Geotechnical
Environmental
Hydrogeology
Material Testing
Construction Inspection

May 16, 2017 Project No. 16-6239

Xebec Realty Partners, LLC
3010 Old Ranch Parkway, Suite 470
Seal Beach, CA 92660

Attention: Jake Spring, Senior Acquisitions Analyst

Subject: Preliminary Geotechnical Investigation Report, Signal Hill Business Park, 20th Street and Walnut Avenue, Signal Hill, California

Jake,

In accordance with your request and authorization, TGR Geotechnical, Inc. (TGR) has performed a preliminary geotechnical investigation for the proposed development at the subject site in the City of Signal Hill, California. This report presents the findings of our geotechnical investigation, including site seismicity and liquefaction analysis and provides geotechnical design recommendations for the proposed improvements. The work was performed in general accordance with our proposal dated March 24, 2017.

Based on our investigation the proposed development is feasible from a geotechnical viewpoint provided the recommendations presented in this report are implemented during design and construction.

If you have any questions regarding this report, please do not hesitate to contact this office. We appreciate this opportunity to be of service.

Respectfully submitted,

TGR GEOTECHNICAL, INC.

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Sanjay Govil, PhD, PE, GE 2382
Principal Geotechnical Engineer

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Principal Engineering Geologist

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Attachments:

Figure 1 - Site Location Map
Figure 2 - Regional Geology Map
Figure 3 - Historically High Groundwater Map
Figure 4 - Regional Fault Map
Figure 5 - Seismic Hazard Zone Map
Figure 6 - Retaining Wall Detail

Plate 1 - Geotechnical Map

Appendix A – References
Appendix B – Log of Borings and CPTs by TGR and APEX
Appendix C – Laboratory Testing Procedures and Results
Appendix D – Liquefaction

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INTRODUCTION

Site Descriptions and Proposed Project Development

The subject site consists of two vacant undeveloped dirt covered parcels of land consisting of a total of 8.38 acres. The westernmost parcel is bounded by Walnut Avenue on the east, Gundry Avenue on the west, an apartment complex currently under construction on the north and a landscaped area running parallel with E. Wesley Avenue to the south. This parcel is currently bisected by East 21st Street. The easternmost parcel is bounded by Walnut Avenue on the west, Gaviota Avenue on the east, Alamitos Avenue on the south and American University of Health Services on the north. Both the east and west parcels have a southerly gradient with elevations ranging from 45 feet above mean seal level (msl) along the northern property boundary to approximately 22 feet above msl at the southeast corner of the site. The elevations on the eastern parcel range from 42 feet above msl along the northern property boundary to 23 feet above msl at the southern boundary of the site. A limited review of available historic aerial photos shows that from at least 2002 to 2013 there were soil stockpiles at various locations across both sites. In 1994, there were numerous large diameter storage tanks located on both parcels along with other structures that appear to be oil field related.

Based on our review of the conceptual site plan (GAA Architects, 2017), we understand that the proposed development of the site will consist of nine buildings ranging in size from 6,900 sq. ft. to 26,400 sq. ft. with associated parking, drive aisles, and trash enclosures.

Previous Studies

Prior to the preparation of our report, TGR was provided with boring and CPT logs completed by APEX. The borings and CPTs were completed as part of environmental studies for the subject site. The logs of borings and CPTs by APEX are presented in Appendix B and the locations of the borings and CPTs are shown on Plate 1. Findings these boring and CPT logs are as follows:

The borings, for the most part, were in the northern portion of the westernmost parcel (above 21st Street). The CPTs were in both the northern and southern portions of the westernmost parcel as well as the eastern parcel. The borings consisted of seven (7) 2.5-inch-diameter geoprobes advanced to depths of 32 to 40 feet below ground surface (bgs) and one (1) 8-inch diameter hollow stem auger boring advanced to a depth of 35 feet bgs. Twenty-one (21) CPTs were advanced to depths ranging from approximately 28 to 51 feet bgs.

The subsurface conditions encountered in the APEX borings generally consisted of a blanket of artificial fill ranging from one (1) to five (5) feet in depth which was encountered throughout the project site. Immediately underlying the artificial fill to depths ranging from 8 ½ to 14 feet silt and clayey silt was encountered. Below this and generally extending to the maximum depths explored, sand was encountered. Groundwater was encountered within the APEX borings at depths ranging from 24 to 40 feet bgs.

Scope of Work

The scope of work for this geotechnical investigation included the following:

- Site reconnaissance.

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- Review of readily available aerial photographs and previous work done for the site.
- Excavation of five (5) hollow stem auger borings to the approximate depths of 16.5 feet to 51.5 feet below the existing grade.
- Laboratory testing of selected samples for in-situ moisture density, maximum dry density and optimum moisture content, shear, consolidation, expansion potential, sulfates, corrosion, R-value, and sieve analysis.
- Analyses of data, including site seismicity, liquefaction study, seismic settlement, and foundation design for proposed improvements, and soils engineering/earthwork with respect to the suitability of the proposed development.
- Preparing this report summarizing current subsurface soil conditions, findings, and presenting our recommendations for the proposed development.

Field Investigation

Field exploration was performed on April 6, 2017 by a member from our firm who logged the borings and obtained representative samples, which were subsequently transported to the laboratory for further review and testing. The approximate locations of the borings are indicated on the enclosed Boring Location Map (Plate 1).

The subsurface conditions were explored by drilling, sampling, and logging five borings with a truck mounted hollow stem drill rig. Borings B-1 and B-5 were advanced to an approximate depth of 16.5 feet below existing grade, boring B-2 was advanced to an approximate depth of 26.5 feet below existing grade, and borings B-3 and B-4 were advanced to a depth of 51.5 feet below existing grade. Subsequent to drilling, all borings were backfilled with bentonite and the cuttings drummed for disposal by others. The logs of borings presenting soil conditions and descriptions are given in Appendix B.

The drill rig was equipped with a sampling apparatus to allow for recovery of driven modified California Ring Sampler (CRS), 3-inch outside diameter, and 2.42-inch inside diameter and SPT samples. Driven samples and bulk samples of the earth materials encountered at selected intervals were recovered from the borings.

The samples were driven using an automatic 140-pound hammer falling freely from a height of 30 inches. The blow counts for CRS were converted to equivalent SPT blow count. Soil descriptions were entered on the logs in general accordance with the Unified Soil Classification System (USCS). The locations and depths of the soil samples recovered are indicated on the logs in Appendix B.

Laboratory Testing

Laboratory tests were performed on representative samples to verify the field classification of the recovered samples and to evaluate the geotechnical properties of the subsurface soils. The following tests were performed:

- In-situ moisture content (ASTM D2216) and dry density (ASTM D7263);
- Maximum Dry Density and Optimum Moisture Content (ASTM D1557);
- Corrosion series:
    1. Soluble Sulfate (CAL.417A);
    2. Soluble Chlorides (CAL.422);

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3. Minimum Resistivity (CAL.643); and
4. pH.

- Consolidation (ASTM D2435);
- Direct Shear Strength (ASTM D3080);
- Expansion Potential (ASTM D4829);
- R-Value (CAL 301); and
- Sieve Analysis (ASTM D6913).

Laboratory tests for geotechnical characteristics were performed in general accordance with the ASTM procedures. The results of the in-situ moisture content and density tests are shown on the borings logs (Appendix B). The results of the laboratory tests are presented in Appendix C.

GEOTECHNICAL FINDINGS

Geology

Regional Geologic Setting

The project site is located in the southwest portion of the Long Beach 7.5-minute Quadrangle, Los Angeles County, California. Per the Geologic Map of the Long Beach 30'x60' Quadrangle, Los Angeles County, California (CGS, 2010), the subject site is underlain by Quaternary alluvial deposits comprised of layers of gravel, sand and silt. Figure 2 presents the Regional Geology Map.

Earth Units

Based on our subsurface investigation and a review of the borings by APEX, the subject area is underlain by a thin mantle of fill overlying Quaternary age alluvial deposits. The undocumented fill, which varies in thickness from 1 to 5 feet, consisted of sandy silt with scattered gravels. The undocumented fill is not considered suitable for support of the proposed structures. Based on verbal conversations with APEX, some oversize material (cobble to boulder size) was encountered during their field exploration in the southern portion of the western parcel. Based on a photo provided to us, the oversize material appears to be concrete. Given the history of the site and the observation of previous stockpiled material at the site as part of our limited aerial photo review, oversize material may be encountered during grading. While the amount of oversize material at the site is anticipated to be minor, its presence should be noted and accounted for. The underlying alluvium was present to the maximum depth explored of 51.5 feet below the existing grade. Generally, the alluvium consisted of silt and clayey silt in the upper 10 to 15 feet. Below this depth, the soils generally consisted of fine to medium grained sand with some clay and silt layers to the total depth explored of 51.5 feet below grade. Detailed descriptions of the earth units encountered in our borings are presented in the log of the borings.

Groundwater

Subsurface water was encountered during the exploration at 25 to 29 feet below existing ground surface. Based on our review of available historical groundwater information (CDMG, 1998) regional groundwater has been mapped in the general site area at approximately 15 feet below site grade (Figure 3). Seasonal and long-term fluctuations in the groundwater may occur as a result of variations in subsurface conditions, rainfall, run-off conditions and other factors.

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Therefore, variations from our observations may occur. Static groundwater is not anticipated to impact the proposed development.

Seismic Review

Faulting and Seismicity

The subject site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto and Elsinore fault zones. These fault systems produce approximately 5 to 35 millimeters per year of slip between the plates.

By definition of the State Mining and Geology Board, an active fault is one which has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). The State Mining and Geology Board has defined a potentially active fault as any fault which has been active during the Quaternary Period (approximately the last 1,600,000 years). These definitions are used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Geologic Hazard Zones Act of 1972 and as subsequently revised in 1994 (Hart, 1997) as the Alquist-Priolo Geologic Hazard Zoning Act and Earthquake Fault Zones.

These active and potentially active faults are capable of producing potentially damaging seismic shaking at the site. It is anticipated that the subject site will periodically experience ground acceleration as the result of small to moderate magnitude earthquakes. Other active faults without surface expression (blind faults) or other potentially active seismic sources that are not currently zoned and may be capable of generating an earthquake are known to be present under the region.

Based on our review of the referenced geologic maps, as well as our field reconnaissance, the subject site is not included within any Earthquake Fault Zones as created by the Alquist-Priolo Earthquake Fault Zoning Act (Hart, 1997). Our review of geologic literature pertaining to the site area indicates that there are no known active or potentially active faults located within or immediately adjacent to the subject property. The nearest fault to the subject site is the Newport Inglewood Fault, mapped approximately 0.25 miles northeast of the subject site. Other faults nearby include the Los Alamitos Fault mapped 3.6 miles northeast, the THUMS-Huntington Beach Fault mapped approximately 4.9 miles southwest, and the Palos Verdes Fault Zone mapped approximately 6.6 miles southwest of the site. Regional Fault Map (Figure 4) presents the location of the site with respect to the regional faults.

Secondary Seismic Hazards

Surface Fault Rupture and Ground Shaking

Since no known faults are located within the site, surface fault rupture is not anticipated. However, due to the proximity of known active and potentially active faults, severe ground shaking should be expected during the life of the proposed structures.

Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, fine-grained granular soils behave similarly to a fluid when subjected to high-intensity ground shaking. Liquefaction occurs

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when these ground conditions exist: 1) Shallow groundwater; 2) Low density, fine, clean sandy soils; and 3) High-intensity ground motion. Effects of liquefaction can include sand boils, settlement, and bearing capacity failures below foundations.

A review of the Seismic Hazard Zone Map, Long Beach Quadrangle indicates that a portion of the project site is located in an area identified as having a potential for soil liquefaction (see Figure 5). Published historic high groundwater at this site is approximately 15 feet (Seismic Hazard Zone Report 028, 1998). Groundwater was encountered in borings B-3 and B-4 at depths of 25 and 29 feet, respectively. Liquefaction analysis was performed on the subsurface profile represented by borings B-3 and B-4. The analysis utilized a peak ground acceleration of 0.629g (peak ground acceleration for 2% probability of exceedance in 50 years) and a moment magnitude of 7.1. A historic high groundwater of 15 feet below existing grade was utilized in the calculations. The subsurface soils generally have a negligible potential for liquefaction. The total seismic settlement is estimated to be 0.0 to 0.2 inches. Details of calculations are presented in Appendix D.

Seismically Induced Settlement

Ground accelerations generated from a seismic event can produce settlements in sands or in granular earth materials both above and below the groundwater table. This phenomenon is often referred to as seismic settlement and is most common in relatively clean sands, although it can also occur in other soil materials. The total seismic settlement for the above subject site is anticipated to range from 0.0 inches to 0.20 inches. The differential seismic settlement is estimated to be negligible.

Lateral Spreading

Seismically induced lateral spreading involves primarily movement of earth materials due to earth shaking. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The topography in the vicinity of the subject site is relatively flat. Therefore, the potential for lateral spreading at the subject site is considered very low.

DISCUSSIONS AND CONCLUSIONS

General

Based on our field exploration, laboratory testing and engineering analysis, it is our opinion that the proposed structures will be safe against hazard from landslide, settlement, or slippage and the proposed construction will have no adverse effect on the geologic stability of the adjacent properties provided our recommendations presented in this report are followed.

Conclusions

Based on our findings and analyses, the subject site is likely to be subjected to moderate to severe ground shaking due to the proximity of known active and potentially active faults. This may reasonably be expected during the life of the structures and should be designed accordingly.

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The engineering evaluation performed concerning site preparation and the recommendations presented are based on information provided to us and obtained by us during our office and fieldwork. This report is prepared for the development of the nine industrial buildings between 6,900 and 24,600 square feet and associated parking lots, drive aisles, and trash enclosures at the subject property. In the event that any significant changes are made to the proposed development, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the recommendations of this report are verified or modified in writing by TGR.

RECOMMENDATIONS

Seismic Design Parameters

When reviewing the 2016 California Building Code the following data should be incorporated into the design.

Latitude (degree)	33.7956
Longitude (degree)	-118.1727
Site Class	D
Site Coefficient, F_a	1.0
Site Coefficient, F_v	1.5
Mapped Spectral Acceleration at 0.2-sec Period, S_s	1.631 g
Mapped Spectral Acceleration at 1.0-sec Period, S_1	0.611 g
Spectral Acceleration at 0.2-sec Period Adjusted for Site Class, S_{MS}	1.631 g
Spectral Acceleration at 1.0-sec Period Adjusted for Site Class, S_{M1}	0.916 g
Design Spectral Acceleration at 0.2-sec Period, S_{DS}	1.087 g
Design Spectral Acceleration at 1.0-sec Period, S_{D1}	0.611 g

The structural consultant should review the above parameters and the 2016 California Building Code to evaluate the seismic design.

Conformance to the criteria presented in the above table for seismic design does not constitute any type of guarantee or assurance that significant structural damage or ground failure will not occur during a large earthquake event. The intent of the code is “life safety” and not to completely prevent damage of the structure, since such design may be economically prohibitive.

Foundation Design Recommendations

The proposed buildings may be supported on continuous and/or spread footings. Bearing capacity recommendations for shallow foundations are presented below. These recommendations assume that the footings will be supported on a minimum of three (3) feet or half the width of the footing (whichever is greater) of engineered fill. Existing undocumented fill is considered unsuitable for the support of structures and shall be removed prior to the placement of engineered fill.

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For foundations supported on three (3) feet or half the width of the footing (whichever is greater) of engineered fill with minimum ninety (90) percent relative compaction, an allowable bearing pressure of 2000 pounds per square foot may be used in design.

All shallow foundations should extend a minimum of twenty-four (24) inches below the lowest adjacent grade. The minimum recommended footing width is fifteen (15) inches for continuous footing and twenty-four (24) inches for pad footing. A minimum reinforcement of two (2) No. 4 steel bar top and bottom is required for continuous footings from a geotechnical viewpoint.

A one-third (1/3) increase on the aforementioned bearing pressure may be used in design for short-term wind or seismic loads.

Total settlement is estimated to not exceed 1.0 inches and the differential settlement is estimated as 0.50 inches over 30 feet or less.

Resistance to lateral loads including wind and seismic forces may be provided by frictional resistance between the bottom of concrete and the underlying fill soils and by passive pressure against the sides of the foundations. A coefficient of friction of 0.35 may be used between concrete foundation and underlying soil. The recommended passive pressure of the engineered fill may be taken as an equivalent fluid pressure of 250 pounds per cubic foot (2,500 psf max).

Retaining Walls

The following soil parameters may be used for the design of retaining walls with level backfill and a maximum height of ten (10) feet. Retaining walls may be supported on continuous footings with a minimum width of 18 inches and minimum embedment of 24 inches below lowest adjacent grade.

Conditions	Equivalent Fluid Pressure (psf/ft)
Active (level)	45
Active (2:1)	66
Passive	250 (maximum 2500 psf)

- The retaining wall may be designed for a seismic uniform lateral load of $18H^2$ pounds. The seismic load shall be applied at a distance of 0.6H above the base of the wall.
- A coefficient of friction of 0.35 may be used between concrete foundation and underlying soil.
- All footings should meet the setback requirements presented in 2016 CBC.
- The retaining wall should be provided with a drainage system (Miradrain or equivalent) to prevent buildup of hydrostatic pressure behind the walls. We do not recommend omitting the drains behind walls.

In addition to the above lateral forces due to retained earth, surcharge due to improvements, such as an adjacent structure, should be considered in the design of retaining walls. Loads applied within a 1:1 projection from the surcharging structure on the stem of the wall shall be considered as lateral surcharge. For lateral surcharge conditions, we recommend utilizing a

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horizontal load equal to 50 percent of the vertical load, as a minimum. This horizontal load should be applied below the 1:1 projection plane. To minimize the surcharge load from an adjacent footing, deepened footings may be considered.

Cement Type and Corrosion

Concrete used should be designed in accordance with the provisions of ACI 318-11, Chapter 4 for Exposure Class S0.

Corrosion tests indicate strong corrosion potential for ferrous metals exposed to site soils.

TGR does not practice corrosion engineering. If needed, a qualified specialist should review the site conditions and evaluate the corrosion potential of the site soil to the proposed improvements and to provide the appropriate corrosion mitigations for the project.

Expansive Soil

Expansion index testing performed indicates that the materials underlying the site are considered to have a “very low” expansion potential (EI=10).

Shrinkage/Subsidence

Removal and recompaction of the near surface soils is estimated to result in shrinkage ranging from 10 to 15 percent. Minor ground subsidence is expected to occur in the soils below the zone of removal, due to settlement and machinery working. The subsidence is estimated to be between one and two tenths of a foot.

Slab-On-Grade

Slab-on-grade should be a minimum of 5-inches thick and reinforced with a minimum of No. 4 reinforcing bar on 18-inch centers in two horizontally perpendicular directions. Reinforcing should be properly supported to ensure placement near the vertical midpoint of the slab. "Hooking" of the reinforcement is not considered an acceptable method of positioning the steel. The slab should not be structurally connected to the buildings. The subgrade material should be compacted to a minimum of 90 percent of the maximum laboratory dry density (ASTM 1557) to a minimum depth of three (3) feet. Prior to placement of concrete, the subgrade soils should be well moistened to at least optimum moisture content and verified by our field representative. The actual thickness and reinforcement of the slab shall be designed by the structural engineer and should include the anticipated loading condition (fork lift, etc.) and the anticipated use of the building. Areas requiring moisture sensitive flooring shall be underlain by a minimum 10-mil visqueen overlain and underlain by 2-inches clean moist sand.

Flatwork

Flatwork should be a minimum of 4-inches thick should be reinforced with a minimum of No. 3 reinforcing bar on 24-inch centers in two horizontally perpendicular directions. Reinforcing should be properly supported to ensure placement near the vertical midpoint of the slab. "Hooking" of the reinforcement is not considered an acceptable method of positioning the steel. The subgrade material should be compacted to a minimum of 90 percent of the maximum laboratory dry density (ASTM 1557) to a minimum depth of two (2) feet. Prior to placement of concrete, the subgrade soils should be well moistened to at least optimum moisture content and

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verified by our field representative. The actual thickness and reinforcement of the slab shall be designed by the structural engineer and should include the anticipated loading condition. Due to the presence of near surface compressible soils, some movement of the flatwork is anticipated.

Site Development Recommendations

General

During earthwork construction, all site preparation and the general procedures of the contractor should be observed, and the fill selectively tested by a representative of TGR. If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and if warranted, modified and/or additional recommendations will be offered. During site work, voids created from removal of buried elements (footings, pipelines, etc) shall be backfilled with engineered fill (min 90% relative compaction per ASTM D1557) under the observation of TGR.

Grading

All grading should conform to the guidelines presented in the California Building Code (2016 edition), except where specifically superseded in the text of this report. Prior to grading, TGR's representative should be present at the pre-construction meeting to provide grading guidelines, if needed, and review any earthwork. All uncertified fill within the building footprint and 5 feet outside laterally should be removed and replaced with engineered fill. Based on our review of information provided by APEX, it is our understanding that a portion of the onsite soils have environmental contamination that would require export and proper disposal of excavated soils. Due to the required removal of soil, export should be expected, and import of approved soil may be required to achieve design grades.

To support the foundation a minimum three (3) feet or half the width of the footing (whichever is greater) of approved engineered fill should be placed under the footings. A minimum of three (3) feet of engineered fill is recommended under slab-on-grade, and a minimum of two (2) feet of engineered fill is recommended under flatwork and pavement. Site soils could be reused as engineered fill provided there are no environmental concerns with the soil and the recommendations presented in this report are implemented. Exposed bottoms should be scarified a minimum of 6-inches, moisture conditioned and compacted to a minimum 90 percent relative compaction. Subsequently, site fill soils should be re-compacted to a minimum of ninety (90) percent relative compaction at a minimum of optimum moisture content. The lateral extent of removals beyond the building/structure/footing limits should be equal to at least the depth of fill or 5 feet, whichever is greater.

The depth of over-excavation should be reviewed by the Geotechnical Consultant during the actual construction. Any subsurface obstruction buried structural elements, and unsuitable material encountered during grading, should be immediately brought to the attention of the Geotechnical Consultant for proper exposure, removal and processing, as recommended.

Fill Placement

Prior to any fill placement, TGR should observe the exposed surface soils. The site soils may be re-used as engineered fill provided they comply with environmental regulations and are free of organic content and particle size greater than 4-inches. Fill shall be moisture-conditioned to a minimum of optimum moisture content and compacted to a minimum relative compaction of 90

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percent in accordance with ASTM D1557. Any import soils shall be non-expansive and approved by TGR Geotechnical Inc.

Compaction

Prior to fill placement, the exposed surface should be scarified to a minimum depth of six (6) inches, fill placed in six (6) inch thick loose lifts if cohesionless and eight (8) inch thick loose lifts if cohesive fill, moisture conditioned to near optimum for cohesionless soils or a minimum of two (2) percent over optimum moisture for cohesive soils, and compacted to a minimum relative compaction of ninety (90) percent in accordance with ASTM D 1557.

Trenching

All excavations should conform to CAL-OSHA and local safety codes.

Drainage

Positive site drainage should be maintained at all times. Water should be directed away from foundations and not allowed to pond and/or seep into the ground. Pad drainage should be directed towards street/parking or other approved area.

Utility Trench Backfill

All utility trench backfill in structural areas and beneath hardscape features should be brought to near-optimum moisture content and compacted to a minimum relative compaction of 90 percent of the laboratory standard. Flooding/jetting is not recommended.

Sand backfill, (unless trench excavation material), should not be allowed in parallel exterior trenches adjacent to and within an area extending below a 1:1 plane projected from the outside bottom edge of the footing. All trench excavations should minimally conform to CAL-OSHA and local safety codes. Soils generated from utility trench excavations may be used provided it is moisture conditioned and compacted to 90 percent minimum relative compaction.

Percolation Testing

The upper 10 to 15 feet of the onsite soils consisted of silts and clayey silts where explored. The historic high groundwater for the general site area is approximately 15 feet below ground surface. Furthermore, the onsite soils had a moderate to strong hydrocarbon odor. Based on the above, percolation testing was not performed at the subject site.

Preliminary Pavement Design

The Caltrans method of design was utilized to develop the following asphalt pavement section. The section was developed based on a tested “R-Value” for site subgrade soils.

Traffic indices of 4.5, 5, 6, and 7 were assumed for use in the evaluation of automobile parking stalls and driveways, and medium and heavy truck driveways, respectively. The traffic indices are subject to approval by controlling authorities and shall be approved by the project civil engineer.

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ASPHALT PAVEMENT SECTION					PCC PAVEMENT SECTION		
Pavement Utilization	Traffic Index	Asphalt (Inch)	Aggregate Base (Inch)	Total (Inch)	PCC	Aggregate Base (Inch)	Total (Inch)
Parking Stalls	4.5	3.0	4.0	7.0	--	--	--
Auto Driveways	5.0	3.0	6.0	9.0	--	--	--
Truck Aisles/ Driveways	6.0	4.0	6.0	10.0	**7	-	7
Loading Dock	7.0	4.0	8.0	12.0	**7	-	7

**Minimum concrete compressive strength of 4,000 psi.

Aggregate base material should consist of CAB/CMB complying with the specifications in Section 200.2.2 of the current "Standard Specifications for Public Works Construction" and should be compacted to at least ninety-five (95) percent of the maximum dry density (ASTM D1557). The surface of the aggregate base should exhibit a firm and unyielding condition just prior to the placement of asphalt concrete paving.

The pavement subgrade should be constructed in accordance with the recommendations presented in the grading section of this report.

The PCC pavement should be minimally reinforced with #4 bars at 24-inches on center in two perpendicular directions or a minimum 7 pounds per cubic yard of Fibermesh 650 (or equivalent). The maximum joint spacing shall be 10 feet on center.

The R-value and the associated pavement section should be confirmed at the completion of site grading.

Geotechnical Review of Plans

All grading and foundation plans should be reviewed and accepted by the geotechnical consultant prior to construction. If significant time elapses since preparation of this report, the geotechnical consultant should verify the current site conditions, and provide any additional recommendations (if necessary) prior to construction.

Geotechnical Observation/Testing During Construction

The geotechnical consultant should perform observation and/or testing at the following stages:

- During any grading and fill placement;
- After foundation excavation and prior to placing concrete;
- During placement of aggregate base and asphalt concrete;

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- When any unusual soil conditions are encountered during any construction operation subsequent to issuance of this report.

Limitations

This report was prepared for a specific client and a specific project, based on the client's needs, directions and requirements at the time.

This report was necessarily based upon data obtained from a limited number of observances, site visits, soil and/or other samples, tests, analyses, histories of occurrences, spaced subsurface exploration and limited information on historical events and observations. Such information is necessarily incomplete. Variations can be experienced within small distances and under various climatic conditions. Changes in subsurface conditions can and do occur over time.

This report is not authorized for use by, and is not to be relied upon by any party except the client with whom TGR contracted for the work. Use or reliance on this report by any other party is that party's sole risk. Unauthorized use of or reliance on this report constitutes and agreement to defend and indemnify TGR from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of TGR.

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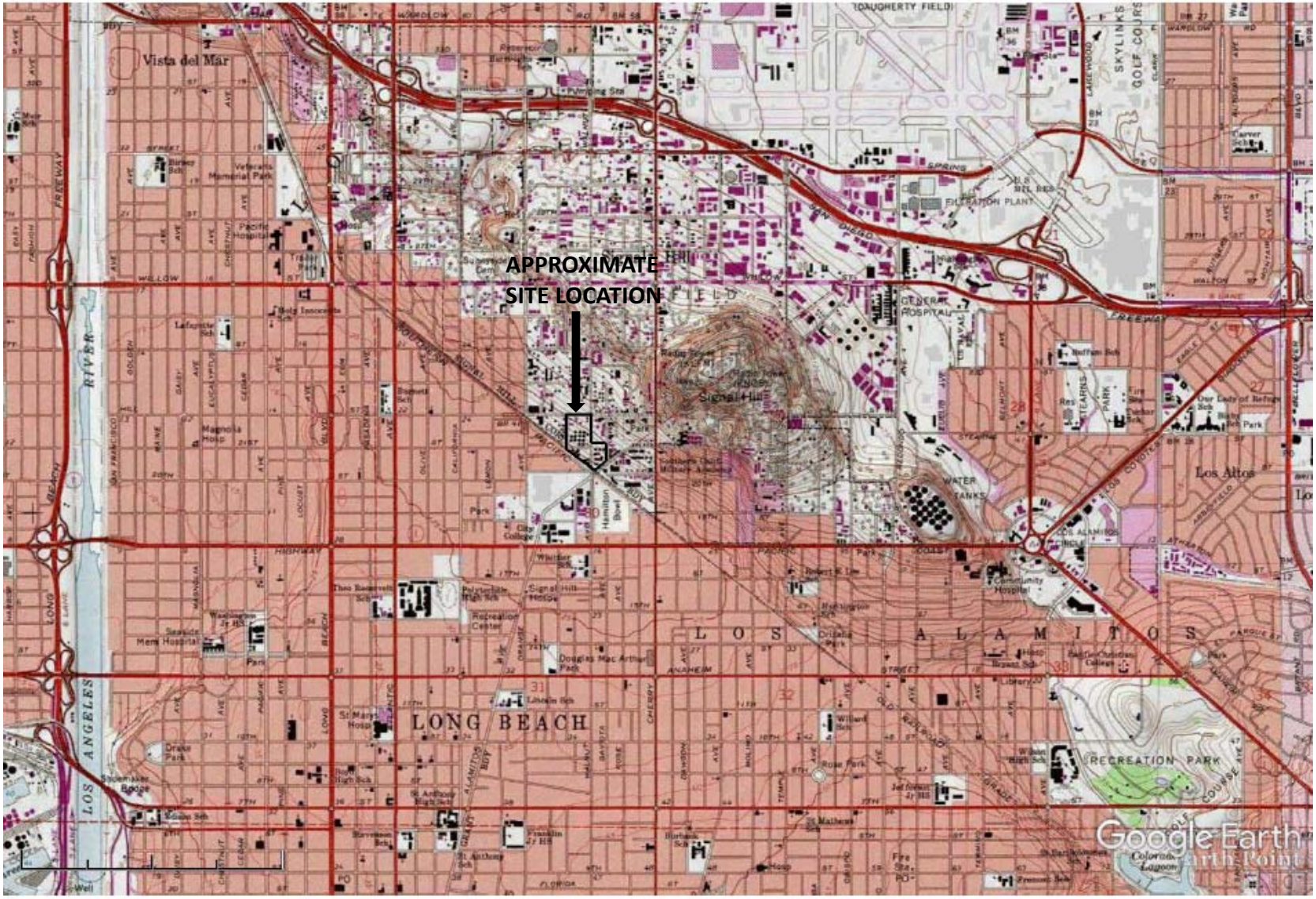

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SITE LOCATION MAP
SIGNAL HILL BUSINESS PARK,
2020 WALNUT AVENUE, SIGNAL HILL, CALIFORNIA

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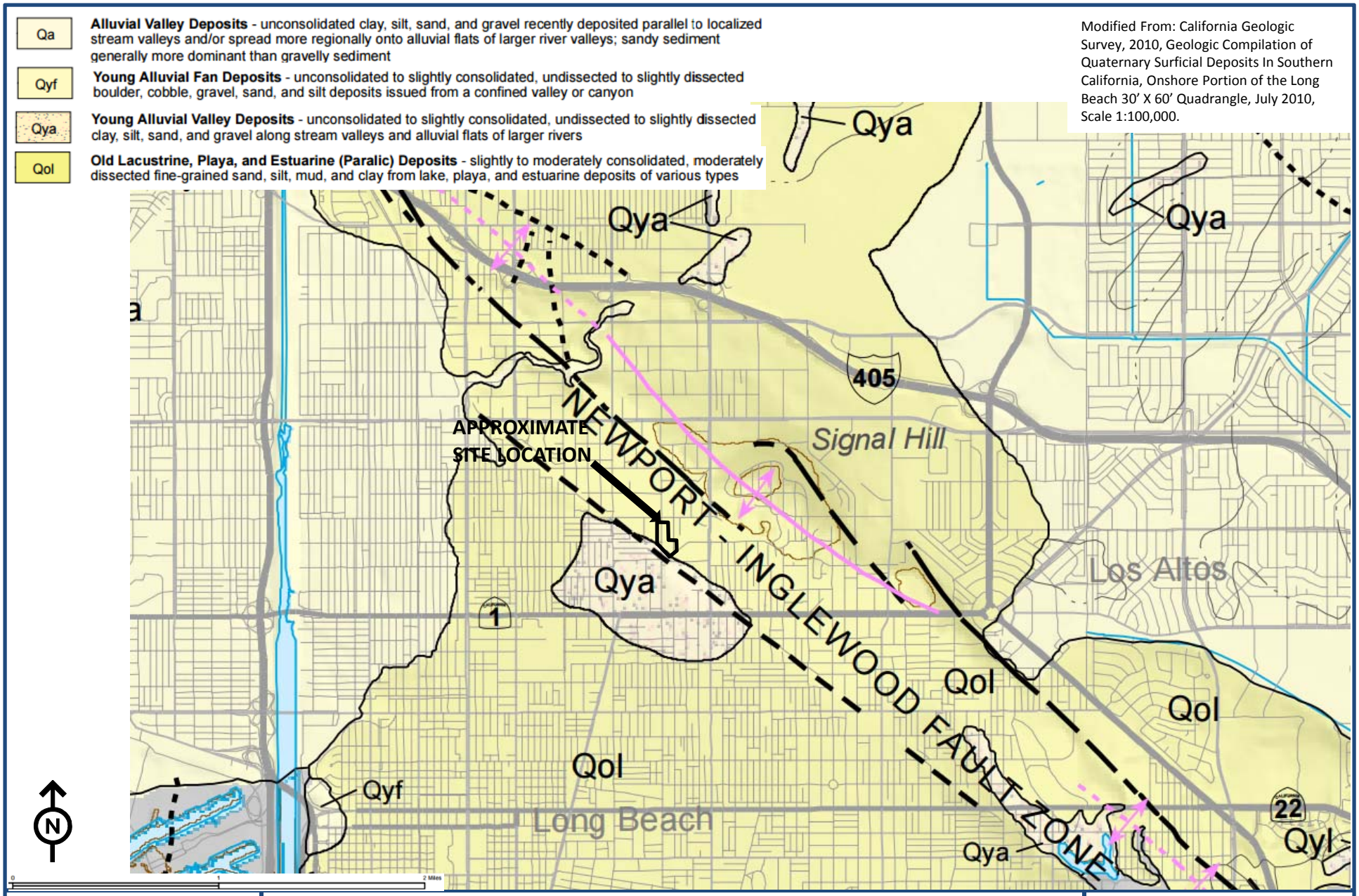
FIGURE 1



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REGIONAL GEOLOGY MAP
SIGNAL HILL BUSINESS PARK,
2020 WALNUT AVENUE, SIGNAL HILL, CALIFORNIA

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FIGURE 2

Modified From: California Department of Conservation, Division of Mines and Geology, 1998, Seismic Hazard Zone Report for the Long Beach 7.5-Minute Quadrangle, Los Angeles County, California, Seismic Hazard Zone Report 028.

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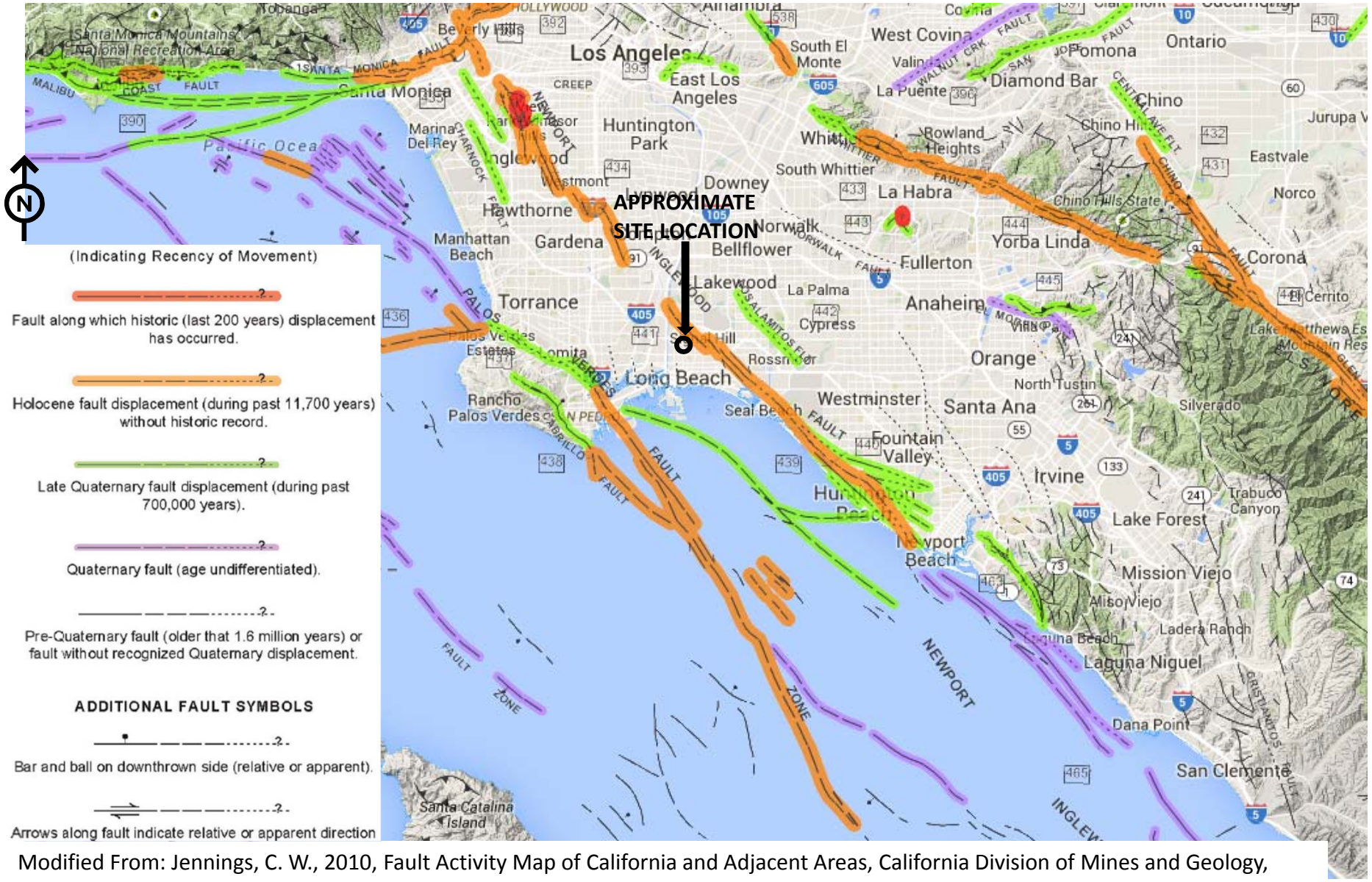
Material Testing
Construction Inspection

HISTORIC HIGH GROUNDWATER MAP
SIGNAL HILL BUSINESS PARK,
2020 WALNUT AVENUE, SIGNAL HILL, CALIFORNIA

PROJECT NO. 16-6239

FIGURE 3



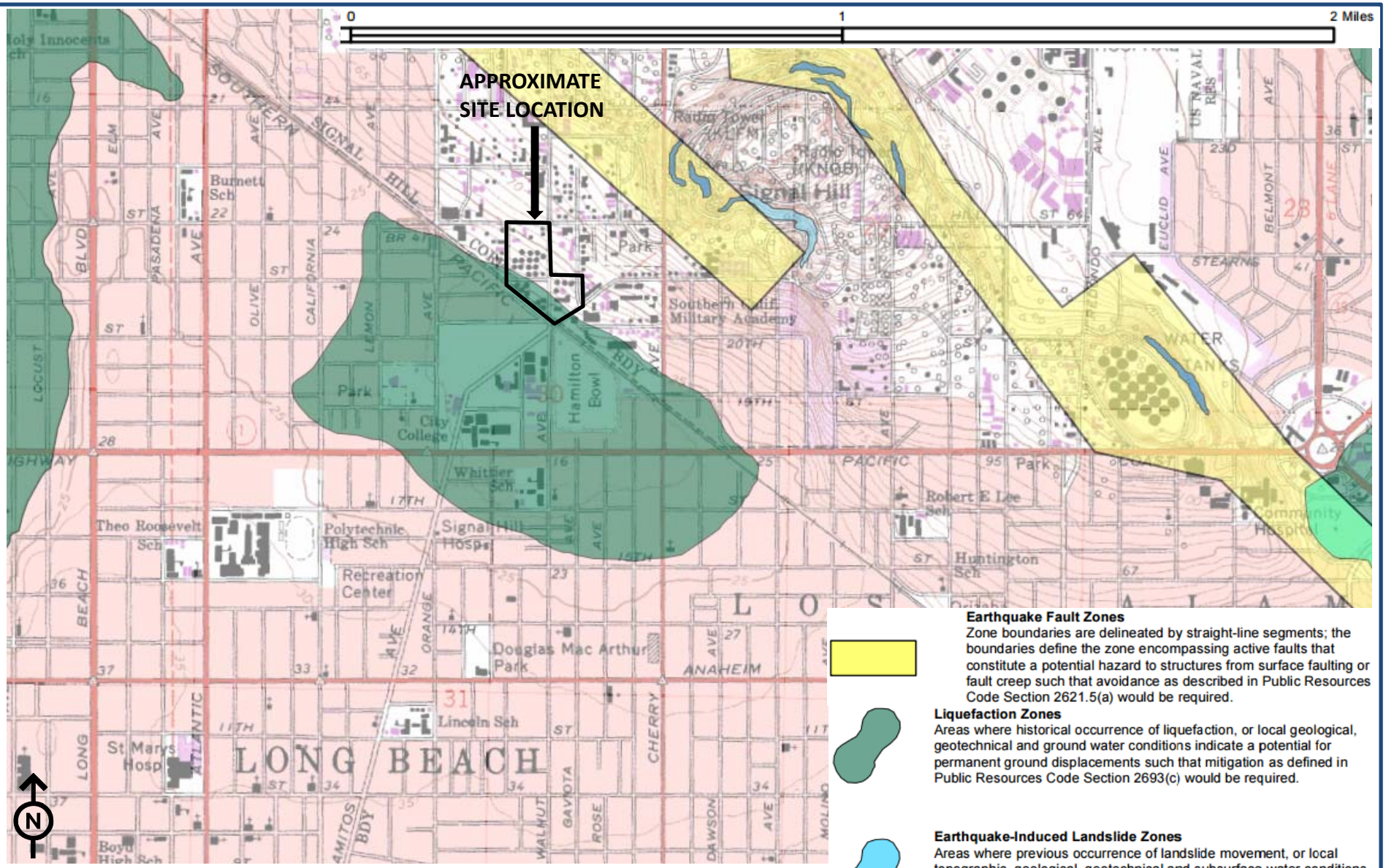
Modified From: Jennings, C. W., 2010, Fault Activity Map of California and Adjacent Areas, California Division of Mines and Geology, Geologic Data Map Series, No. 6, Scale 1:750,000.

TGR Geotechnical Environmental Hydrogeology Material Testing Construction Inspection

REGIONAL FAULT MAP
SIGNAL HILL BUSINESS PARK,
2020 WALNUT AVENUE, SIGNAL HILL, CALIFORNIA

PROJECT NO. 16-6239

FIGURE 4



Modified From: California Geologic Survey, 1998, Earthquake Zones of Required Investigation, Long Beach Quadrangle, Earthquake Fault Zones Revised Official Map Released July 1, 1986, Seismic Hazard Zones official map Released March 25, 1999

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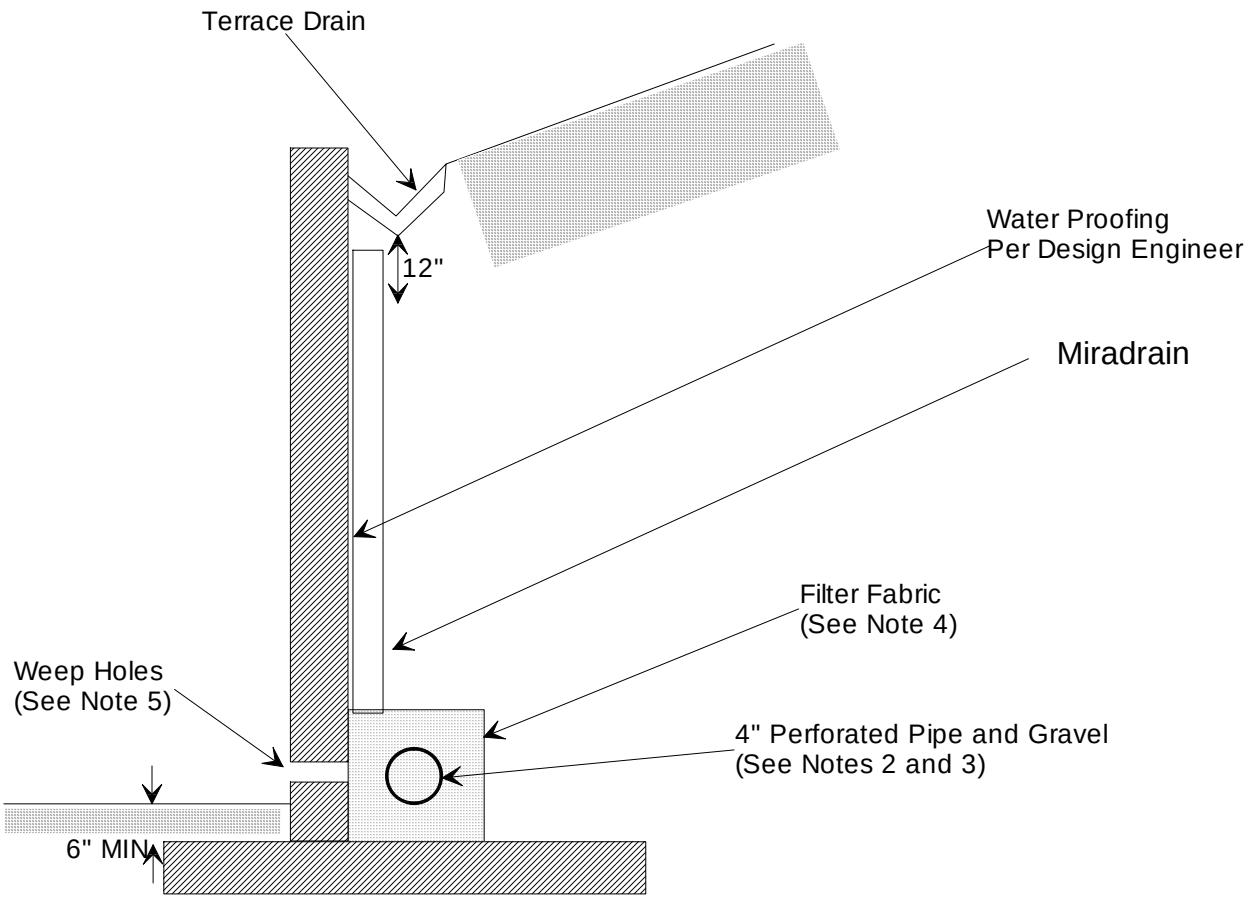
SEISMIC HAZARD ZONE MAP
SIGNAL HILL BUSINESS PARK,
2020 WALNUT AVENUE, SIGNAL HILL, CALIFORNIA

PROJECT NO. 16-6239

FIGURE 5



GENERAL NOTES

- Waterproofing should be provided where moisture through the wall is undesirable.
- Waterproofing of the wall is not under the purview of the geotechnical engineer.
- All drains should have a minimum 1% gradient.
- The subdrain should have a 4-inch diameter solid pipe outlet discharging to a suitable disposal area and shall be designed by the project engineer. The subdrain pipe shall be accessible for cleaning.
- Other subdrain backfill options are subject to review by the geotechnical engineer and may involve modification of the design parameters.

