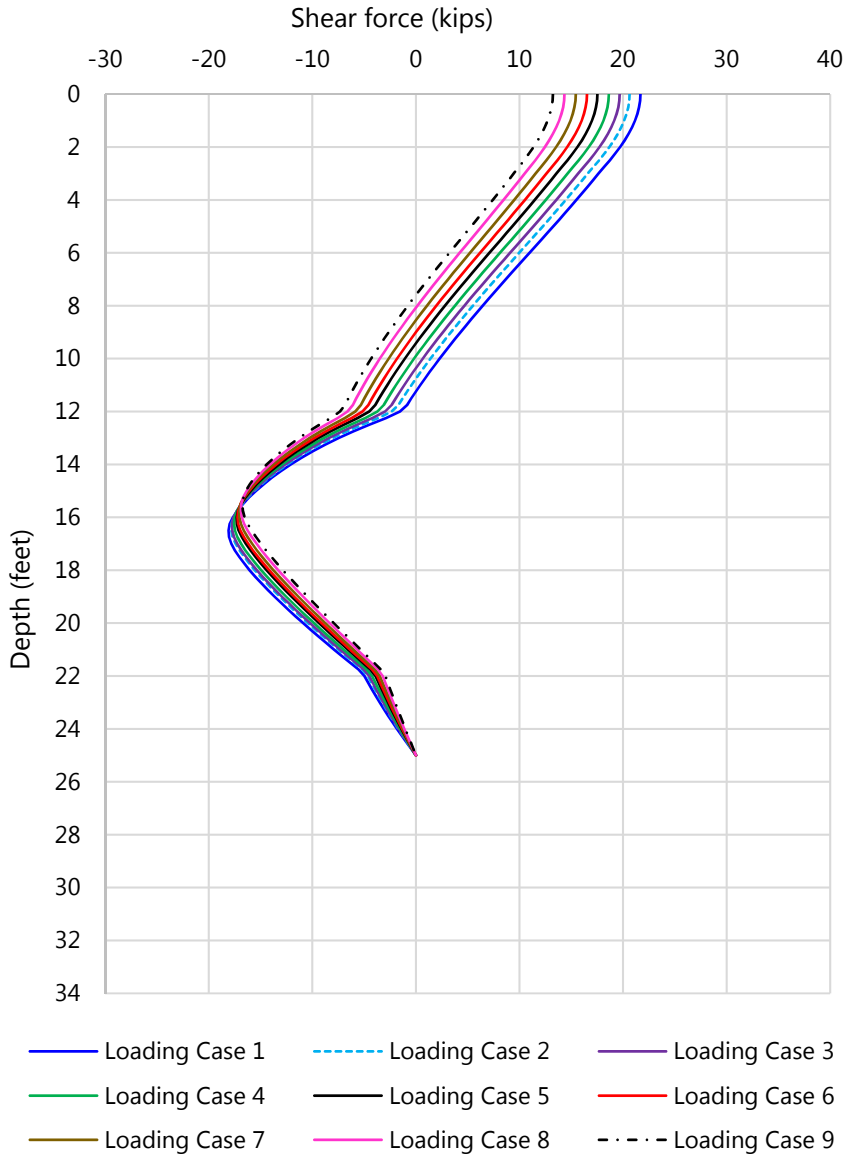


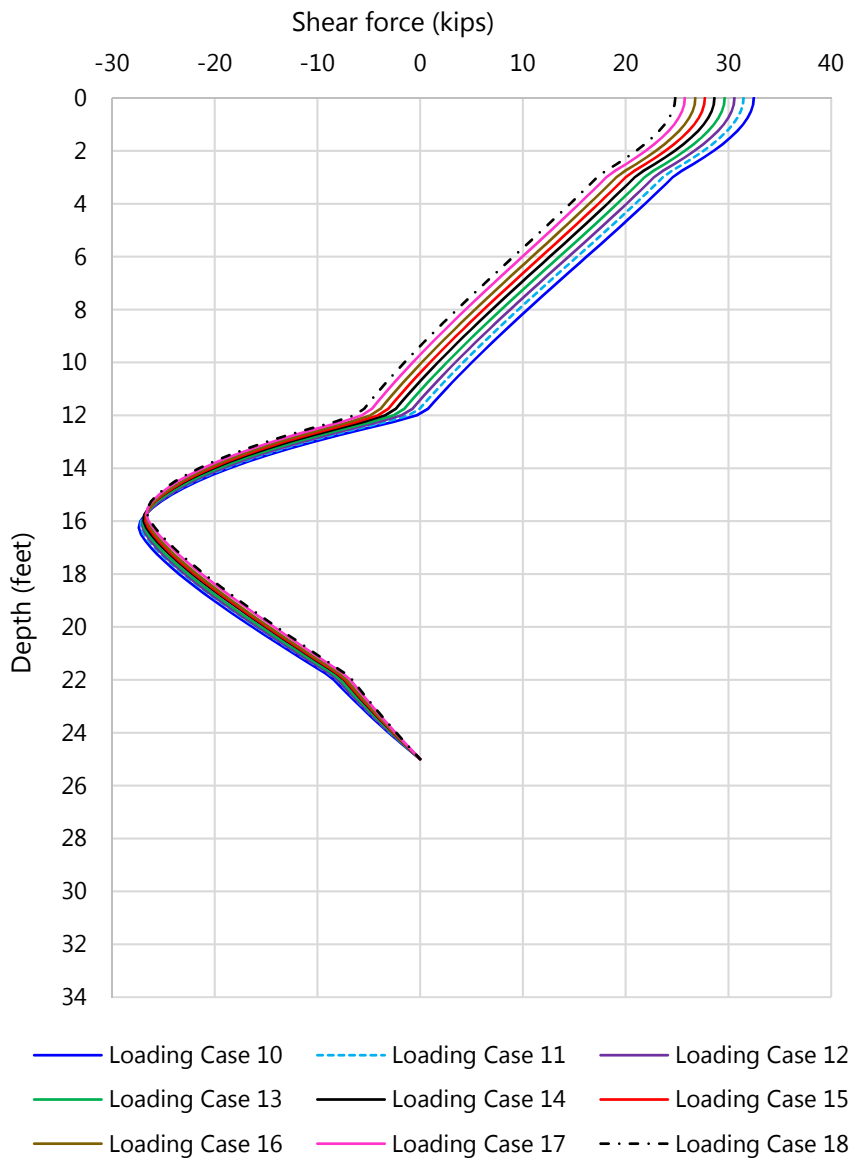
Diameter = 30 in, Length = 25 feet





Diameter = 30 in, Length = 25 feet

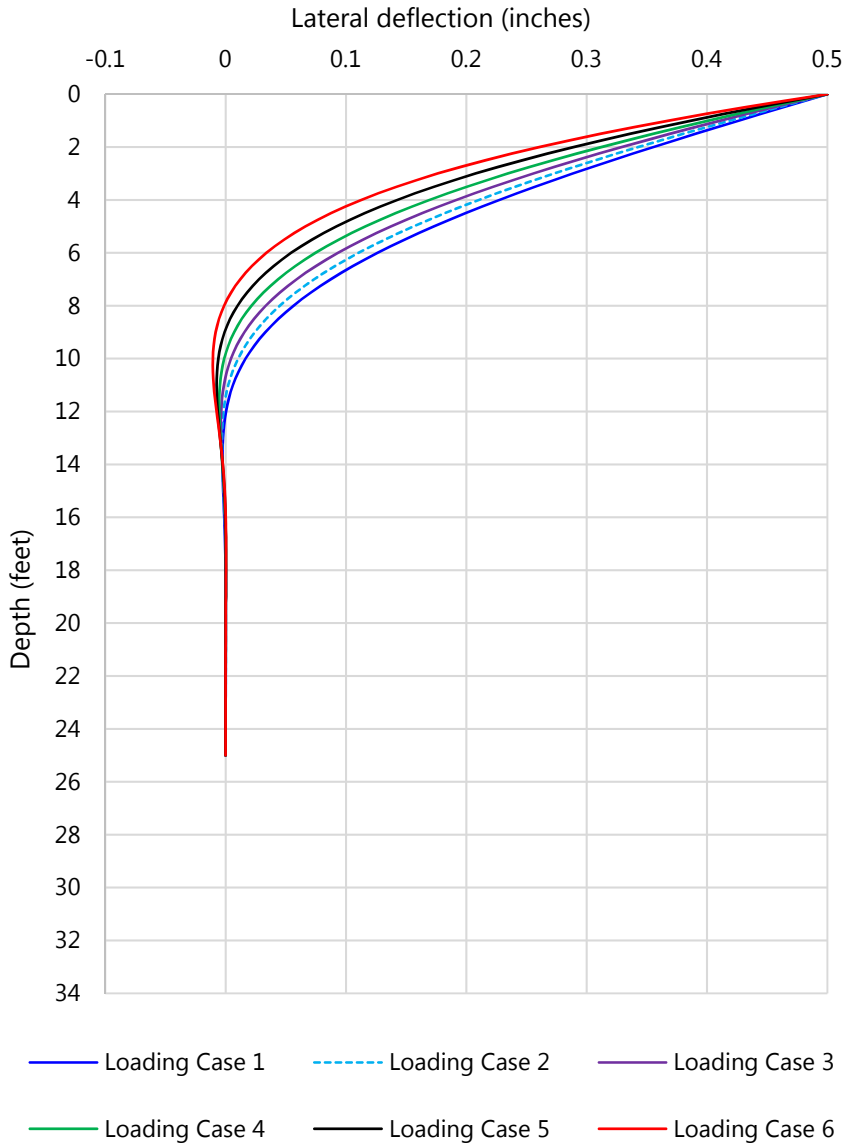


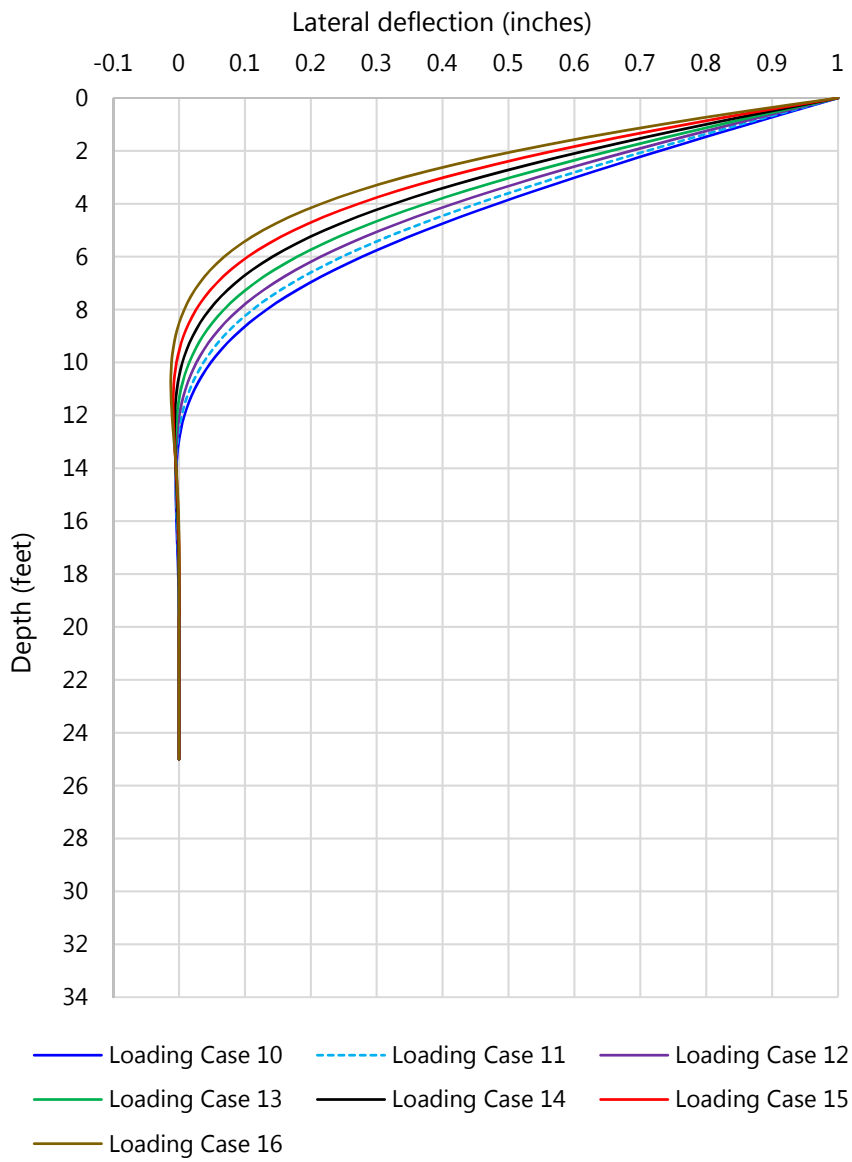


Diameter = 30 in, Length = 25 feet