NOTES

1. The granular backfill shall have a sand equivalent of 30 or greater and shall be non expansive. or greater and shall be well graded & non expansive.
2. One (1) cubic foot per foot of 1/4 to 1-1/2 inch gravel wrapped in filter fabric.
3. Pipe shall be ABS SDR35 or PVC Schedule 40 or equivalent with 3/8 inch perforations. Pipe shall be installed with performations down.
4. The filter fabric shall be Mirafi 140NC or equivalent.
5. Weepholes shall be a minimum 3-inch in diameter and spaced no more than 10 foot on center. The weepholes shall drain appropriately so as not to adversely impact any foundations. This shall be designed by the project engineer.
6. Final retaining wall plans should be reviewed and approved by the geotechnical engineer.

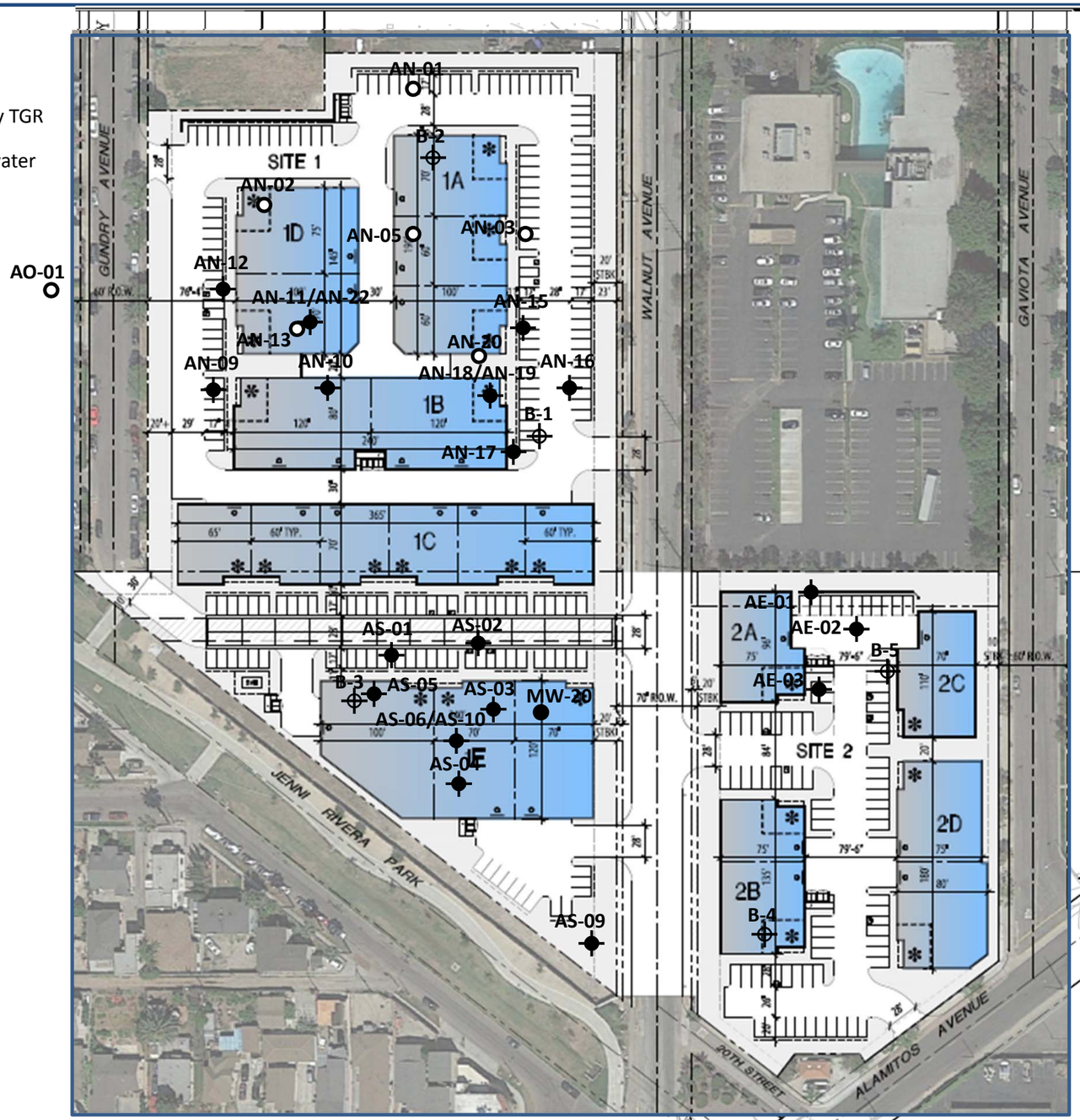
NOT TO SCALE

TGR	**TYPICAL RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS UP TO 10 FEET HIGH**	**Project No.: 16-6239** **FIGURE 6**

LEGEND

- **B-5** — Approximate Location of Boring by TGR
- **MW-20** — Approximate Location of Groundwater Monitoring Well (APEX, 2017)
- **AE-01** — Approximate Location of Boring by UVOST (2016)
- **AN-20** — Approximate Location of Soil and Groundwater Grab Sample (Apex, 2017)

CONCEPTUAL GRADING AND UTILITY PLAN
WALNUT AVE.
SIGNAL HILL, CA



LEGEND
- PROPOSED STORM DRAIN
- PROPOSED SEWER
- SS EXISTING SEWER
- W PROPOSED WATER
- W EXISTING WATER

NORTH
CA

GRAPHIC SCALE
(IN FEET)
1 inch = 40 ft.

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GEOTECHNICAL MAP
SIGNAL HILL BUSINESS PARK
2020 WALNUT AVENUE, SIGNAL HILL, CALIFORNIA

Project No.:16-6239

PLATE 1

APPENDIX A
REFERENCES

DRAFT

TGR GEOTECHNICAL
DBE & 8(a) firm
3037 S. HARBOR BLVD
SANTA ANA, CA 92704
P 714.641.7189 F 714.641.7190
www.tgrgeotech.com

APPENDIX A

References

California, State of, Department of Conservation, Division of Mines and Geology, 2008, Guidelines for Evaluating and Mitigating Seismic Hazards in California, CDMG Special Publication 117A.

_____, 1998, Maps of Known Active Fault Near – Source Zones in California and Adjacent Portions of Nevada.

_____, 1998, Seismic Hazard Zone Report for the Long Beach 7.5-Minute Quadrangle, Los Angeles County, California, Seismic Hazard Zone Report 028.

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International Code Council (ICC), California Building Code, 2016 Edition

Jennings, C. W., 2010, Fault Activity Map of California and Adjacent Areas, California Division of Mines and Geology, Geologic Data Map Series, No. 6, Scale 1:750,000.

DRAFT

DRAFT

APPENDIX B
LOG OF BORINGS

TGR GEOTECHNICAL
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THE FOLLOWING DESCRIBES THE TERMS AND SYMBOLS USED ON THE LOG OF BORINGS TO SUMMARIZE THE RESULTS OBTAINED IN THE FIELD INVESTIGATION AND SUBSEQUENT LABORATORY TESTING.

DENSITY AND CONSISTENCY

The consistency of fine grained soils and the density of coarse grained soils are described on the basis of the Standard Penetration Test as follows:

COARSE GRAINED SOILS		Estimated Unconfined Compressive Strength (Tsf)	FINE GRAINED SOILS	
Very Loose	< 4	< 0.25	Very soft	< 2
Loose	4 – 10	0.35 – 0.50	Soft	2 – 4
Medium	10 – 30	0.50 – 1.0	Firm (medium)	4 – 8
Dense	30 – 50	1.0 – 2.0	Stiff	8 – 15
Very dense	> 50	2.0 – 4.0	Very stiff	15 – 30
		> 4.0	Hard	> 30

PARTICULE SIZE DEFINITION (As per ASTM D2487 And D422)

Boulder	⇒ Larger than 12 inches	Coarse Sands	⇒ No. 10 to No. 4 sieve
Cobbles	⇒ 3 to 12 inches	Medium Sands	⇒ No. 40 to No. 10 sieve
Coarse Gravel	⇒ 3/4 to 3 inches	Fine Sands	⇒ No. 200 to 40 sieve
Fine Gravel	⇒ No. 4 to 3/4 inches	Silt	⇒ 5μm to No. 200 sieve
		Clay	⇒ Smaller than 5μm

SOIL CLASSIFICATION

Soils and bedrock are classified and described based on their engineering properties and characteristics and using ASTM D2487 and D2488.

Percentage description of minor components

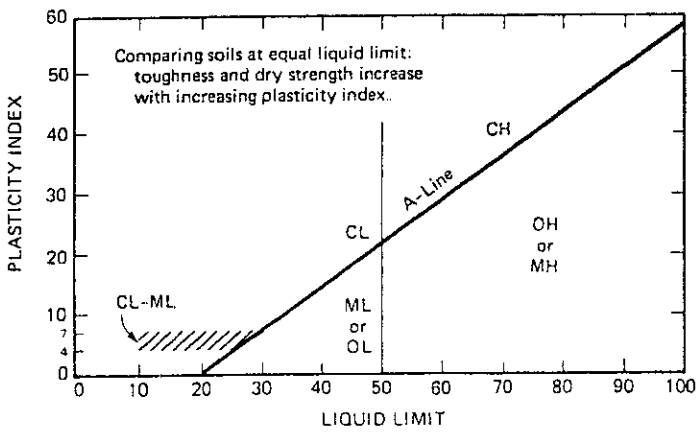
Trace	1-10 %	Some	20-35 %
Little	10-20 %	And or y	35-50 %

Stratified soils description

Parting	0 to 1/16 inch thick	Layer	½ to 12 inches thick
Seam	1/16 to ½ inch thick	Stratum	> 12 inches thick

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS	CLASSIFICATION CRITERIA
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	Not meeting all above requirements
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES	Atterberg limits below "A" line or $I_p < 4$
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES	Atterberg limits above "A" line or $I_p > 7$
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES	Not meeting all above requirements
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES	Atterberg limits below "A" line or $I_p < 4$
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES	Atterberg limits above "A" line or $I_p > 7$
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	$W_L < 50$
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	$W_L < 30$
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	$W_L > 50$
				CH	INORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	$W_L > 50$
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	Strong color or odor and often fibrous texture



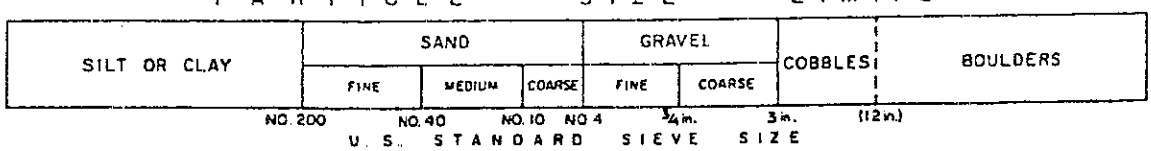
LABORATORY TEST DESIGNATIONS

BR	Bearing Ration	PP	Pocket Penetrometer
C	Consolidation	R	R-Value
COR	Corrosion Test	S	Direct Shear
Chl	Water Soluble Chlorides	SA	Sieve Analysis
EI	Expansive Index	SE	Sand Equivalent
ER	Electrical Resistivity	Sg	Specific Gravity
K	Permeability	SO_4	Water Soluble Sulfates
MC	Moisture Content	SV	Shear Vane
OC	Organic Content	TC	Triaxial Compression
PH	PH Test	UC	Unconfined Compression

ADDITIONAL SOIL CLASSIFICATION

Fill	Ss Sandstone	Ms Siltstone	Bdr Bedrock

PARTICLE SIZE LIMITS



TGR GEOTECHNICAL, INC.

LOG OF BORING EXPLANATION

LOG OF EXPLORATORY BORING B-1

Project Number: **16-6239**
Project Name: **Xebec Signal Hill**
Date Drilled: **4/6/17 - 4/6/17**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Surface covered with imported gravel.			
							Silt- brown, slightly moist, stiff.			
			■	16		ML		10	116	
5			■	34		ML		13	121	
							Silt- grey, slightly moist, slight hydrocarbon odor.			
10			■	7		SP	Sand- grey, slightly moist, fine grained, hydrocarbon odor.	17	99	Consol
15			■	22		SP	Sand- light grey, slightly moist, fine to medium grained, slight hydrocarbon odor.	3	100	
							Total Depth: 16.5 feet below existing grade. No groundwater encountered during drilling. No caving observed. Boring backfilled with bentonite upon completion, cuttings placed in 55-gallon drums for removal by others.			
20										

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 2

TGR GEOTECHNICAL, INC.

LOG OF BORING 16-6239 XEBEC SIGNAL HILL.GPJ TGR GEOTECH.GDT 4/24/17

LOG OF EXPLORATORY BORING B-2

Project Number: **16-6239**
Project Name: **Xebec Signal Hill**
Date Drilled: **4/6/17 - 4/6/17**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
							Silt- brown, dry, loose.			
							Sandy Silt- dark grey, slightly moist, hydrocarbon odor.			
			■	6		ML		14	104	Cor., Max, Shear
5			■	16		ML		15	118	Consol
10			■	11		ML	Silt- grey, slightly moist, hydrocarbon odor, trace of fine grained sand.	14	106	
15			■	21		SP	Sand- light grey, slightly moist, fine to medium grained, strong hydrocarbon odor.	9	95	
20			■	42		SP		7	103	
25			⊠	44		SP		4		
							Total Depth: 26.5 feet below existing grade. No groundwater encountered during drilling. No caving observed. Boring backfilled with bentonite upon completion, cuttings placed in 55-gallon drums for removal by others.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 3

TGR GEOTECHNICAL, INC.

LOG OF BORING 16-6239 XEBEC SIGNAL HILL.GPJ TGR GEOTECH.GDT 4/24/17

LOG OF EXPLORATORY BORING B-3

Project Number: **16-6239**
Project Name: **Xebec Signal Hill**
Date Drilled: **4/6/17 - 4/6/17**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
			■	20		ML	Siltt Sand to Sandy Silt- some clay, dark grey, moist, hydrocarbon odor.	11	124	EI, Cor., R-value
5			■	28		ML	Silt- dark grey, slightly moist, hydrocarbon odor.	13	124	
10			■	32		SP	Sand- grey, slightly moist, fine grained, hydrocarbon odor.	10	123	
15			■	15		SP	Sand- grey, slightly moist, fine to medium grained, hydrocarbon odor.	14	110	
20			⊠	26		SP		19		-200= 3.5%
25			⊠	35		SP	▼ ...becomes wet.	18		

LOG OF BORING 16-6239 XEBEC SIGNAL HILL.GPJ TGR GEOTECH.GDT 4/24/17

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 4

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-3

Project Number: **16-6239**
Project Name: **Xebec Signal Hill**
Date Drilled: **4/6/17 - 4/6/17**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
			■	46		SP	Sand- grey, slightly moist, fine to medium grained, 2-inch thick layer of silt, hydrocarbon odor.	18		
35			■	26		ML	Clayey Silt- light grey, orange oxidation, slightly moist.	19		
40			■	42		ML	Clay, Silt, and Sand layers- grey and light grey, slightly moist to moist, fine to medium sand.	30		-200= 74.1%
45			■	35		SP	Sand- grey, wet, fine grained, hydrocarbon odor.	26		
50			■			SP		29		-200= 11%
55							Total Depth: 51.5 feet below existing grade. Groundwater encountered at 25 feet below grade during drilling. No caving observed. Boring backfilled with bentonite upon completion, cuttings placed in 55-gallon drums for removal by others.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 5

TGR GEOTECHNICAL, INC.

LOG OF BORING 16-6239 XEBEC SIGNAL HILL.GPJ TGR GEOTECH.GDT 4/24/17

LOG OF EXPLORATORY BORING B-4

Project Number: **16-6239**
Project Name: **Xebec Signal Hill**
Date Drilled: **4/6/17 - 4/6/17**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
			■	12		ML	Sandy Silt- light brown to reddish brown, dry to slightly moist, no hydrocarbon odor.	5	106	
5			■	>50		ML	Silt- reddish brown, dry to slightly moist, no hydrocarbon odor.	6	126	
10			■	41		SP	Sand- light brown to reddish brown, slightly moist, fine grained, slight hydrocarbon odor.	12	125	Consol
15			■	30		SP	Sand- fine to medium grained, light brown, slightly moist, slight hydrocarbon odor.	4		
20			⊠	56		SP		4		-200= 3.8%
25			⊠	49		SP		21		
							▼ ...becomes wet.			

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 6

TGR GEOTECHNICAL, INC.

LOG OF BORING 16-6239 XEBEC SIGNAL HILL.GPJ TGR GEOTECH.GDT 4/24/17

LOG OF EXPLORATORY BORING B-4

Project Number: **16-6239**
Project Name: **Xebec Signal Hill**
Date Drilled: **4/6/17 - 4/6/17**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
			☒	60		SP	Sand- fine to medium grained, light brown, wet, slight hydrocarbon odor.	21		
35			☒	28		SP	...no hydrocarbon odor.	20		
40			☒	30		SP		28		-200= 44.9%
45			☒	32		SP	Sand- fine to medium grained, light brown, wet, layered with light brown silt.	29		
50			☒	26		SP		25		
							Total Depth: 51.5 feet below existing grade. Groundwater encountered at 29 feet below grade during drilling. No caving observed. Boring backfilled with bentonite upon completion, cuttings placed in 55-gallon drums for removal by others.			
55										

LOG OF BORING 16-6239 XEBEC SIGNAL HILL.GPJ TGR GEOTECH.GDT 4/24/17

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 7

TGR GEOTECHNICAL, INC.

LOG OF EXPLORATORY BORING B-5

Project Number: **16-6239**
Project Name: **Xebec Signal Hill**
Date Drilled: **4/6/17 - 4/6/17**
Ground Elev:

Logged By: **ELB**
Project Engineer: **SG**
Drill Type: **Hollow Stem**
Drive Wt & Drop: **140lbs / 30in**

Shelby Tube | Standard Split Spoon | No recovery | Modified California | Water Table ATD

Depth (ft)	Graphic Log	FIELD RESULTS: Bulk Sample	Drive Sample	SPT blows/ft (or equivalent N)	Pocket Pen (tsf)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	LAB RESULTS: Moisture Content (%)	Dry Density, (pcf)	Other Tests
			■	31		SM	Silty Sand- light brown, dry to slightly moist, no hydrocarbon odor.	5	111	EI, Cor., R-value
5			■	49		ML	Silt- reddish brown, slightly moist, no hydrocarbon odor.	9	129	Consol
10			■	29		SP	Sand- fine grained, brown, slightly moist, no hydrocarbon odor.	13	122	
15			■	21		SP	Sand- medium grained, light brown, slightly moist, no hydrocarbon odor.	5	132	
20							Total Depth: 16.5 feet below existing grade. No groundwater encountered during drilling. No caving observed. Boring backfilled with bentonite upon completion, cuttings placed in 55-gallon drums for removal by others.			

LOG OF BORING 16-6239 XEBEC SIGNAL HILL.GPJ TGR GEOTECH.GDT 4/24/17

This Boring Log should be evaluated in conjunction with the complete geotechnical report. This Boring Log represents conditions observed at the specific location and date indicated, it is not warranted to be representative of subsurface conditions at other locations and times.

PLATE 8

TGR GEOTECHNICAL, INC.

BOREHOLE LOG

BORING / WELL ID: **AN-01**

TOTAL DEPTH: **40'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **North parcel, north side.**

PROJECT INFORMATION

PROJECT NO.:	**093-CHEMOIL-001**
PERMIT NO.:	
LOGGED BY:	**R. Robitaille**
REVIEWED BY:	**P. Fuller**
SURFACE ELEVATION:	**42.5 feet amsl**
CASING TOP ELEVATION:	**NA**
START DATE (TIME):	**01/04/17 (0750)**
FINISH DATE (TIME):	**01/04/17 (1000)**

DRILLING INFORMATION

SUBCONTRACTOR:	**Kehoe Testing & Engineering**
EQUIPMENT:	**GeoProbe 7800**
SAMPLING METHOD:	**Continuous 1.75" x 48"**
MONITORING DEVICE:	**PID 100 ppm Hexane**
BORING DIAMETER (IN):	**2.5 inches**
ANNULUS MATERIAL:	**NA**
BORING ANGLE: **Vertical**	CASING DIAMETER: **NA**
SCREEN INTERVAL: **NA**	

▽ First Water Encountered ▼ Stabilized Water Level ■ Sample Packaged for Analysis

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
	1.5				0		Boring cleared to five feet bgs with hand auger. ML: Sandy silt with gravel, very dark brown (10YR 3/2), moderately hard, dry, trace concrete debris, fill.	
	0.2				5		ML: Clayey silt, dark yellowish brown (10YR 4/6), moderately soft, dry, trace fine grained sand.	
0840	22							
0840					10		ML: Dark greenish gray (GLEY 4/1), moderately soft, dry, trace fine grained sand.	
	13				15		SM: Silty sand, gray (5Y 5/1), loose, dry, well sorted fine to very fine grained sand, micaceous.	

BOREHOLE LOG

BORING / WELL ID: **AN-01**

TOTAL DEPTH: **40'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **North parcel, north side.**

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
0900							Grades coarser sand, less silt.	
	44						SP: Sand, gray (2.5Y 6/1), loose, dry, well sorted fine to medium grained sand, trace shell fragments.	
0915	82				20			Boring backfilled with bentonite.
	5.5				25			
							SW: Sand, light brownish gray (2.5Y 6/2), loose, dry, moderately poorly sorted fine to coarse grained sand, abundant shell fragments.	
					30		SP: Sand, gray (2.5Y 6/1), loose, dry, well sorted fine grained sand, no shell fragments.	
					35		ML: Silt with clay, gray (5Y 5/1), moderately hard, dry, abundant shell fragments, (0,0,75,25).	
	34						CL: Clayey silt, olive gray (5Y 5/2), dense, moist, very fine grained sand, abundant shell fragments, (0,20,40,40).	
1000	4.4				40		Hydropunch sampling performed at the following interval: 39 to 43 feet bgs (AN-01-40'GW, 1100).	

BOREHOLE LOG

BORING / WELL ID: **AN-02**

TOTAL DEPTH: **38'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **North parcel**

PROJECT INFORMATION

PROJECT NO.:	**093-CHEMOIL-001**
PERMIT NO.:	
LOGGED BY:	**R. Robitaille**
REVIEWED BY:	**P. Fuller**
SURFACE ELEVATION:	**35.4 feet amsl**
CASING TOP ELEVATION:	**NA**
START DATE (TIME):	**01/04/17 (1320)**
FINISH DATE (TIME):	**01/04/17 (1440)**

DRILLING INFORMATION

SUBCONTRACTOR:	**Kehoe Testing & Engineering**
EQUIPMENT:	**GeoProbe 7800**
SAMPLING METHOD:	**Continuous 1.75' x 48"**
MONITORING DEVICE:	**PID 100ppm Hexane**
BORING DIAMETER (IN):	**2.5 inches**
ANNULUS MATERIAL:	**NA**
BORING ANGLE: **Vertical**	CASING DIAMETER: **NA**
SCREEN INTERVAL: **NA**	

▽ First Water Encountered ▼ Stabilized Water Level ■ Sample Packaged for Analysis

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
					0		Boring cleared to five feet bgs with hand auger. SM: Sandy silt with gravel, fill.	
							SM: Sandy silt, dark grayish brown (10YR 4/2), moderately hard, trace gravel, fine to coarse grained sand.	
					5		Grades with gravel and oil, very dark brown oil (asphaltic).	
1335	>15,000						ML: Silt, very dark gray (5Y 3/1) to black (5Y 2.5/1), moderately soft, dry, abundant oily staining, micaceous.	
1340	86				10		Grades to trace staining, dark gray (GLEY 4/0), strong hydrocarbon odor.	
1345								
	126				15		SP: Sand, gray (5Y 6/1), loose, dry, fine to very fine grained sand, well sorted, micaceous, hydrocarbon odor.	

BOREHOLE LOG

BORING / WELL ID: **AN-02**

TOTAL DEPTH: **38'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **North parcel**

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
	184						Grades coarser sand, trace shell fragments.	Boring backfilled with bentonite.
1355	10.8				20		SW: Sand, gray (5Y 6/1), loose, dry, poorly sorted, fine to coarse grained sand, abundant shell fragments.	
	85				25		SP: Sand, gray (5Y 6/1), loose, dry, poorly sorted, predominately fine grained sand, shell fragments.	
							Grades no shell fragments.	
1410	>15,000				30			
1420	>15,000						SW: Sand, gray (5Y 6/1), looe, dry to wet at 36 feet bgs, poorly sorted, fine to coarse grained sand, abundant shell fragments, strong hydrocarbon odor.	
	>15,000				35		Hydropunch sampling performed at the following interval: 34 to 38 feet bgs (AN-02-38'GW, 0810).	

BOREHOLE LOG

BORING / WELL ID: **AN-03**

TOTAL DEPTH: **36'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **East side of north parcel**

PROJECT INFORMATION

PROJECT NO.:	**093-CHEMOIL-001**
PERMIT NO.:	
LOGGED BY:	**R. Robitaille**
REVIEWED BY:	**P. Fuller**
SURFACE ELEVATION:	**35.8 feet amsl**
CASING TOP ELEVATION:	**NA**
START DATE (TIME):	**01/05/17 (1245)**
FINISH DATE (TIME):	**01/05/17 (1345)**

DRILLING INFORMATION

SUBCONTRACTOR:	**Kehoe Testing & Engineering**
EQUIPMENT:	**GeoProbe 7800**
SAMPLING METHOD:	**Continuous 1.75" x 48"**
MONITORING DEVICE:	**PID 100 ppm Hexane**
BORING DIAMETER (IN):	**2.5 inches**
ANNULUS MATERIAL:	**NA**
BORING ANGLE: **Vertical**	CASING DIAMETER: **NA**
SCREEN INTERVAL: **NA**	

▽ First Water Encountered ▼ Stabilized Water Level ■ Sample Packaged for Analysis

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
					0		Boring cleared to five feet bgs with hand auger. Fill: Sandy silt with gravel, gray (2.5Y 6/1).	
	>15,000						Mixed Fill: Native soil, silt with gravel (ML), debris, dark gray (5Y 4/1).	
1310					5		ML: Silt, dark yellowish brown (10YR 4/4), moderately soft, dry, trace fine grained sand, strong hydrocarbon odor.	
	>15,000						ML: Silt, gray (5Y 6/1), soft, dry, strong hydrocarbon odor.	
							Grades with fine grained sand.	
1320					10		SP: Sand, gray (5Y 5/1), loose, dry, well sorted fine grained sand, strong hydrocarbon odor.	
	>15,000						Grades coarse grained sand with shell fragments.	
							Predominately medium grained sand.	
					15			

BOREHOLE LOG

BORING / WELL ID: **AN-03**

TOTAL DEPTH: **36'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **East side of north parcel**

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
							SW: Sand, gray (5Y 5/1), loose, dry, poorly sorted fine to coarse grained sand, abundant shell fragments.	
							CL: Silty clay, olive (5Y 5/3), hard, dry.	
							SW: Sand, gray (5Y 5/1), loose, dry, poorly sorted fine to coarse grained sand, abundant shell fragments.	
1330	>15,000				20		SP: Sand, gray (5Y 5/1), loose, dry, well sorted fine grained sand, no shell fragments, strong hydrocarbon odor.	
	>15,000						Grades with trace shell fragments.	
							Grades light yellowish brown (2.5Y 6/3).	
					25		Grades light yellowish brown (2.5Y 6/3) and gray (5Y 5/1) mottled, no shell fragments.	
1340					30		SW: Sand, gray (5Y 5/1), loose, dry, poorly sorted fine to coarse grained sand, abundant shell fragments.	
	>15,000						SM: Silty sand, gray (5Y 5/1) and light olive brown (2.5Y 5/3) mottled, soft, moist, micaceous, no shell fragments, strong hydrocarbon odor.	
1345					35		Hydropunch sampling performed at the following interval: 36 to 40 feet bgs (AN-03-40'GW, 1430). Very slow recharge.	Boring backfilled with bentonite.

BOREHOLE LOG

BORING / WELL ID: **AN-05**

TOTAL DEPTH: **36'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **North parcel, central area**

PROJECT INFORMATION

PROJECT NO.:	**093-CHEMOIL-001**
PERMIT NO.:	
LOGGED BY:	**R. Robitaille**
REVIEWED BY:	**P. Fuller**
SURFACE ELEVATION:	**33.9 feet amsl**
CASING TOP ELEVATION:	**NA**
START DATE (TIME):	**01/05/17 (0845)**
FINISH DATE (TIME):	**01/05/17 (1010)**

DRILLING INFORMATION

SUBCONTRACTOR:	**Kehoe Testing & Engineering**
EQUIPMENT:	**GeoProbe 7800**
SAMPLING METHOD:	**Continuous 1.75" x 48"**
MONITORING DEVICE:	**PID 100ppm Hexane**
BORING DIAMETER (IN):	**2.5 inches**
ANNULUS MATERIAL:	**NA**
BORING ANGLE: **Vertical**	CASING DIAMETER: **NA**
SCREEN INTERVAL: **NA**	

▽ First Water Encountered ▼ Stabilized Water Level ■ Sample Packaged for Analysis

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
					0		Boring cleared to five feet bgs with hand auger. Fill: Silty sand with gravel.	
	>15,000						ML: Silt, dark gray (5Y 4/1), moderately soft, dry, trace fine grained sand, strong hydrocarbon odor.	
0930					5			
	>15,000						CL: Clayey silt, gray (5Y 5/1), moderately hard, dry, trace caliche, strong hydrocarbon odor. Grades with fine grained sand.	
0940					10		SP: Sand, gray (5Y 5/1), loose, dry, fine to medium grained sand, grades coarser with depth with silt at top.	
	>15,000						Grades with trace shell fragments.	
					15			

BOREHOLE LOG

BORING / WELL ID: **AN-05**

TOTAL DEPTH: **36'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **North parcel, central area**

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
1000	>15,000				20		Abundant shell fragments, strong hydrocarbon odor.	Boring backfilled with bentonite.
	>15,000						Grades no shell fragments, predominately fine grained sand.	
					25			
					30			
1010	>15,000				35		Hydropunch sampling performed at the following interval: 36 to 40 feet bgs (AN-05-40'GW, 1100). No oil blebs, slight sheen, strong hydrocarbon odor.	

BOREHOLE LOG

BORING / WELL ID: **AN-13**

TOTAL DEPTH: **32'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **Center of north parcel**

PROJECT INFORMATION

PROJECT NO.:	**093-CHEMOIL-001**
PERMIT NO.:	
LOGGED BY:	**R. Robitaille**
REVIEWED BY:	**P. Fuller**
SURFACE ELEVATION:	**29.9 feet amsl**
CASING TOP ELEVATION:	**NA**
START DATE (TIME):	**01/09/17 (1200)**
FINISH DATE (TIME):	**01/09/17 (1620)**

DRILLING INFORMATION

SUBCONTRACTOR:	**Kehoe Testing & Engineering**
EQUIPMENT:	**GeoProbe 7800**
SAMPLING METHOD:	**Continuous 1.75" x 48"**
MONITORING DEVICE:	**PID 100 ppm Hexane**
BORING DIAMETER (IN):	**2.5 inches**
ANNULUS MATERIAL:	**NA**
BORING ANGLE: **Vertical**	CASING DIAMETER: **NA**
SCREEN INTERVAL: **NA**	

▽ First Water Encountered ▼ Stabilized Water Level ■ Sample Packaged for Analysis

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
					0		Boring cleared to five feet bgs with hand auger. Fill: Silty sand with gravel and debris.	
1210	208				5		CL: Clayey silt, dark gray (2.5Y 4/1), moderately hard, dry, trace fine grained sand, moderate hydrocarbon odor, (0,0,80,20).	
	>15,000						ML: Silt, gray (5Y 5/1), moderately soft, dry, trace clay, micaceous, strong hydrocarbon odor.	
1220	>15,000				10		Grades with increasing clay (0,0,80,20) (2 inches only). Grades with fine grained sand (0,30,70,0).	
							SM: Silty sand, gray (5Y 5/1), loose, dry, well sorted fine grained sand, trace medium grained sand, strong hydrocarbon odor.	
1225	>15,000				15		Grades increasing medium grained sand.	

BOREHOLE LOG

BORING / WELL ID: **AN-13**

TOTAL DEPTH: **32'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **Center of north parcel**

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
1245	>15,000				20		(Sampler jammed in rods.)	Boring backfilled with bentonite.
					25			
1320	>15,000							
1330							Observed free product in soil. Hydropunch sampling performed at the following intervals: 27 to 31 feet bgs (AN-13-31' GW, 09:00). Mostly oil and oily water, low viscosity, dark brown. 37 to 41 feet bgs (AN-13-41' GW, 10:00). Heavy sheen. 51 to 54 feet bgs (AN-13-54' GW, 11:00). No sheen.	
					30			

BOREHOLE LOG

BORING / WELL ID: **AN-20**

TOTAL DEPTH: **36'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **Southwest of MW-11, northwest parcel**

PROJECT INFORMATION

PROJECT NO.:	**093-CHEMOIL-001**
PERMIT NO.:	
LOGGED BY:	**A. Czuba**
REVIEWED BY:	**P. Fuller**
SURFACE ELEVATION:	**30.7 feet amsl**
CASING TOP ELEVATION:	**NA**
START DATE (TIME):	**01/18/17 (0805)**
FINISH DATE (TIME):	**01/18/17 (0850)**

DRILLING INFORMATION

SUBCONTRACTOR:	**Kehoe Testing & Engineering**
EQUIPMENT:	**GeoProbe 6610DT**
SAMPLING METHOD:	**Continuous 1.75" x 48"**
MONITORING DEVICE:	**PID 100ppm Hexane**
BORING DIAMETER (IN):	**2.5 inches**
ANNULUS MATERIAL:	**NA**
BORING ANGLE: **Vertical**	CASING DIAMETER: **NA**
SCREEN INTERVAL: **NA**	

▽ First Water Encountered ▼ Stabilized Water Level ■ Sample Packaged for Analysis

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
					0		Fill: Boring cleared to five feet bgs with hand auger. Fill.	
					5		ML: Sandy silt, brown (10YR 4/3), moist, poorly graded very fine grained sand, non-plastic, slight hydrocarbon odor, (0,40,60,0).	
0813	>15,000						Olive brown (2.5Y 4/3), strong hydrocarbon odor.	
0816	>15,000				10			
							SP: Poorly graded sand, gray (GLEY1 5/10Y), dry, fine to coarse grained sand, hydrocarbon odor, (0,100,0,0).	
0820	>15,000				15			

BOREHOLE LOG

BORING / WELL ID: **AN-20**

TOTAL DEPTH: **36'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **Southwest of MW-11, northwest parcel**

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
0826	3946						Poorly graded fine to medium grained sand, strong hydrocarbon odor.	Boring backfilled with bentonite.
0830	>15,000				20		Very fine grained sand, (0,90,10,0).	
0840	>15,000				25			
0845	>15,000				30		SM: Silty sand, gray (GLEY 5/10Y), very moist, poorly graded fine grained sand, non-plastic, very strong hydrocarbon odor, (0,80,20,0).	
0850	>15,000						At 33.5 feet bgs: Sheen observed on soil/water.	
0850	>15,000				35		ML: Sandy silt, olive brown (2.5Y 4/1), slightly moist, hard, trace clay, strong hydrocarbon odor, (0,10,85,5). Hydropunch sampling performed at the following intervals: 28 to 32 feet bgs (AN-20-32'GW, 0943). 38 to 42 feet bgs (AN-20-42'GW, 1032). 48 to 52 feet bgs (AN-20-52'GW, 1130). 58 to 62 feet bgs (AN-20-62'GW, 1345).	

BOREHOLE LOG

BORING / WELL ID: **AO-01**

TOTAL DEPTH: **32'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **In the street in fron tof 2109 Gundry Avenue**

PROJECT INFORMATION

PROJECT NO.:	**093-CHEMOIL-001**
PERMIT NO.:	
LOGGED BY:	**R. Robitaille**
REVIEWED BY:	**P. Fuller**
SURFACE ELEVATION:	**27.0 feet amsl**
CASING TOP ELEVATION:	**NA**
START DATE (TIME):	**01/10/17 (0700)**
FINISH DATE (TIME):	**01/10/17 (0930)**

DRILLING INFORMATION

SUBCONTRACTOR:	**Kehoe Testing & Engineering**
EQUIPMENT:	**GeoProbe 7800**
SAMPLING METHOD:	**Continuous 1.75" x 48"**
MONITORING DEVICE:	**PID 100ppm Hexane**
BORING DIAMETER (IN):	**2.5 inches**
ANNULUS MATERIAL:	**NA**
BORING ANGLE: **Vertical**	CASING DIAMETER: **NA**
SCREEN INTERVAL: **NA**	

▽ First Water Encountered ▼ Stabilized Water Level ■ Sample Packaged for Analysis

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
					0		Boring cleared to five feet bgs with hand auger. Asphalt to 0.25 feet bgs.	
	0.8						Base coarse fill material.	
0830					5		ML: Silt, dark grayish brown (2.5Y 4/2), moderately soft, dry, trace clay and fine grained sand. At 2.9 feet bgs: Grades dark gray (2.5Y 4/1). At 4.5 feet bgs: Grades dark yellowish brown (10YR 4/4).	
0835	8.0				10		ML: Clayey silt, dark grayish brown (2.5Y 4/2), soft, moist, trace fine grained sand, (0,0,75,25).	
							ML: Silt, olive gray (5Y 5/2), soft, dry, trace fine grained sand.	
	5.2						Grades increasing sand.	
0845					15		SM: Silty sand, light olive gray (5Y 6/2), loose, dry, micaceous,	

BOREHOLE LOG

BORING / WELL ID: **AO-01**

TOTAL DEPTH: **32'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **In the street in fron tof 2109 Gundry Avenue**

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.	WELL CONSTRUCTION DETAILS
	5.1						very fine to fine grained sand, (0,70,30,0).	Boring backfilled with bentonite.
							SC: Thin zone clayey sand.	
0855	8.8				20		SP: Sand, gray (5Y 6/1), loose, dry, some shell fragments, micaceous, predominately fine grained sand, trace medium grained sand. At 19 feet bgs: Grades no shell fragments.	
	24				25		Gray (5Y 5/1), trace silt, faint hydrocarbon odor.	
0900							ML: Clayey silt, olive gray (5Y 5/2), moderately hard, dry.	
	>15,000						SP: Sand, gray (5Y 5/1), loose, dry, trace silt, faint hydrocarbon odor, micaceous, trace shell fragments.	
0920	>15,000				30		Hydropunch sampling performed at the following intervals: 30 to 34 feet bgs (AO-01-34'GW, 0945). Sheen. 40 to 44 feet bgs (AO-01-44'GW, 1140). Slight sheen. 56 to 60 feet bgs (AO-01-60'GW, 1320). No sheen.	

BOREHOLE LOG

BORING / WELL ID: **MW-20**

TOTAL DEPTH: **35'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **Southwest parcel near AS-03.**

PROJECT INFORMATION

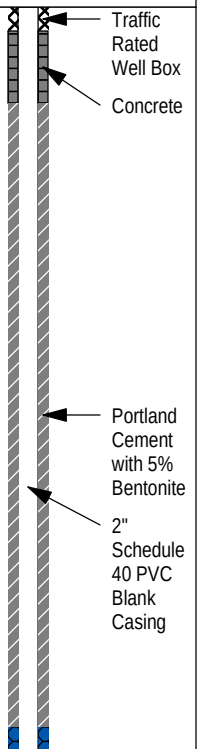
PROJECT NO.:	**093-CHEMOIL-001**
PERMIT NO.:	**SR0092630**
LOGGED BY:	**A. Czuba**
REVIEWED BY:	**P. Fuller**
SURFACE ELEVATION:	**25.4 feet amsl**
CASING TOP ELEVATION:	**24.79 feet amsl**
START DATE (TIME):	**01/10/17**
FINISH DATE (TIME):	**01/10/17**

DRILLING INFORMATION

SUBCONTRACTOR:	**Gregg Drilling**
EQUIPMENT:	**Truck-mounted HSA**
SAMPLING METHOD:	**Split Spoon**
MONITORING DEVICE:	**PID**
BORING DIAMETER (IN):	**8 inches**
ANNULUS MATERIAL:	**#2/12 Monterey Sand**
BORING ANGLE: **Vertical**	CASING DIAMETER: **2 inches**
SCREEN INTERVAL:	**20 to 35 feet bgs**

First Water Encountered Stabilized Water Level Sample Packaged for Analysis

TIME	PID READING	DEPTH	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.
0920	0	0	Boring cleared to five feet bgs with hand auger. SM: Silty sand, brown, slightly moist, poorly graded fine to coarse grained sand, low plasticity, no odor, (0,80,20,0).
0943	40	5	SM: Silty sand, olive gray, dry, moderately soft, poorly graded, trace clay, slight hydrocarbon odor.
0943	40		Grades brown.
0949	34.2		Grades olive gray, poorly graded very fine grained sand.
0955	>15,000		ML: Clayey silt, dark olive gray, dry, hard, poorly graded, low plasticity, no odor.
1000	>15,000	10	SM: Silty sand, olive gray, dry, very fine grained sand, slight hydrocarbon odor, (0,70,30,0).
1006	>15,000		Grades increasing silt, (0,60,40,0).
1015	>15,000		SP: Poorly graded sand, dark gray, dry, fine to medium grained sand, trace silt, slight hydrocarbon odor, (0,100,0,0).
1015	>15,000		
1020	81	15	SM: Silty sand, gray, dry, poorly graded fine to medium grained



WELL CONSTRUCTION DETAILS

BOREHOLE LOG

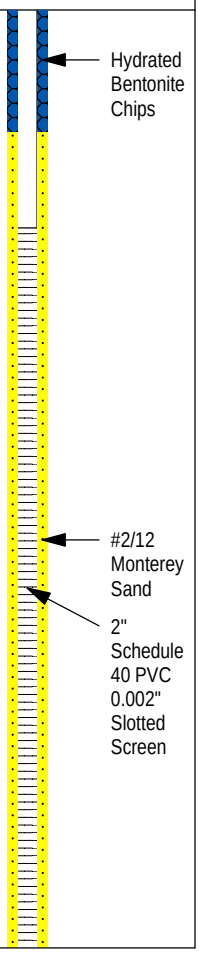
BORING / WELL ID: **MW-20**

TOTAL DEPTH: **35'**

PROJECT NAME AND SITE ADDRESS: **Former ChemOil Facility, Signal Hill, California**

BORING LOCATION / DESCRIPTION: **Southwest parcel near AS-03.**

TIME	PID READING	WATER LEVEL	SAMPLE INTERVAL	RECOVERY (%)	DEPTH	STRATIGRAPHY	LITHOLOGIC DESCRIPTION (classification, color, moisture, density, grain size / plasticity, other) ALL PERCENTAGES ARE APPROXIMATE UNLESS OTHERWISE STATED.
1026							sand, non-plastic, slight hydrocarbon odor, (0,80,20,0).
							SP: Poorly graded sand, gray, dry, fine to medium graned, slight hydrocarbon odor, (0,100,0,0).
1033	>15,000						SM: Silty sand, gray, dry, poorly graded fine to medium grained sand, non-plastic, slight hydrocarbon odor, (0,80,20,0).
1040					20		Olive gray, hydrocarbon odor, (0,75,25,0).
1045	300						Very fine grained sand, hydrocarbon odor, (0,70,30,0).
1055							Strong hydrocarbon odor, (0,75,25,0).
1338					25		ML: Sandy silt, olive gray, saturated, poorly graded very fine grained sand, non-plastic, strong hydrocarbon odor, (0,20,80,0).
1340	276						SM: Silty sand, olive gray, poorly graded very fine grained sand, non-plastic, strong hydrocarbon odor, (0,60,40,0).
1346	>15,000						
1352	>15,000				30		Grades increasing sand, (0,70,30,0).
1358	249						
1405	>15,000						
1405	28.5				35		ML: Clayey silt, light olive gray, saturated, poorly graded, medium plasticity, hydrocarbon odor, (0,0,75,25).



WELL CONSTRUCTION DETAILS

FUGRO USA LAND, INC.
469 Roland Way
Oakland, CA 9621
T +1 510-430-8851

Date: February 20, 2017
Report Number 04.0916-0020

Apex Companies, LLC
3478 Buskirk Avenue, Suite 100
Pleasant Hill, CA 94523

Attn.: Kirsten L. Duey

REPORT FOR PIEZOCONE PENETRATION TESTING
ULTRA-VIOLET OPTICAL SCREENING TOOL PCPT/UVOST™) TESTING
AND RELATED SERVICES
SIGNAL HILL, CALIFORNIA

Dear Ms. Duey:

Fugro USA Land, Inc. (Fugro) is pleased to present this data report for Piezocone Penetration (PCPT) and Ultra-Violet Optical Screening Tool (UVOST™) testing at the above-referenced site to The Source Group, a division of Apex Companies. PCPT/UVOST™ provided continuous characterization of stratigraphy and petroleum hydrocarbon distribution at the testing location. A description of the PCPT and UVOST™ technologies and a discussion of general UVOST™ data interpretation follow. PCPT and UVOST™ logs are included as attachments.

Scope of Services

We performed eighteen (18) PCPT/ UVOST™ soundings as directed by client representative. Fugro is pleased to present data report for Piezocone Penetration Testing (PCPT) services and Ultra-Violet Optical Screening Tool (UVOST™) screening performed at the above-referenced site in accordance with Fugro Proposal PLC16-042 dated November 16, 2016 to The Source Group.

PCPT Testing

The PCPT soundings were conducted in general accordance with ASTM D5778-12, Electronic Friction Cone and Piezocone Penetration Testing of Soils using a 30-ton truck mounted PCPT unit. The in-situ soil data was obtained by hydraulically advancing a cylindrical steel rod, with an instrumented probe at the base, vertically into the subsurface materials at a constant rate of 2 centimeters per second. The instrumented probe consists of a cone-shaped tip element, with an apex angle of 60 degrees with a base area of 15 square centimeters (cm2), a

cylindrical-shaped side friction with a surface area of 200 cm2 Measurements of penetration resistance at the cone tip (qc), frictional resistance along the friction sleeve (fs), and pore water pressure (u2), were recorded with depth during penetration. PCPT sounding measurements collected for this project are presented on the logs attached at the end of this report.

PCPT methods test the soil in situ and soil samples are not obtained. There are several methods to identify the soil type using the PCPT data collected. For your reference, we have presented soil stratigraphy using the attached Campanella and Robertson's Simplified Soil Behavior Chart (12-zone, 1986). Please note that because of the empirical nature of the soil behavior chart, the soil identification should be verified locally from soil borings and laboratory testing. Some soils, such as cemented or calcareous soils, or glacial tills are outside the limits of the soil behavior chart.