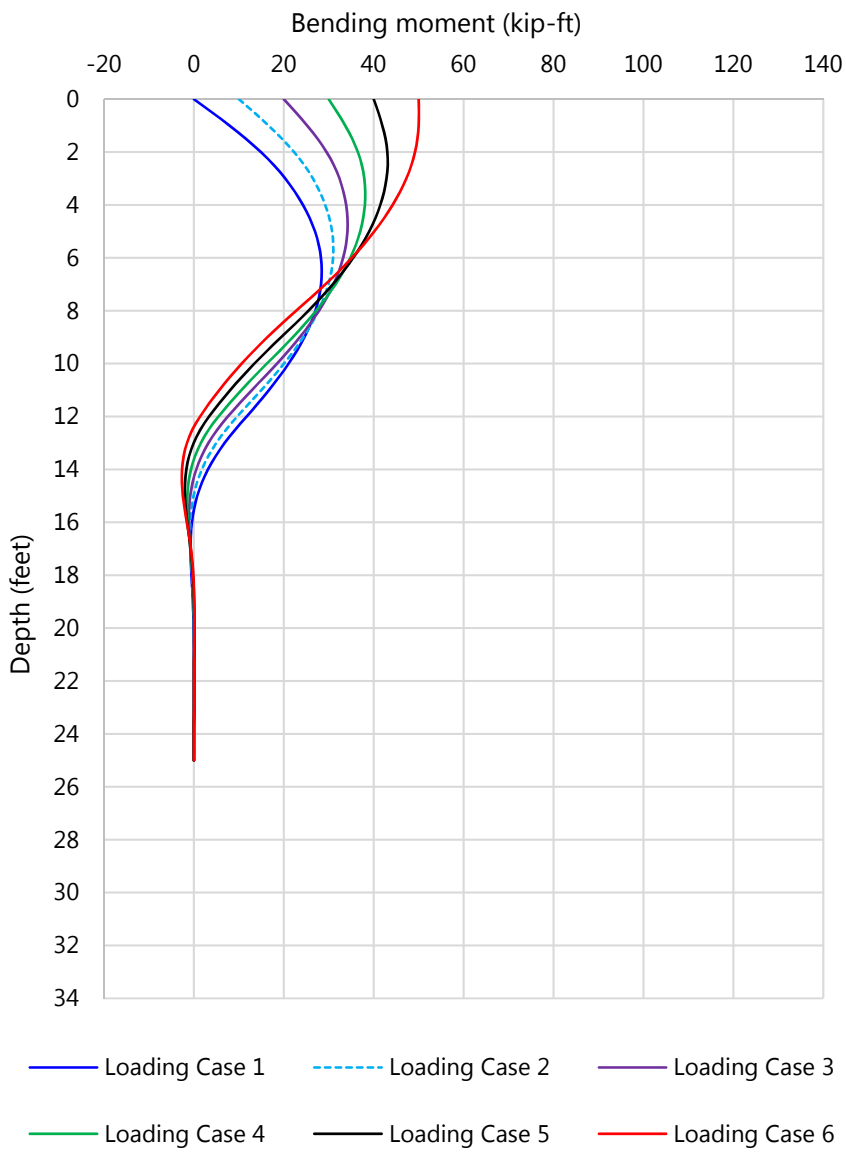
Appendix H

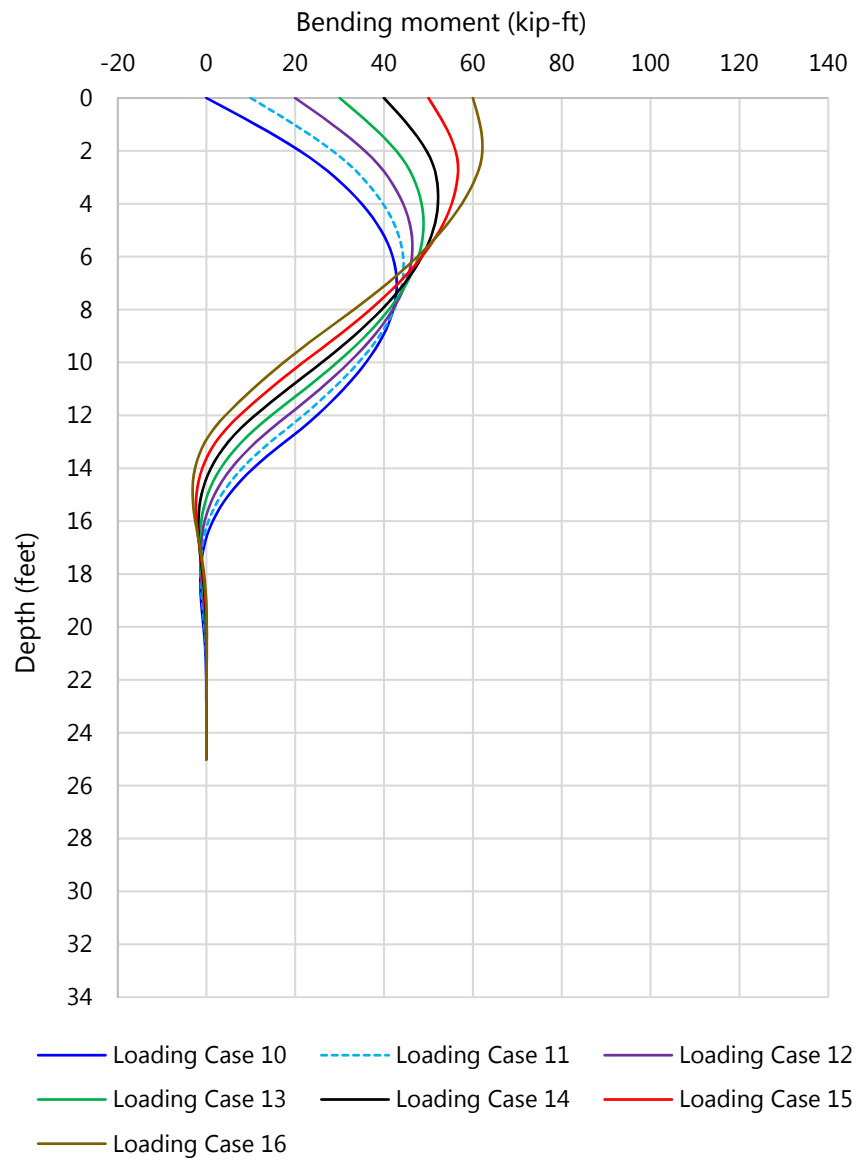
SPPC Piles Lateral Load Analysis Results



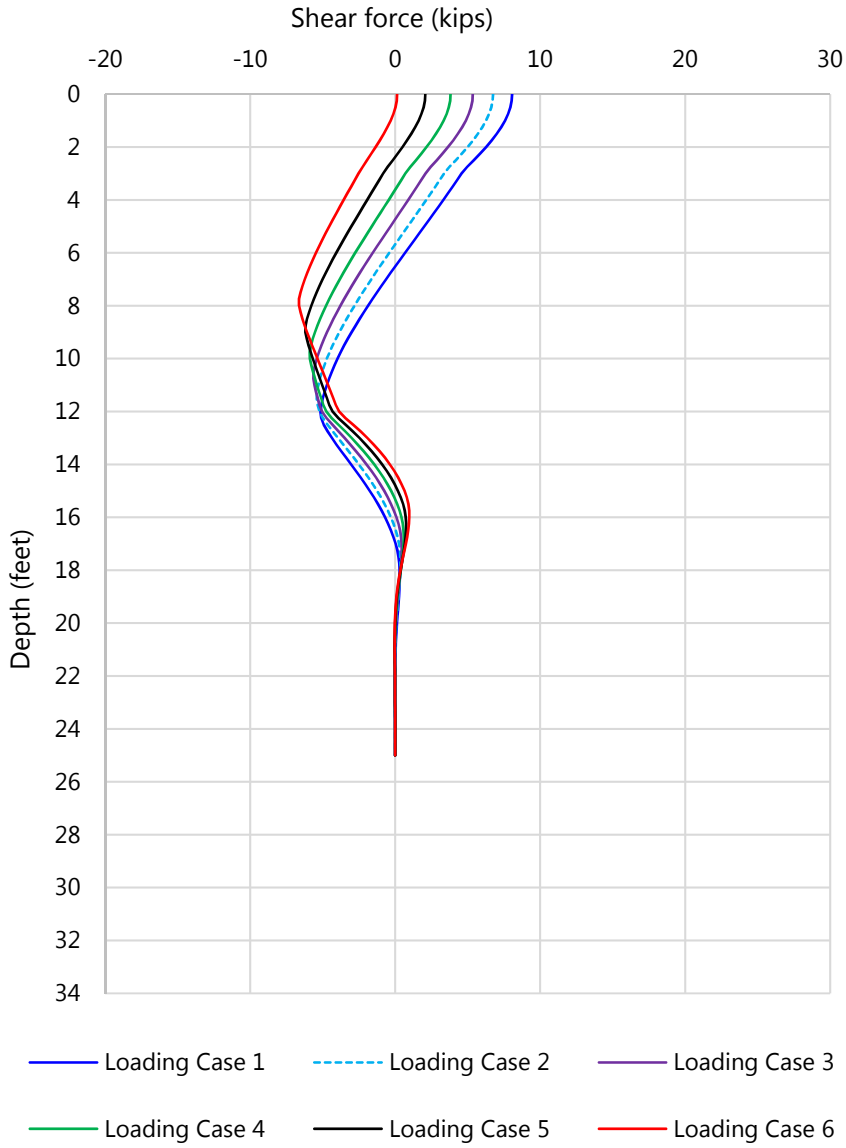


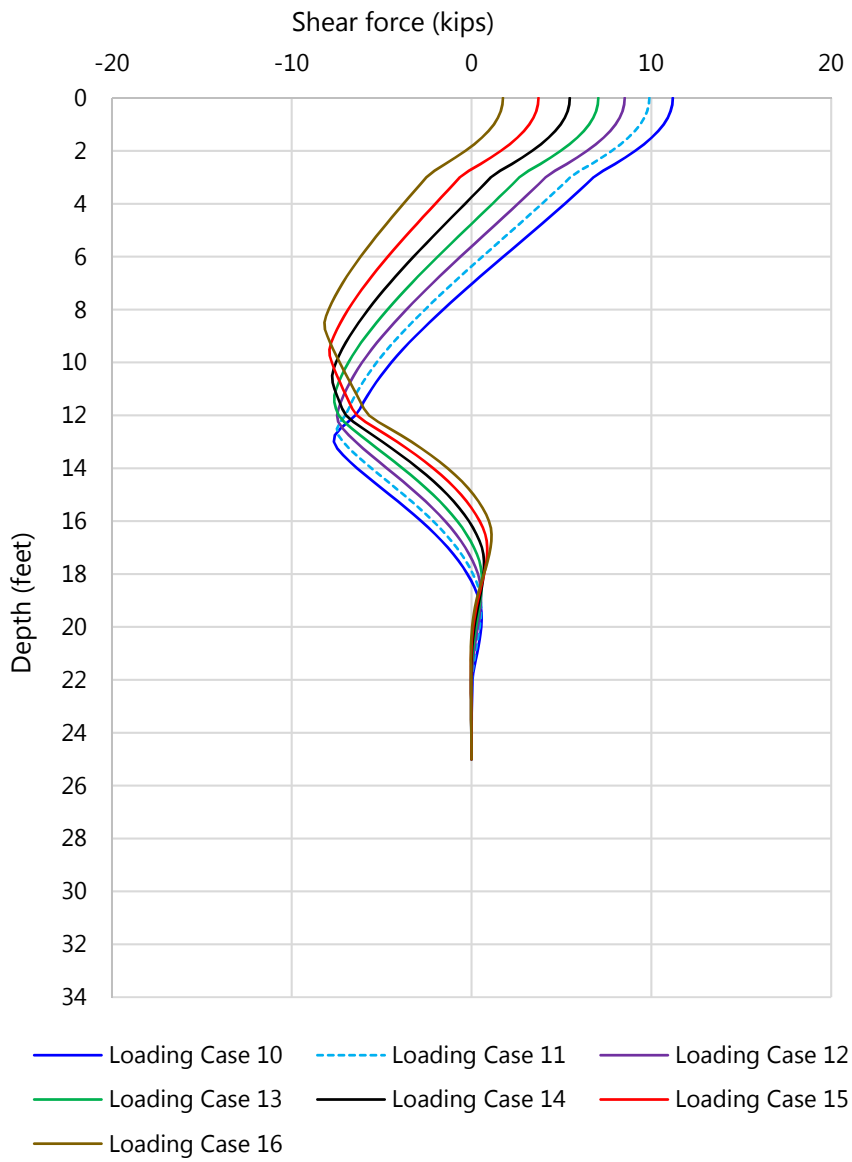
12-inch SPPC pile, Length = 25 feet