UVOST™ Testing

Fugro USA Land's UVOST™ Laser-Induced Fluorescence system was used for this investigation to screen soils for petroleum hydrocarbon materials containing aromatic hydrocarbon constituents. The system consists of a laser mounted in the CPT unit that is connected to a down-hole sensor. The down-hole sensor consists of a sapphire window mounted flush with the side of the cone penetrometer probe.

The laser and associated equipment transmit pulsed of light to the sensor through a fiber optic cable. The wavelength of the pulsed excitation light is set to an excitation wavelength of 308 nm.

The laser light passes through the sapphire window and is absorbed by aromatic hydrocarbon molecules in contact with the window, as the probe is advanced. This addition of energy (photons) to the aromatic hydrocarbons causes them to fluoresce. A portion of the fluorescence emitted from any encountered aromatic constituents is returned through the sapphire window and conveyed by a second fiber optic cable to a detection system within the CPT unit. The emission data resulting from the pulsed laser light is averaged into one reading per one-second interval (approximately one reading per 2 cm vertical interval) and is recorded continuously.

Several characteristics of the emitted fluorescence are measured and recorded simultaneously at four (4) specific wavelengths (340, 390, 440, and 490 nm). These four wavelengths represent the spectrum of fluorescence typically produced by aromatic hydrocarbons ranging from light fuels through heavy contaminants such as coal tar and creosote. The recorded data is then presented as a color graph of fluorescence intensity (the combined fluorescence of all four monitored wavelengths) versus depth (FVD).

On the FVD graph, each of the four monitored wavelengths is assigned a color. These colors are combined based on the proportional fluorescence intensity of each of the individual wavelengths. The combined color is then used on the FVD graph. Changes in color on the FVD graph typically represent changes in product type. Similarly, like colors on the FVD graph typically represent the same product, regardless of the total fluorescence intensity. Changes in the total fluorescence intensity typically indicate changes in contaminant concentration,

with higher fluorescence intensities representing proportionally higher concentrations when compared to lower fluorescence intensities.

In addition to the FVD graph, randomly selected depth specific waveforms are presented at up to five (5) depths throughout the sounding. These waveform graphs are presented to the left of the FVD graph on each plot. On each waveform graph, shorter waves are shown on the left and increase from left to right. For general interpretation purposes, lighter aromatic hydrocarbon molecules will emit fluorescence at the shorter wavelengths, and heavier, longer chained hydrocarbons will emit fluorescence at the longer wavelengths. The presented waveforms can be compared to waveforms typical of common hydrocarbon products to determine the likely product type that has been encountered. Please note that the waveforms are available at every two-centimeter interval throughout the entire sounding. Additional waveforms can be generated at any time during or after testing is complete.

REFERENCE SOLUTION: The fluorescence intensity of a reference solution placed on the sapphire window was measured immediately prior to conducting each test. This reference solution measurement serves two purposes. First, as a quality control check, the solution is used to ensure that the performance of the system is within specifications. Second, it allows for normalization of the data from different test locations for variation in laser power, operating conditions, and monitored emission wavelength. The reference solution used for this project was the standard M1 reference, which is a proprietary PHC containing solution. M1 provides consistent fluorescence response across the portion of the spectrum analyzed by UVOST™ and therefore, allows the fluorescence data collected to be consistently normalized to intensities recorded as a percentage of M1.

LIMITATIONS OF ENVIRONMENTAL SUBSURFACE WORK

Fugro's report is based upon our observations made during fieldwork, the information provided to Fugro and the results of the UVOST™/PCPT survey. Given the inherent limitation of environmental subsurface work, Fugro cannot guarantee that the site is free of hazardous or potentially hazardous materials or conditions or that latent or undiscovered conditions will not become evident in the future. Fugro's report was prepared in accordance with our proposal and the General Conditions agreed to between Fugro and Client and no warranties, representations, or certifications are made.

Closing

Fugro appreciates the opportunity to be of service to THE SOURCE GROUP. If you have any questions, please feel free to contact me at 510-430-8851.

Best Regards,
FUGRO USA LAND, INC.

Virgil A. Baker
CPT Manager

Attachments: PCPT Sounding Logs (18 pages)
UVOST™ Sounding Logs (18 pages)
Additional PCPT Sounding Logs Generated During PCPT/MIP Testing (3 pages)
Campanella and Robertson's Simplified Soil Behavior Chart (1 page)
"Interpreting LIF Waveforms", Dakota Technologies (6 pages)

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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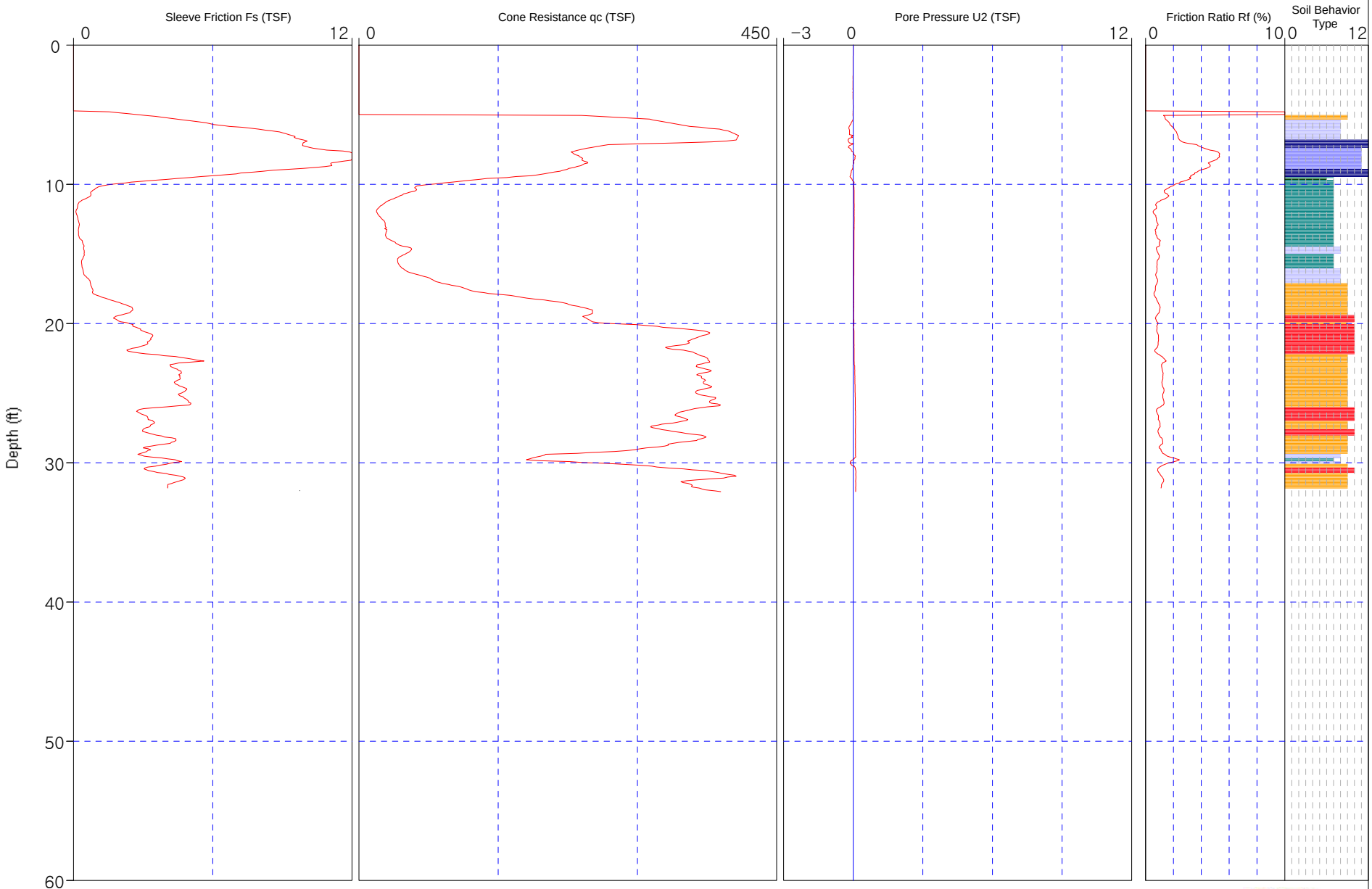
Date: 13-Dec-2016
Elevation: 0.00

Coordinates:
Cone Number: CP15-CF25PB7SN2-P1E1 1519



Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

CPT Number: AE-02
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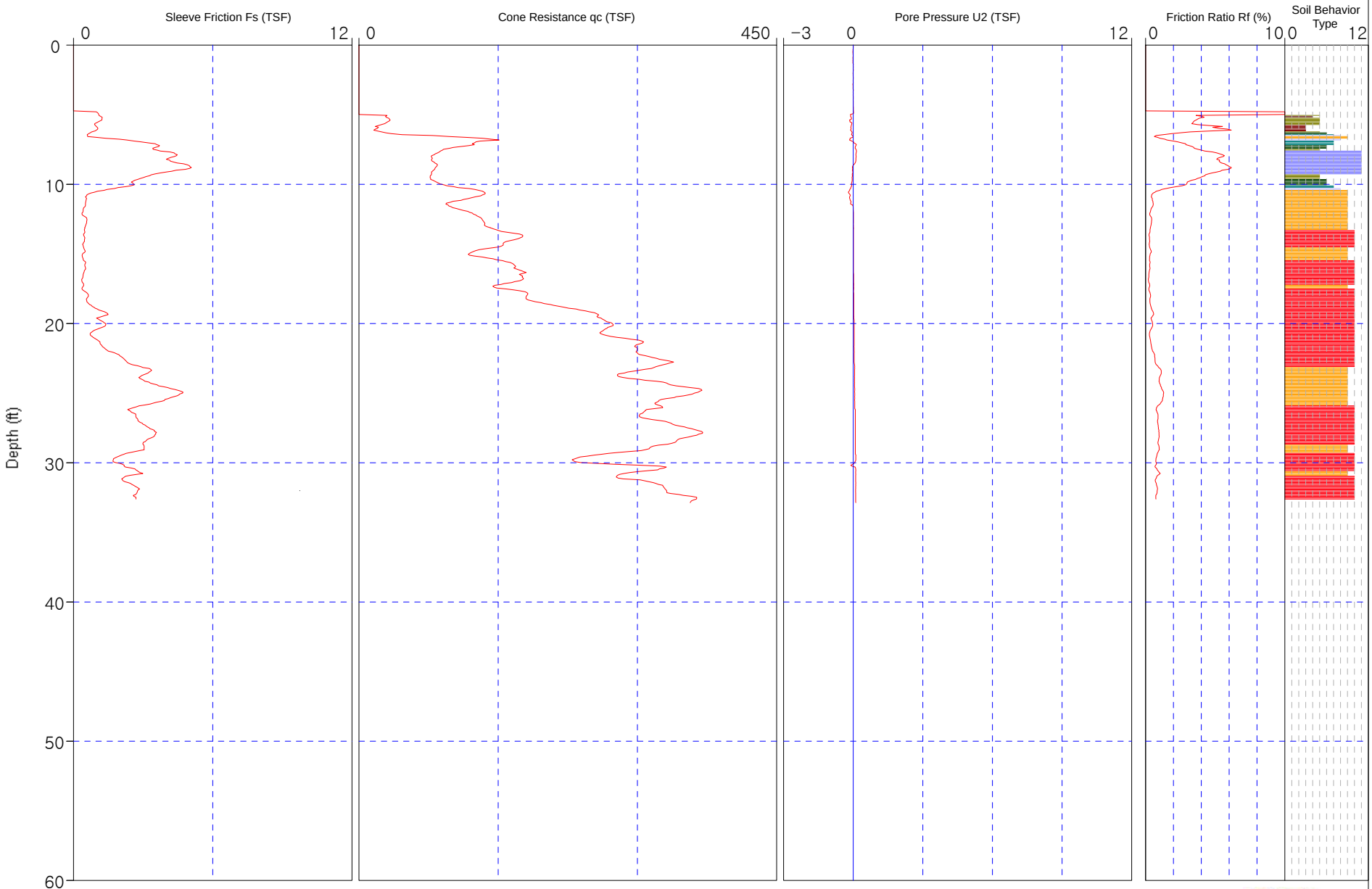

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

CPT Number: AE-03
Date: 13-Dec-2016
Elevation: 0.00

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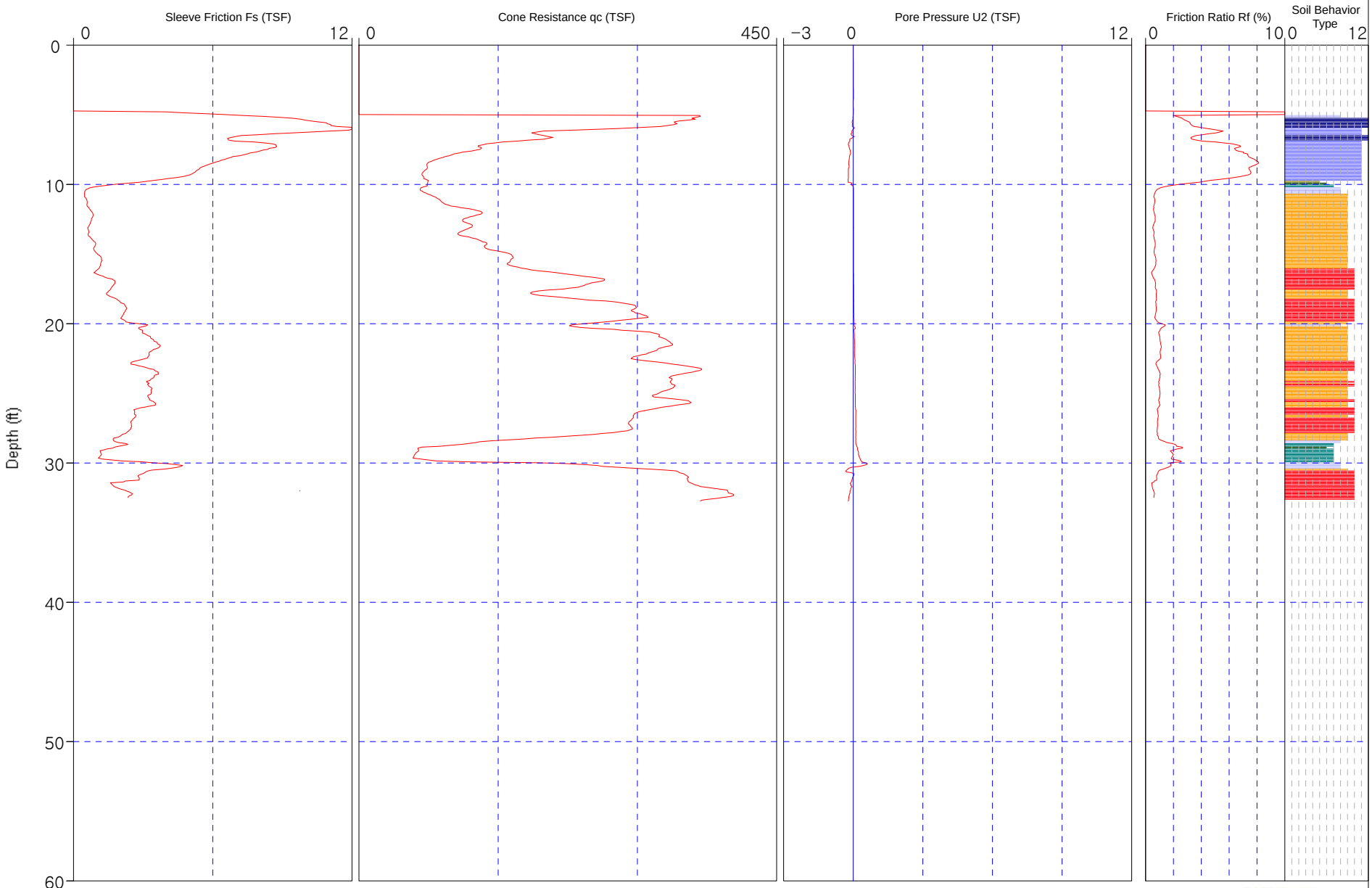

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(2) organic material (OL-OH)
(3) clay (CH)
(4) silty clay to clay (CL-CH)
(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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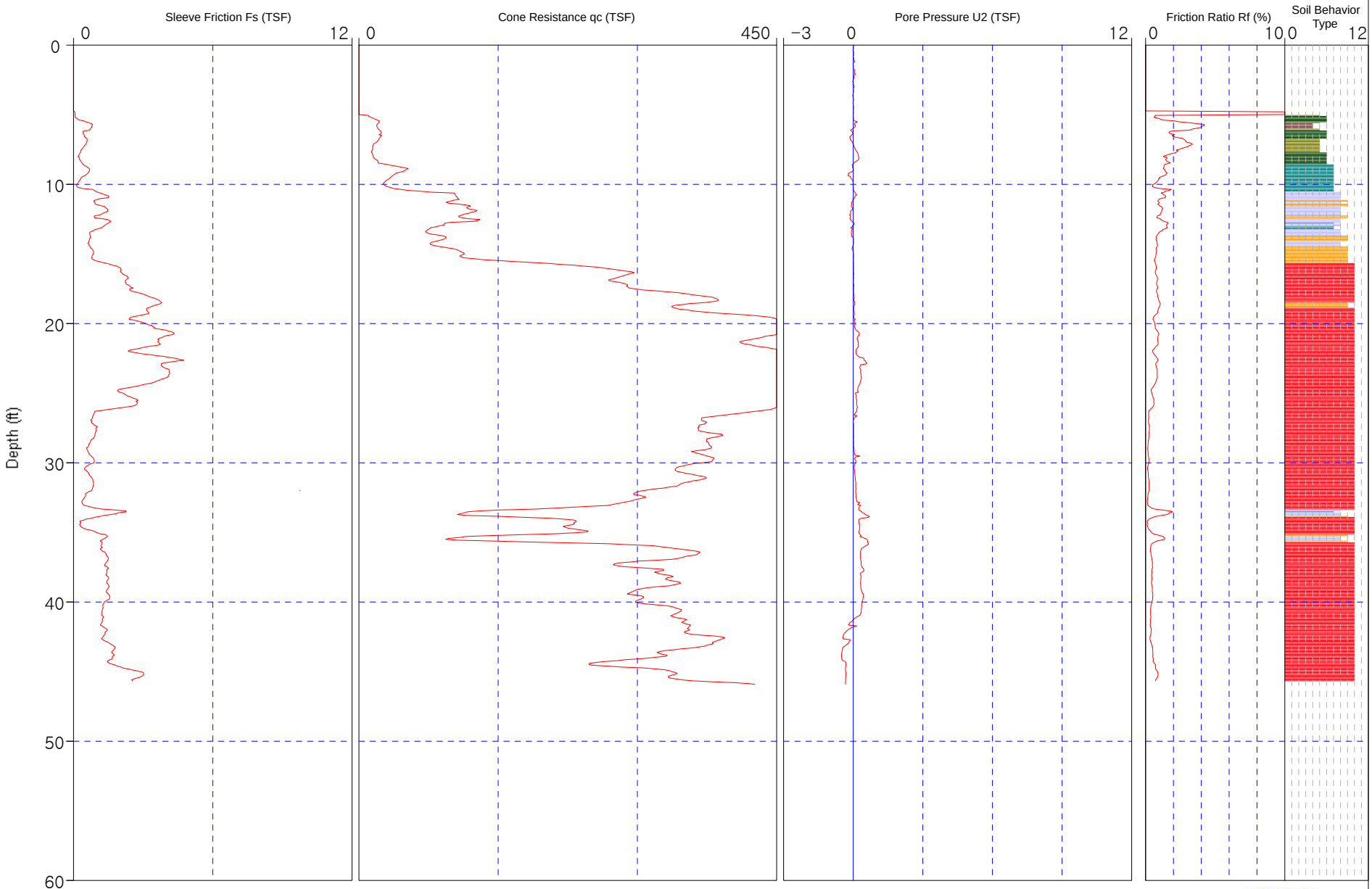

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

CPT Number: AN-10
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Elevation: 0.00

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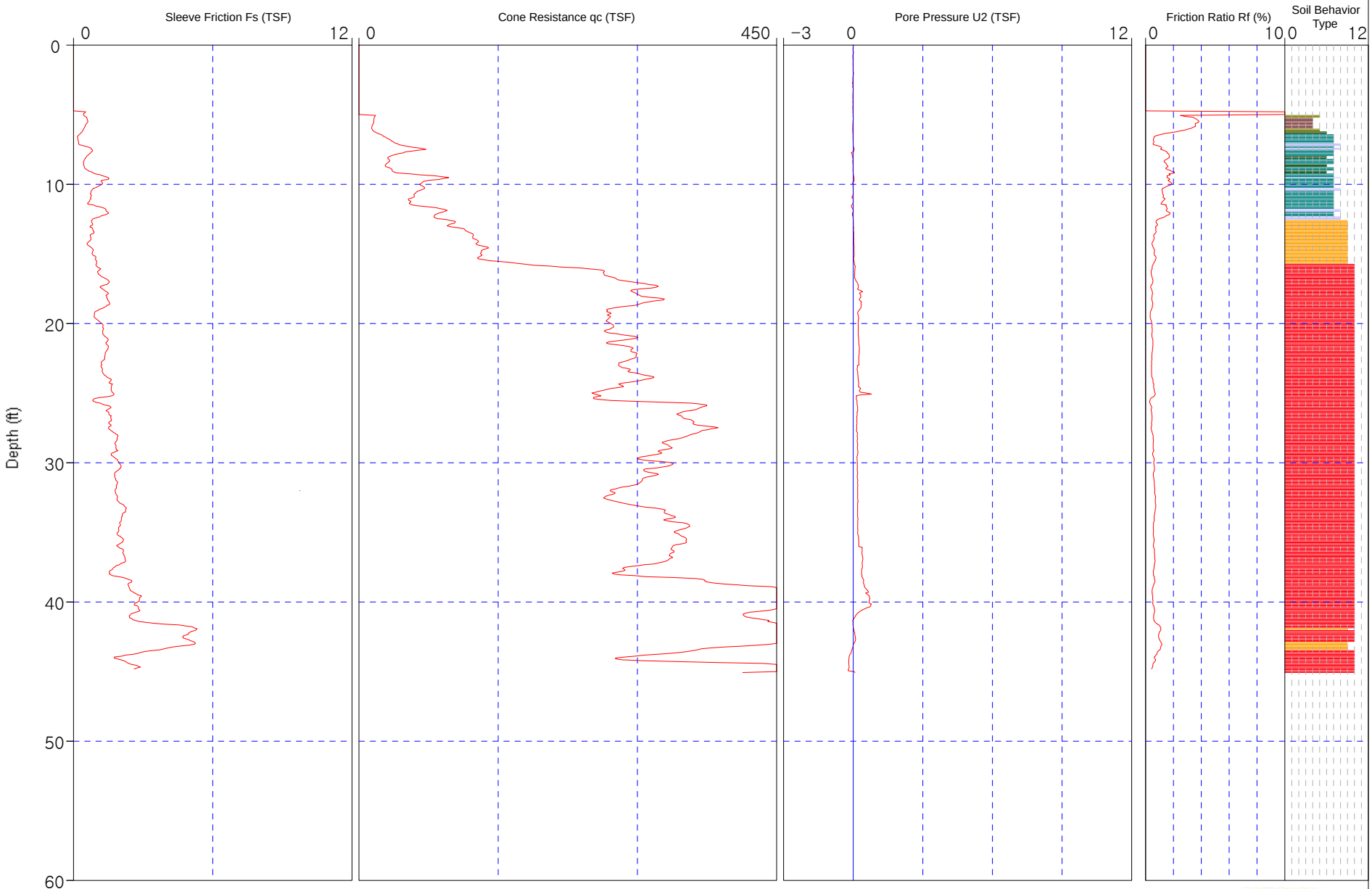

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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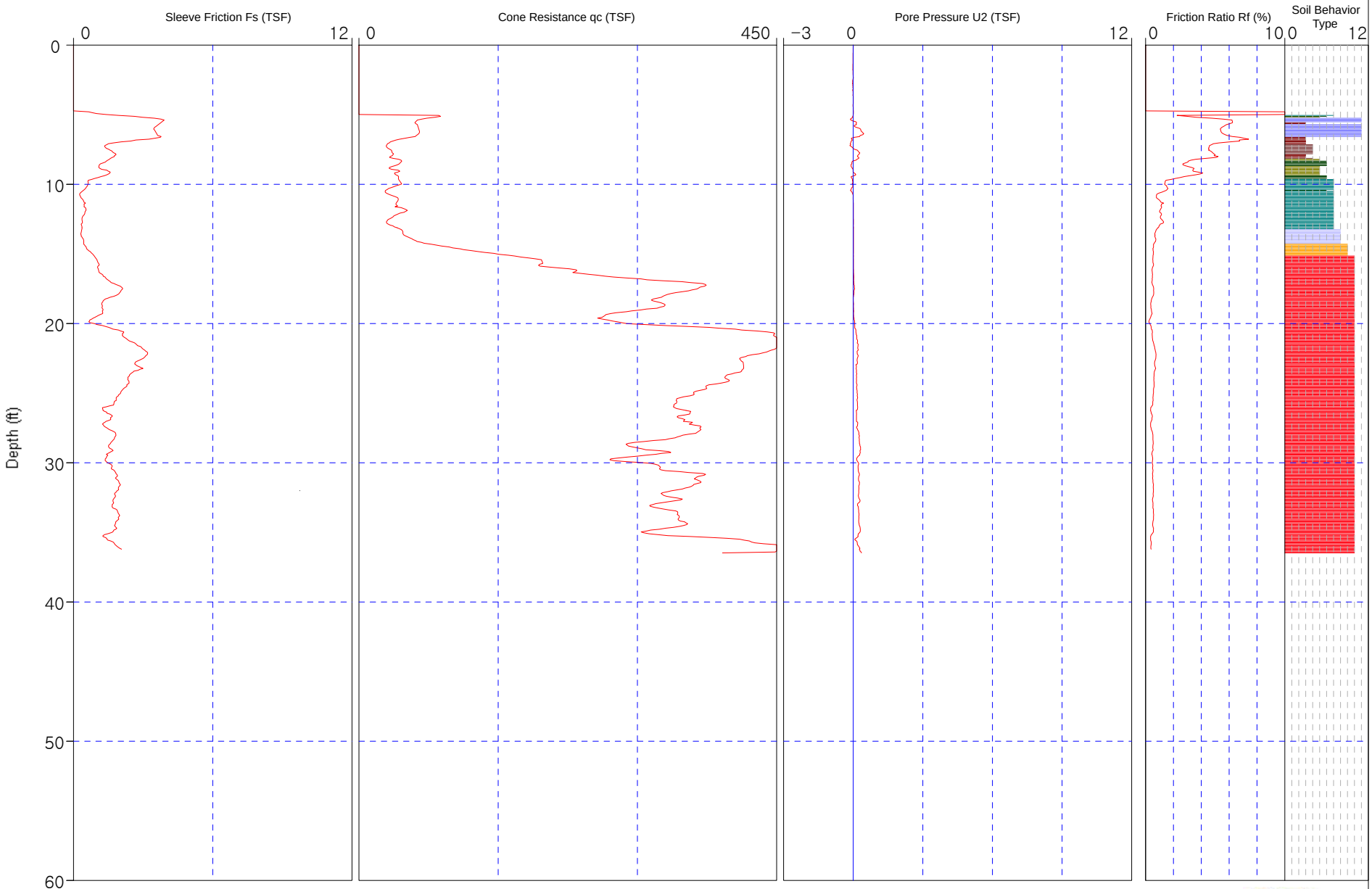

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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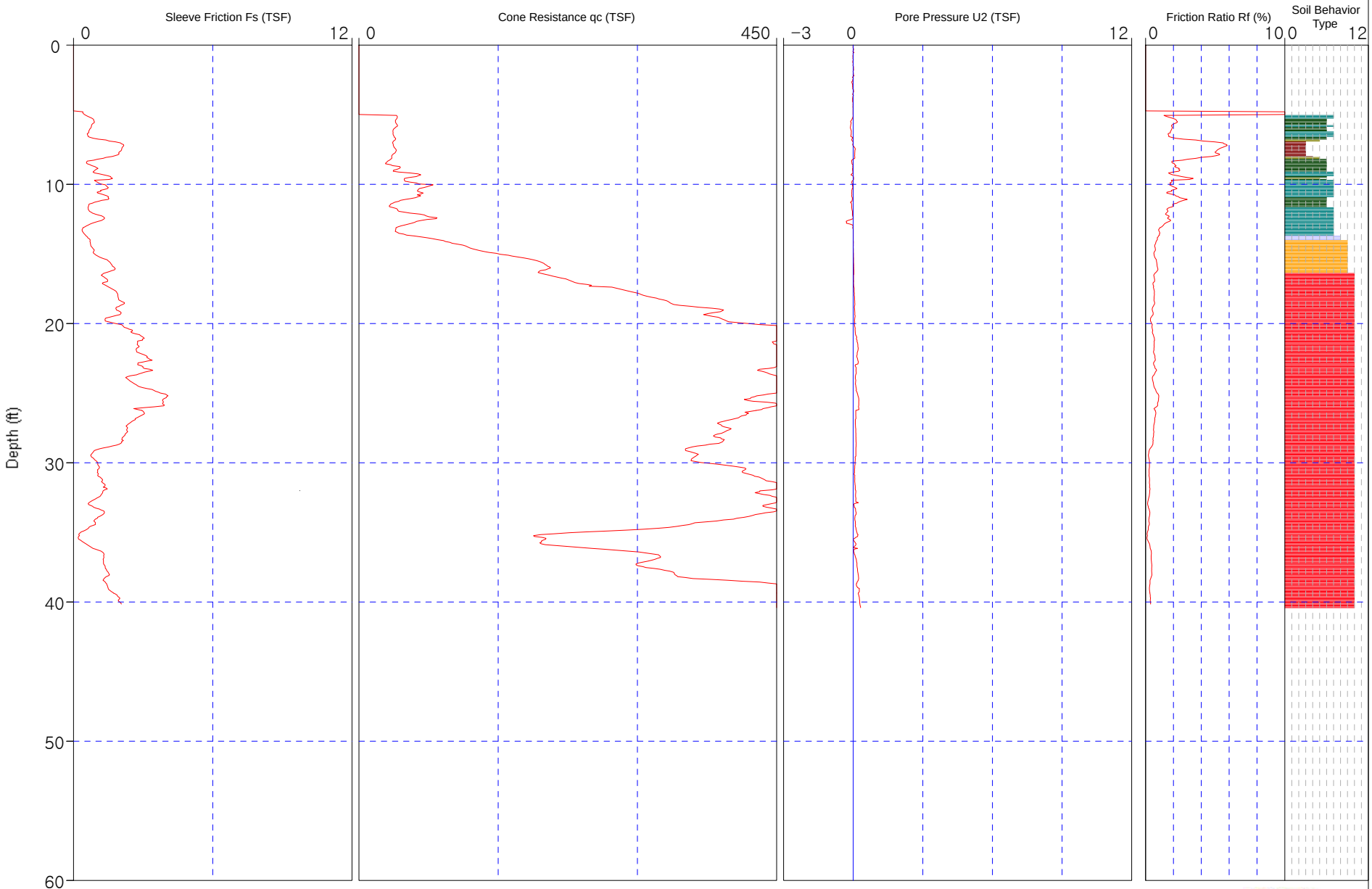

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(2) organic material (OL-OH)
(3) clay (CH)
(4) silty clay to clay (CL-CH)
(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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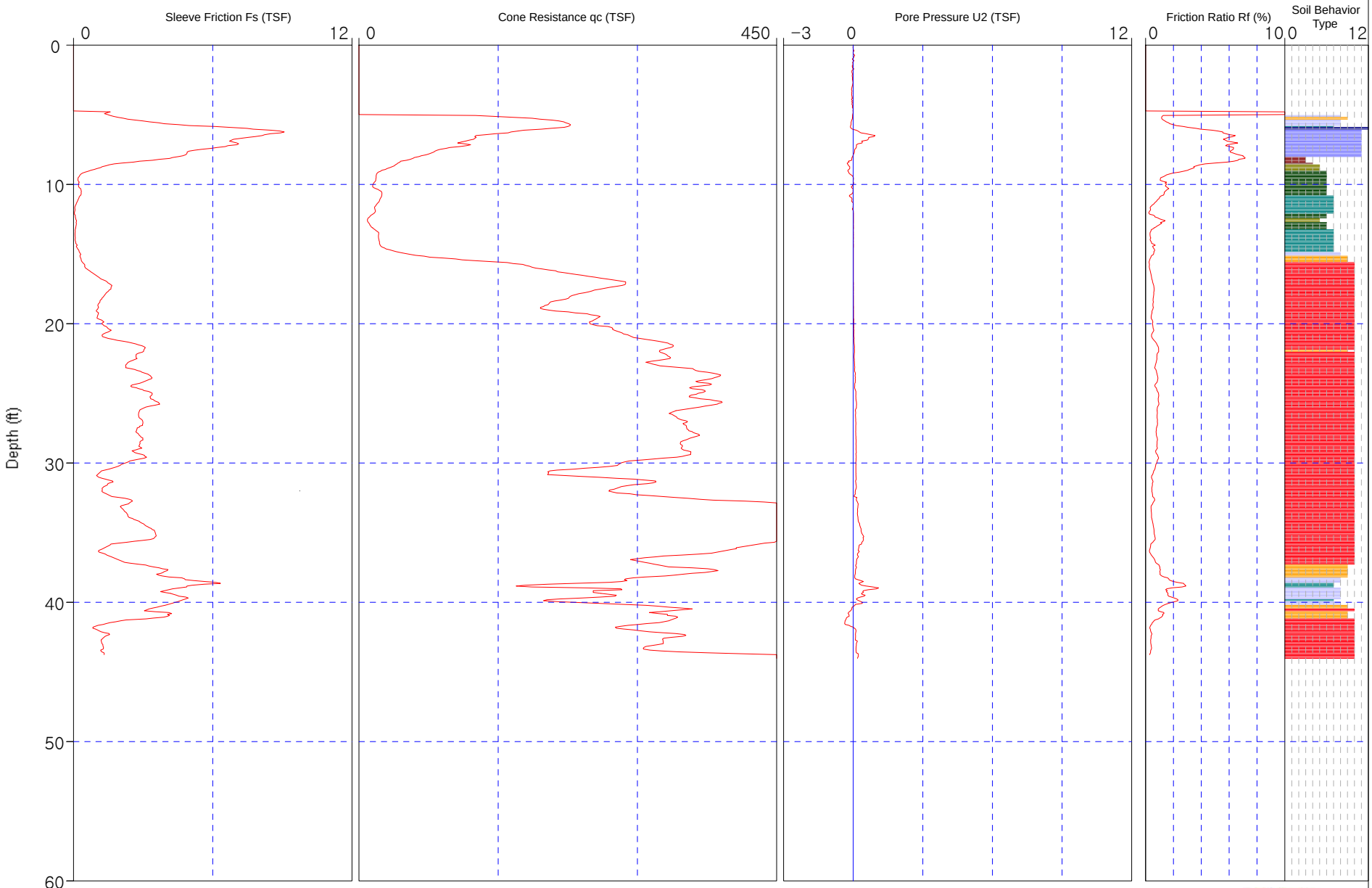

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 0409160020
Operator: D. Garza
Location: Signal Hill, CA

CPT Number: AN-16
Date: 14-Dec-2016
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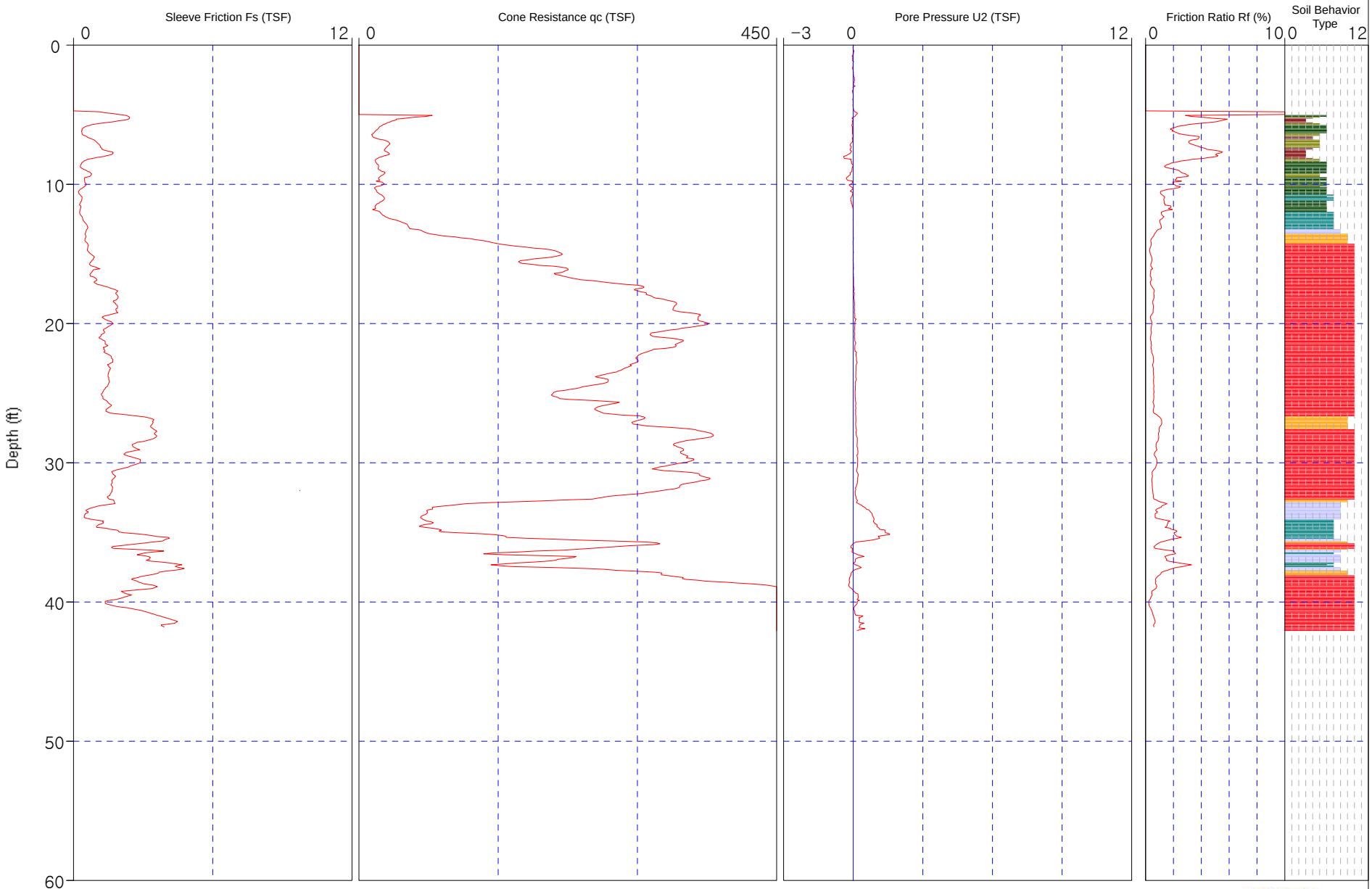

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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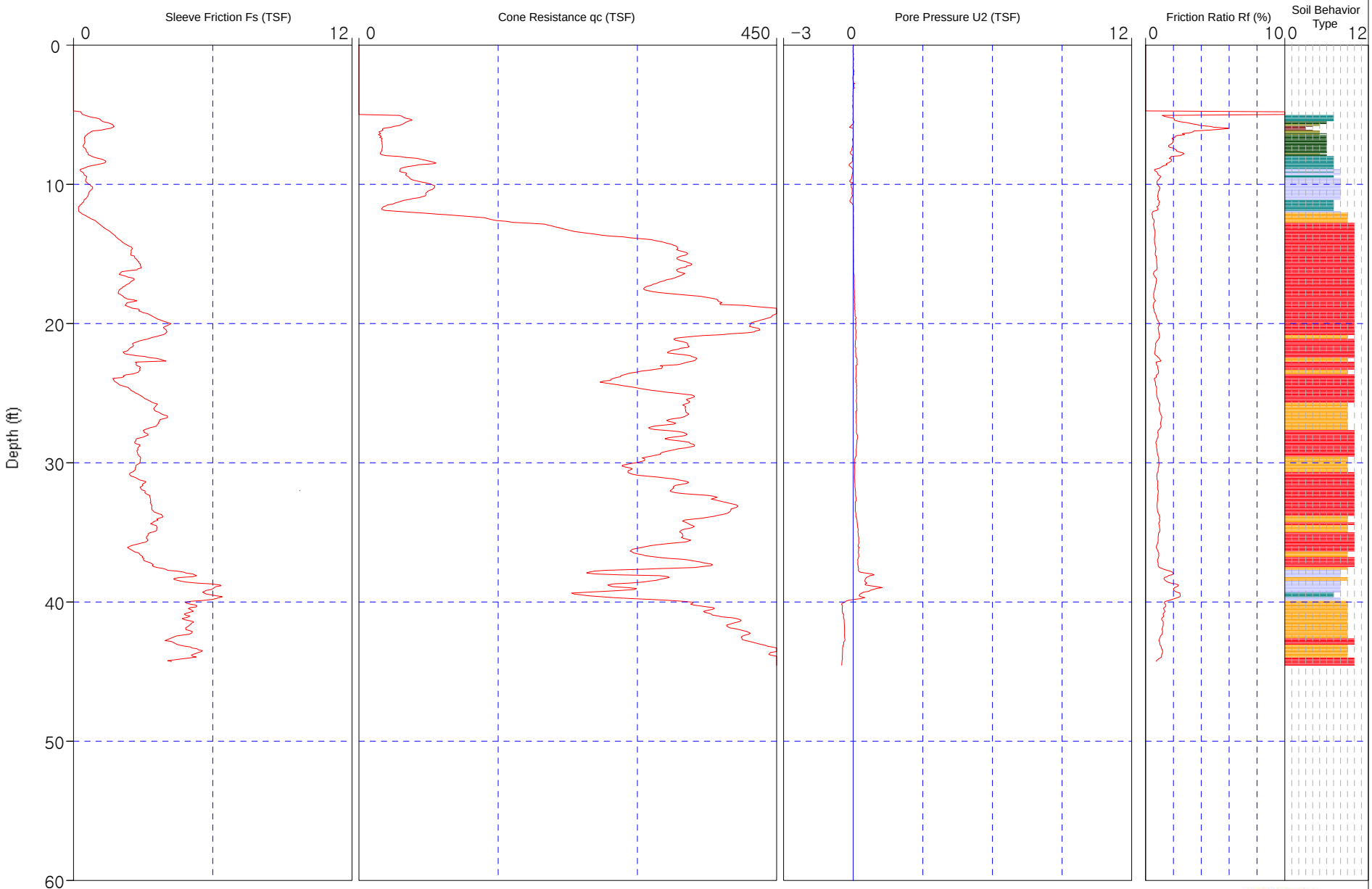

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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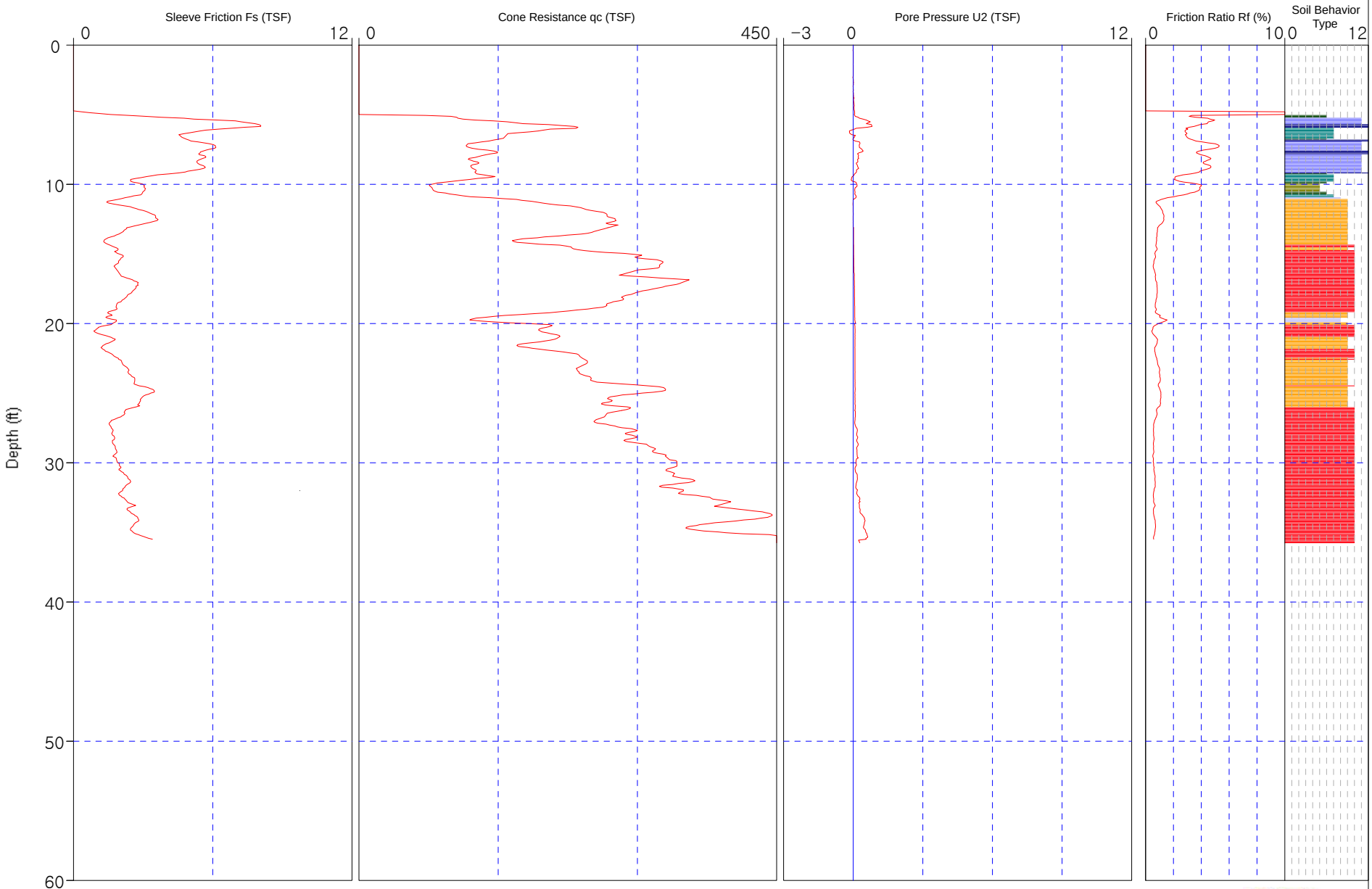