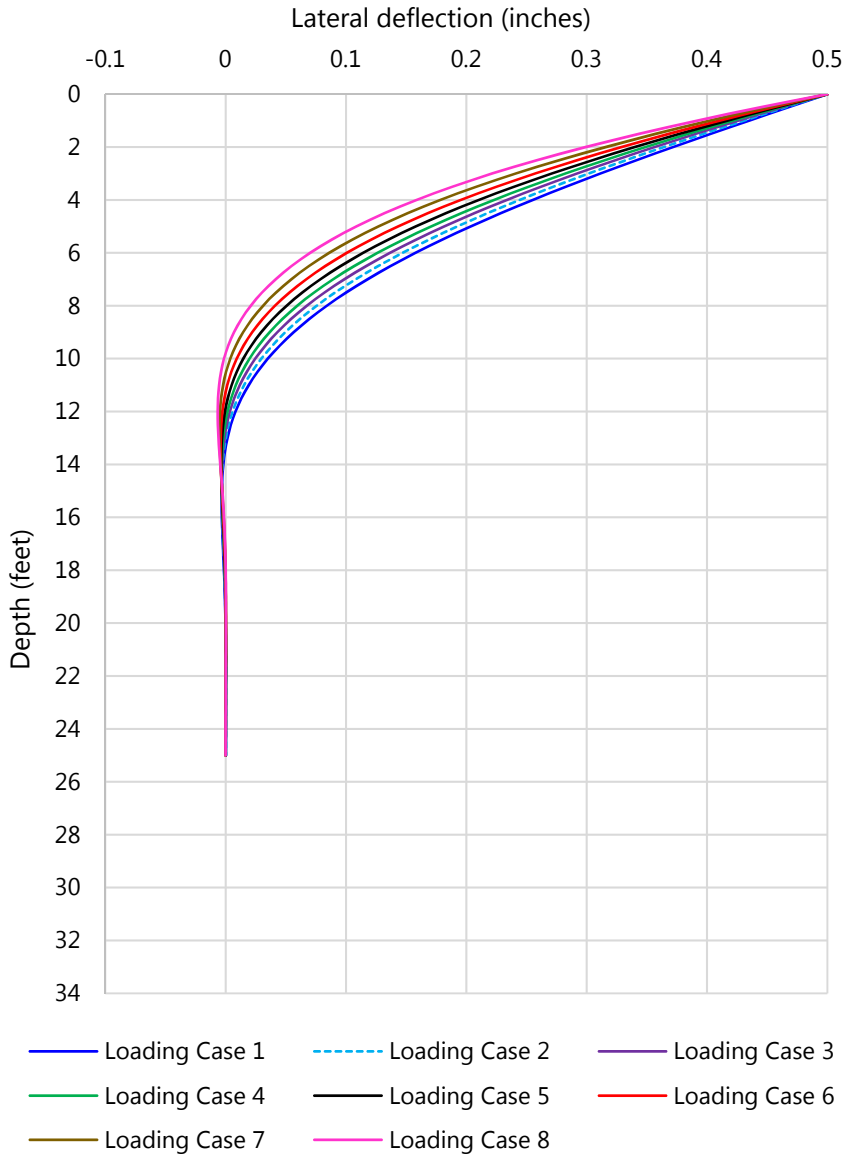


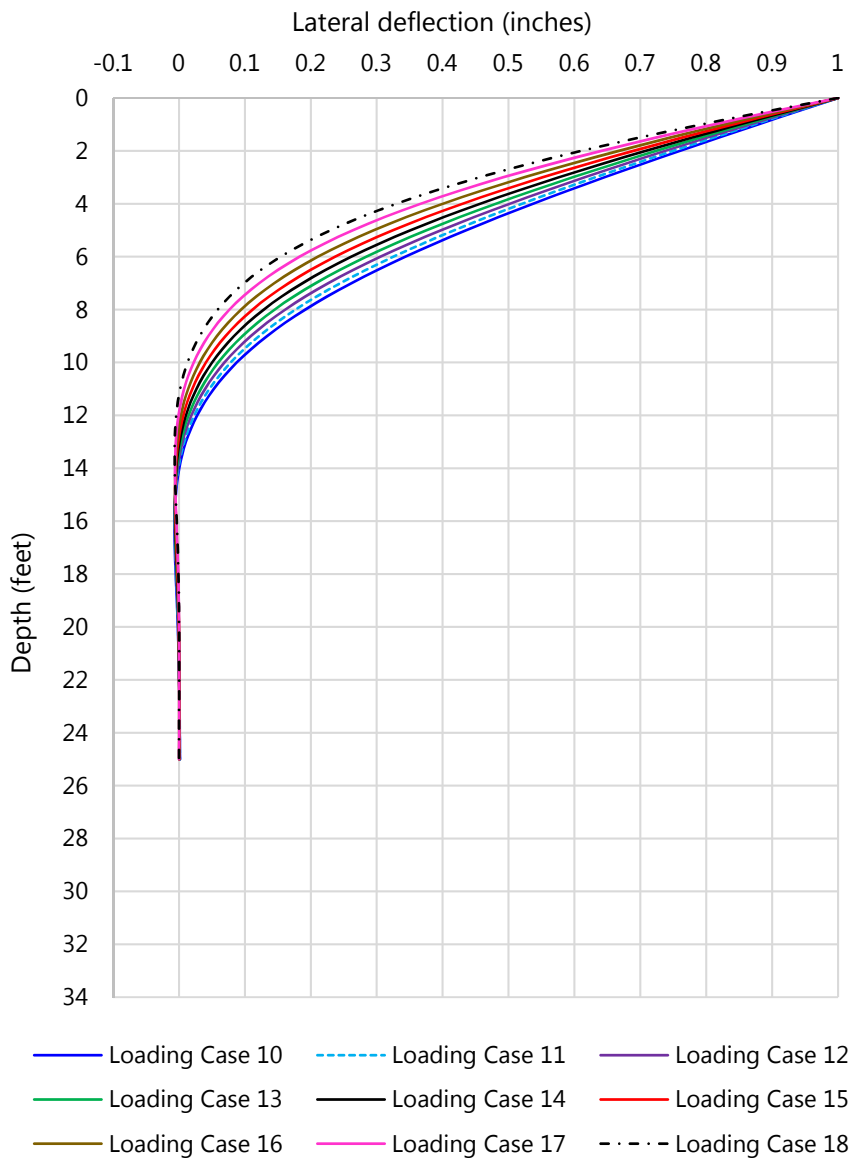
12-inch SPPC pile, Length = 25 feet



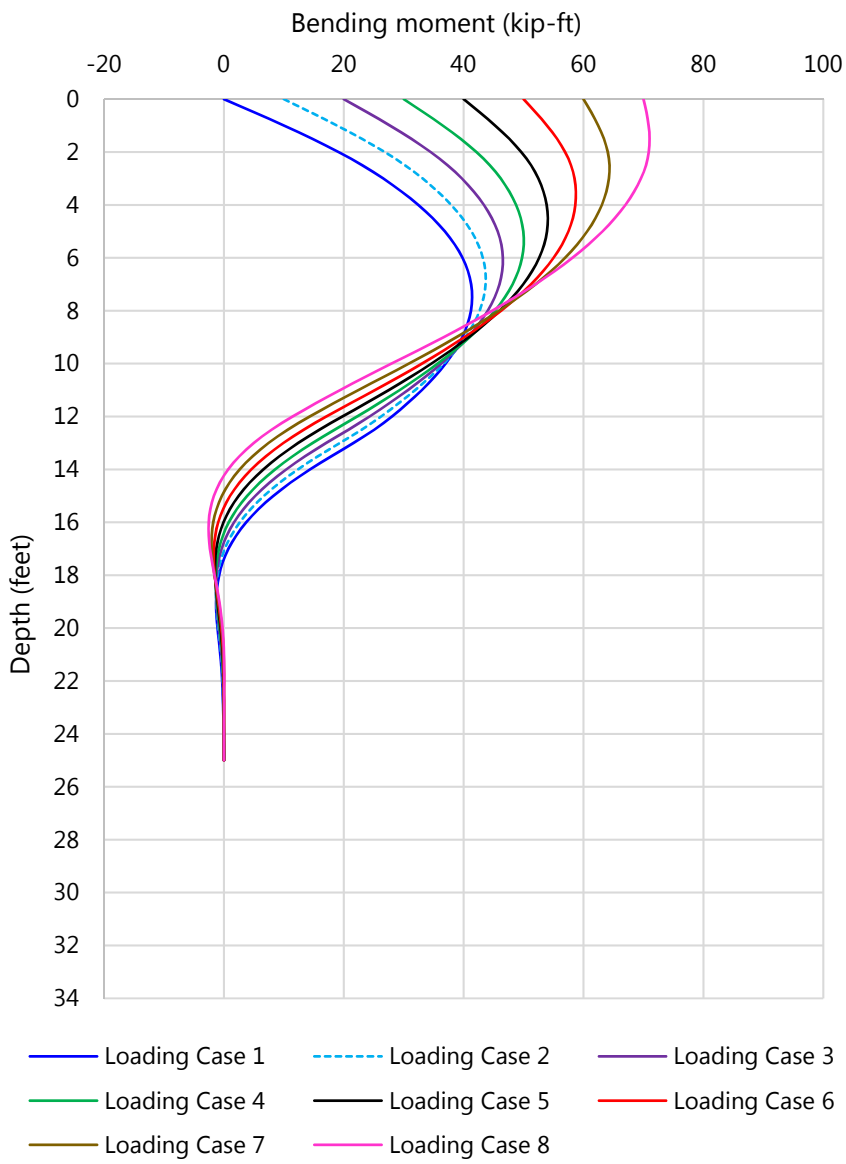


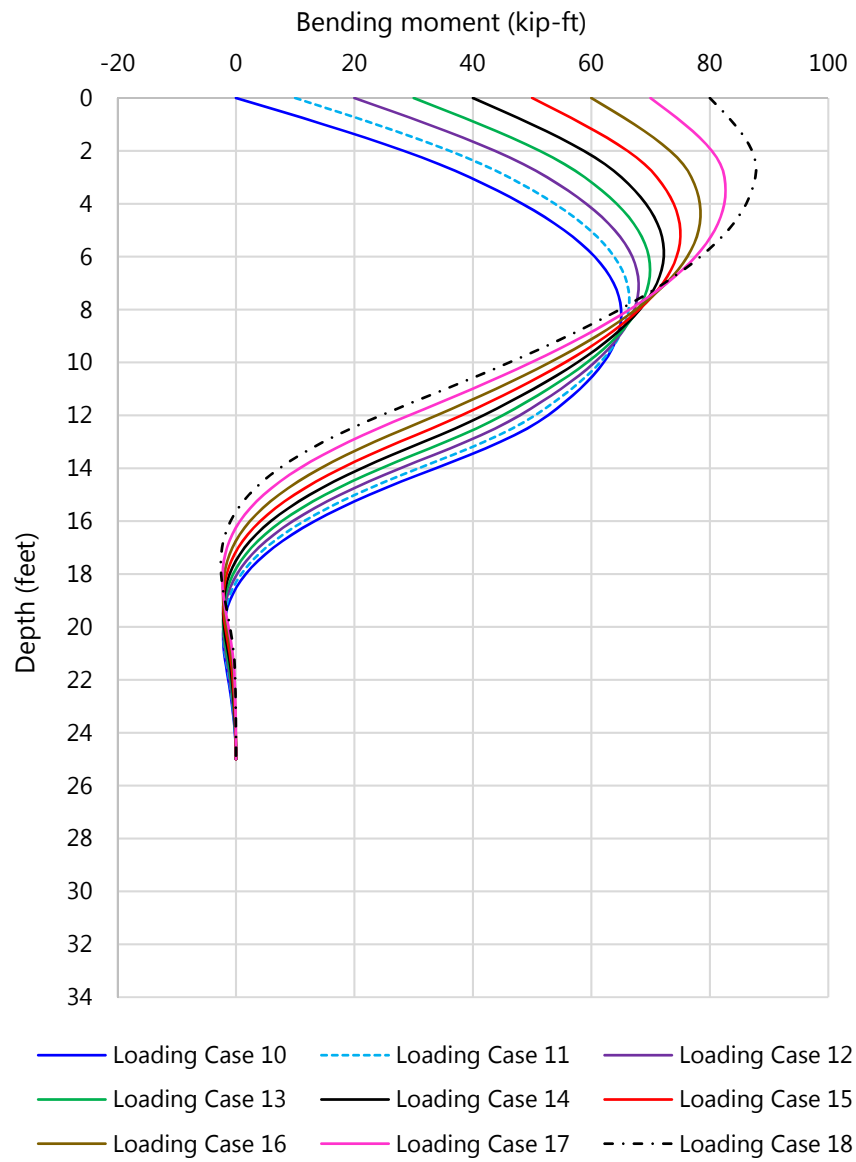