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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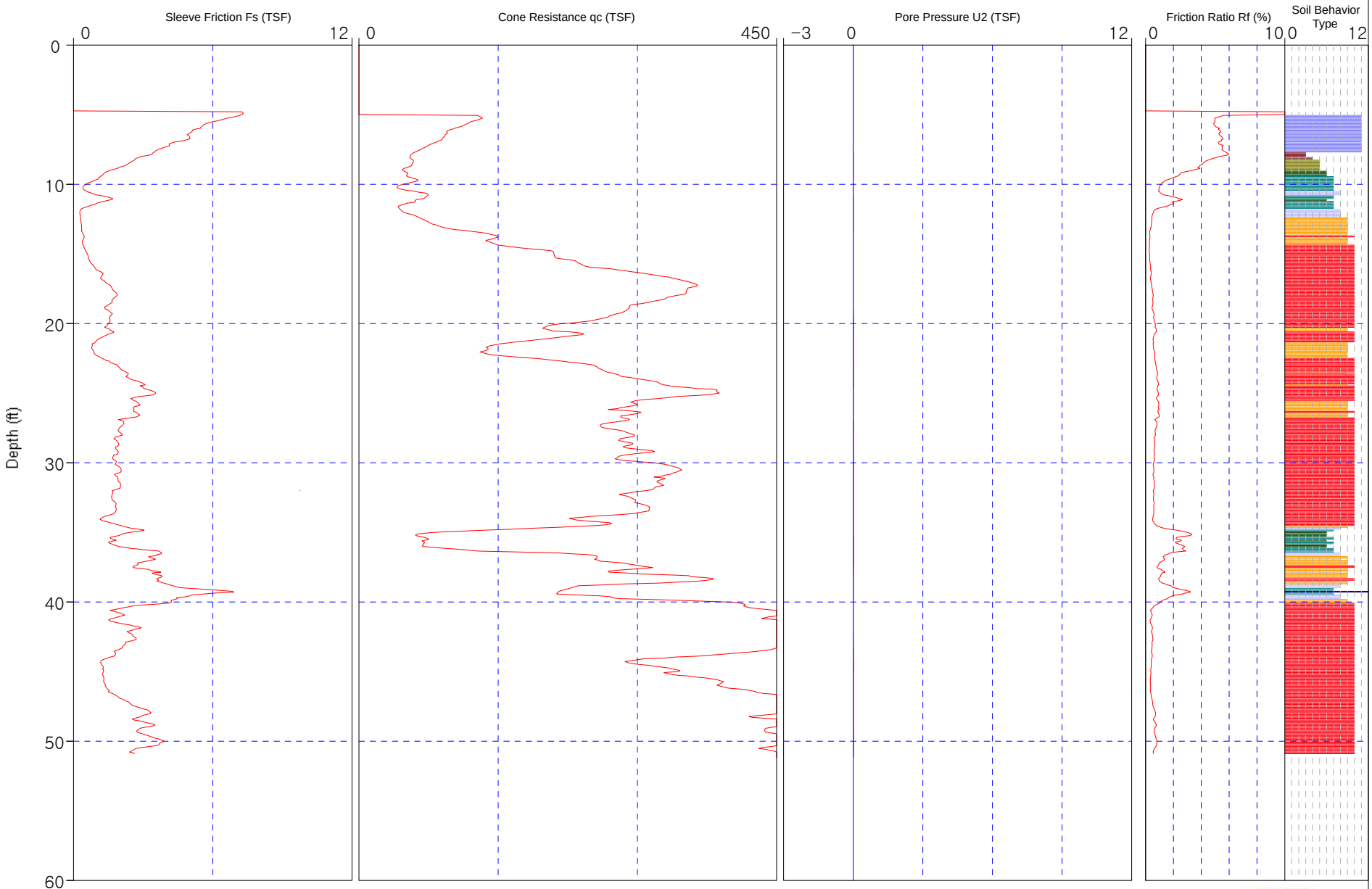

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(4) silty clay to clay (CL-CH)
(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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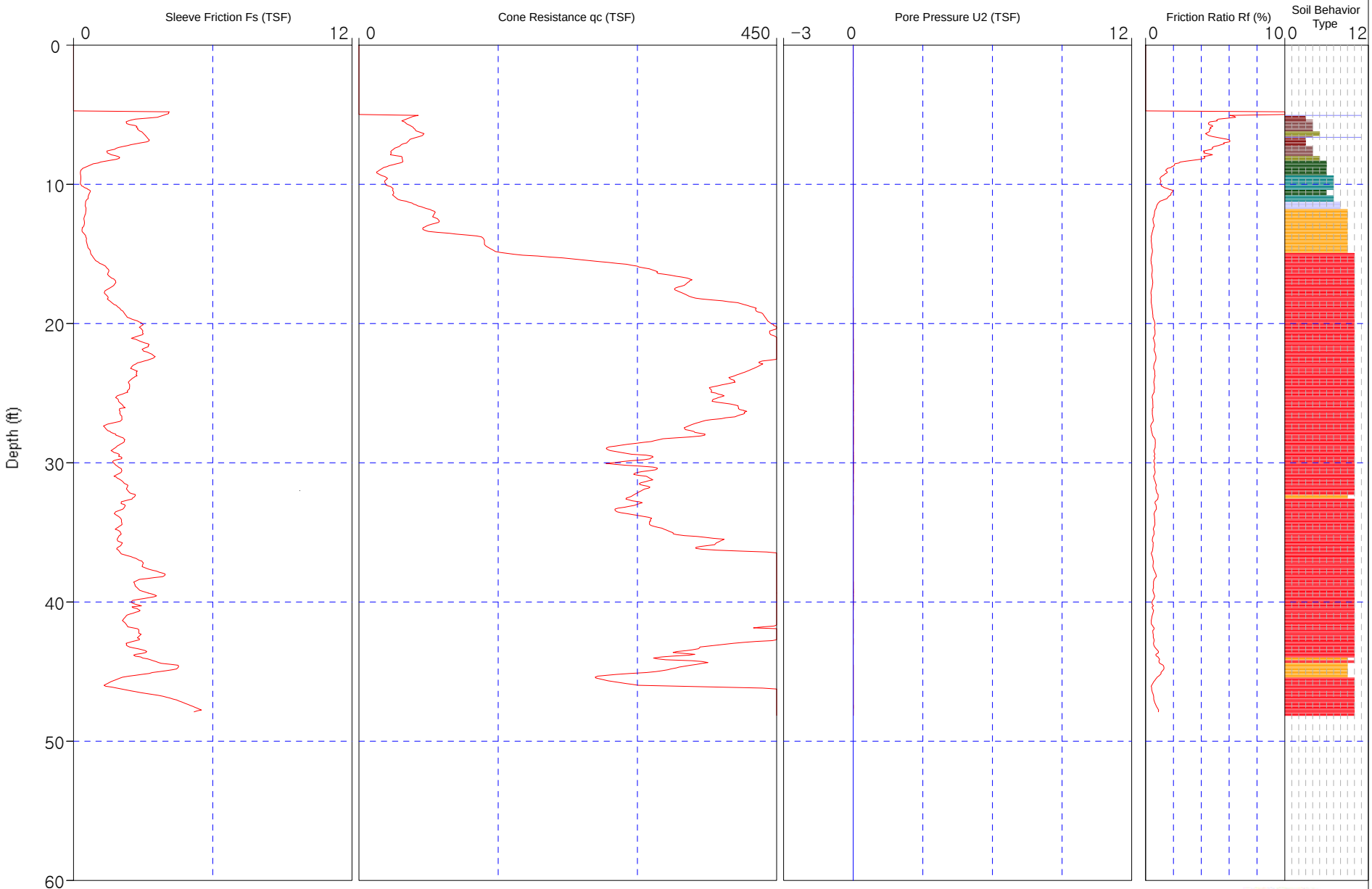

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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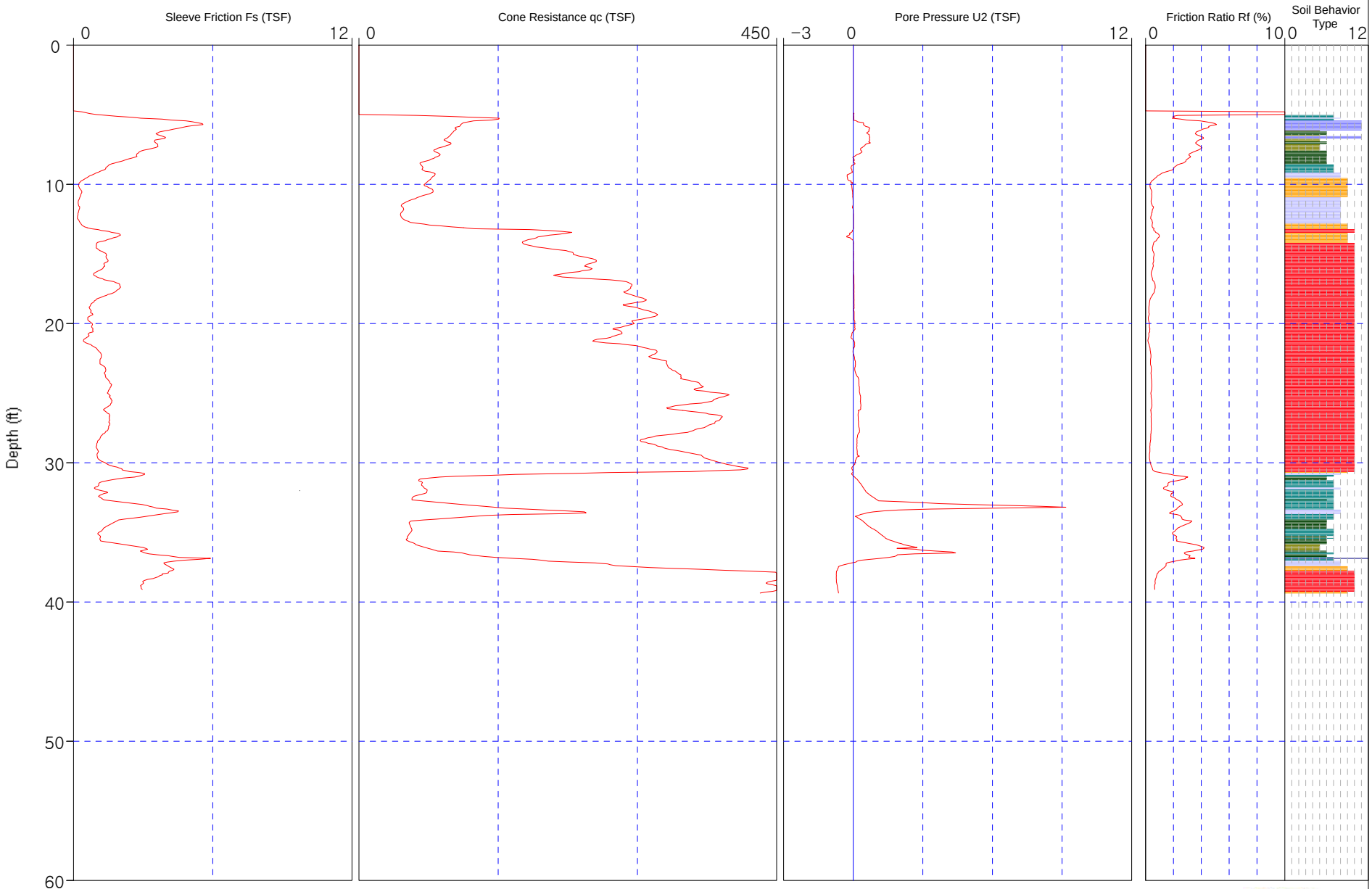

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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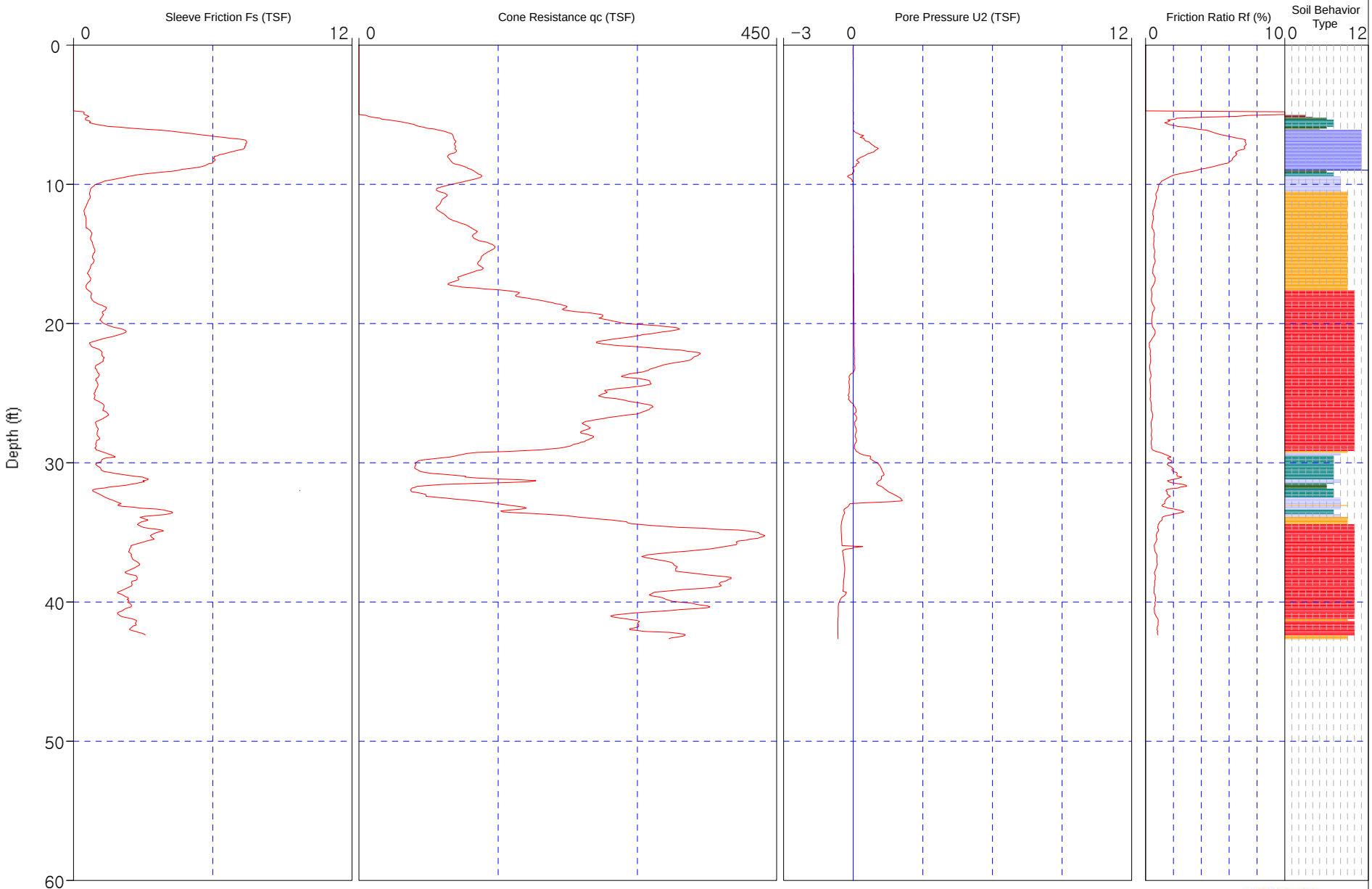

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(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
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(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

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Date: 14-Dec-2016
Elevation: 0.00

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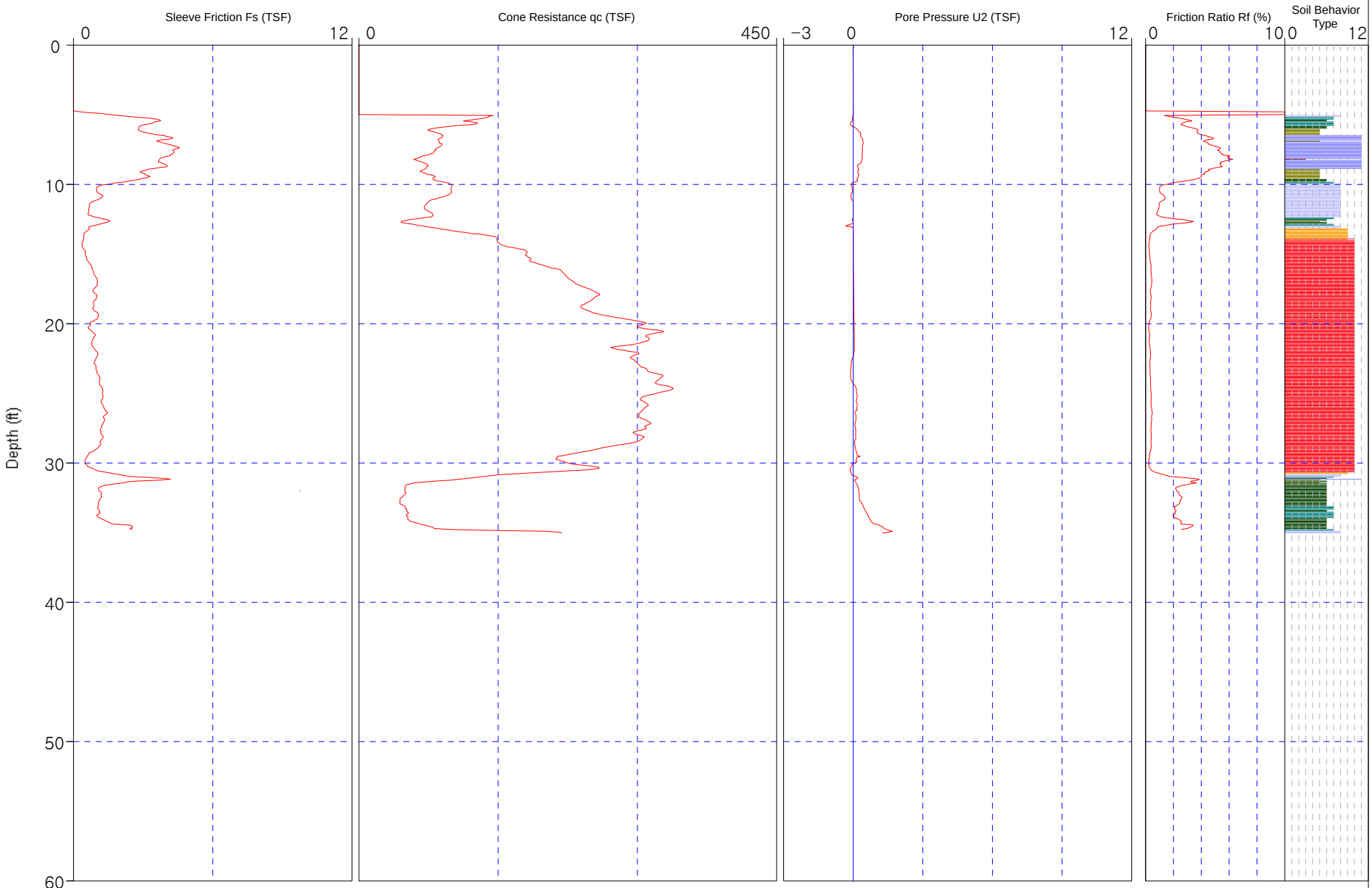

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(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

CPT Number: AS-04
Date: 14-Dec-2016
Elevation: 0.00

Coordinates:
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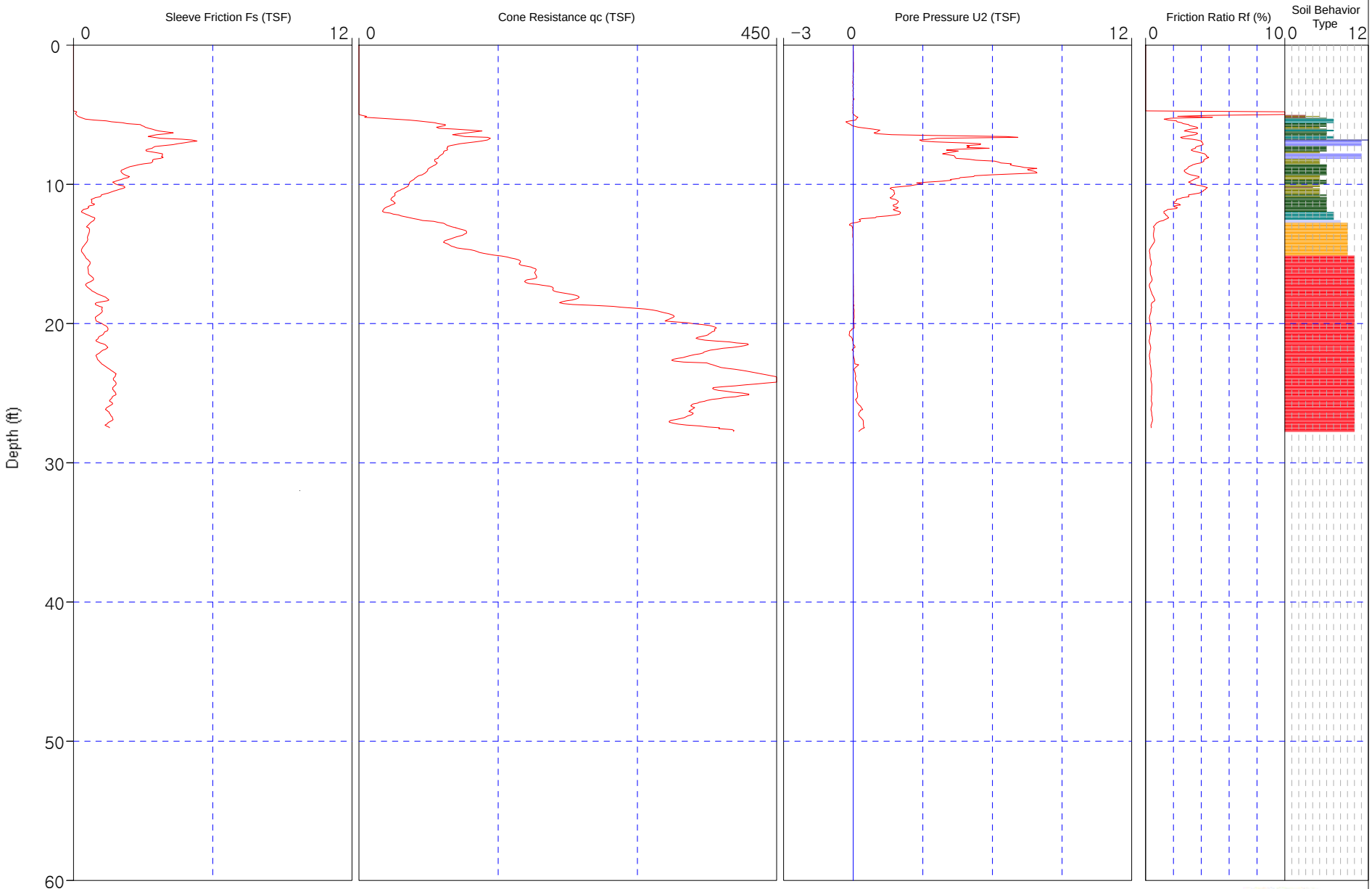

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(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

CPT Number: AS-05
Date: 14-Dec-2016
Elevation: 0.00

Coordinates:
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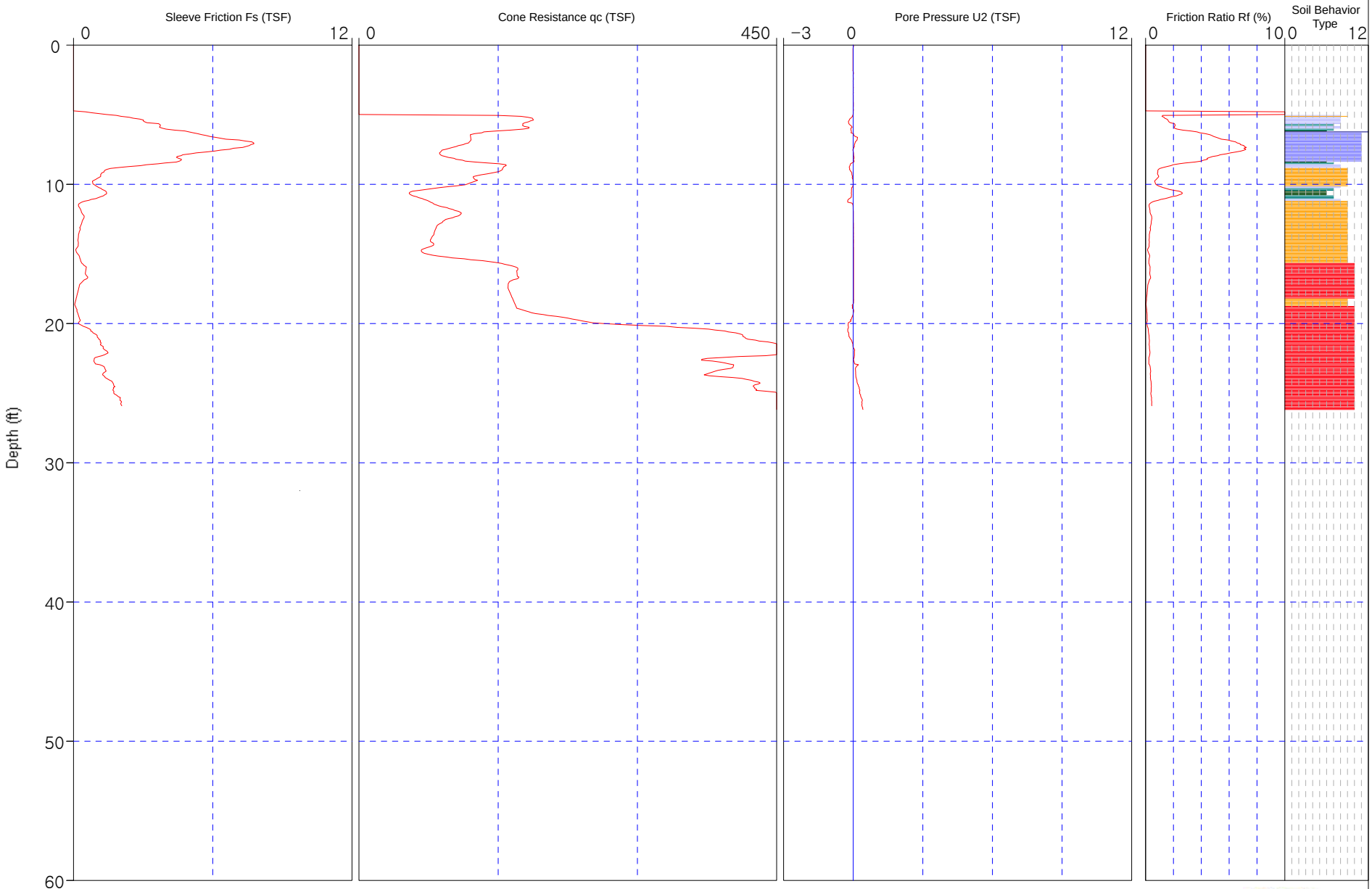

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 0409160020
Operator: D. Garza
Location: Signal Hill, CA

CPT Number: AS-06
Date: 15-Dec-2016
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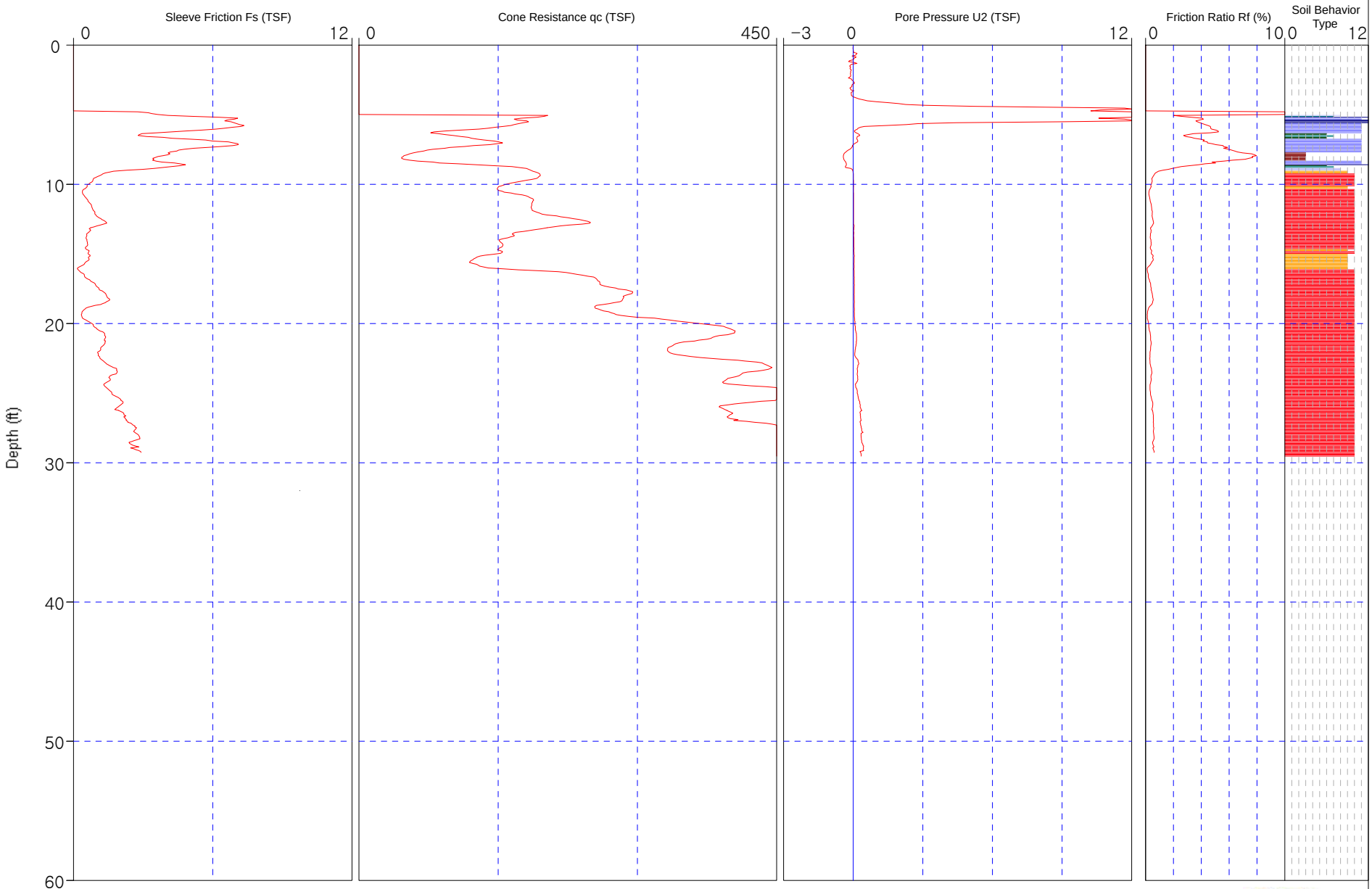

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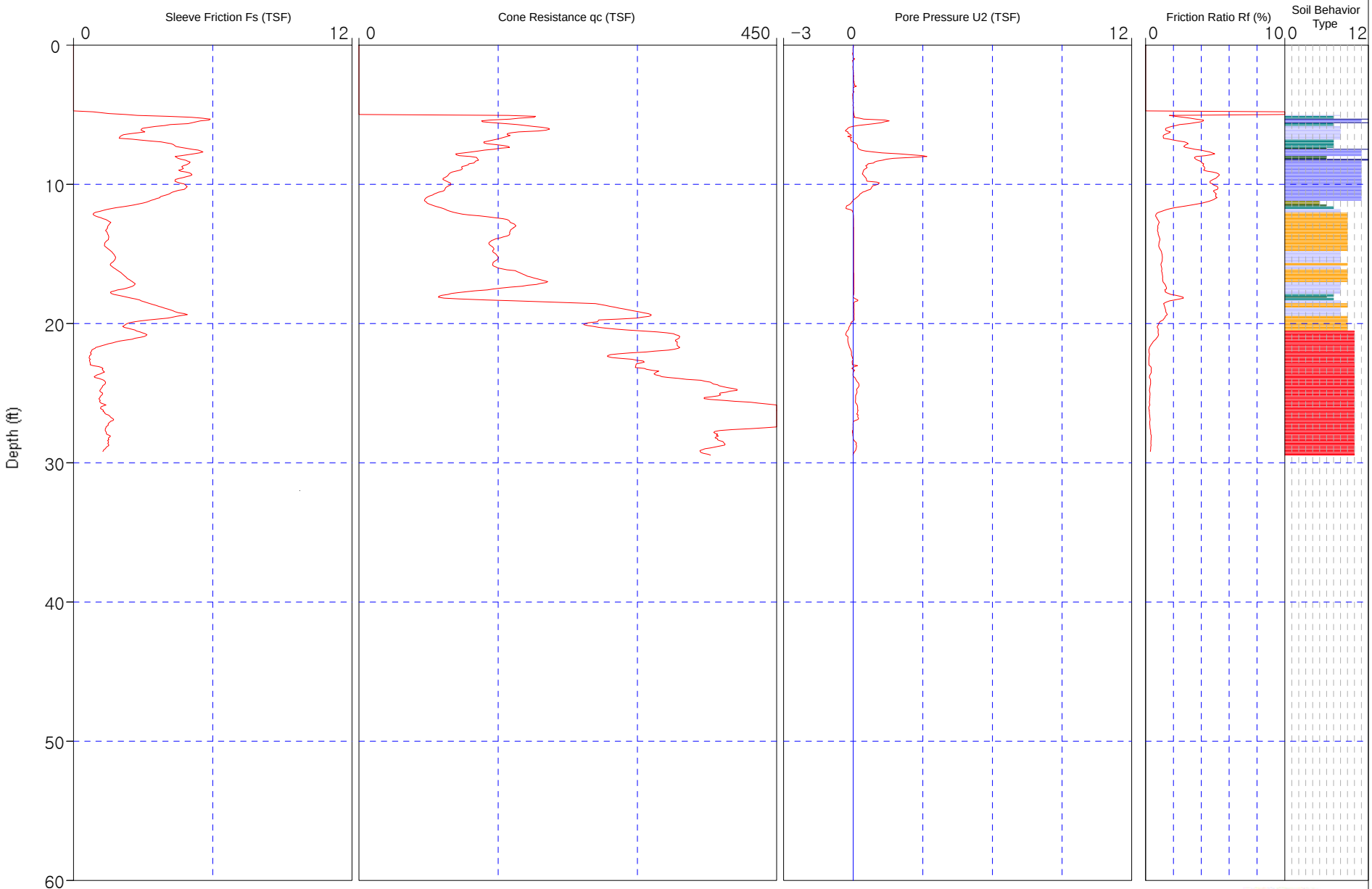
(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

CPT Number: AS-09
Date: 14-Dec-2016
Elevation: 0.00

Coordinates:
Cone Number: CP15-CF25PB7SN2-P1E1 1519



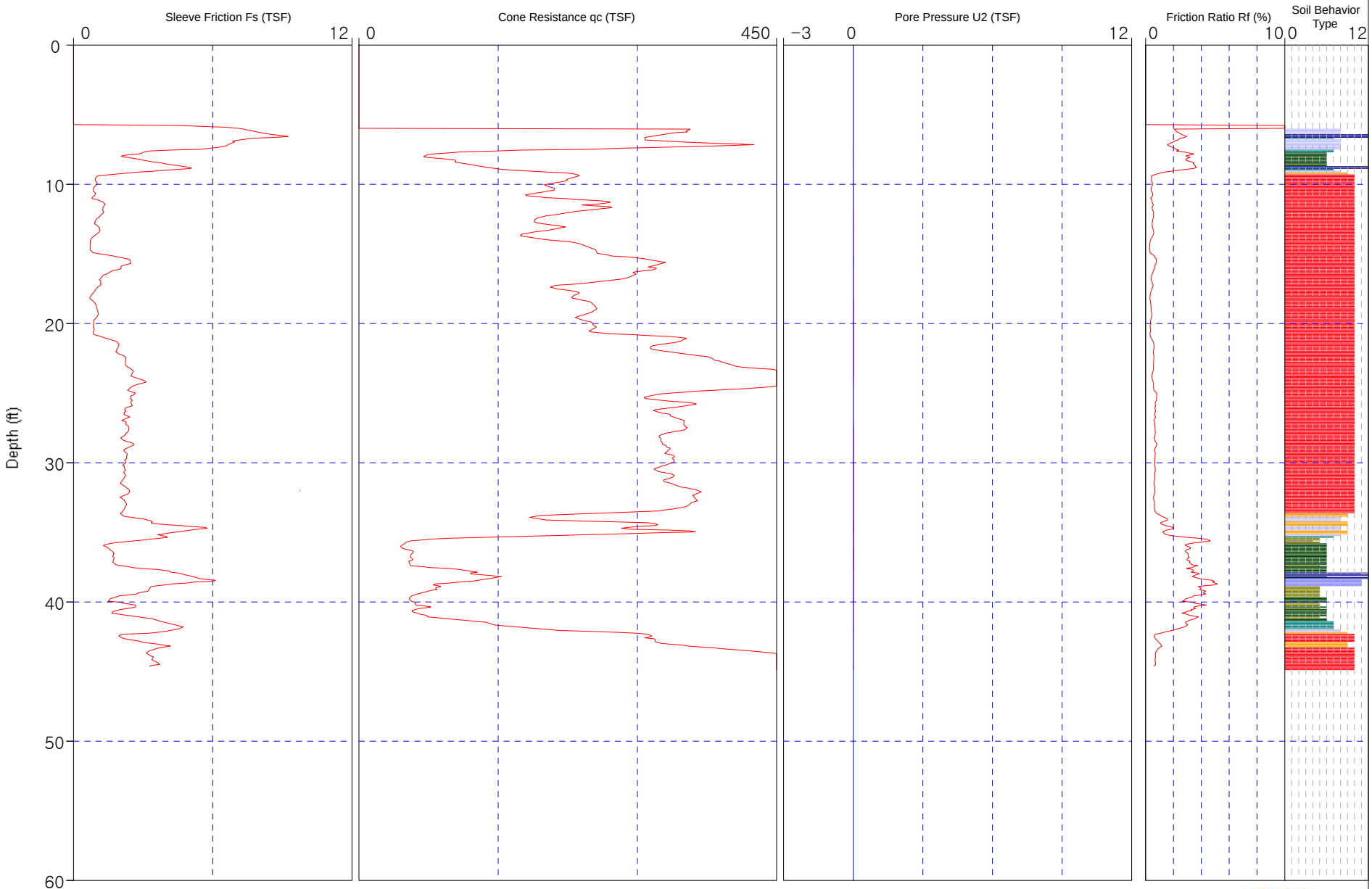
(1) sensitive fine grained (OL-CH)
(2) organic material (OL-OH)
(3) clay (CH)
(4) silty clay to clay (CL-CH)
(5) clayey silt to silty clay (MH-CL)
(6) sandy silt to clayey silt (ML-MH)
(7) silty sand to sandy silt (SM-ML)
(8) sand to silty sand (SM-SP)
(9) sand (SW-SP)
(10) gravel to gravelly sand (SW-GW)
(11) very stiff fine grained* (CH-CL)
(12) sand to clayey sand* (SC-SM)

Robertson et al. 1986 *Overconsolidated or Cemented

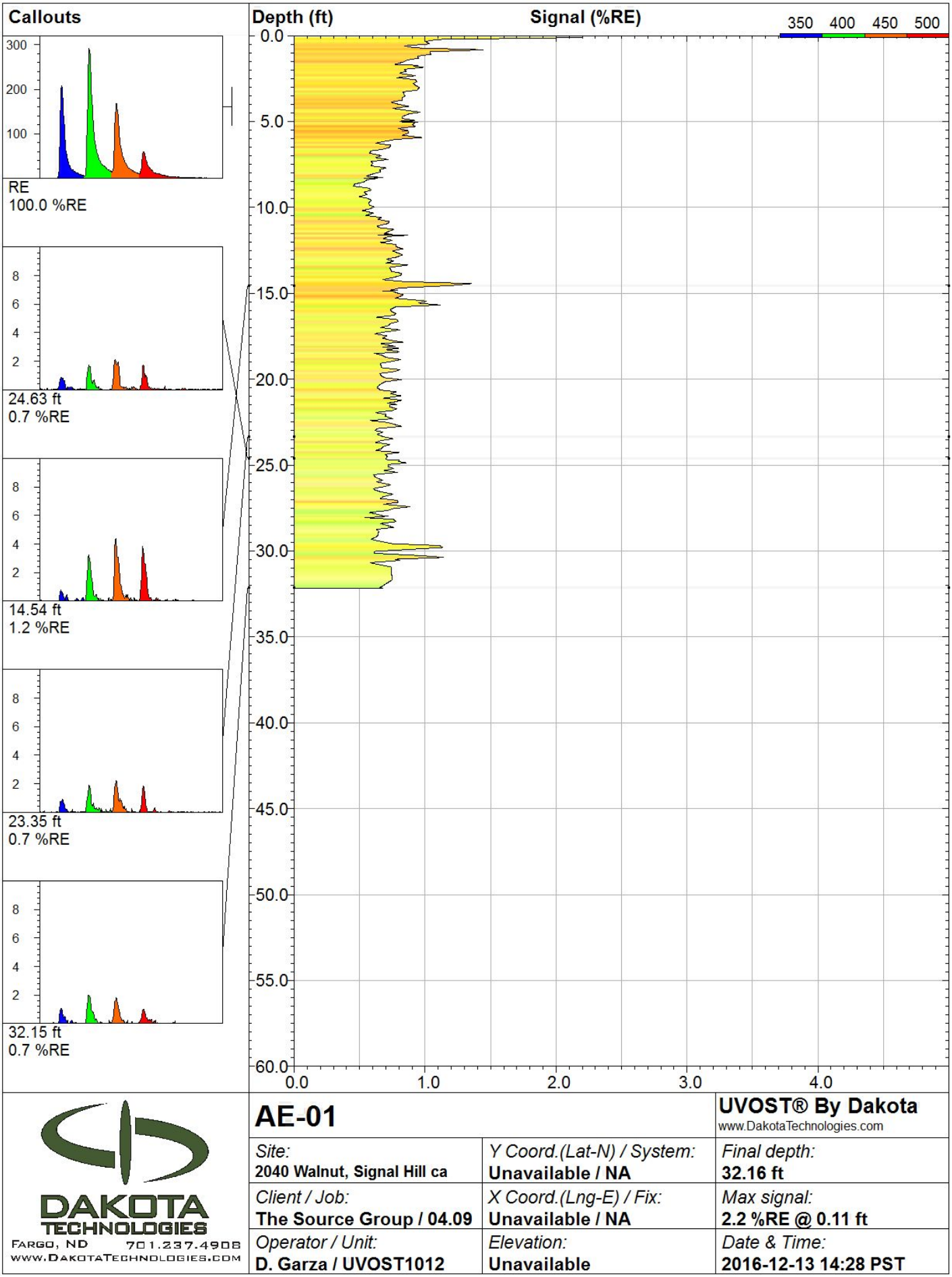
Job Number: 04.0916-0020
Operator: Danny Garza
Location: Signal Hill, CA

CPT Number: AS-10
Date: 19-Dec-2016
Elevation: 0.00

Coordinates:
Cone Number: CP15-CF25PB7SN2-P1E1 2095



Robertson et al. 1986 *Overconsolidated or Cemented



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AE-01

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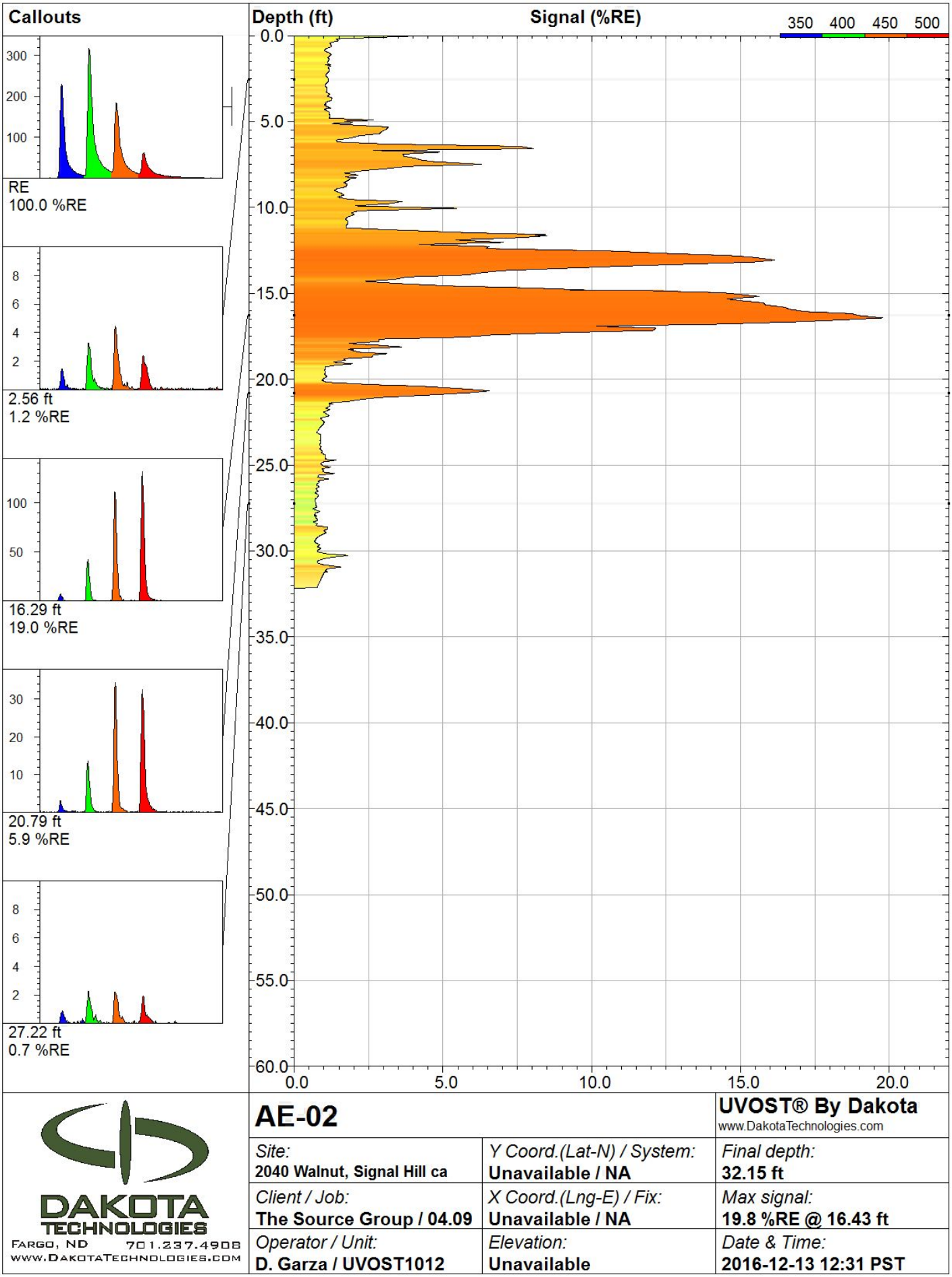
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **32.16 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **2.2 %RE @ 0.11 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-13 14:28 PST**