12-inch SPPC pile, Length = 25 feet



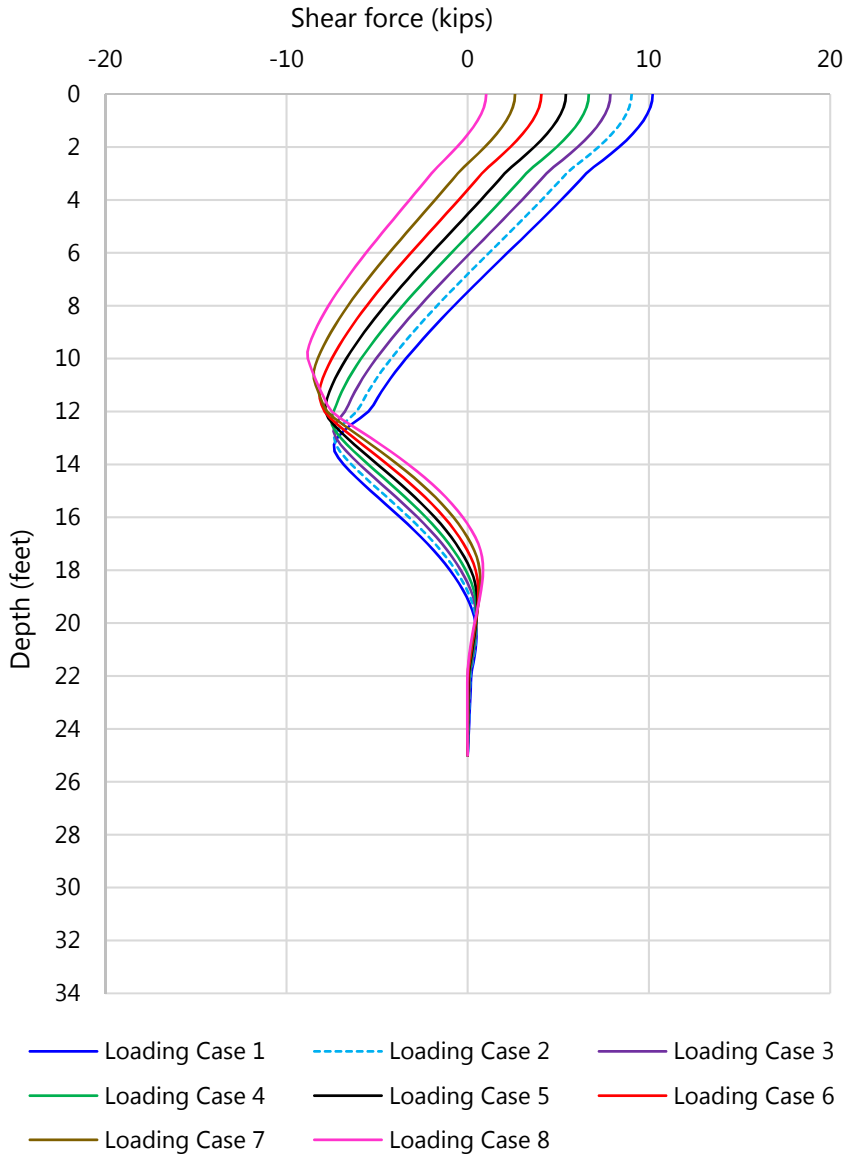


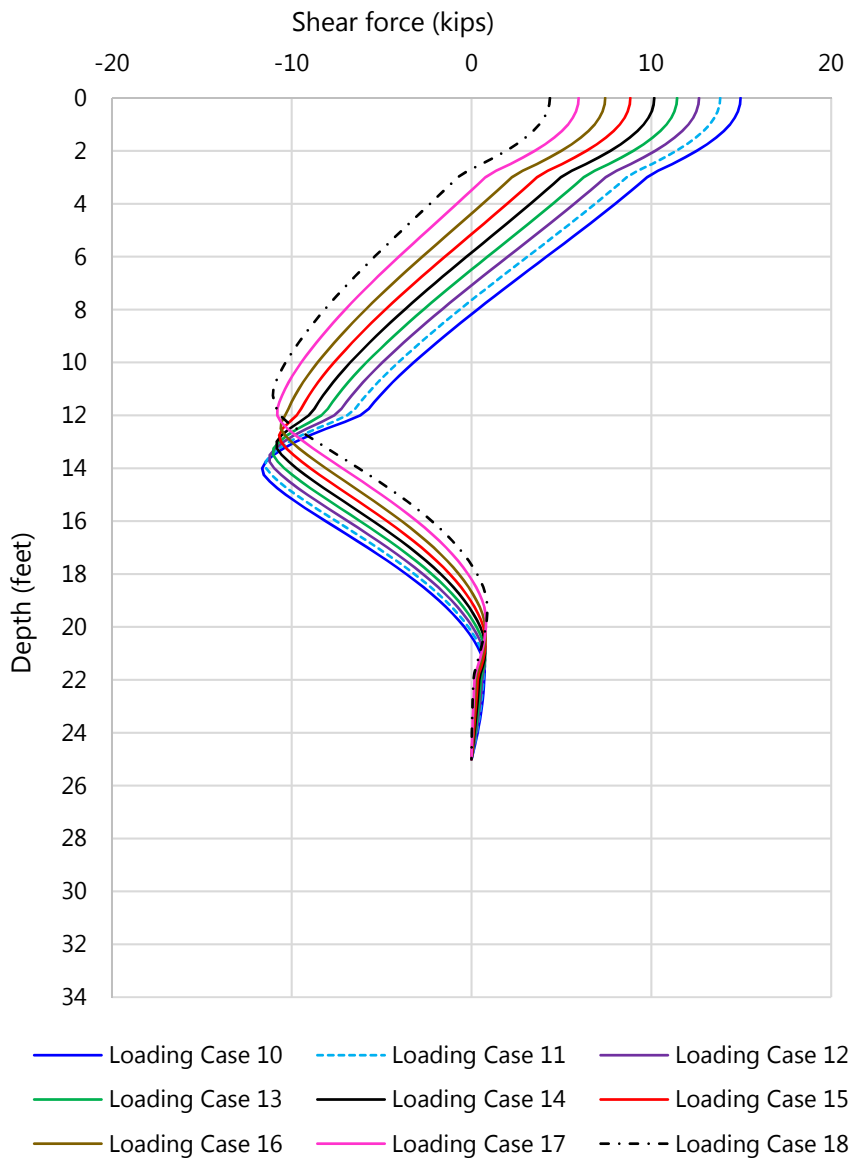
14-inch SPPC pile, Length = 25 feet





14-inch SPPC pile, Length = 25 feet





14-inch SPPC pile, Length = 25 feet