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AE-02

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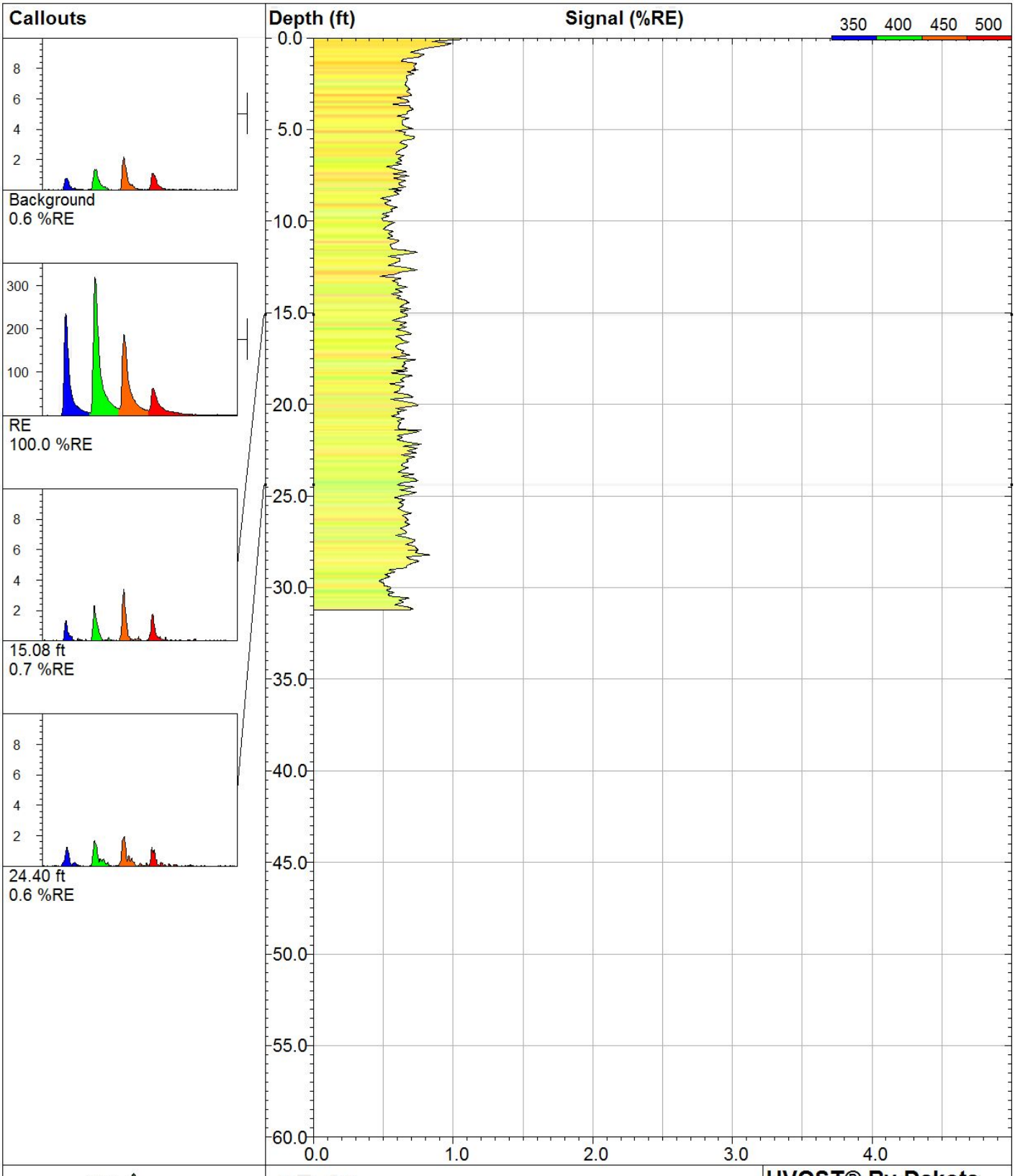
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **32.15 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **19.8 %RE @ 16.43 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-13 12:31 PST**



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AE-03

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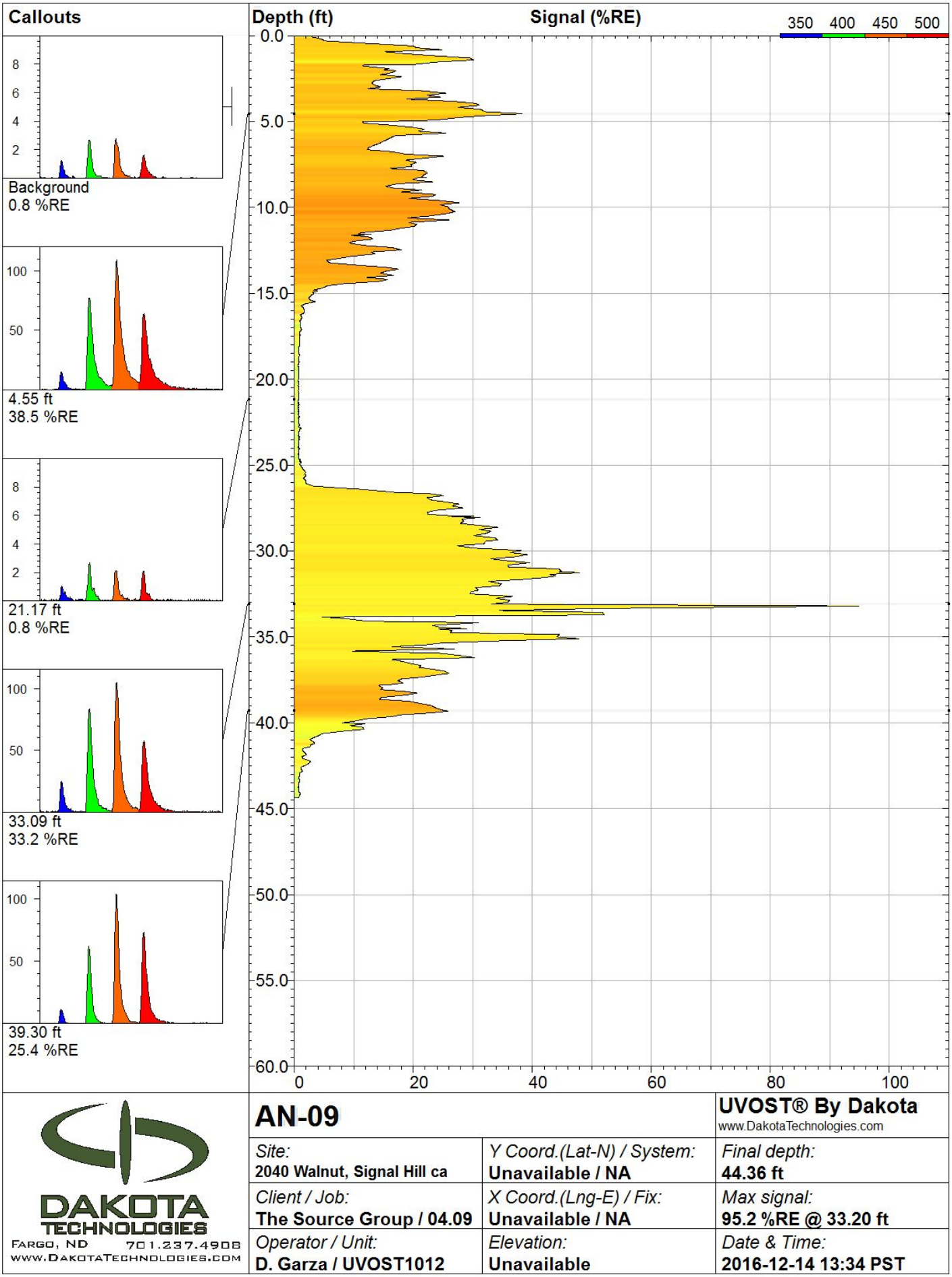
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **31.24 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **1.1 %RE @ 0.08 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-13 15:12 PST**



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AN-09

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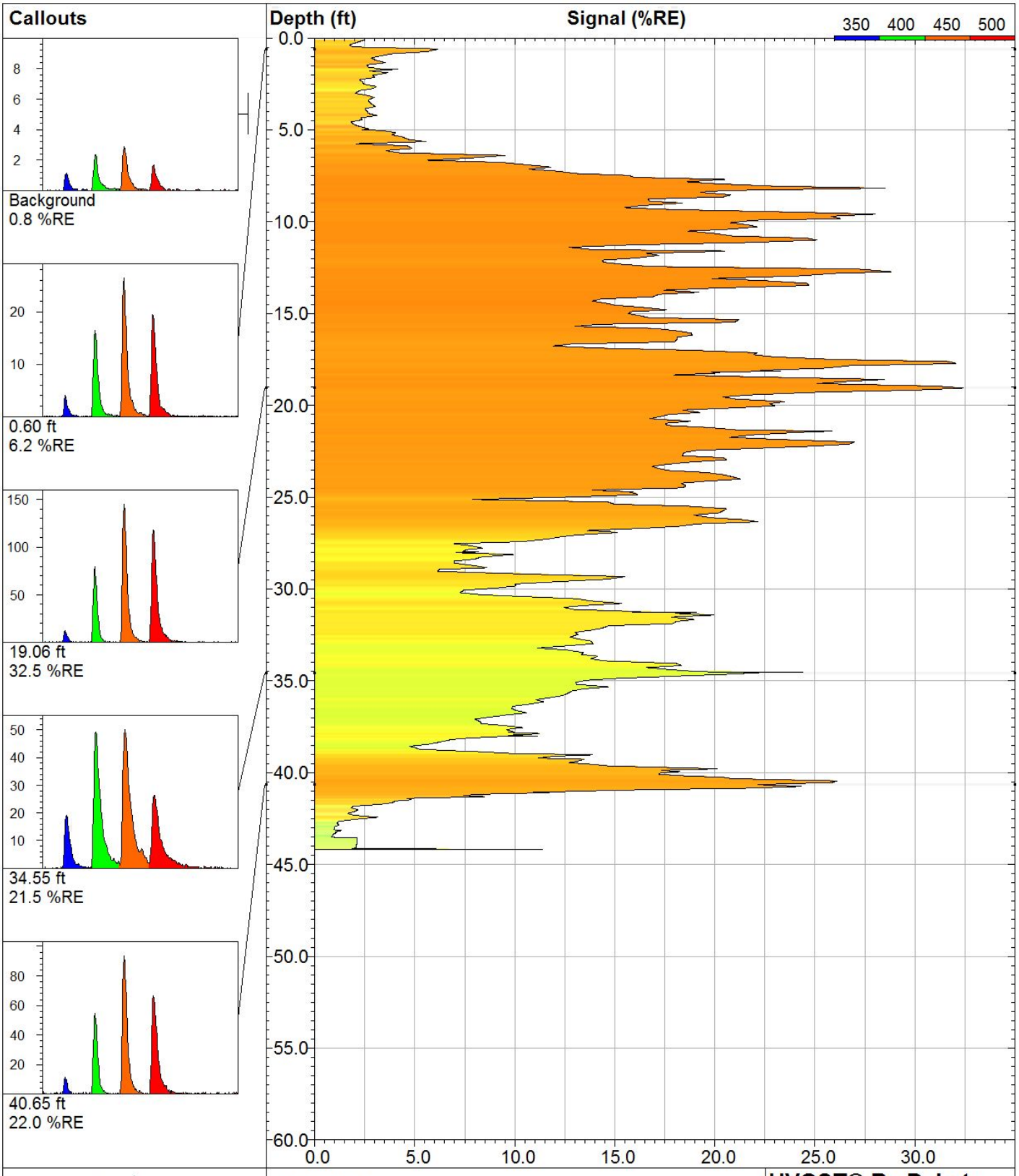
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **44.36 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **95.2 %RE @ 33.20 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-14 13:34 PST**



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AN-10

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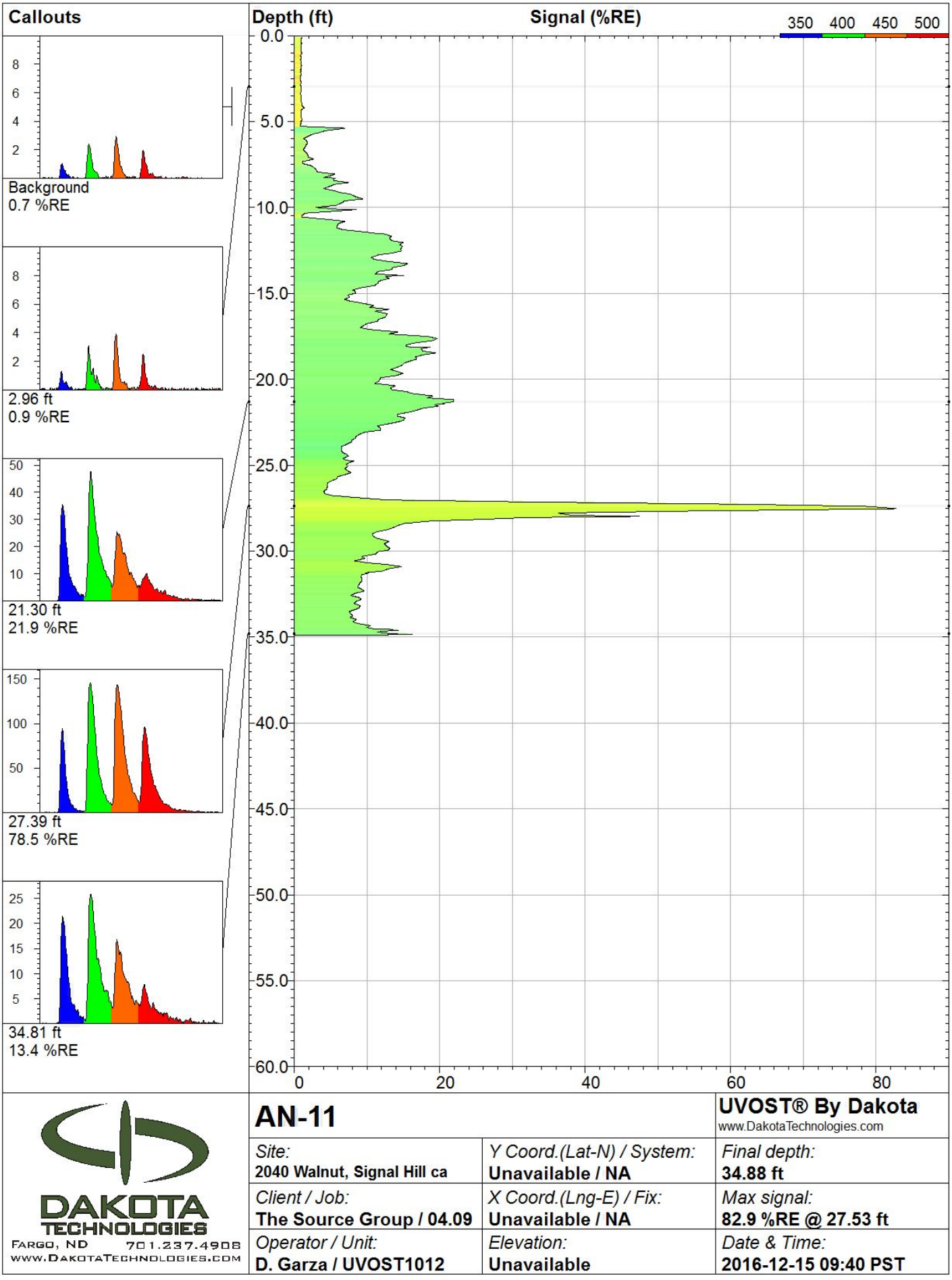
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **44.19 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **32.5 %RE @ 19.06 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-14 14:32 PST**



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AN-11

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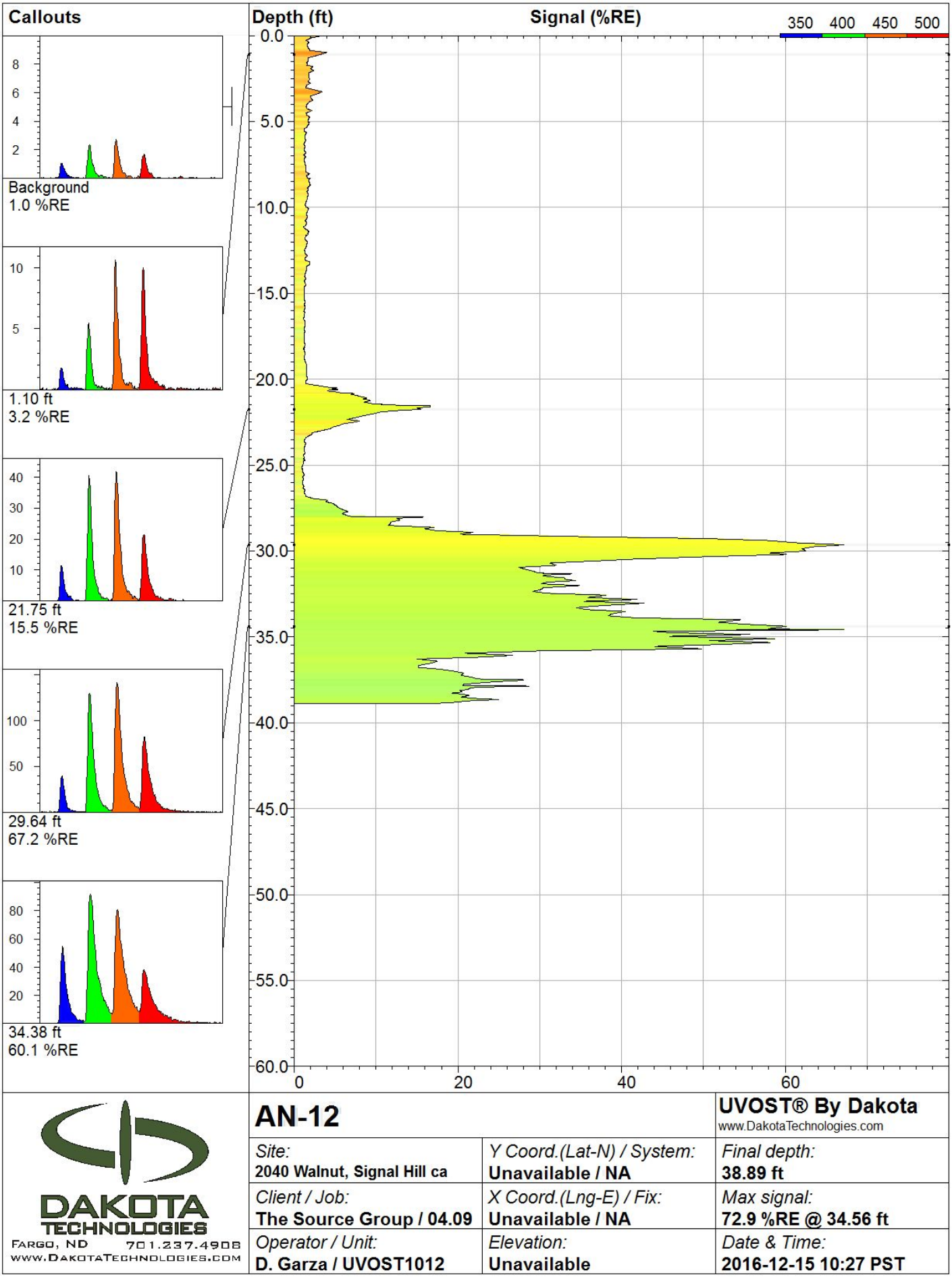
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **34.88 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **82.9 %RE @ 27.53 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-15 09:40 PST**



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AN-12

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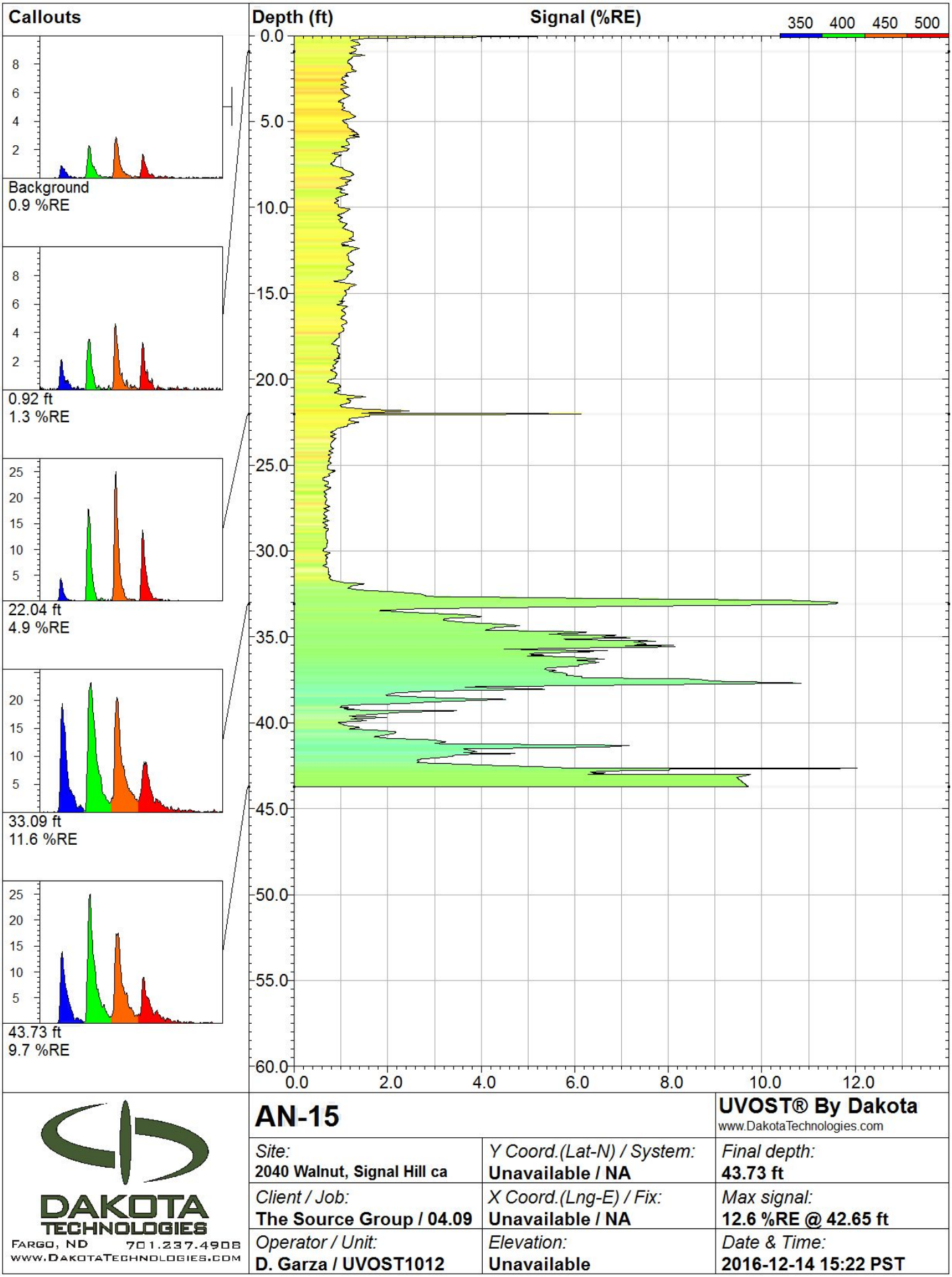
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **38.89 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **72.9 %RE @ 34.56 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-15 10:27 PST**



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AN-15

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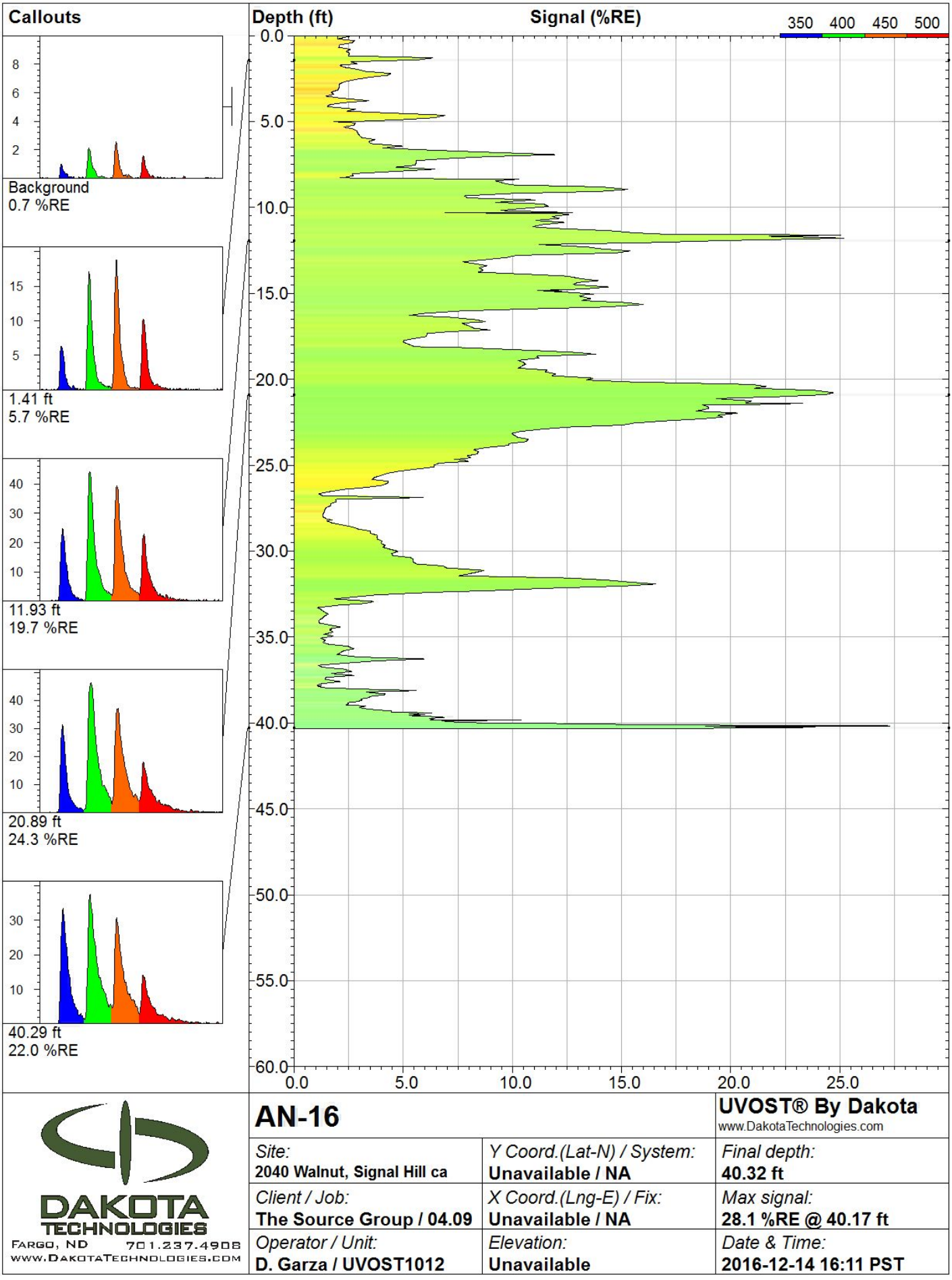
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **43.73 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **12.6 %RE @ 42.65 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-14 15:22 PST**



AN-16

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Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **40.32 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **28.1 %RE @ 40.17 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-14 16:11 PST**

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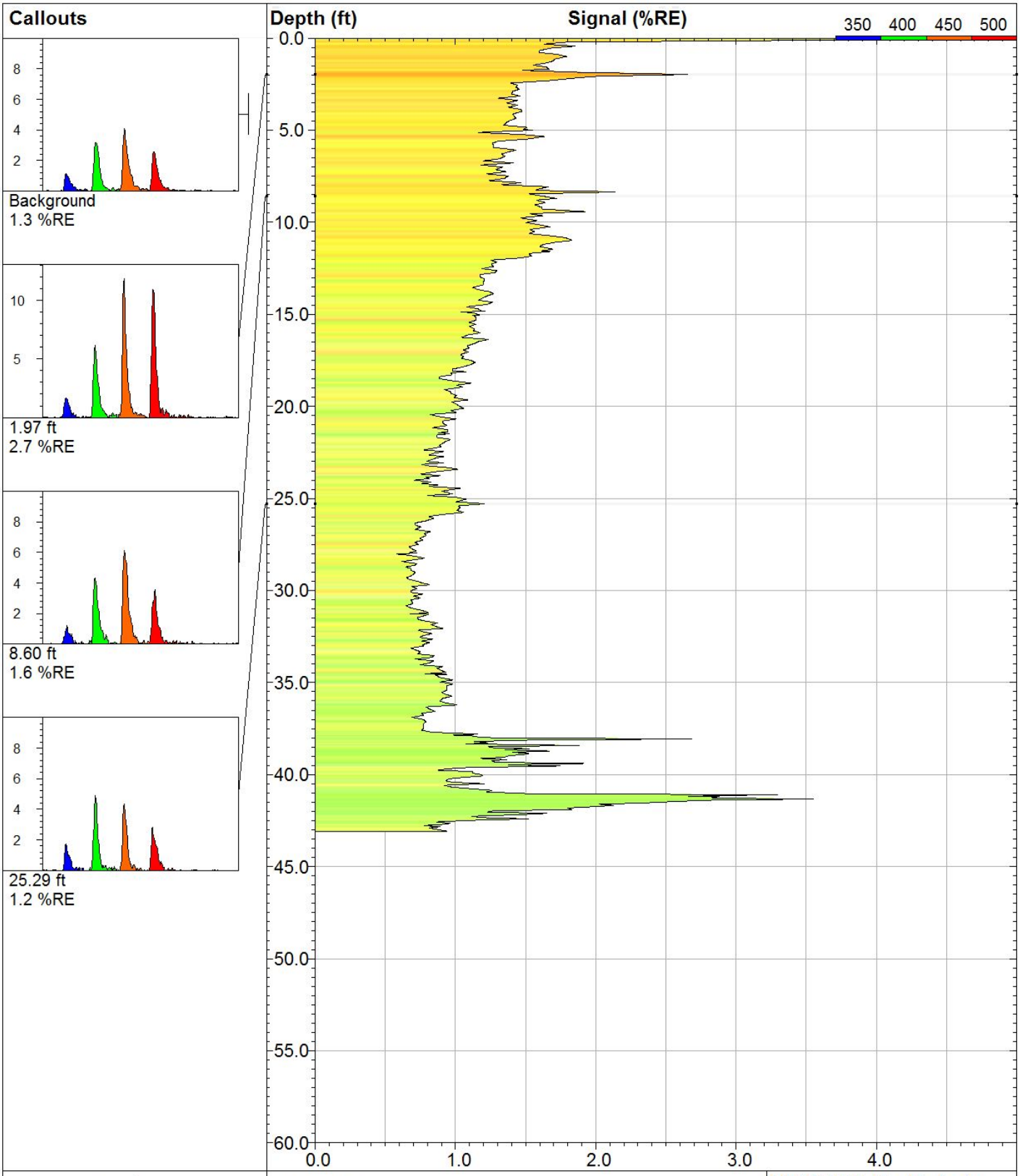

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AN-17

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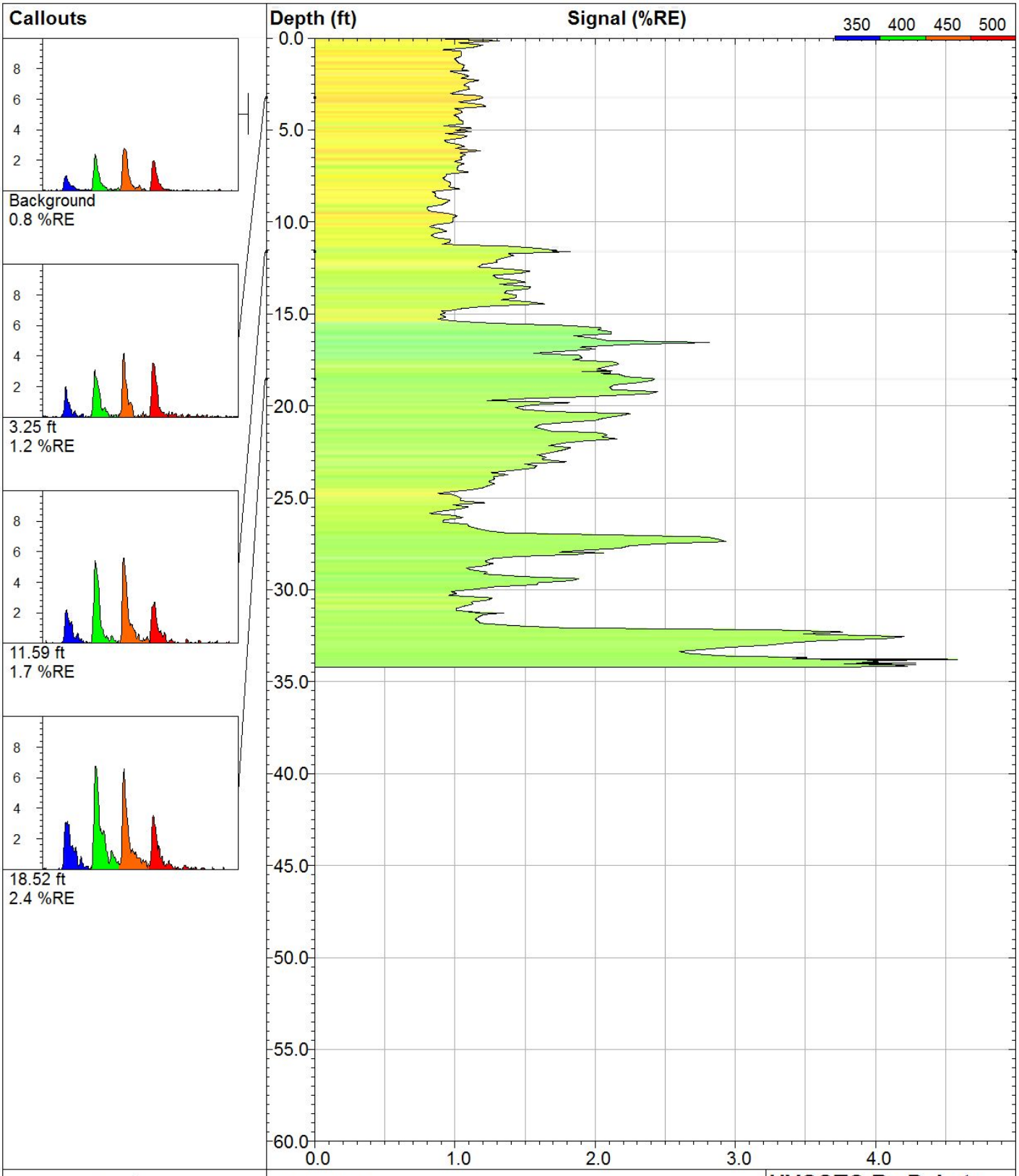
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **43.08 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **4.1 %RE @ 0.08 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-15 07:54 PST**



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AN-18

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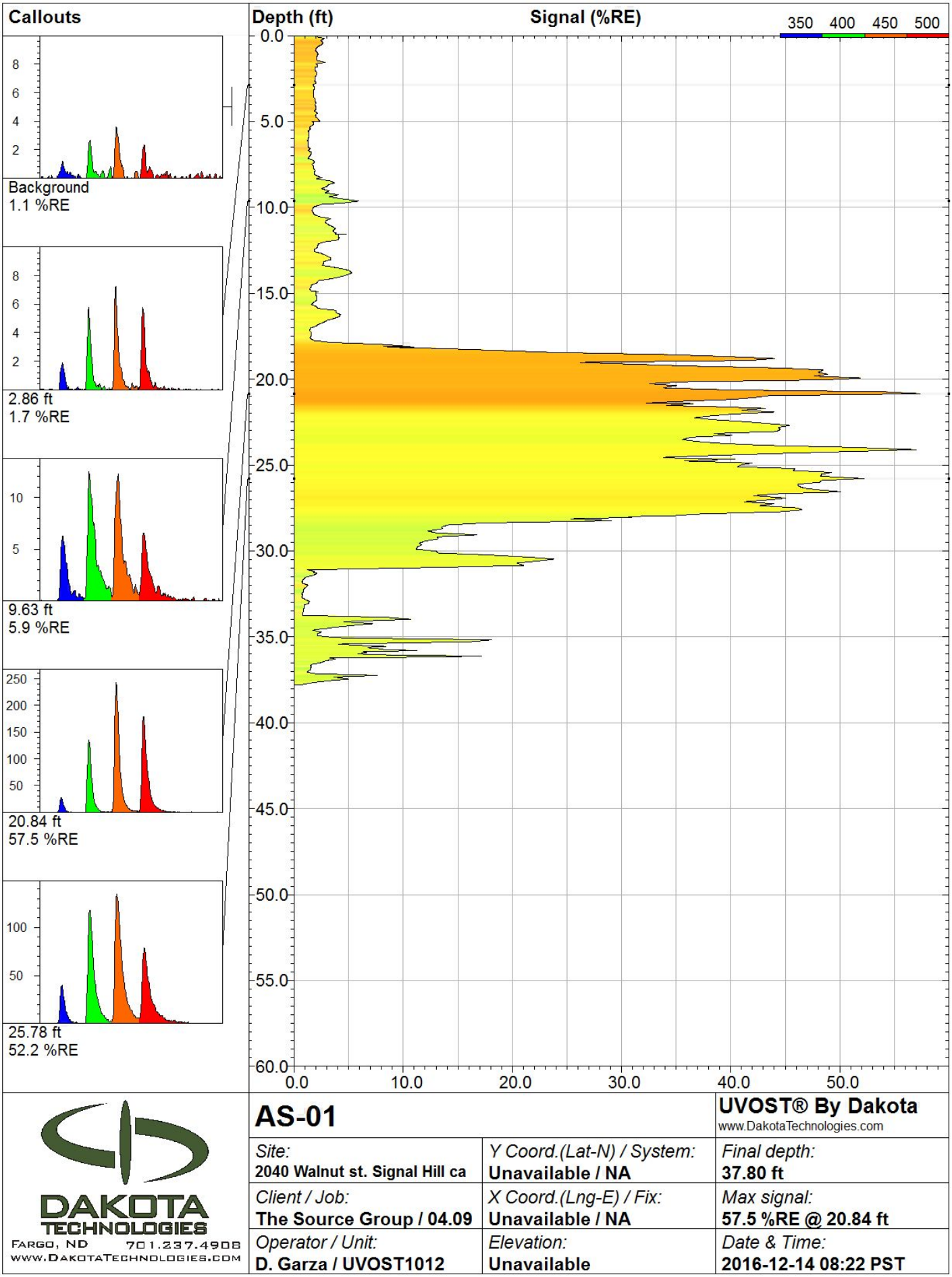
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **34.21 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **4.6 %RE @ 33.78 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-15 08:47 PST**



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AS-01

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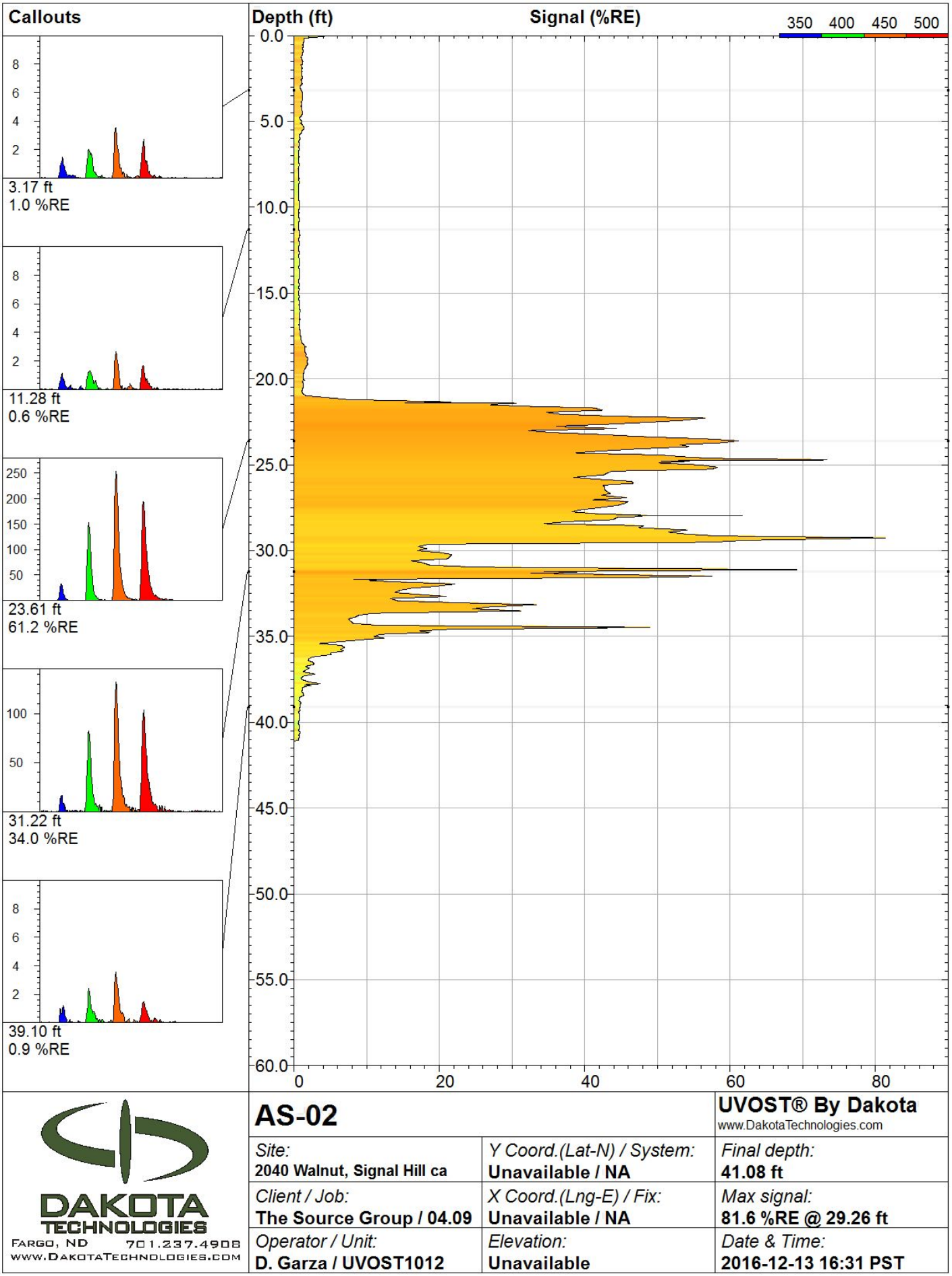
Site: **2040 Walnut st. Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **37.80 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **57.5 %RE @ 20.84 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-14 08:22 PST**



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AS-02

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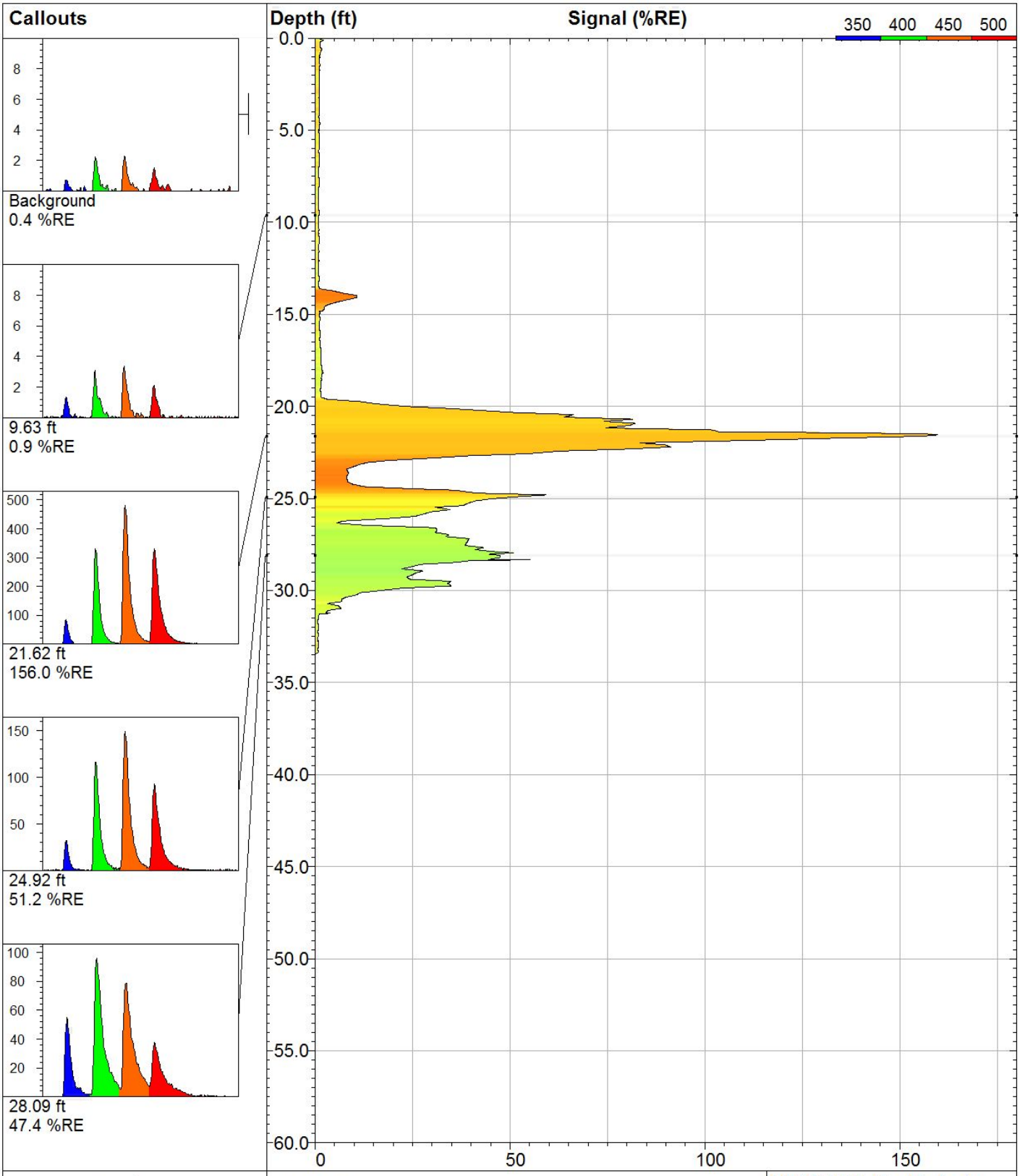
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **41.08 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **81.6 %RE @ 29.26 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-13 16:31 PST**



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AS-03

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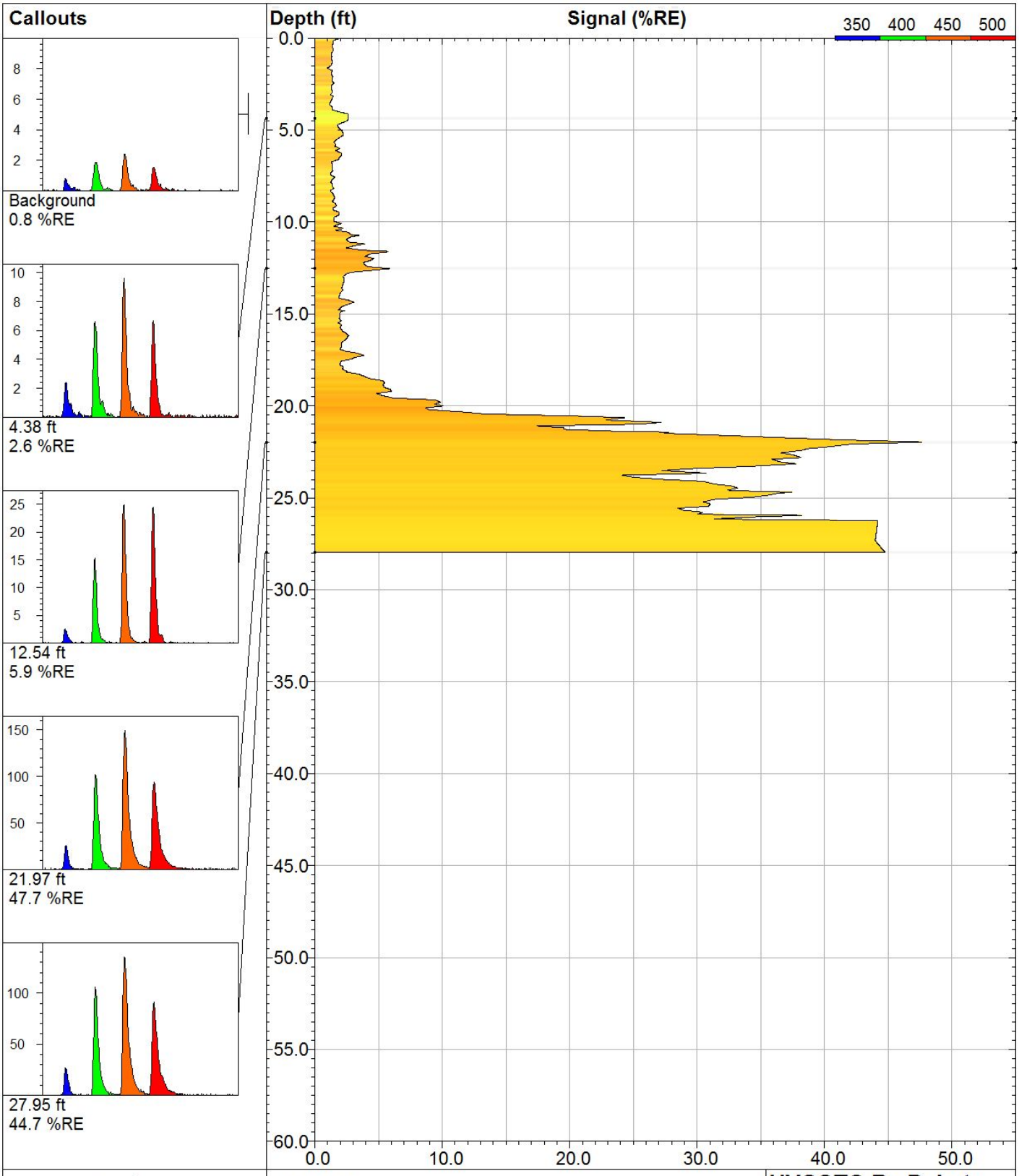
Site: **2040 Walnut st. Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **33.41 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **159.8 %RE @ 21.52 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-14 09:12 PST**



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AS-04

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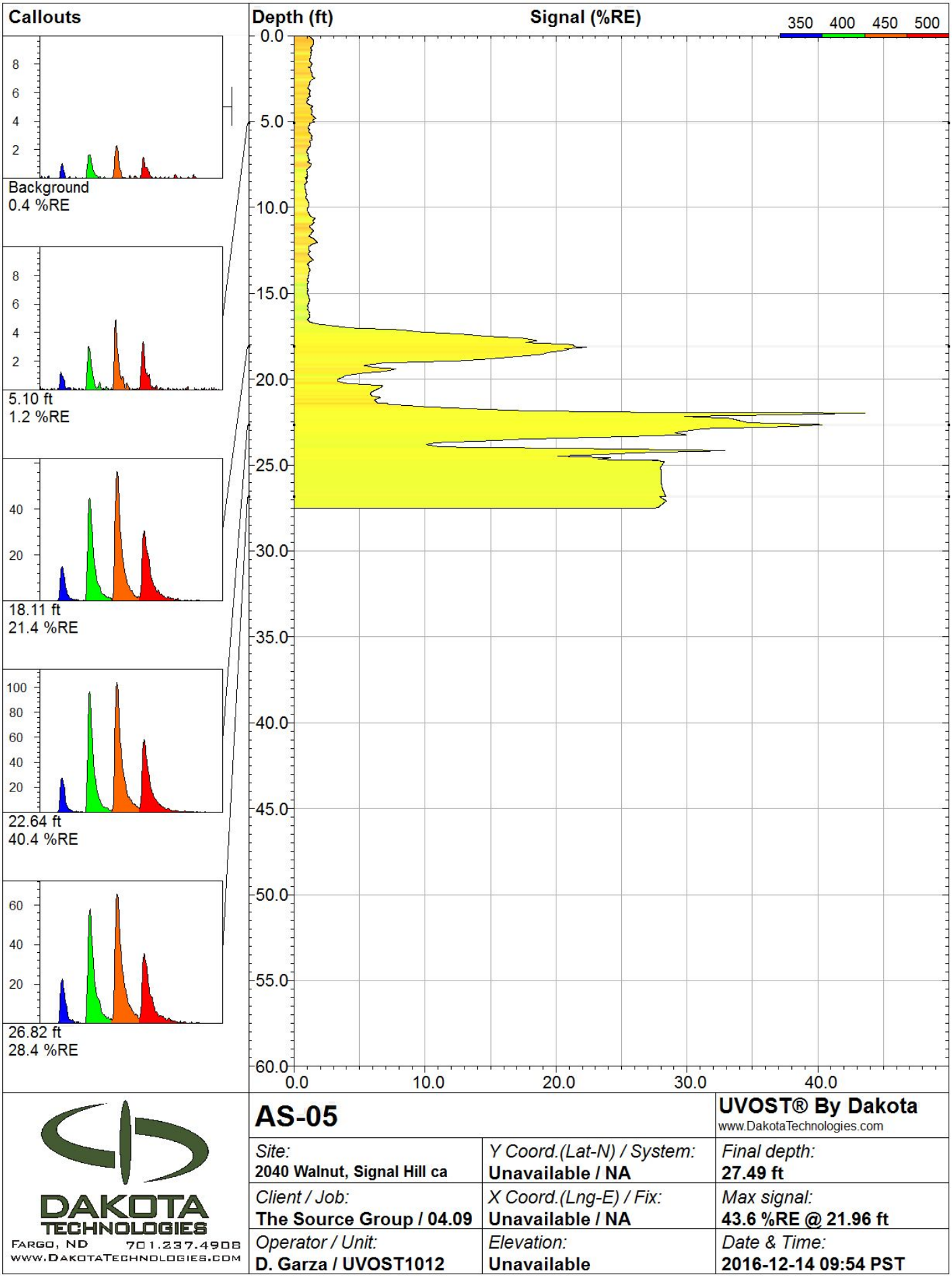
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **27.96 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **47.7 %RE @ 21.96 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-14 10:42 PST**



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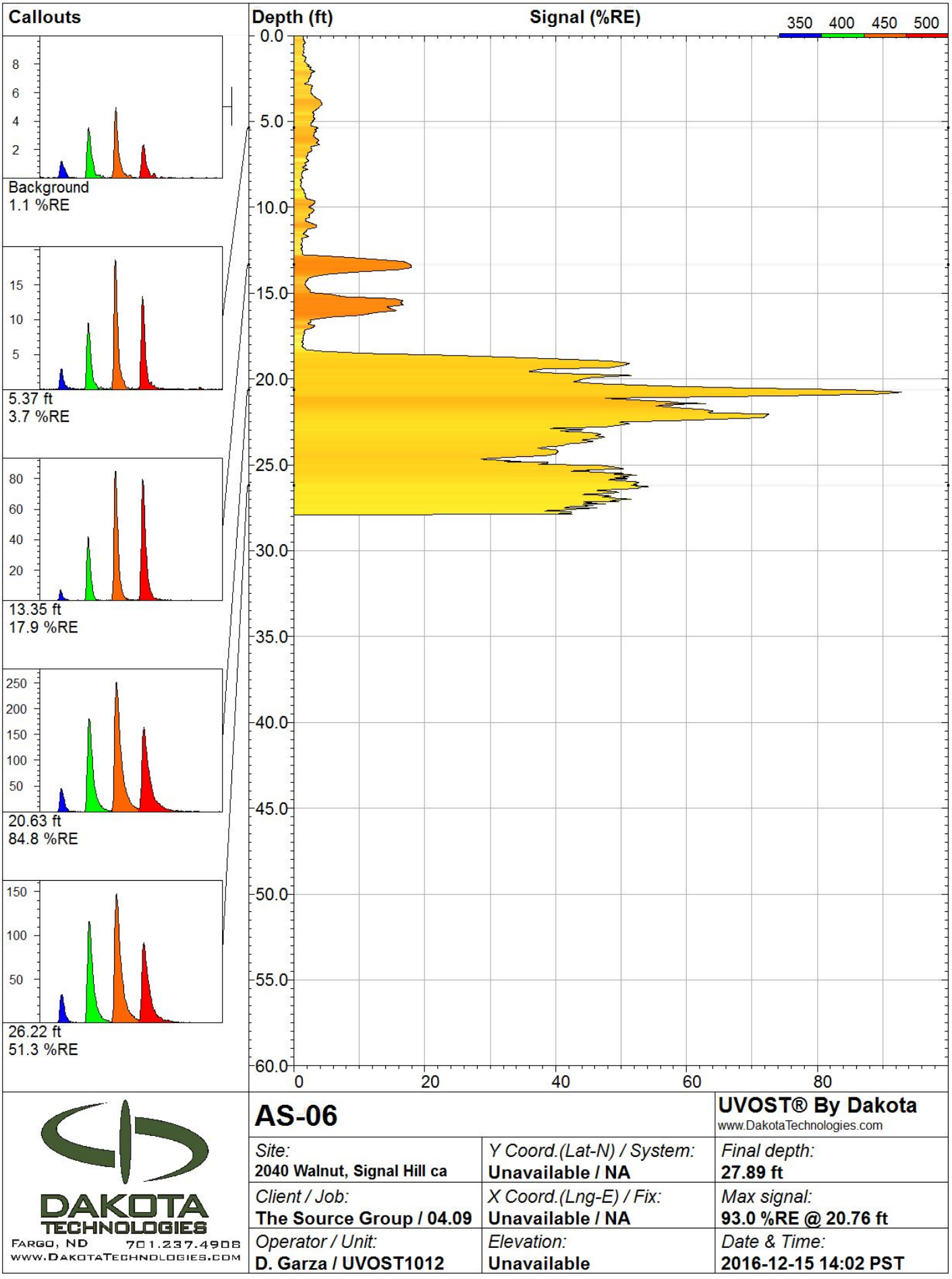
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **27.49 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **43.6 %RE @ 21.96 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-14 09:54 PST**



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AS-06

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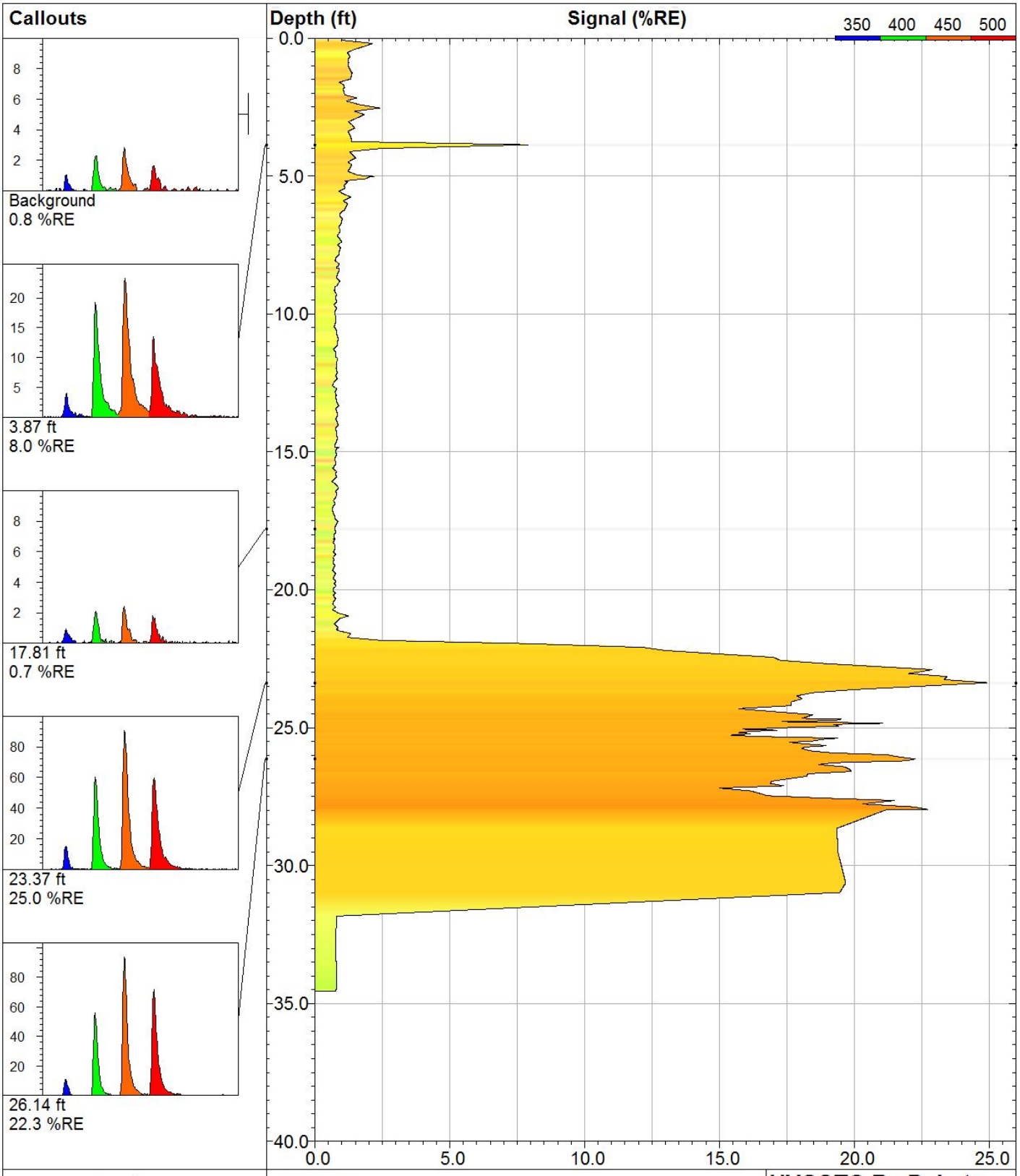
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **27.89 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **93.0 %RE @ 20.76 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-15 14:02 PST**



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AS-09

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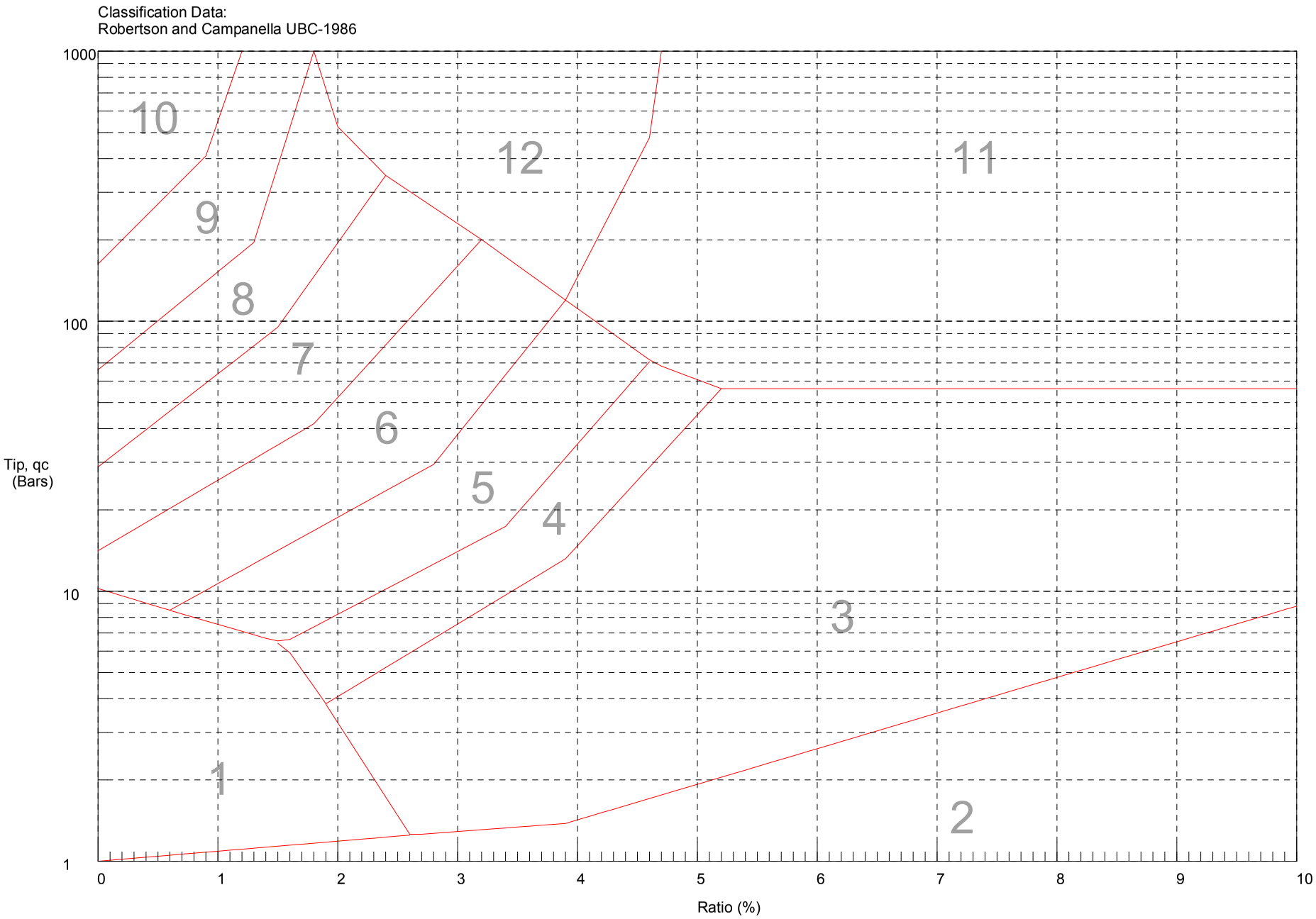
Site: **2040 Walnut, Signal Hill ca**	*Y Coord.(Lat-N) / System:* **Unavailable / NA**	*Final depth:* **34.55 ft**
Client / Job: **The Source Group / 04.09**	*X Coord.(Lng-E) / Fix:* **Unavailable / NA**	*Max signal:* **25.0 %RE @ 23.37 ft**
Operator / Unit: **D. Garza / UVOST1012**	*Elevation:* **Unavailable**	*Date & Time:* **2016-12-14 11:28 PST**

12 Zone Soil Behavior Chart



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

* Overconsolidated or cemented

NEWSLETTERS

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Interpreting LIF Waveforms

Laser-Induced Fluorescence Primer II: Interpreting Waveforms

Randy St. Germain, President

Ultraviolet (UV) laser-induced fluorescence (LIF) screening tools cause fluorescence in light non-aqueous phase liquids (LNAPLs). Total fluorescence readings estimate the quantity of LNAPL present, but LIF can also capture fluorescence "waveforms" to qualitatively evaluate LNAPL type.

[This article focuses on UV LIF's application to petroleum fuels and oils, but NOT creosotes and coal tar. These require the Tar-specific Green Optical Screening Tool or TarGOST. TarGOST and the problem inherent with the fluorescence of heavier hydrocarbons will be discussed in a forthcoming LIF Line]

BACKGROUND:

Optical screening tools (OSTs) "flash" a sample with intense light for a few nanoseconds, then analyze the fluorescence that continues to be emitted long after the flash has stopped. This fluorescence "lifetime" varies, from well under a nanosecond to tens or even hundreds of nanoseconds.

OSTs have this time-resolved LIF capability built in so that they can simultaneously record the "color" (spectral nature) and lifetime (temporal nature) of the fluorescence. OST LIF systems can tentatively identify the type of petroleum, discern false positives, and detect weathering of certain LNAPLs with lifetimes playing a major role.

MULTI-WAVELENGTH WAVEFORMS:

The left side of Figure A illustrates the combined spectral/temporal nature of the fluorescence emitted by the polycyclic aromatic hydrocarbons (PAHs) in diesel, and the right side shows the 2D "shorthand" style waveform characteristic of OST data.

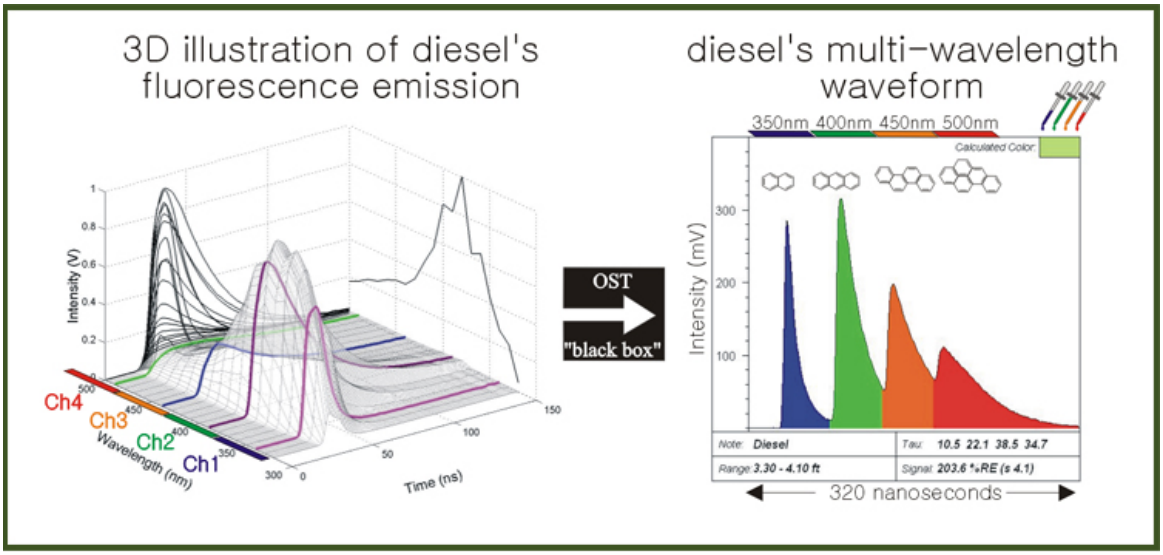

Figure A: The fluorescence emitted by the PAHs in diesel.

Key characteristics of waveforms include:

Intensity (Amount of Fluorescence)

The y-axis represents the intensity or "brightness" of the fluorescence. It is a voltage.

- Intensity generally increases with increasing fuel/oil pore saturation.

- The relative fluorescence intensity is dependent on the composition of the fuel.
  - Some fuels (diesel and crude) fluoresce more intensely than others (gasoline).
  - Low viscosity, high solvent content fuels/oils dominated by smaller 2-3 ring PAHs usually fluoresce better (higher voltages) than large PAHs containing fuels, oils, greases or sludge.

The Four Fluorescence Channels ("Peaks")

The x-axis of Figure A represents 320 nanoseconds of time during which the four wavelength ranges of fluorescence arrive at the detector at sequentially delayed times.

- The four peaks or channels represent 350 nm (blue), 400 nm (green), 450 nm (orange), and 500 nm (red). Each peak is 40 nm wide.

- It is important to note that the blue, green, orange, and red aren't the true colors of those wavelengths – just colors chosen to represent the four peaks.

- The relative intensities between the four channels is used to fill the LIF log with blended color to visualize fluorescence trends "at a glance". [note the fill-color boxes in upper right corner of the example waveforms to follow]

- OST systems are "calibrated" by applying the Reference Emitter (RE) fluid to the window and recording RE's response. The RE is a standard fluorescing NAPL supplied by Dakota to all OST service providers for the last 15 years. The purpose of the RE is to:
  1. Normalize the data for push-to-push fluctuations in optical throughput.
  2. System check to make sure all optics are intact and operating normally.

- All downhole data is normalized to the RE (as percentage) so that data is consistent across all OSTs across the globe, regardless of who is operating them.

- The factory RE is displayed on the oscilloscope along with the latest RE, assisting the operator in assuring that the OST data they generate "matches" all other OSTs.

- The area under the curve of all four channels is summed and divided by the RE waveforms' areas to generate the normalized total fluorescence "Signal" of an LIF log.

- One PAH will usually occupy more than one channel since PAHs fluoresce broadly (naphthalene is a notable exception, fluorescing almost exclusively in the blue channel).

- In general, the shorter wavelength channels (blue/green) are occupied by 2- and 3-ring PAHs, the middle (green/orange) by 3- and 4-ring PAHs, and the rightmost (orange/red) by 4-ring and larger PAHs [Figure A].

- The voltage or height of the waveform generally scales with NAPL saturation for any single NAPL on a single soil type.

Lifetimes (Decaying Fluorescence)

The x-axis of waveforms represents the extremely short time period necessary to capture the pulse of PAH fluorescence. The lifetime is the average time the laser-induced PAH population stays in the excited state prior to fluorescing.

- PAHs fluoresce from a few to hundreds of nanoseconds after excitation.

- In the characteristic diesel example, the blue channel has a shorter lifetime than the green channel (see how the intensity falls back toward baseline more quickly on the right side of the 350 nm peak).

- The lifetimes of some channels “bleed” into subsequent channels (green into orange, for instance) and influence the log’s fill colors.

- Short lifetimes often indicate an energy transfer from smaller excited-state PAHs to surrounding, larger PAHs or the matrix. This leads to quenching (reduction) of fluorescence and red-shifting of the emission toward the right (longer wavelength).

- Long lifetimes often indicate oxygen starvation and/or a solvent-rich fluorescent friendly environment. Natural gas condensates can have unusually long lifetimes.

EXAMPLE WAVEFORMS:

PAHs:

PAH waveforms show the general trend of emission with size/complexity of PAHs (Figure B).

- The upper-left is Naphthalene, fluorescing almost entirely in the blue channel.

- The upper-right is Anthracene, the simple addition of one more benzene ring onto a naphthalene shifted the fluorescence by about 75-100 nm (about 1.5-2 “channels”).

- The lower-left is Pyrene, which is one ring larger but more “compact” so the red-shifting is moderate comparatively.

- The lower-right is Benzo (a) pyrene, emitting almost entirely in the red channel.

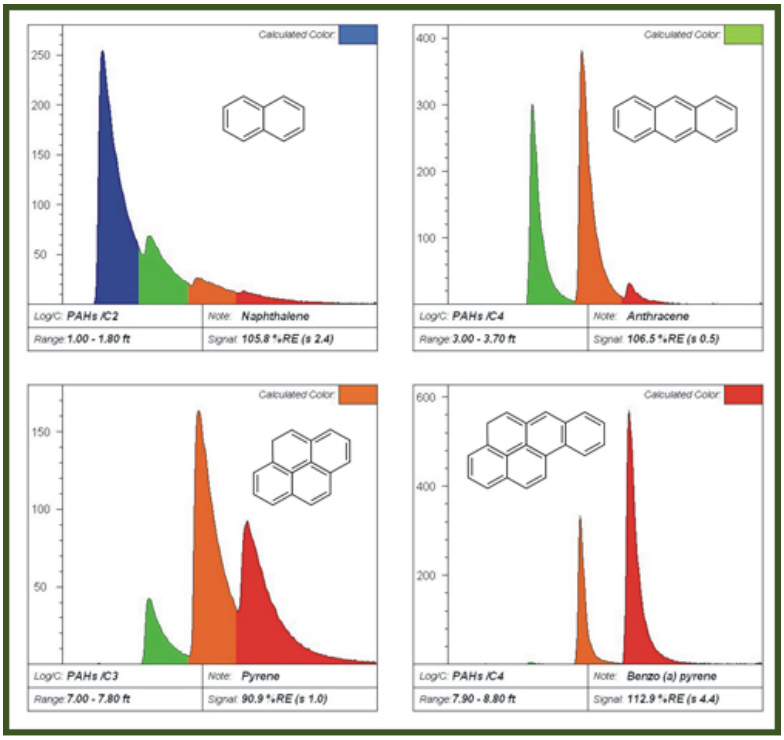

Figure B: The trend of PAH fluorescence "red-shifting" with increasing size and complexity of the PAH.

Fuels/Oils:

Fuels/oils contain complex chemical composition, which results in broad waveforms. The "EPA 16" PAHs only account for approximately 1 percent of the PAHs in crude oil, so there are usually a wide variety of PAHs fluorescing. From "blue to red" some common fuel/oil waveforms, shown in Figure C, include the following:

- Jet/Kerosene [Row 1]:
  - Naphthalene and Jet/Kerosene waveforms are similar because those fuels' PAH content are dominated by the naphthalenes.

- Gasoline [Row 2]:
  - Intact (unweathered) gasoline has the typical shape shown and will fluoresce well enough to be delineated with LIF, even though gasoline contains low concentrations of 2- to 3-ring PAHs relative to the benzene, toluene, ethylebenzene and xylenes (BTEX) and aliphatics.

- Diesel [Row 3]:
  - Diesel has a short lifetime blue (2-ring PAH) peak that is about the same height as the longer lifetime green peak. Evidence of weathering in diesels is rare.

- Oils [Row 4]:
  - Oils such as crude, lubricating, and cutting types fluoresce well and are usually found slightly right of center (red-shifted) and have medium to long lifetimes.

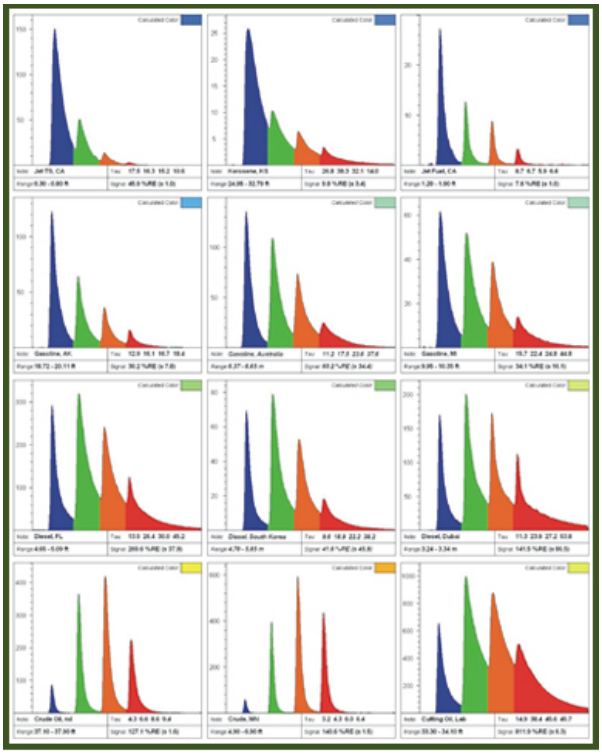

Figure C: Common fuel/oil waveforms.

Weathering:

Weathering typically removes the most soluble, volatile, and readily metabolized PAHs first. Large PAHs remain behind, which causes a red-shift in the fluorescence waveform. Simultaneously there is a loss of solvent aliphatics, which often shortens the lifetime so a weathered light fuel will start to look like oil or even tar. Figure D demonstrates weathering of gasoline in a lab experiment, resulting in red-shifting that can make weathered gasoline display an “oil” waveform. When jet/kerosene weather, they simply “disappear” (become non-fluorescent) because there are too few larger PAHs to fluoresce once the naphthalenes are gone. It is important to appreciate that NAPL (especially gasolines) can vary in their appearance even prior to spilling. The degree of red-shifting is relative to the starting product and site conditions. For instance, one site’s intact (unweathered) gasoline waveform might very well be identical to different site’s moderately weathered gasoline.

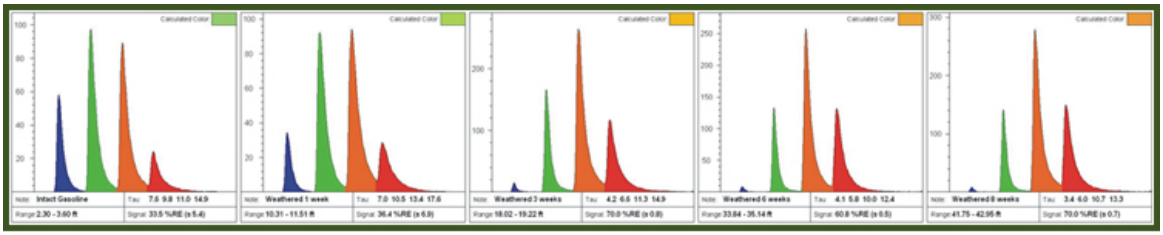

Figure D: Weathering causes red-shifting of gasoline’s fluorescence.

False Positives and Oddities:

Areas with little to no contamination may fluoresce, which generates “false positives.” Figure E contains a variety of noise, false-positives, or highly unusual waveforms. Be prepared to obtain samples in order to figure out what materials are causing any odd fluorescence waveforms.

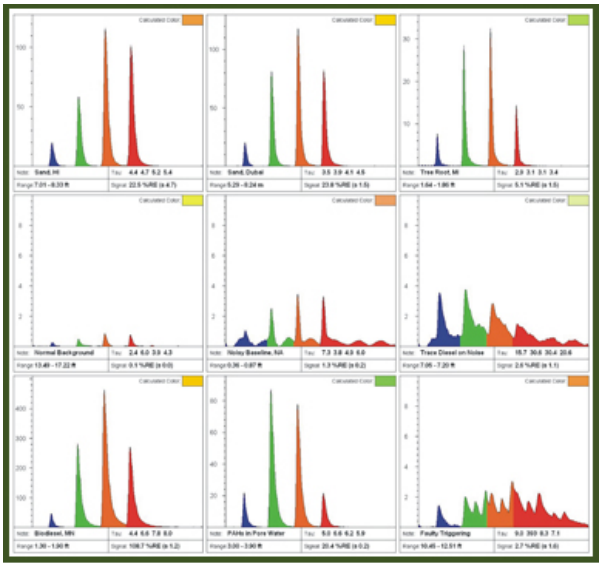

Figure E: Examples of noise, false positives and unusual waveforms.

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APPENDIX C
LABORATORY TEST RESULTS

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APPENDIX C

Laboratory Testing Procedures and Results

Moisture and Density Determination Tests: Moisture content and dry density determinations were performed on relatively undisturbed samples obtained from the test borings. The results of these tests are presented in the boring logs. Where applicable, only moisture content was determined from "undisturbed" or disturbed samples.

Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM Test Method D1557. The results of these tests are presented in the test data and in the table below:

Sample Location	Sample Description	Maximum Dry Density (Pcf)	Optimum Moisture Content (%)
B-2 @ 0-5 feet	Sandy Silt	127.0	11

Direct Shear Tests: Direct shear test was performed on selected remolded and/or undisturbed sample, which was soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1-hour prior to application of shearing force. The sample was tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less than 0.001 to 0.5 inches per minute (depending upon the soil type). The test result is presented in the test data.

Sample Location	Sample Description	Friction Angle (degrees)	Apparent Cohesion (psf)
B-2 @ 0-5 feet	Sandy Silt (Remolded)	28	0
B-2@ 5 feet	Sandy Silt	38	168

Consolidation Tests (ASTM D2435): Consolidation test were performed on selected, relatively undisturbed ring samples. Samples were placed in a consolidometer and loads were applied in geometric progression. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical compression to the original 1-inch height. The consolidation pressure curves are presented in the test data.

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Soluble Sulfates: The soluble sulfate contents of selected samples were determined by standard geochemical methods. The test results are presented in the table below:

Sample Location	Sample Description	Water Soluble Sulfate in Soil, (% by Weight)	Sulfate Content (ppm)	Exposure Class*
B-2 @ 0-5 ft	Silty Sand	0.0274	274	S0
B-3 @ 0-5 ft	Dark Brown Silty Sand	0.0200	200	S0
B-5 @ 0-5 ft	Silty Sand	0.0225	225	S0

* Based on the current version of ACI 318-11 Building Code, Table No. 4.2.1; Exposure Categories and Classes.

Corrosivity Test: Electrical conductivity, pH, and soluble chloride tests were conducted on representative samples and the results are provided below and in the test data:

Sample Location	Sample Description	Soluble Chloride (CAL.422) ppm	Electrical Resistivity (CAL.643) (ohm-cm)	PH (CAL.747)	Potential Degree of Attack on Steel
B-2 @ 0-5 feet	Silty Sand	145	1,500	7.0	Strong
B-3 @ 0-5 feet	Dark Brown Silty Sand	112	2,000	7.0	Strong
B-5 @ 0-5 feet	Silty Sand	107	2,000	6.9	Strong

Expansion Index Tests: The expansion potential of selected materials was evaluated by the Expansion Index Test, ASTM D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below:

Sample Location	Sample Description	Expansion Index	Expansion Potential
B-3 @ 0-5 feet	Fine Silty Sand	10	Very Low
B-5 @ 0-5 feet	Silty Sand	4	Very Low

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Wash Sieve Test: Typical materials were washed over No. 200 sieve (ASTM Test Method D1140). The test results are presented below:

Sample Location	% Passing No. 200 Sieve
B-3 @ 20 feet	3.5%
B-3 @ 40 feet	74.1%
B-3 @ 50 feet	11.0%
B-4 @ 20 feet	3.8%
B-4 @ 40 feet	44.9%

R-Value: The resistance "R"-Value was determined by the California Materials Method No. 301 for subgrade soils. One sample was prepared and exudation pressure and "R"-Value determined. The graphically determined "R"-Value at exudation pressure of 300 psi is summarized in the table below:

Sample Location	Sample Description	R-Value
B-3 @ 0-5 ft	Fine Sandy Silt	48
B-5 @ 0-5ft	Silty Sand	61

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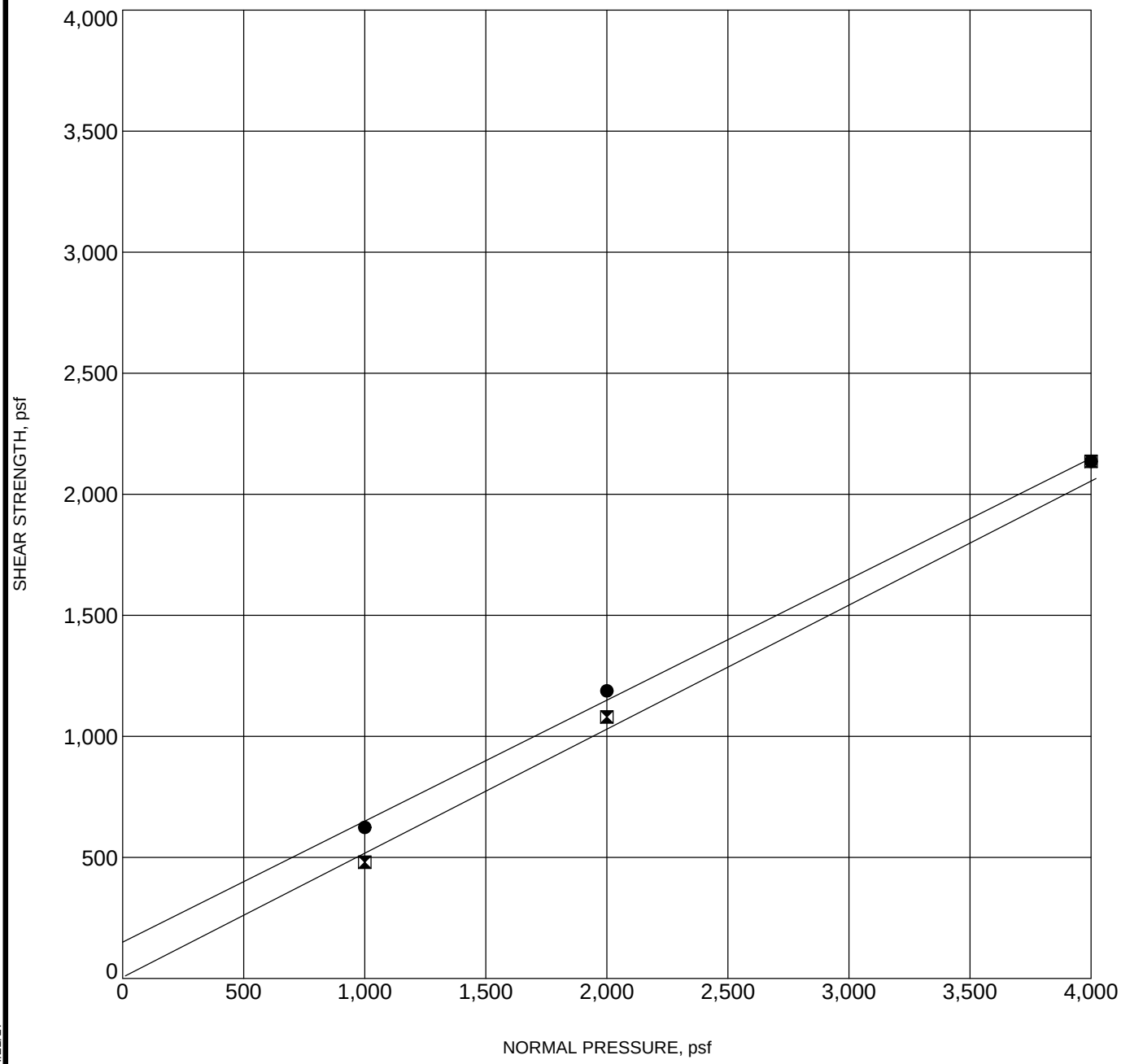

Specimen Identification			Classification	γ_d	MC%	c	ϕ
●	**B-2**	**0-5 feet**	**Sandy Silt, Remolded, Peak Stress**	**114**	**11**	**150**	**27**
⊠	**B-2**	**0-5 feet**	**Sandy Silt, Remolded, Ultimate Stress**	**114**	**11**	**0**	**28**

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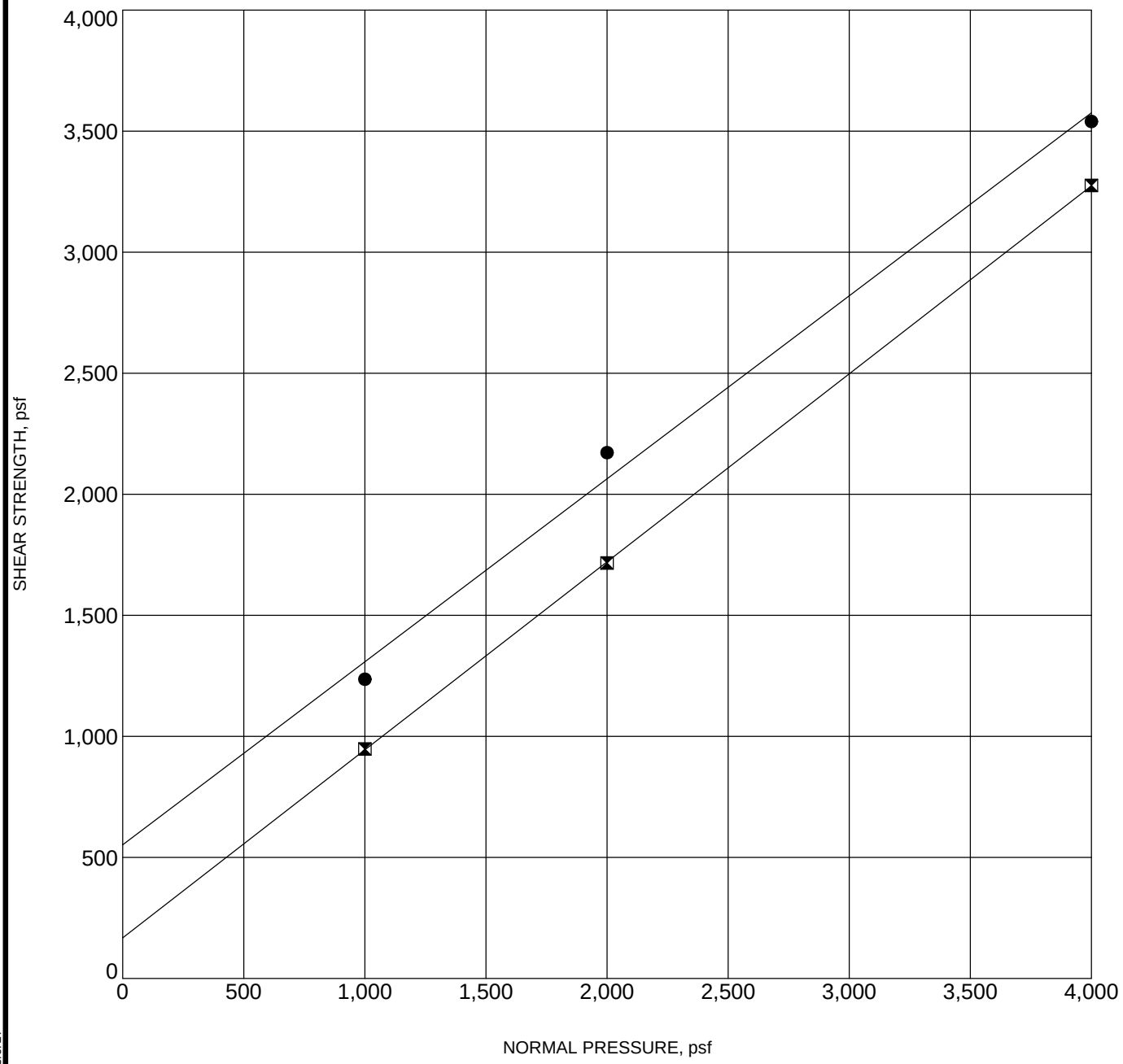
DIRECT SHEAR TEST

Project Number: 16-6239

Project Name: Xebec Signal Hill

US DIRECT SHEAR 16-6239 XEBEC SIGNAL HILL.GPJ TGR GEOTECH.GDT 4/21/17



Specimen Identification		Classification	γ_d	MC%	c	ϕ
●	**B-2 5 ft**	**Silt, Peak Stress**	**118**	**15**	**552**	**37**
⊠	**B-2 5 ft**	**Silt, Ultimate Stress**	**118**	**15**	**168**	**38**

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DIRECT SHEAR TEST

Project Number: 16-6239

Project Name: Xebec Signal Hill

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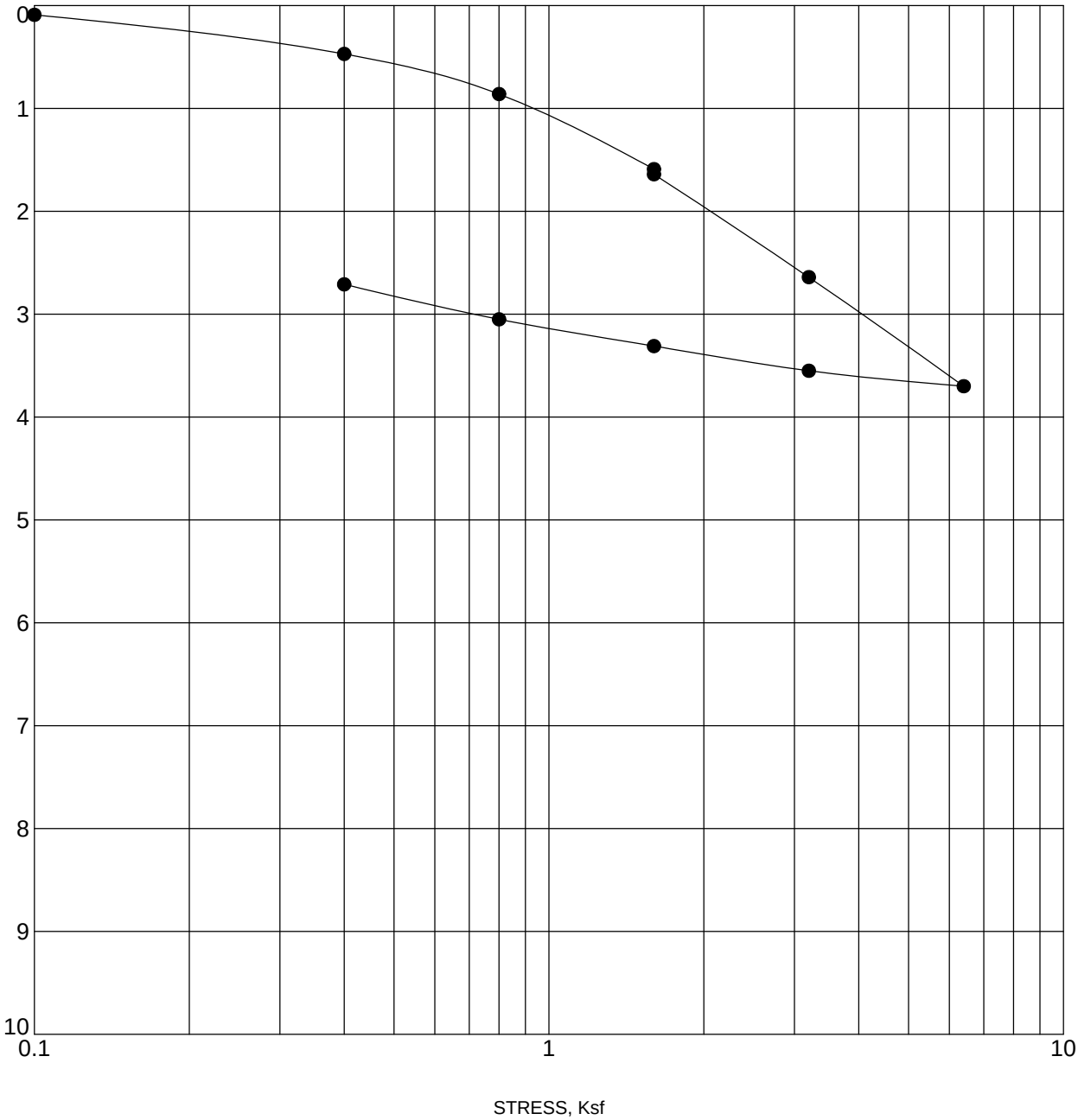

Specimen Identification		Classification	γ_d	MC%
● **B-1** **10.0**		**Sand**	**99**	**17**

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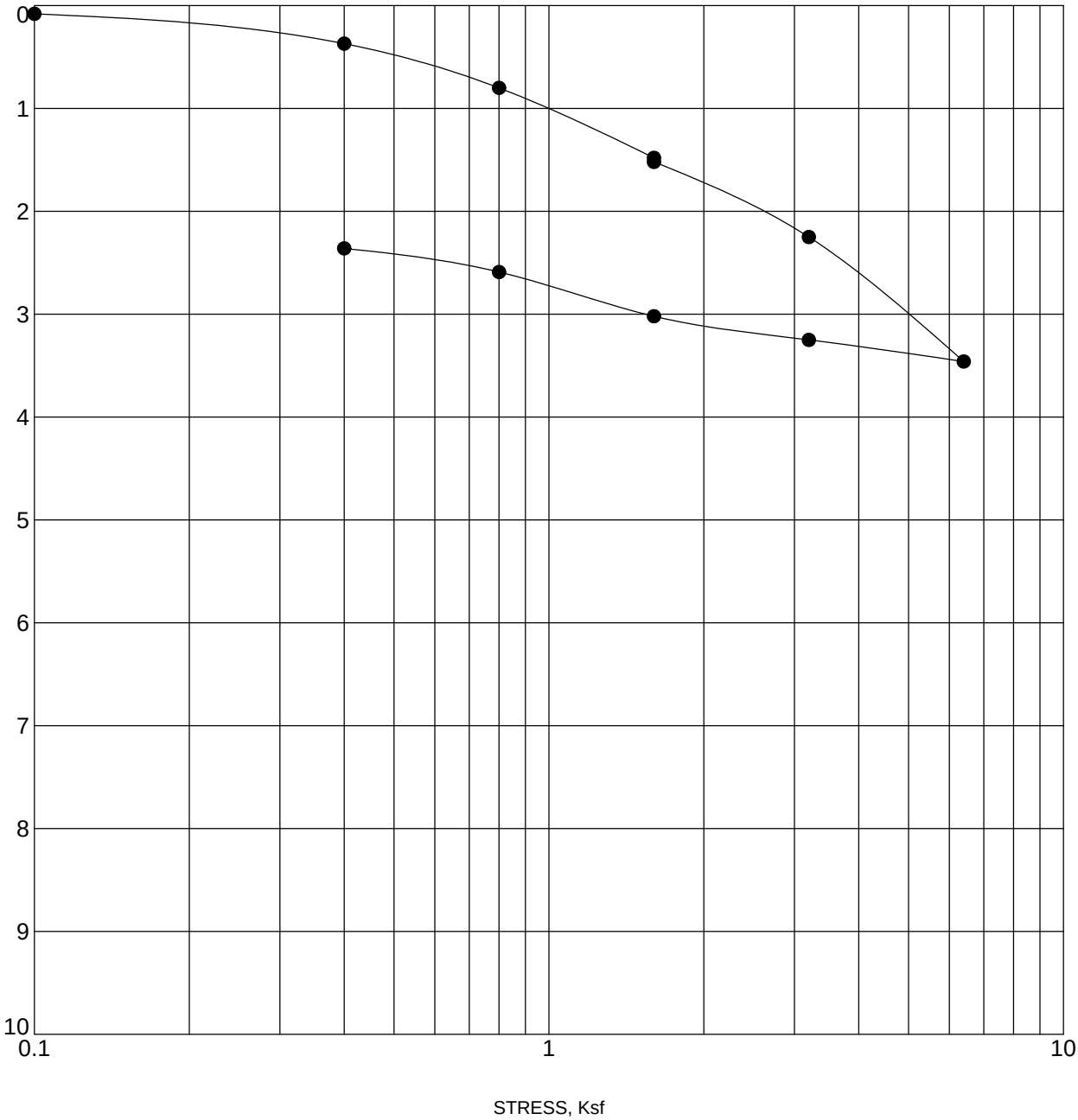

Specimen Identification			Classification	γ_d	MC%
●	**B-2**	**5.0**	**Silt**	**118**	**15**

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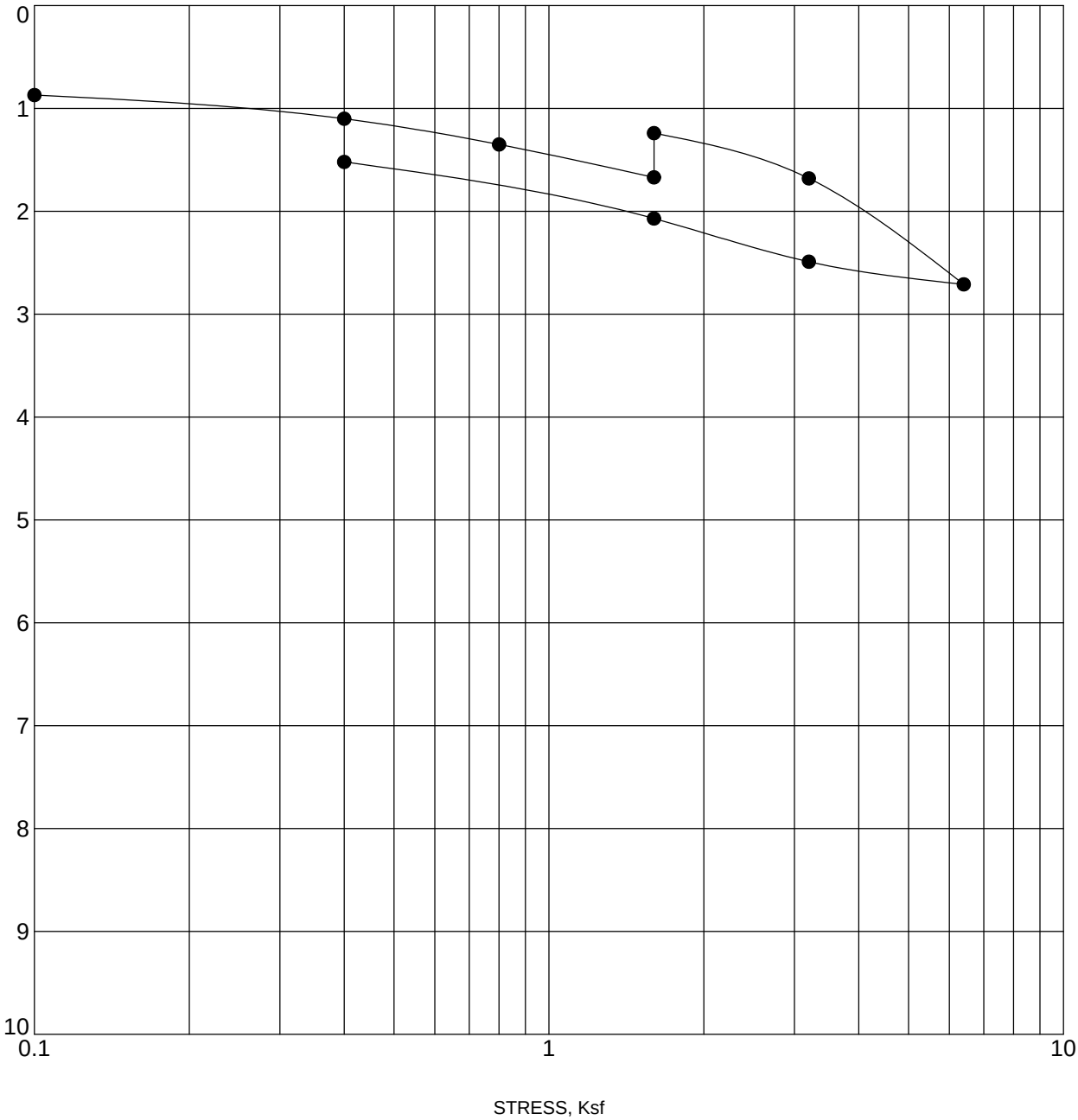

Specimen Identification		Classification	γ_d	MC%
● **B-4** **10.0**		**Sand**	**125**	**12**

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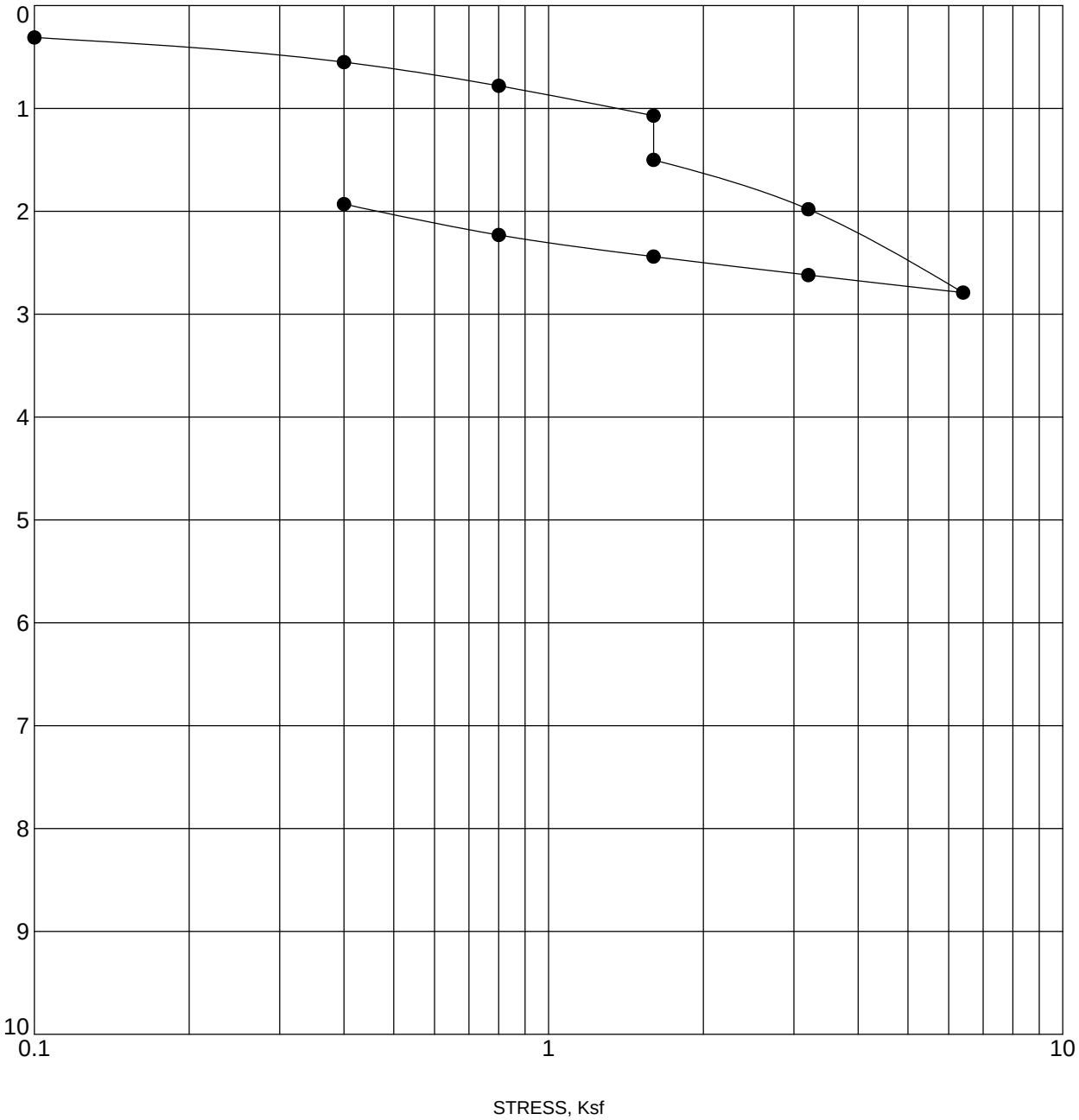

Specimen Identification			Classification	γ_d	MC%
●	**B-5**	**5.0**	**Silt**	**129**	**9**

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Project Name: Xebec Signal Hill

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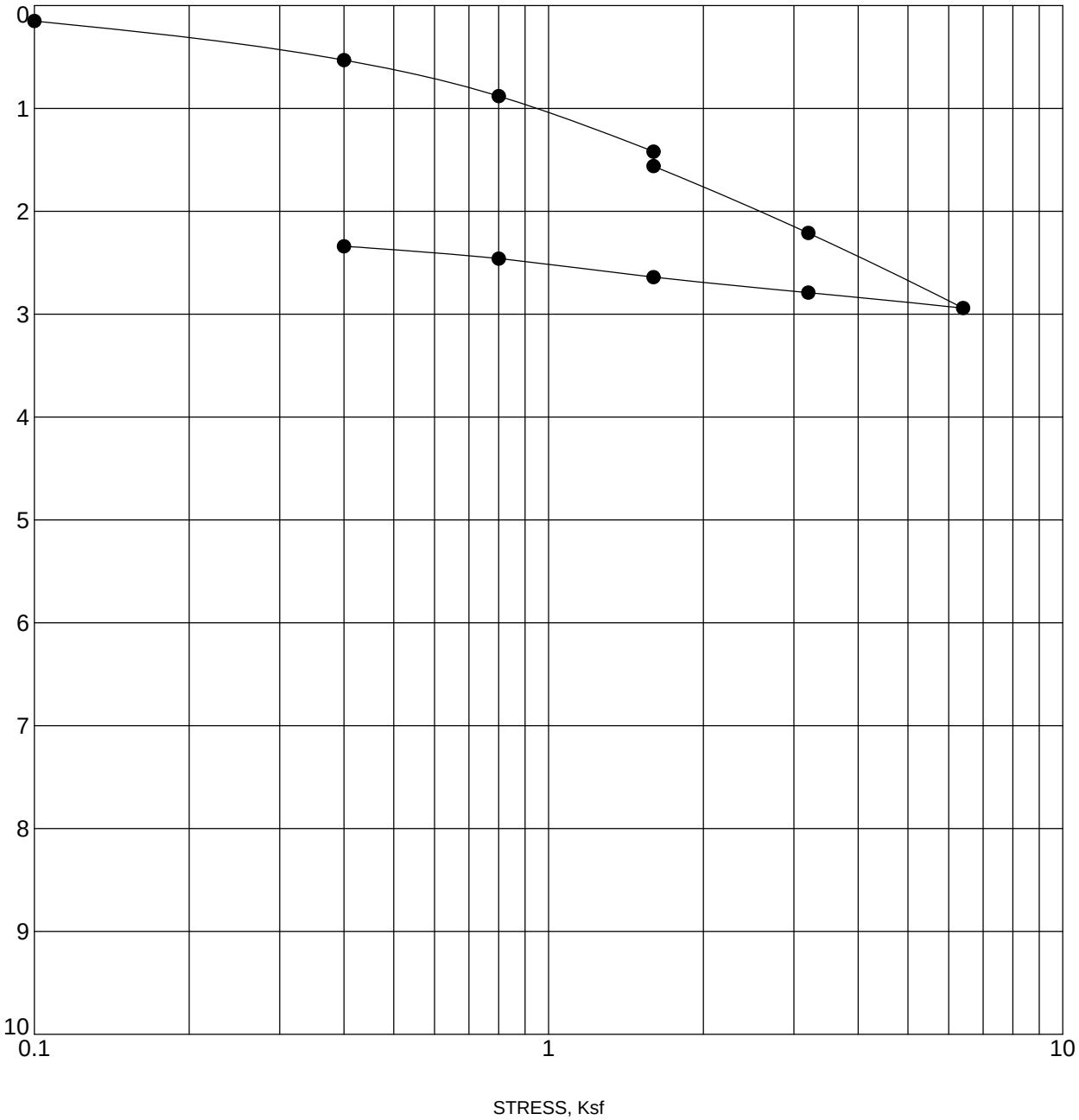

Specimen Identification		Classification	γ_d	MC%
● **B-2** **15.0**		**Sand**	**95**	**9**

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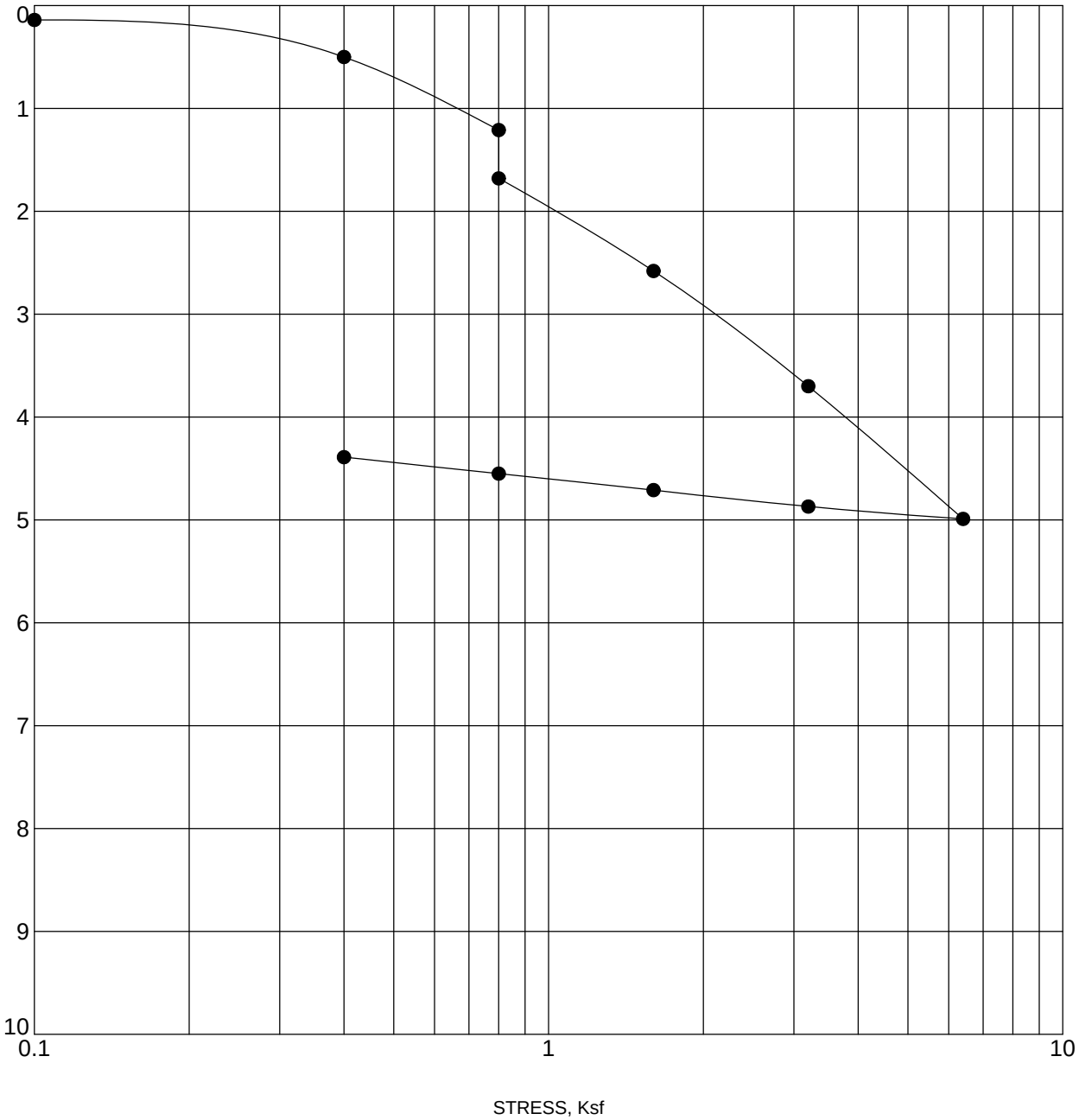

Specimen Identification		Classification	γ_d	MC%
● **B-5** **15.0**		**Sand**	**132**	**5**

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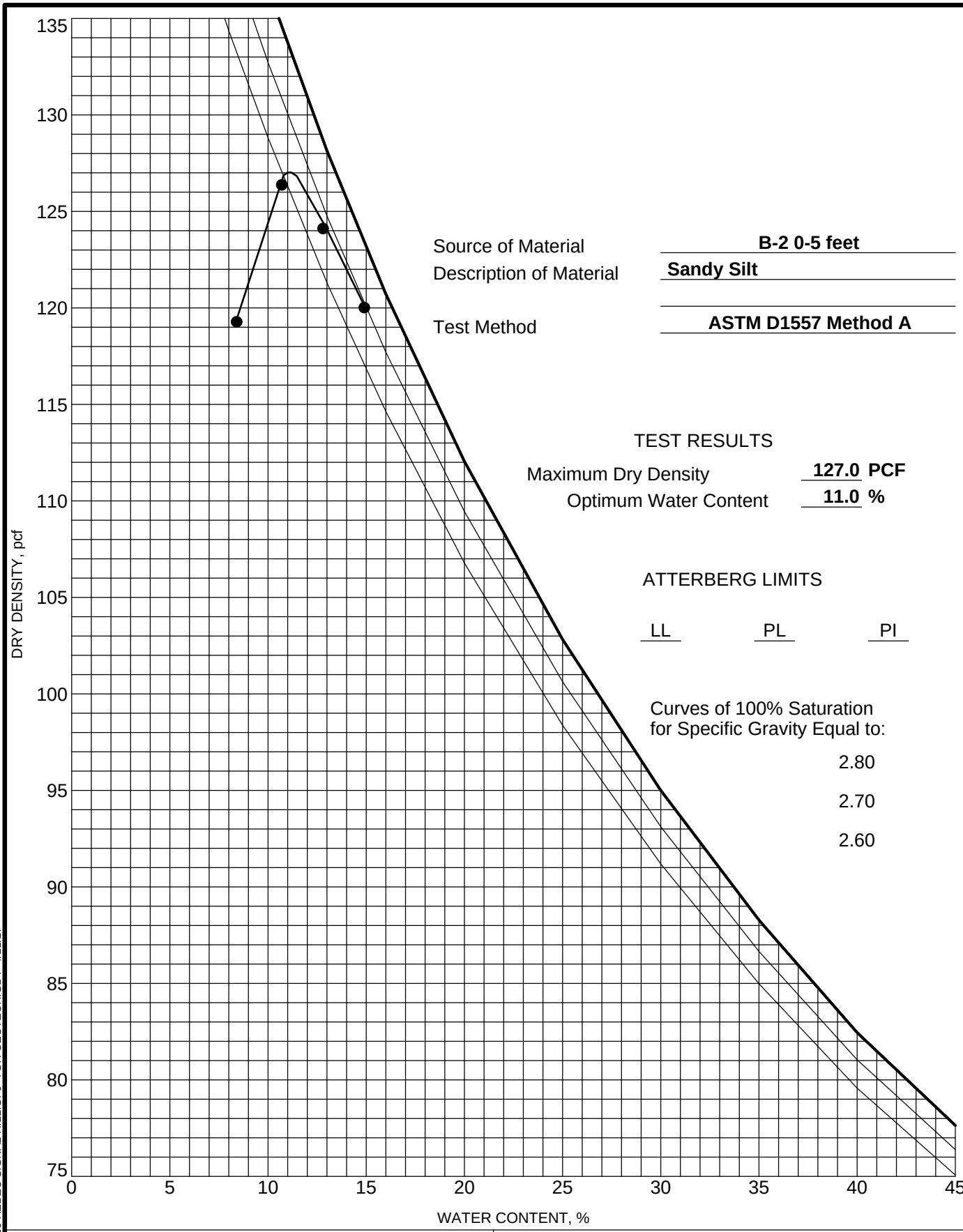

Source of Material: **B-2 0-5 feet**

Description of Material: **Sandy Silt**

Test Method: **ASTM D1557 Method A**

TEST RESULTS

Maximum Dry Density: **127.0 PCF**

Optimum Water Content: **11.0 %**

ATTERBERG LIMITS

LL PL PI

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

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MOISTURE-DENSITY RELATIONSHIP

Project Number: 16-6239

Project Name: Xebec Signal Hill

US COMPACTION 16-6239 XEBEC SIGNAL HILL.GPJ TGR GEOTECH.GDT 4/21/17

ANAHEIM TEST LAB, INC

3008 ORANGE AVENUE
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TO:

TGR GEOTECHNICAL
3037 S. HARBOR BLVD.
SANTA ANA, CA 92704

DATE: 04/11/17

P.O. NO: VERBAL

LAB NO: C-0421 1-2

SPECIFICATION: CA-417/422/643

MATERIAL: Soil

PROJECT NO: 16-6239

Xebec-Signal Hill

ANALYTICAL REPORT

CORROSION SERIES
SUMMARY OF DATA

	PH	SOLUBLE SULFATES per CA. 417 ppm	SOLUBLE CHLORIDES per CA. 422 ppm	MIN. RESISTIVITY per CA. 643 ohm-cm
1) B-3 @ 0-5' Dark Brown, Silty Sand	7.0	200	112	2,000
2) B-5 @ 0-5' Silty Sand	6.9	225	107	2,000

RESPECTFULLY SUBMITTED

WES BRIDGER CHEMIST

ANAHEIM TEST LAB, INC

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PHONE (714) 549-7267

TO:

TGR GEOTECHNICAL
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SANTA ANA, CA 92704

DATE: 04/12/17

P.O. NO: VERBAL

LAB NO: C-0425

SPECIFICATION: CA-417/422/643

MATERIAL: Silty Sand

PROJECT NO: 16-6239

Xebec-Signal Hill

ANALYTICAL REPORT

CORROSION SERIES
SUMMARY OF DATA

	PH	SOLUBLE SULFATES per CA. 417 ppm	SOLUBLE CHLORIDES per CA. 422 ppm	MIN. RESISTIVITY per CA. 643 ohm-cm
B-2 @ 0-5'	7.0	274	145	1,500

RESPECTFULLY SUBMITTED

WES BRIDGER CHEMIST

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PHONE (714) 549-7267

TO:

TGR GEOTECHNICAL
3037 S. HARBOR BLVD.
SANTA ANA, CA. 92704

DATE: 04/13/17

P.O. NO.: VERBAL

LAB NO.: C-0421 1-2

SPECIFICATION: CA 301

MATERIAL: Soil

PROJECT#: 16-6239
Xebec-Signal Hill

ANALYTICAL REPORT

"R" VALUE

	BY EXUDATION	BY EXPANSION
1) B-3 @ 0-5' Brown, F. Sandy Silt w. trace Gravel	48	56
2) B-5 @ 0-5' Brown, F.M. Silty Sand w. Gravel	61	N/A

RESPECTFULLY SUBMITTED

WES BRIDGER CHEMIST

"R" VALUE CA 301

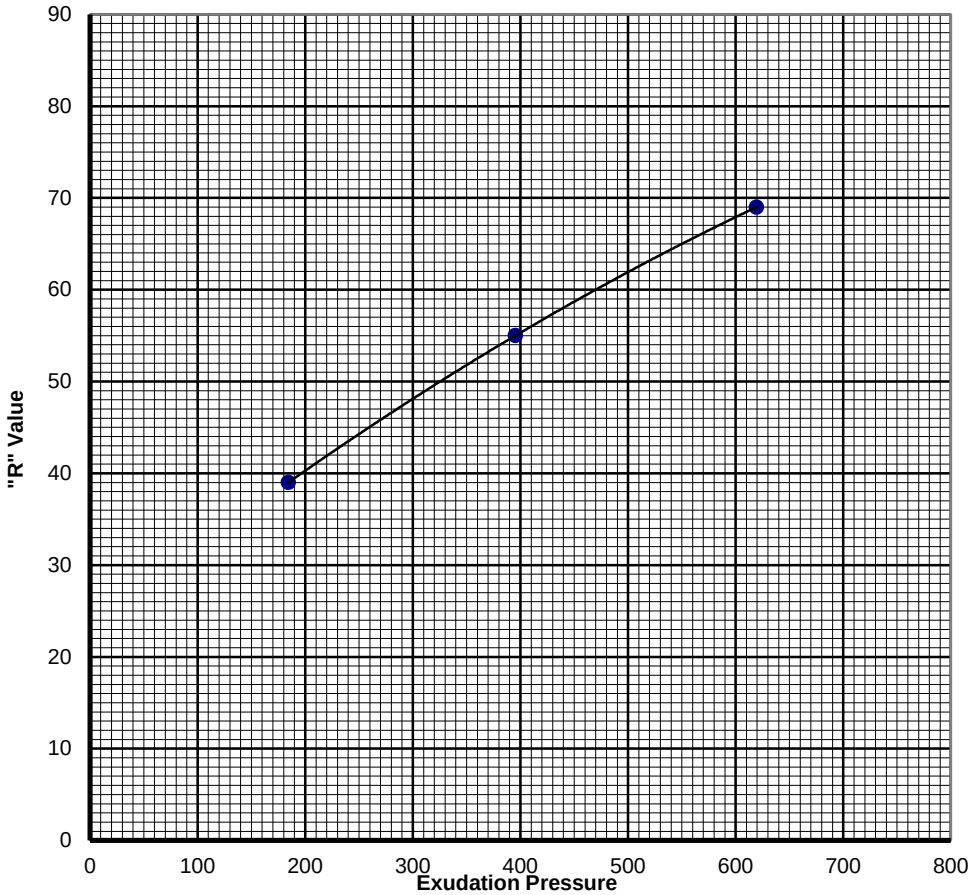
Client: TGR **ATL No.:** C 0421-1 **Date:** 4/12/2017

Client Reference No.: 16-6239

Sample: B-3 @ 0 - 5' **Soil Type:** Brown, F. Sandy Silt w. trace Gravel

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	100	200	300	
Initial Moisture Content	%	8.4	8.4	8.4	
Moisture at Compaction	%	10.2	9.3	8.4	
Briquette Height	in.	2.52	2.50	2.52	
Dry Density	pcf	118.2	121.3	122.8	
EXUDATION PRESSURE	psi	184	395	619	
EXPANSION dial	(x .0001)	0	15	31	
Ph at 1000 pounds	psi	40	28	19	
Ph at 2000 pounds	psi	80	57	39	
Displacement	turns	3.99	3.65	3.41	
"R" Value		39	55	69	
CORRECTED "R" VALUE		39	55	69	

Final "R" Value	
BY EXUDATION: @ 300 psi	**48**
BY EXPANSION: TI = 5.0	**56**



"R" VALUE CA 301

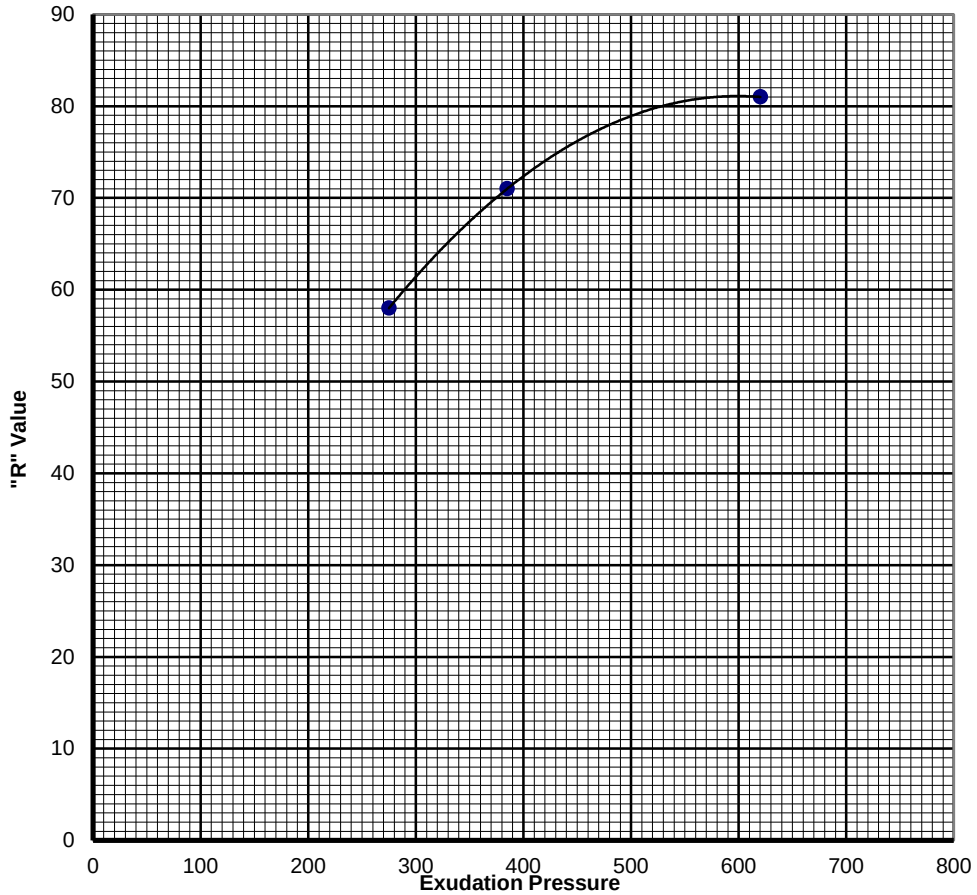
Client: TGR **ATL No.:** C 0421-2 **Date:** 4/12/2017

Client Reference No.: 16-6239

Sample: B-5 @ 0 - 5' **Soil Type:** Brown, F.M. Silty Sand w. Gravel

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	300	350	350	
Initial Moisture Content	%	4.0	4.0	4.0	
Moisture at Compaction	%	10.1	9.6	9.2	
Briquette Height	in.	2.54	2.42	2.46	
Dry Density	pcf	118.8	120.2	122.1	
EXUDATION PRESSURE	psi	275	385	620	
EXPANSION dial	(x .0001)	0	0	0	
Ph at 1000 pounds	psi	28	20	16	
Ph at 2000 pounds	psi	51	35	24	
Displacement	turns	3.8	3.6	3.32	
"R" Value		58	71	81	
CORRECTED "R" VALUE		58	71	81	

Final "R" Value	
BY EXUDATION: @ 300 psi	**61**
BY EXPANSION: TI = 5.0	**N/A**



APPENDIX D
LIQUEFACTION ANALYSIS

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LIQUEFACTION ANALYSIS

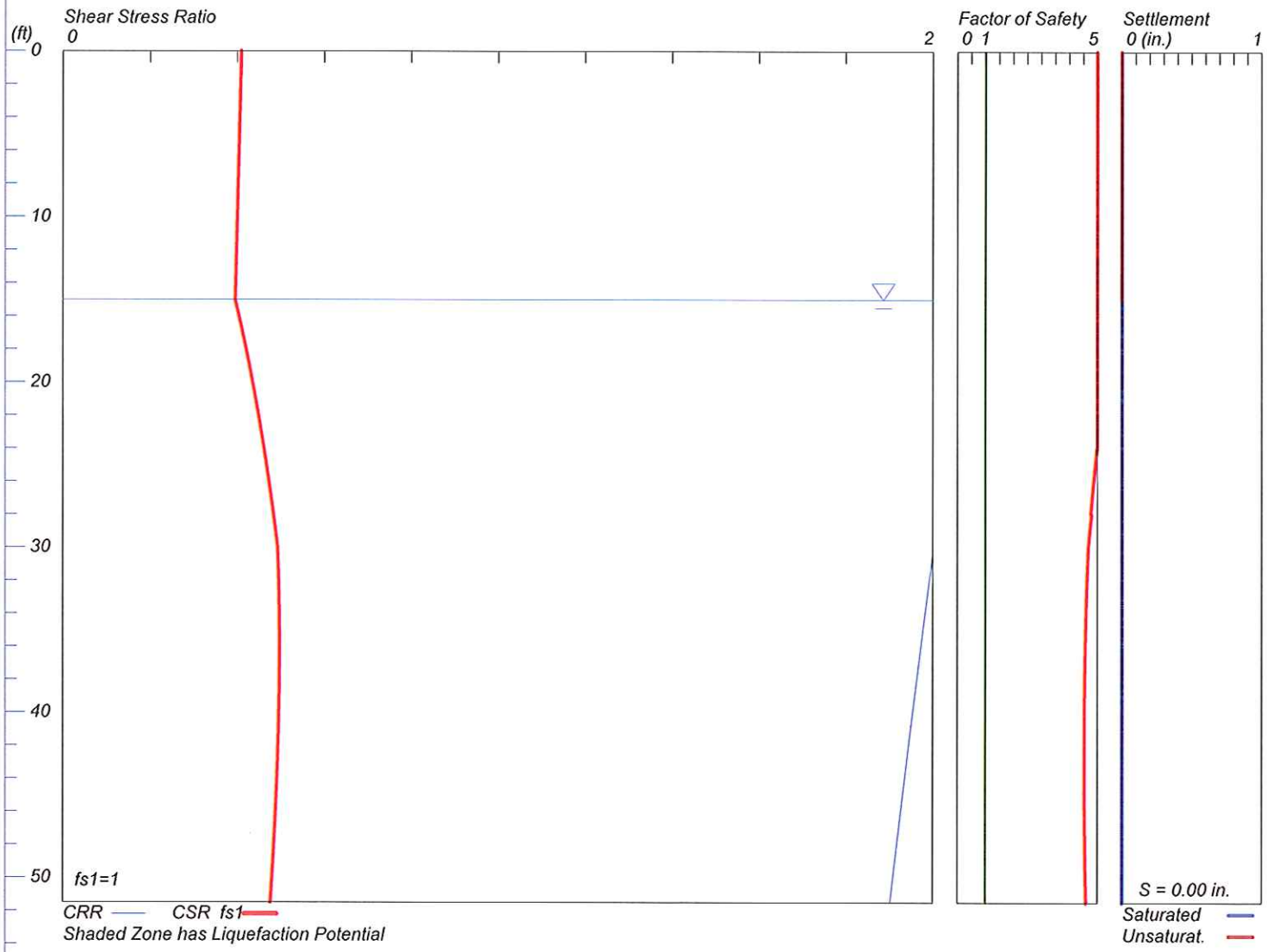
Xebec Signal Hill

Hole No.=B-3 Water Depth=15 ft

Ground Improvement of Fill=5 ft

Magnitude=7.1

Acceleration=0.629g



LiquefyPro CivilTech Software USA www.civiltech.com

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LIQUEFACTION ANALYSIS CALCULATION SHEET

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Input File Name: D:\Liquefy5\16-6239-Xebec Signal Hill-B3.liq
Title: Xebec Signal Hill
Subtitle: 16-6239

Surface Elev.=
Hole No.=B-3
Depth of Hole= 51.5 ft
Water Table during Earthquake= 15.0 ft
Water Table during In-Situ Testing= 25.0 ft
Max. Acceleration= 0.63 g
Earthquake Magnitude= 7.1

Input Data:
Surface Elev.=
Hole No.=B-3
Depth of Hole=51.5 ft
Water Table during Earthquake= 15.0 ft
Water Table during In-Situ Testing= 25.0 ft
Max. Acceleration=0.63 g
Earthquake Magnitude=7.1

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Ishihara / Yoshimine*
3. Fines Correction for Liquefaction: Stark/Olson et al.*
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.25
7. Borehole Diameter, Cb= 1.15
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1
   Plot one CSR curve (fs1=1)
10. Use Curve Smoothing: Yes*
* Recommended Options

Fill on Top= 5 ft Fill Unit Weight= 125 pcf
Depth of this report is based on original ground surface, not based on fill
In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
0.0	20.0	124.0	NoLiq
6.0	28.0	124.0	NoLiq
11.0	32.0	123.0	NoLiq
16.0	15.0	110.0	3.5
21.0	26.0	110.0	3.5
26.0	35.0	110.0	3.5
31.0	46.0	110.0	3.5
36.0	26.0	110.0	3.5
41.0	42.0	110.0	74.0

46.0	35.0	110.0	74.0
51.0	36.0	110.0	11.0

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=0.00 in.
Total Settlement of Saturated and Unsaturated Sands=0.00 in.
Differential Settlement=0.000 to 0.000 in.

Depth ft	CRRv	CSRm	F.S.	S_sat. in.	S_dry in.	S_all in.
0.00	2.00	0.41	5.00	0.00	0.00	0.00
0.05	2.00	0.41	5.00	0.00	0.00	0.00
0.10	2.00	0.41	5.00	0.00	0.00	0.00
0.15	2.00	0.41	5.00	0.00	0.00	0.00
0.20	2.00	0.41	5.00	0.00	0.00	0.00
0.25	2.00	0.41	5.00	0.00	0.00	0.00
0.30	2.00	0.41	5.00	0.00	0.00	0.00
0.35	2.00	0.41	5.00	0.00	0.00	0.00
0.40	2.00	0.41	5.00	0.00	0.00	0.00
0.45	2.00	0.41	5.00	0.00	0.00	0.00
0.50	2.00	0.41	5.00	0.00	0.00	0.00
0.55	2.00	0.41	5.00	0.00	0.00	0.00
0.60	2.00	0.41	5.00	0.00	0.00	0.00
0.65	2.00	0.41	5.00	0.00	0.00	0.00
0.70	2.00	0.41	5.00	0.00	0.00	0.00
0.75	2.00	0.41	5.00	0.00	0.00	0.00
0.80	2.00	0.41	5.00	0.00	0.00	0.00
0.85	2.00	0.41	5.00	0.00	0.00	0.00
0.90	2.00	0.41	5.00	0.00	0.00	0.00
0.95	2.00	0.41	5.00	0.00	0.00	0.00
1.00	2.00	0.41	5.00	0.00	0.00	0.00
1.05	2.00	0.41	5.00	0.00	0.00	0.00
1.10	2.00	0.41	5.00	0.00	0.00	0.00
1.15	2.00	0.41	5.00	0.00	0.00	0.00
1.20	2.00	0.41	5.00	0.00	0.00	0.00
1.25	2.00	0.41	5.00	0.00	0.00	0.00
1.30	2.00	0.41	5.00	0.00	0.00	0.00
1.35	2.00	0.41	5.00	0.00	0.00	0.00
1.40	2.00	0.41	5.00	0.00	0.00	0.00
1.45	2.00	0.41	5.00	0.00	0.00	0.00
1.50	2.00	0.41	5.00	0.00	0.00	0.00
1.55	2.00	0.41	5.00	0.00	0.00	0.00
1.60	2.00	0.41	5.00	0.00	0.00	0.00
1.65	2.00	0.41	5.00	0.00	0.00	0.00
1.70	2.00	0.41	5.00	0.00	0.00	0.00
1.75	2.00	0.41	5.00	0.00	0.00	0.00
1.80	2.00	0.41	5.00	0.00	0.00	0.00
1.85	2.00	0.41	5.00	0.00	0.00	0.00
1.90	2.00	0.41	5.00	0.00	0.00	0.00
1.95	2.00	0.41	5.00	0.00	0.00	0.00
2.00	2.00	0.41	5.00	0.00	0.00	0.00
2.05	2.00	0.41	5.00	0.00	0.00	0.00
2.10	2.00	0.41	5.00	0.00	0.00	0.00
2.15	2.00	0.41	5.00	0.00	0.00	0.00
2.20	2.00	0.41	5.00	0.00	0.00	0.00
2.25	2.00	0.41	5.00	0.00	0.00	0.00
2.30	2.00	0.41	5.00	0.00	0.00	0.00
2.35	2.00	0.41	5.00	0.00	0.00	0.00
2.40	2.00	0.41	5.00	0.00	0.00	0.00
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2.60	2.00	0.41	5.00	0.00	0.00	0.00
2.65	2.00	0.41	5.00	0.00	0.00	0.00
2.70	2.00	0.41	5.00	0.00	0.00	0.00
2.75	2.00	0.41	5.00	0.00	0.00	0.00
2.80	2.00	0.41	5.00	0.00	0.00	0.00
2.85	2.00	0.41	5.00	0.00	0.00	0.00
2.90	2.00	0.41	5.00	0.00	0.00	0.00
2.95	2.00	0.41	5.00	0.00	0.00	0.00
3.00	2.00	0.41	5.00	0.00	0.00	0.00
3.05	2.00	0.41	5.00	0.00	0.00	0.00
3.10	2.00	0.41	5.00	0.00	0.00	0.00
3.15	2.00	0.41	5.00	0.00	0.00	0.00
3.20	2.00	0.41	5.00	0.00	0.00	0.00
3.25	2.00	0.41	5.00	0.00	0.00	0.00
3.30	2.00	0.41	5.00	0.00	0.00	0.00
3.35	2.00	0.41	5.00	0.00	0.00	0.00
3.40	2.00	0.41	5.00	0.00	0.00	0.00
3.45	2.00	0.41	5.00	0.00	0.00	0.00
3.50	2.00	0.41	5.00	0.00	0.00	0.00
3.55	2.00	0.41	5.00	0.00	0.00	0.00
3.60	2.00	0.41	5.00	0.00	0.00	0.00
3.65	2.00	0.41	5.00	0.00	0.00	0.00
3.70	2.00	0.41	5.00	0.00	0.00	0.00
3.75	2.00	0.41	5.00	0.00	0.00	0.00
3.80	2.00	0.41	5.00	0.00	0.00	0.00
3.85	2.00	0.41	5.00	0.00	0.00	0.00
3.90	2.00	0.41	5.00	0.00	0.00	0.00
3.95	2.00	0.41	5.00	0.00	0.00	0.00
4.00	2.00	0.41	5.00	0.00	0.00	0.00
4.05	2.00	0.40	5.00	0.00	0.00	0.00
4.10	2.00	0.40	5.00	0.00	0.00	0.00
4.15	2.00	0.40	5.00	0.00	0.00	0.00
4.20	2.00	0.40	5.00	0.00	0.00	0.00
4.25	2.00	0.40	5.00	0.00	0.00	0.00
4.30	2.00	0.40	5.00	0.00	0.00	0.00
4.35	2.00	0.40	5.00	0.00	0.00	0.00
4.40	2.00	0.40	5.00	0.00	0.00	0.00
4.45	2.00	0.40	5.00	0.00	0.00	0.00
4.50	2.00	0.40	5.00	0.00	0.00	0.00
4.55	2.00	0.40	5.00	0.00	0.00	0.00
4.60	2.00	0.40	5.00	0.00	0.00	0.00
4.65	2.00	0.40	5.00	0.00	0.00	0.00
4.70	2.00	0.40	5.00	0.00	0.00	0.00
4.75	2.00	0.40	5.00	0.00	0.00	0.00
4.80	2.00	0.40	5.00	0.00	0.00	0.00
4.85	2.00	0.40	5.00	0.00	0.00	0.00
4.90	2.00	0.40	5.00	0.00	0.00	0.00
4.95	2.00	0.40	5.00	0.00	0.00	0.00
5.00	2.00	0.40	5.00	0.00	0.00	0.00
5.05	2.00	0.40	5.00	0.00	0.00	0.00
5.10	2.00	0.40	5.00	0.00	0.00	0.00
5.15	2.00	0.40	5.00	0.00	0.00	0.00
5.20	2.00	0.40	5.00	0.00	0.00	0.00
5.25	2.00	0.40	5.00	0.00	0.00	0.00
5.30	2.00	0.40	5.00	0.00	0.00	0.00
5.35	2.00	0.40	5.00	0.00	0.00	0.00
5.40	2.00	0.40	5.00	0.00	0.00	0.00
5.45	2.00	0.40	5.00	0.00	0.00	0.00
5.50	2.00	0.40	5.00	0.00	0.00	0.00
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5.75	2.00	0.40	5.00	0.00	0.00	0.00
5.80	2.00	0.40	5.00	0.00	0.00	0.00
5.85	2.00	0.40	5.00	0.00	0.00	0.00
5.90	2.00	0.40	5.00	0.00	0.00	0.00
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6.05	2.00	0.40	5.00	0.00	0.00	0.00
6.10	2.00	0.40	5.00	0.00	0.00	0.00
6.15	2.00	0.40	5.00	0.00	0.00	0.00
6.20	2.00	0.40	5.00	0.00	0.00	0.00
6.25	2.00	0.40	5.00	0.00	0.00	0.00
6.30	2.00	0.40	5.00	0.00	0.00	0.00
6.35	2.00	0.40	5.00	0.00	0.00	0.00
6.40	2.00	0.40	5.00	0.00	0.00	0.00
6.45	2.00	0.40	5.00	0.00	0.00	0.00
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6.75	2.00	0.40	5.00	0.00	0.00	0.00
6.80	2.00	0.40	5.00	0.00	0.00	0.00
6.85	2.00	0.40	5.00	0.00	0.00	0.00
6.90	2.00	0.40	5.00	0.00	0.00	0.00
6.95	2.00	0.40	5.00	0.00	0.00	0.00
7.00	2.00	0.40	5.00	0.00	0.00	0.00
7.05	2.00	0.40	5.00	0.00	0.00	0.00
7.10	2.00	0.40	5.00	0.00	0.00	0.00
7.15	2.00	0.40	5.00	0.00	0.00	0.00
7.20	2.00	0.40	5.00	0.00	0.00	0.00
7.25	2.00	0.40	5.00	0.00	0.00	0.00
7.30	2.00	0.40	5.00	0.00	0.00	0.00
7.35	2.00	0.40	5.00	0.00	0.00	0.00
7.40	2.00	0.40	5.00	0.00	0.00	0.00
7.45	2.00	0.40	5.00	0.00	0.00	0.00
7.50	2.00	0.40	5.00	0.00	0.00	0.00
7.55	2.00	0.40	5.00	0.00	0.00	0.00
7.60	2.00	0.40	5.00	0.00	0.00	0.00
7.65	2.00	0.40	5.00	0.00	0.00	0.00
7.70	2.00	0.40	5.00	0.00	0.00	0.00
7.75	2.00	0.40	5.00	0.00	0.00	0.00
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7.95	2.00	0.40	5.00	0.00	0.00	0.00
8.00	2.00	0.40	5.00	0.00	0.00	0.00
8.05	2.00	0.40	5.00	0.00	0.00	0.00
8.10	2.00	0.40	5.00	0.00	0.00	0.00
8.15	2.00	0.40	5.00	0.00	0.00	0.00
8.20	2.00	0.40	5.00	0.00	0.00	0.00
8.25	2.00	0.40	5.00	0.00	0.00	0.00
8.30	2.00	0.40	5.00	0.00	0.00	0.00
8.35	2.00	0.40	5.00	0.00	0.00	0.00
8.40	2.00	0.40	5.00	0.00	0.00	0.00
8.45	2.00	0.40	5.00	0.00	0.00	0.00
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8.65	2.00	0.40	5.00	0.00	0.00	0.00
8.70	2.00	0.40	5.00	0.00	0.00	0.00
8.75	2.00	0.40	5.00	0.00	0.00	0.00

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8.95	2.00	0.40	5.00	0.00	0.00	0.00
9.00	2.00	0.40	5.00	0.00	0.00	0.00
9.05	2.00	0.40	5.00	0.00	0.00	0.00
9.10	2.00	0.40	5.00	0.00	0.00	0.00
9.15	2.00	0.40	5.00	0.00	0.00	0.00
9.20	2.00	0.40	5.00	0.00	0.00	0.00
9.25	2.00	0.40	5.00	0.00	0.00	0.00
9.30	2.00	0.40	5.00	0.00	0.00	0.00
9.35	2.00	0.40	5.00	0.00	0.00	0.00
9.40	2.00	0.40	5.00	0.00	0.00	0.00
9.45	2.00	0.40	5.00	0.00	0.00	0.00
9.50	2.00	0.40	5.00	0.00	0.00	0.00
9.55	2.00	0.40	5.00	0.00	0.00	0.00
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9.90	2.00	0.40	5.00	0.00	0.00	0.00
9.95	2.00	0.40	5.00	0.00	0.00	0.00
10.00	2.00	0.40	5.00	0.00	0.00	0.00
10.05	2.00	0.40	5.00	0.00	0.00	0.00
10.10	2.00	0.40	5.00	0.00	0.00	0.00
10.15	2.00	0.40	5.00	0.00	0.00	0.00
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11.05	2.00	0.40	5.00	0.00	0.00	0.00
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11.15	2.00	0.40	5.00	0.00	0.00	0.00
11.20	2.00	0.40	5.00	0.00	0.00	0.00
11.25	2.00	0.40	5.00	0.00	0.00	0.00
11.30	2.00	0.40	5.00	0.00	0.00	0.00
11.35	2.00	0.40	5.00	0.00	0.00	0.00
11.40	2.00	0.40	5.00	0.00	0.00	0.00
11.45	2.00	0.40	5.00	0.00	0.00	0.00
11.50	2.00	0.40	5.00	0.00	0.00	0.00
11.55	2.00	0.40	5.00	0.00	0.00	0.00
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12.05	2.00	0.40	5.00	0.00	0.00	0.00
12.10	2.00	0.40	5.00	0.00	0.00	0.00
12.15	2.00	0.40	5.00	0.00	0.00	0.00
12.20	2.00	0.40	5.00	0.00	0.00	0.00
12.25	2.00	0.40	5.00	0.00	0.00	0.00
12.30	2.00	0.40	5.00	0.00	0.00	0.00
12.35	2.00	0.40	5.00	0.00	0.00	0.00
12.40	2.00	0.40	5.00	0.00	0.00	0.00
12.45	2.00	0.40	5.00	0.00	0.00	0.00
12.50	2.00	0.40	5.00	0.00	0.00	0.00
12.55	2.00	0.40	5.00	0.00	0.00	0.00
12.60	2.00	0.40	5.00	0.00	0.00	0.00
12.65	2.00	0.40	5.00	0.00	0.00	0.00
12.70	2.00	0.40	5.00	0.00	0.00	0.00
12.75	2.00	0.40	5.00	0.00	0.00	0.00
12.80	2.00	0.40	5.00	0.00	0.00	0.00
12.85	2.00	0.40	5.00	0.00	0.00	0.00
12.90	2.00	0.40	5.00	0.00	0.00	0.00
12.95	2.00	0.40	5.00	0.00	0.00	0.00
13.00	2.00	0.40	5.00	0.00	0.00	0.00
13.05	2.00	0.40	5.00	0.00	0.00	0.00
13.10	2.00	0.40	5.00	0.00	0.00	0.00
13.15	2.00	0.40	5.00	0.00	0.00	0.00
13.20	2.00	0.40	5.00	0.00	0.00	0.00
13.25	2.00	0.40	5.00	0.00	0.00	0.00
13.30	2.00	0.40	5.00	0.00	0.00	0.00
13.35	2.00	0.40	5.00	0.00	0.00	0.00
13.40	2.00	0.40	5.00	0.00	0.00	0.00
13.45	2.00	0.40	5.00	0.00	0.00	0.00
13.50	2.00	0.40	5.00	0.00	0.00	0.00
13.55	2.00	0.40	5.00	0.00	0.00	0.00
13.60	2.00	0.40	5.00	0.00	0.00	0.00
13.65	2.00	0.40	5.00	0.00	0.00	0.00
13.70	2.00	0.40	5.00	0.00	0.00	0.00
13.75	2.00	0.40	5.00	0.00	0.00	0.00
13.80	2.00	0.40	5.00	0.00	0.00	0.00
13.85	2.00	0.40	5.00	0.00	0.00	0.00
13.90	2.00	0.40	5.00	0.00	0.00	0.00
13.95	2.00	0.40	5.00	0.00	0.00	0.00
14.00	2.00	0.40	5.00	0.00	0.00	0.00
14.05	2.00	0.40	5.00	0.00	0.00	0.00
14.10	2.00	0.40	5.00	0.00	0.00	0.00
14.15	2.00	0.40	5.00	0.00	0.00	0.00
14.20	2.00	0.40	5.00	0.00	0.00	0.00
14.25	2.00	0.40	5.00	0.00	0.00	0.00
14.30	2.00	0.40	5.00	0.00	0.00	0.00
14.35	2.00	0.40	5.00	0.00	0.00	0.00
14.40	2.00	0.40	5.00	0.00	0.00	0.00
14.45	2.00	0.40	5.00	0.00	0.00	0.00
14.50	2.00	0.40	5.00	0.00	0.00	0.00
14.55	2.00	0.39	5.00	0.00	0.00	0.00
14.60	2.00	0.39	5.00	0.00	0.00	0.00
14.65	2.00	0.39	5.00	0.00	0.00	0.00
14.70	2.00	0.39	5.00	0.00	0.00	0.00
14.75	2.00	0.39	5.00	0.00	0.00	0.00
14.80	2.00	0.39	5.00	0.00	0.00	0.00
14.85	2.00	0.39	5.00	0.00	0.00	0.00
14.90	2.00	0.39	5.00	0.00	0.00	0.00
14.95	2.00	0.39	5.00	0.00	0.00	0.00
15.00	2.00	0.39	5.00	0.00	0.00	0.00
15.05	2.00	0.40	5.00	0.00	0.00	0.00

15.10	2.00	0.40	5.00	0.00	0.00	0.00
15.15	2.00	0.40	5.00	0.00	0.00	0.00
15.20	2.00	0.40	5.00	0.00	0.00	0.00
15.25	2.00	0.40	5.00	0.00	0.00	0.00
15.30	2.00	0.40	5.00	0.00	0.00	0.00
15.35	2.00	0.40	5.00	0.00	0.00	0.00
15.40	2.00	0.40	5.00	0.00	0.00	0.00
15.45	2.00	0.40	5.00	0.00	0.00	0.00
15.50	2.00	0.40	5.00	0.00	0.00	0.00
15.55	2.00	0.40	5.00	0.00	0.00	0.00
15.60	2.00	0.40	5.00	0.00	0.00	0.00
15.65	2.00	0.40	5.00	0.00	0.00	0.00
15.70	2.00	0.40	5.00	0.00	0.00	0.00
15.75	2.00	0.40	5.00	0.00	0.00	0.00
15.80	2.00	0.40	5.00	0.00	0.00	0.00
15.85	2.00	0.40	5.00	0.00	0.00	0.00
15.90	2.00	0.40	5.00	0.00	0.00	0.00
15.95	2.00	0.40	5.00	0.00	0.00	0.00
16.00	2.00	0.40	5.00	0.00	0.00	0.00
16.05	2.00	0.40	5.00	0.00	0.00	0.00
16.10	2.00	0.40	5.00	0.00	0.00	0.00
16.15	2.00	0.40	5.00	0.00	0.00	0.00
16.20	2.00	0.41	5.00	0.00	0.00	0.00
16.25	2.00	0.41	5.00	0.00	0.00	0.00
16.30	2.00	0.41	5.00	0.00	0.00	0.00
16.35	2.00	0.41	5.00	0.00	0.00	0.00
16.40	2.00	0.41	5.00	0.00	0.00	0.00
16.45	2.00	0.41	5.00	0.00	0.00	0.00
16.50	2.00	0.41	5.00	0.00	0.00	0.00
16.55	2.00	0.41	5.00	0.00	0.00	0.00
16.60	2.00	0.41	5.00	0.00	0.00	0.00
16.65	2.00	0.41	5.00	0.00	0.00	0.00
16.70	2.00	0.41	5.00	0.00	0.00	0.00
16.75	2.00	0.41	5.00	0.00	0.00	0.00
16.80	2.00	0.41	5.00	0.00	0.00	0.00
16.85	2.00	0.41	5.00	0.00	0.00	0.00
16.90	2.00	0.41	5.00	0.00	0.00	0.00
16.95	2.00	0.41	5.00	0.00	0.00	0.00
17.00	2.00	0.41	5.00	0.00	0.00	0.00
17.05	2.00	0.41	5.00	0.00	0.00	0.00
17.10	2.00	0.41	5.00	0.00	0.00	0.00
17.15	2.00	0.41	5.00	0.00	0.00	0.00
17.20	2.00	0.41	5.00	0.00	0.00	0.00
17.25	2.00	0.41	5.00	0.00	0.00	0.00
17.30	2.00	0.41	5.00	0.00	0.00	0.00
17.35	2.00	0.41	5.00	0.00	0.00	0.00
17.40	2.00	0.42	5.00	0.00	0.00	0.00
17.45	2.00	0.42	5.00	0.00	0.00	0.00
17.50	2.00	0.42	5.00	0.00	0.00	0.00
17.55	2.00	0.42	5.00	0.00	0.00	0.00
17.60	2.00	0.42	5.00	0.00	0.00	0.00
17.65	2.00	0.42	5.00	0.00	0.00	0.00
17.70	2.00	0.42	5.00	0.00	0.00	0.00
17.75	2.00	0.42	5.00	0.00	0.00	0.00
17.80	2.00	0.42	5.00	0.00	0.00	0.00
17.85	2.00	0.42	5.00	0.00	0.00	0.00
17.90	2.00	0.42	5.00	0.00	0.00	0.00
17.95	2.00	0.42	5.00	0.00	0.00	0.00
18.00	2.00	0.42	5.00	0.00	0.00	0.00
18.05	2.00	0.42	5.00	0.00	0.00	0.00
18.10	2.00	0.42	5.00	0.00	0.00	0.00
18.15	2.00	0.42	5.00	0.00	0.00	0.00
18.20	2.00	0.42	5.00	0.00	0.00	0.00

18.25	2.00	0.42	5.00	0.00	0.00	0.00
18.30	2.00	0.42	5.00	0.00	0.00	0.00
18.35	2.00	0.42	5.00	0.00	0.00	0.00
18.40	2.00	0.42	5.00	0.00	0.00	0.00
18.45	2.00	0.42	5.00	0.00	0.00	0.00
18.50	2.00	0.42	5.00	0.00	0.00	0.00
18.55	2.00	0.42	5.00	0.00	0.00	0.00
18.60	2.00	0.42	5.00	0.00	0.00	0.00
18.65	2.00	0.42	5.00	0.00	0.00	0.00
18.70	2.00	0.43	5.00	0.00	0.00	0.00
18.75	2.00	0.43	5.00	0.00	0.00	0.00
18.80	2.00	0.43	5.00	0.00	0.00	0.00
18.85	2.00	0.43	5.00	0.00	0.00	0.00
18.90	2.00	0.43	5.00	0.00	0.00	0.00
18.95	2.00	0.43	5.00	0.00	0.00	0.00
19.00	2.00	0.43	5.00	0.00	0.00	0.00
19.05	2.00	0.43	5.00	0.00	0.00	0.00
19.10	2.00	0.43	5.00	0.00	0.00	0.00
19.15	2.00	0.43	5.00	0.00	0.00	0.00
19.20	2.00	0.43	5.00	0.00	0.00	0.00
19.25	2.00	0.43	5.00	0.00	0.00	0.00
19.30	2.00	0.43	5.00	0.00	0.00	0.00
19.35	2.00	0.43	5.00	0.00	0.00	0.00
19.40	2.00	0.43	5.00	0.00	0.00	0.00
19.45	2.00	0.43	5.00	0.00	0.00	0.00
19.50	2.00	0.43	5.00	0.00	0.00	0.00
19.55	2.00	0.43	5.00	0.00	0.00	0.00
19.60	2.00	0.43	5.00	0.00	0.00	0.00
19.65	2.00	0.43	5.00	0.00	0.00	0.00
19.70	2.00	0.43	5.00	0.00	0.00	0.00
19.75	2.00	0.43	5.00	0.00	0.00	0.00
19.80	2.00	0.43	5.00	0.00	0.00	0.00
19.85	2.00	0.43	5.00	0.00	0.00	0.00
19.90	2.00	0.43	5.00	0.00	0.00	0.00
19.95	2.00	0.43	5.00	0.00	0.00	0.00
20.00	2.00	0.43	5.00	0.00	0.00	0.00
20.05	2.00	0.44	5.00	0.00	0.00	0.00
20.10	2.00	0.44	5.00	0.00	0.00	0.00
20.15	2.00	0.44	5.00	0.00	0.00	0.00
20.20	2.00	0.44	5.00	0.00	0.00	0.00
20.25	2.00	0.44	5.00	0.00	0.00	0.00
20.30	2.00	0.44	5.00	0.00	0.00	0.00
20.35	2.00	0.44	5.00	0.00	0.00	0.00
20.40	2.00	0.44	5.00	0.00	0.00	0.00
20.45	2.00	0.44	5.00	0.00	0.00	0.00
20.50	2.00	0.44	5.00	0.00	0.00	0.00
20.55	2.00	0.44	5.00	0.00	0.00	0.00
20.60	2.00	0.44	5.00	0.00	0.00	0.00
20.65	2.00	0.44	5.00	0.00	0.00	0.00
20.70	2.00	0.44	5.00	0.00	0.00	0.00
20.75	2.00	0.44	5.00	0.00	0.00	0.00
20.80	2.00	0.44	5.00	0.00	0.00	0.00
20.85	2.00	0.44	5.00	0.00	0.00	0.00
20.90	2.00	0.44	5.00	0.00	0.00	0.00
20.95	2.00	0.44	5.00	0.00	0.00	0.00
21.00	2.00	0.44	5.00	0.00	0.00	0.00
21.05	2.00	0.44	5.00	0.00	0.00	0.00
21.10	2.00	0.44	5.00	0.00	0.00	0.00
21.15	2.00	0.44	5.00	0.00	0.00	0.00
21.20	2.00	0.44	5.00	0.00	0.00	0.00
21.25	2.00	0.44	5.00	0.00	0.00	0.00
21.30	2.00	0.44	5.00	0.00	0.00	0.00
21.35	2.00	0.44	5.00	0.00	0.00	0.00

21.40	2.00	0.44	5.00	0.00	0.00	0.00
21.45	2.00	0.44	5.00	0.00	0.00	0.00
21.50	2.00	0.45	5.00	0.00	0.00	0.00
21.55	2.00	0.45	5.00	0.00	0.00	0.00
21.60	2.00	0.45	5.00	0.00	0.00	0.00
21.65	2.00	0.45	5.00	0.00	0.00	0.00
21.70	2.00	0.45	5.00	0.00	0.00	0.00
21.75	2.00	0.45	5.00	0.00	0.00	0.00
21.80	2.00	0.45	5.00	0.00	0.00	0.00
21.85	2.00	0.45	5.00	0.00	0.00	0.00
21.90	2.00	0.45	5.00	0.00	0.00	0.00
21.95	2.00	0.45	5.00	0.00	0.00	0.00
22.00	2.00	0.45	5.00	0.00	0.00	0.00
22.05	2.00	0.45	5.00	0.00	0.00	0.00
22.10	2.00	0.45	5.00	0.00	0.00	0.00
22.15	2.00	0.45	5.00	0.00	0.00	0.00
22.20	2.00	0.45	5.00	0.00	0.00	0.00
22.25	2.00	0.45	5.00	0.00	0.00	0.00
22.30	2.00	0.45	5.00	0.00	0.00	0.00
22.35	2.00	0.45	5.00	0.00	0.00	0.00
22.40	2.00	0.45	5.00	0.00	0.00	0.00
22.45	2.00	0.45	5.00	0.00	0.00	0.00
22.50	2.00	0.45	5.00	0.00	0.00	0.00
22.55	2.00	0.45	5.00	0.00	0.00	0.00
22.60	2.00	0.45	5.00	0.00	0.00	0.00
22.65	2.00	0.45	5.00	0.00	0.00	0.00
22.70	2.00	0.45	5.00	0.00	0.00	0.00
22.75	2.00	0.45	5.00	0.00	0.00	0.00
22.80	2.00	0.45	5.00	0.00	0.00	0.00
22.85	2.00	0.45	5.00	0.00	0.00	0.00
22.90	2.00	0.45	5.00	0.00	0.00	0.00
22.95	2.00	0.45	5.00	0.00	0.00	0.00
23.00	2.00	0.45	5.00	0.00	0.00	0.00
23.05	2.00	0.46	5.00	0.00	0.00	0.00
23.10	2.00	0.46	5.00	0.00	0.00	0.00
23.15	2.00	0.46	5.00	0.00	0.00	0.00
23.20	2.00	0.46	5.00	0.00	0.00	0.00
23.25	2.00	0.46	5.00	0.00	0.00	0.00
23.30	2.00	0.46	5.00	0.00	0.00	0.00
23.35	2.00	0.46	5.00	0.00	0.00	0.00
23.40	2.00	0.46	5.00	0.00	0.00	0.00
23.45	2.00	0.46	5.00	0.00	0.00	0.00
23.50	2.00	0.46	5.00	0.00	0.00	0.00
23.55	2.00	0.46	5.00	0.00	0.00	0.00
23.60	2.00	0.46	5.00	0.00	0.00	0.00
23.65	2.00	0.46	5.00	0.00	0.00	0.00
23.70	2.00	0.46	5.00	0.00	0.00	0.00
23.75	2.00	0.46	5.00	0.00	0.00	0.00
23.80	2.00	0.46	5.00	0.00	0.00	0.00
23.85	2.00	0.46	5.00	0.00	0.00	0.00
23.90	2.00	0.46	5.00	0.00	0.00	0.00
23.95	2.00	0.46	4.99	0.00	0.00	0.00
24.00	2.00	0.46	4.99	0.00	0.00	0.00
24.05	2.00	0.46	4.99	0.00	0.00	0.00
24.10	2.00	0.46	4.98	0.00	0.00	0.00
24.15	2.00	0.46	4.98	0.00	0.00	0.00
24.20	2.00	0.46	4.98	0.00	0.00	0.00
24.25	2.00	0.46	4.97	0.00	0.00	0.00
24.30	2.00	0.46	4.97	0.00	0.00	0.00
24.35	2.00	0.46	4.97	0.00	0.00	0.00
24.40	2.00	0.46	4.96	0.00	0.00	0.00
24.45	2.00	0.46	4.96	0.00	0.00	0.00
24.50	2.00	0.46	4.96	0.00	0.00	0.00

24.55	2.00	0.46	4.95	0.00	0.00	0.00
24.60	2.00	0.46	4.95	0.00	0.00	0.00
24.65	2.00	0.46	4.95	0.00	0.00	0.00
24.70	2.00	0.47	4.95	0.00	0.00	0.00
24.75	2.00	0.47	4.94	0.00	0.00	0.00
24.80	2.00	0.47	4.94	0.00	0.00	0.00
24.85	2.00	0.47	4.94	0.00	0.00	0.00
24.90	2.00	0.47	4.93	0.00	0.00	0.00
24.95	2.00	0.47	4.93	0.00	0.00	0.00
25.00	2.00	0.47	4.93	0.00	0.00	0.00
25.05	2.00	0.47	4.92	0.00	0.00	0.00
25.10	2.00	0.47	4.92	0.00	0.00	0.00
25.15	2.00	0.47	4.92	0.00	0.00	0.00
25.20	2.00	0.47	4.92	0.00	0.00	0.00
25.25	2.00	0.47	4.91	0.00	0.00	0.00
25.30	2.00	0.47	4.91	0.00	0.00	0.00
25.35	2.00	0.47	4.91	0.00	0.00	0.00
25.40	2.00	0.47	4.90	0.00	0.00	0.00
25.45	2.00	0.47	4.90	0.00	0.00	0.00
25.50	2.00	0.47	4.90	0.00	0.00	0.00
25.55	2.00	0.47	4.89	0.00	0.00	0.00
25.60	2.00	0.47	4.89	0.00	0.00	0.00
25.65	2.00	0.47	4.89	0.00	0.00	0.00
25.70	2.00	0.47	4.89	0.00	0.00	0.00
25.75	2.00	0.47	4.88	0.00	0.00	0.00
25.80	2.00	0.47	4.88	0.00	0.00	0.00
25.85	2.00	0.47	4.88	0.00	0.00	0.00
25.90	2.00	0.47	4.87	0.00	0.00	0.00
25.95	2.00	0.47	4.87	0.00	0.00	0.00
26.00	2.00	0.47	4.87	0.00	0.00	0.00
26.05	2.00	0.47	4.87	0.00	0.00	0.00
26.10	2.00	0.47	4.86	0.00	0.00	0.00
26.15	2.00	0.47	4.86	0.00	0.00	0.00
26.20	2.00	0.47	4.86	0.00	0.00	0.00
26.25	2.00	0.47	4.86	0.00	0.00	0.00
26.30	2.00	0.47	4.85	0.00	0.00	0.00
26.35	2.00	0.47	4.85	0.00	0.00	0.00
26.40	2.00	0.47	4.85	0.00	0.00	0.00
26.45	2.00	0.47	4.84	0.00	0.00	0.00
26.50	2.00	0.48	4.84	0.00	0.00	0.00
26.55	2.00	0.48	4.84	0.00	0.00	0.00
26.60	2.00	0.48	4.84	0.00	0.00	0.00
26.65	2.00	0.48	4.83	0.00	0.00	0.00
26.70	2.00	0.48	4.83	0.00	0.00	0.00
26.75	2.00	0.48	4.83	0.00	0.00	0.00
26.80	2.00	0.48	4.83	0.00	0.00	0.00
26.85	2.00	0.48	4.82	0.00	0.00	0.00
26.90	2.00	0.48	4.82	0.00	0.00	0.00
26.95	2.00	0.48	4.82	0.00	0.00	0.00
27.00	2.00	0.48	4.81	0.00	0.00	0.00
27.05	2.00	0.48	4.81	0.00	0.00	0.00
27.10	2.00	0.48	4.81	0.00	0.00	0.00
27.15	2.00	0.48	4.81	0.00	0.00	0.00
27.20	2.00	0.48	4.80	0.00	0.00	0.00
27.25	2.00	0.48	4.80	0.00	0.00	0.00
27.30	2.00	0.48	4.80	0.00	0.00	0.00
27.35	2.00	0.48	4.80	0.00	0.00	0.00
27.40	2.00	0.48	4.79	0.00	0.00	0.00
27.45	2.00	0.48	4.79	0.00	0.00	0.00
27.50	2.00	0.48	4.79	0.00	0.00	0.00
27.55	2.00	0.48	4.79	0.00	0.00	0.00
27.60	2.00	0.48	4.78	0.00	0.00	0.00
27.65	2.00	0.48	4.78	0.00	0.00	0.00

27.70	2.00	0.48	4.78	0.00	0.00	0.00
27.75	2.00	0.48	4.78	0.00	0.00	0.00
27.80	2.00	0.48	4.77	0.00	0.00	0.00
27.85	2.00	0.48	4.77	0.00	0.00	0.00
27.90	2.00	0.48	4.77	0.00	0.00	0.00
27.95	2.01	0.48	4.80	0.00	0.00	0.00
28.00	2.01	0.48	4.79	0.00	0.00	0.00
28.05	2.01	0.48	4.79	0.00	0.00	0.00
28.10	2.01	0.48	4.79	0.00	0.00	0.00
28.15	2.01	0.48	4.78	0.00	0.00	0.00
28.20	2.01	0.48	4.78	0.00	0.00	0.00
28.25	2.01	0.48	4.78	0.00	0.00	0.00
28.30	2.01	0.48	4.77	0.00	0.00	0.00
28.35	2.01	0.48	4.77	0.00	0.00	0.00
28.40	2.01	0.48	4.77	0.00	0.00	0.00
28.45	2.01	0.49	4.77	0.00	0.00	0.00
28.50	2.01	0.49	4.76	0.00	0.00	0.00
28.55	2.01	0.49	4.76	0.00	0.00	0.00
28.60	2.01	0.49	4.76	0.00	0.00	0.00
28.65	2.01	0.49	4.75	0.00	0.00	0.00
28.70	2.01	0.49	4.75	0.00	0.00	0.00
28.75	2.01	0.49	4.75	0.00	0.00	0.00
28.80	2.01	0.49	4.74	0.00	0.00	0.00
28.85	2.01	0.49	4.74	0.00	0.00	0.00
28.90	2.01	0.49	4.74	0.00	0.00	0.00
28.95	2.01	0.49	4.74	0.00	0.00	0.00
29.00	2.01	0.49	4.73	0.00	0.00	0.00
29.05	2.01	0.49	4.73	0.00	0.00	0.00
29.10	2.01	0.49	4.73	0.00	0.00	0.00
29.15	2.01	0.49	4.72	0.00	0.00	0.00
29.20	2.01	0.49	4.72	0.00	0.00	0.00
29.25	2.01	0.49	4.72	0.00	0.00	0.00
29.30	2.01	0.49	4.72	0.00	0.00	0.00
29.35	2.01	0.49	4.71	0.00	0.00	0.00
29.40	2.01	0.49	4.71	0.00	0.00	0.00
29.45	2.00	0.49	4.71	0.00	0.00	0.00
29.50	2.00	0.49	4.70	0.00	0.00	0.00
29.55	2.00	0.49	4.70	0.00	0.00	0.00
29.60	2.00	0.49	4.70	0.00	0.00	0.00
29.65	2.00	0.49	4.70	0.00	0.00	0.00
29.70	2.00	0.49	4.69	0.00	0.00	0.00
29.75	2.00	0.49	4.69	0.00	0.00	0.00
29.80	2.00	0.49	4.69	0.00	0.00	0.00
29.85	2.00	0.49	4.69	0.00	0.00	0.00
29.90	2.00	0.49	4.68	0.00	0.00	0.00
29.95	2.00	0.49	4.68	0.00	0.00	0.00
30.00	2.00	0.49	4.68	0.00	0.00	0.00
30.05	2.00	0.49	4.68	0.00	0.00	0.00
30.10	2.00	0.49	4.68	0.00	0.00	0.00
30.15	2.00	0.49	4.67	0.00	0.00	0.00
30.20	2.00	0.49	4.67	0.00	0.00	0.00
30.25	2.00	0.49	4.67	0.00	0.00	0.00
30.30	2.00	0.49	4.67	0.00	0.00	0.00
30.35	2.00	0.49	4.67	0.00	0.00	0.00
30.40	2.00	0.49	4.67	0.00	0.00	0.00
30.45	2.00	0.49	4.67	0.00	0.00	0.00
30.50	2.00	0.49	4.67	0.00	0.00	0.00
30.55	2.00	0.49	4.66	0.00	0.00	0.00
30.60	2.00	0.49	4.66	0.00	0.00	0.00
30.65	2.00	0.49	4.66	0.00	0.00	0.00
30.70	2.00	0.49	4.66	0.00	0.00	0.00
30.75	2.00	0.49	4.66	0.00	0.00	0.00
30.80	2.00	0.49	4.66	0.00	0.00	0.00

30.85	2.00	0.49	4.66	0.00	0.00	0.00
30.90	2.00	0.49	4.66	0.00	0.00	0.00
30.95	2.00	0.49	4.65	0.00	0.00	0.00
31.00	2.00	0.49	4.65	0.00	0.00	0.00
31.05	2.00	0.49	4.65	0.00	0.00	0.00
31.10	2.00	0.49	4.65	0.00	0.00	0.00
31.15	2.00	0.49	4.65	0.00	0.00	0.00
31.20	2.00	0.49	4.65	0.00	0.00	0.00
31.25	2.00	0.49	4.65	0.00	0.00	0.00
31.30	2.00	0.49	4.65	0.00	0.00	0.00
31.35	2.00	0.49	4.65	0.00	0.00	0.00
31.40	2.00	0.49	4.64	0.00	0.00	0.00
31.45	2.00	0.49	4.64	0.00	0.00	0.00
31.50	1.99	0.49	4.64	0.00	0.00	0.00
31.55	1.99	0.49	4.64	0.00	0.00	0.00
31.60	1.99	0.49	4.64	0.00	0.00	0.00
31.65	1.99	0.49	4.64	0.00	0.00	0.00
31.70	1.99	0.49	4.64	0.00	0.00	0.00
31.75	1.99	0.49	4.64	0.00	0.00	0.00
31.80	1.99	0.49	4.64	0.00	0.00	0.00
31.85	1.99	0.49	4.64	0.00	0.00	0.00
31.90	1.99	0.49	4.63	0.00	0.00	0.00
31.95	1.99	0.49	4.63	0.00	0.00	0.00
32.00	1.99	0.49	4.63	0.00	0.00	0.00
32.05	1.99	0.49	4.63	0.00	0.00	0.00
32.10	1.99	0.49	4.63	0.00	0.00	0.00
32.15	1.99	0.49	4.63	0.00	0.00	0.00
32.20	1.99	0.49	4.63	0.00	0.00	0.00
32.25	1.99	0.49	4.63	0.00	0.00	0.00
32.30	1.99	0.50	4.63	0.00	0.00	0.00
32.35	1.99	0.50	4.63	0.00	0.00	0.00
32.40	1.99	0.50	4.62	0.00	0.00	0.00
32.45	1.99	0.50	4.62	0.00	0.00	0.00
32.50	1.99	0.50	4.62	0.00	0.00	0.00
32.55	1.99	0.50	4.62	0.00	0.00	0.00
32.60	1.99	0.50	4.62	0.00	0.00	0.00
32.65	1.99	0.50	4.62	0.00	0.00	0.00
32.70	1.99	0.50	4.62	0.00	0.00	0.00
32.75	1.99	0.50	4.62	0.00	0.00	0.00
32.80	1.99	0.50	4.62	0.00	0.00	0.00
32.85	1.99	0.50	4.62	0.00	0.00	0.00
32.90	1.99	0.50	4.61	0.00	0.00	0.00
32.95	1.99	0.50	4.61	0.00	0.00	0.00
33.00	1.99	0.50	4.61	0.00	0.00	0.00
33.05	1.99	0.50	4.61	0.00	0.00	0.00
33.10	1.99	0.50	4.61	0.00	0.00	0.00
33.15	1.99	0.50	4.61	0.00	0.00	0.00
33.20	1.99	0.50	4.61	0.00	0.00	0.00
33.25	1.99	0.50	4.61	0.00	0.00	0.00
33.30	1.99	0.50	4.61	0.00	0.00	0.00
33.35	1.99	0.50	4.61	0.00	0.00	0.00
33.40	1.99	0.50	4.61	0.00	0.00	0.00
33.45	1.99	0.50	4.61	0.00	0.00	0.00
33.50	1.99	0.50	4.60	0.00	0.00	0.00
33.55	1.98	0.50	4.60	0.00	0.00	0.00
33.60	1.98	0.50	4.60	0.00	0.00	0.00
33.65	1.98	0.50	4.60	0.00	0.00	0.00
33.70	1.98	0.50	4.60	0.00	0.00	0.00
33.75	1.98	0.50	4.60	0.00	0.00	0.00
33.80	1.98	0.50	4.60	0.00	0.00	0.00
33.85	1.98	0.50	4.60	0.00	0.00	0.00
33.90	1.98	0.50	4.60	0.00	0.00	0.00
33.95	1.98	0.50	4.60	0.00	0.00	0.00

34.00	1.98	0.50	4.60	0.00	0.00	0.00
34.05	1.98	0.50	4.60	0.00	0.00	0.00
34.10	1.98	0.50	4.59	0.00	0.00	0.00
34.15	1.98	0.50	4.59	0.00	0.00	0.00
34.20	1.98	0.50	4.59	0.00	0.00	0.00
34.25	1.98	0.50	4.59	0.00	0.00	0.00
34.30	1.98	0.50	4.59	0.00	0.00	0.00
34.35	1.98	0.50	4.59	0.00	0.00	0.00
34.40	1.98	0.50	4.59	0.00	0.00	0.00
34.45	1.98	0.50	4.59	0.00	0.00	0.00
34.50	1.98	0.50	4.59	0.00	0.00	0.00
34.55	1.98	0.50	4.59	0.00	0.00	0.00
34.60	1.98	0.50	4.59	0.00	0.00	0.00
34.65	1.98	0.50	4.59	0.00	0.00	0.00
34.70	1.98	0.50	4.59	0.00	0.00	0.00
34.75	1.98	0.50	4.59	0.00	0.00	0.00
34.80	1.98	0.50	4.58	0.00	0.00	0.00
34.85	1.98	0.50	4.58	0.00	0.00	0.00
34.90	1.98	0.50	4.58	0.00	0.00	0.00
34.95	1.98	0.50	4.58	0.00	0.00	0.00
35.00	1.98	0.50	4.58	0.00	0.00	0.00
35.05	1.98	0.50	4.58	0.00	0.00	0.00
35.10	1.98	0.50	4.58	0.00	0.00	0.00
35.15	1.98	0.50	4.58	0.00	0.00	0.00
35.20	1.98	0.50	4.58	0.00	0.00	0.00
35.25	1.98	0.50	4.58	0.00	0.00	0.00
35.30	1.98	0.50	4.58	0.00	0.00	0.00
35.35	1.98	0.50	4.58	0.00	0.00	0.00
35.40	1.98	0.50	4.58	0.00	0.00	0.00
35.45	1.98	0.50	4.58	0.00	0.00	0.00
35.50	1.98	0.50	4.58	0.00	0.00	0.00
35.55	1.98	0.50	4.57	0.00	0.00	0.00
35.60	1.98	0.50	4.57	0.00	0.00	0.00
35.65	1.97	0.50	4.57	0.00	0.00	0.00
35.70	1.97	0.50	4.57	0.00	0.00	0.00
35.75	1.97	0.50	4.57	0.00	0.00	0.00
35.80	1.97	0.50	4.57	0.00	0.00	0.00
35.85	1.97	0.50	4.57	0.00	0.00	0.00
35.90	1.97	0.50	4.57	0.00	0.00	0.00
35.95	1.97	0.50	4.57	0.00	0.00	0.00
36.00	1.97	0.50	4.57	0.00	0.00	0.00
36.05	1.97	0.50	4.57	0.00	0.00	0.00
36.10	1.97	0.50	4.57	0.00	0.00	0.00
36.15	1.97	0.50	4.57	0.00	0.00	0.00
36.20	1.97	0.50	4.57	0.00	0.00	0.00
36.25	1.97	0.50	4.57	0.00	0.00	0.00
36.30	1.97	0.50	4.57	0.00	0.00	0.00
36.35	1.97	0.50	4.57	0.00	0.00	0.00
36.40	1.97	0.50	4.57	0.00	0.00	0.00
36.45	1.97	0.50	4.56	0.00	0.00	0.00
36.50	1.97	0.50	4.56	0.00	0.00	0.00
36.55	1.97	0.50	4.56	0.00	0.00	0.00
36.60	1.97	0.50	4.56	0.00	0.00	0.00
36.65	1.97	0.50	4.56	0.00	0.00	0.00
36.70	1.97	0.50	4.56	0.00	0.00	0.00
36.75	1.97	0.50	4.56	0.00	0.00	0.00
36.80	1.97	0.50	4.56	0.00	0.00	0.00
36.85	1.97	0.50	4.56	0.00	0.00	0.00
36.90	1.97	0.50	4.56	0.00	0.00	0.00
36.95	1.97	0.50	4.56	0.00	0.00	0.00
37.00	1.97	0.50	4.56	0.00	0.00	0.00
37.05	1.97	0.50	4.56	0.00	0.00	0.00
37.10	1.97	0.50	4.56	0.00	0.00	0.00

37.15	1.97	0.50	4.56	0.00	0.00	0.00
37.20	1.97	0.50	4.56	0.00	0.00	0.00
37.25	1.97	0.50	4.56	0.00	0.00	0.00
37.30	1.97	0.50	4.56	0.00	0.00	0.00
37.35	1.97	0.50	4.56	0.00	0.00	0.00
37.40	1.97	0.50	4.56	0.00	0.00	0.00
37.45	1.97	0.50	4.56	0.00	0.00	0.00
37.50	1.97	0.50	4.55	0.00	0.00	0.00
37.55	1.97	0.50	4.55	0.00	0.00	0.00
37.60	1.97	0.50	4.55	0.00	0.00	0.00
37.65	1.97	0.50	4.55	0.00	0.00	0.00
37.70	1.97	0.50	4.55	0.00	0.00	0.00
37.75	1.97	0.50	4.55	0.00	0.00	0.00
37.80	1.96	0.50	4.55	0.00	0.00	0.00
37.85	1.96	0.50	4.55	0.00	0.00	0.00
37.90	1.96	0.50	4.55	0.00	0.00	0.00
37.95	1.96	0.50	4.55	0.00	0.00	0.00
38.00	1.96	0.50	4.55	0.00	0.00	0.00
38.05	1.96	0.50	4.55	0.00	0.00	0.00
38.10	1.96	0.50	4.55	0.00	0.00	0.00
38.15	1.96	0.50	4.55	0.00	0.00	0.00
38.20	1.96	0.50	4.55	0.00	0.00	0.00
38.25	1.96	0.50	4.55	0.00	0.00	0.00
38.30	1.96	0.50	4.55	0.00	0.00	0.00
38.35	1.96	0.50	4.55	0.00	0.00	0.00
38.40	1.96	0.50	4.55	0.00	0.00	0.00
38.45	1.96	0.50	4.55	0.00	0.00	0.00
38.50	1.96	0.50	4.55	0.00	0.00	0.00
38.55	1.96	0.50	4.55	0.00	0.00	0.00
38.60	1.96	0.50	4.55	0.00	0.00	0.00
38.65	1.96	0.50	4.55	0.00	0.00	0.00
38.70	1.96	0.50	4.55	0.00	0.00	0.00
38.75	1.96	0.50	4.55	0.00	0.00	0.00
38.80	1.96	0.50	4.55	0.00	0.00	0.00
38.85	1.96	0.50	4.55	0.00	0.00	0.00
38.90	1.96	0.50	4.55	0.00	0.00	0.00
38.95	1.96	0.50	4.54	0.00	0.00	0.00
39.00	1.96	0.50	4.54	0.00	0.00	0.00
39.05	1.96	0.50	4.54	0.00	0.00	0.00
39.10	1.96	0.50	4.54	0.00	0.00	0.00
39.15	1.96	0.50	4.54	0.00	0.00	0.00
39.20	1.96	0.50	4.54	0.00	0.00	0.00
39.25	1.96	0.50	4.54	0.00	0.00	0.00
39.30	1.96	0.50	4.54	0.00	0.00	0.00
39.35	1.96	0.50	4.54	0.00	0.00	0.00
39.40	1.96	0.50	4.54	0.00	0.00	0.00
39.45	1.96	0.50	4.54	0.00	0.00	0.00
39.50	1.96	0.50	4.54	0.00	0.00	0.00
39.55	1.96	0.50	4.54	0.00	0.00	0.00
39.60	1.96	0.50	4.54	0.00	0.00	0.00
39.65	1.96	0.50	4.54	0.00	0.00	0.00
39.70	1.96	0.50	4.54	0.00	0.00	0.00
39.75	1.96	0.50	4.54	0.00	0.00	0.00
39.80	1.96	0.50	4.54	0.00	0.00	0.00
39.85	1.96	0.50	4.54	0.00	0.00	0.00
39.90	1.95	0.50	4.54	0.00	0.00	0.00
39.95	1.95	0.50	4.54	0.00	0.00	0.00
40.00	1.95	0.50	4.54	0.00	0.00	0.00
40.05	1.95	0.50	4.54	0.00	0.00	0.00
40.10	1.95	0.50	4.54	0.00	0.00	0.00
40.15	1.95	0.50	4.54	0.00	0.00	0.00
40.20	1.95	0.50	4.54	0.00	0.00	0.00
40.25	1.95	0.50	4.54	0.00	0.00	0.00

40.30	1.95	0.49	4.54	0.00	0.00	0.00
40.35	1.95	0.49	4.54	0.00	0.00	0.00
40.40	1.95	0.49	4.54	0.00	0.00	0.00
40.45	1.95	0.49	4.54	0.00	0.00	0.00
40.50	1.95	0.49	4.54	0.00	0.00	0.00
40.55	1.95	0.49	4.54	0.00	0.00	0.00
40.60	1.95	0.49	4.54	0.00	0.00	0.00
40.65	1.95	0.49	4.54	0.00	0.00	0.00
40.70	1.95	0.49	4.54	0.00	0.00	0.00
40.75	1.95	0.49	4.54	0.00	0.00	0.00
40.80	1.95	0.49	4.54	0.00	0.00	0.00
40.85	1.95	0.49	4.54	0.00	0.00	0.00
40.90	1.95	0.49	4.54	0.00	0.00	0.00
40.95	1.95	0.49	4.54	0.00	0.00	0.00
41.00	1.95	0.49	4.54	0.00	0.00	0.00
41.05	1.95	0.49	4.54	0.00	0.00	0.00
41.10	1.95	0.49	4.54	0.00	0.00	0.00
41.15	1.95	0.49	4.54	0.00	0.00	0.00
41.20	1.95	0.49	4.54	0.00	0.00	0.00
41.25	1.95	0.49	4.54	0.00	0.00	0.00
41.30	1.95	0.49	4.54	0.00	0.00	0.00
41.35	1.95	0.49	4.54	0.00	0.00	0.00
41.40	1.95	0.49	4.54	0.00	0.00	0.00
41.45	1.95	0.49	4.54	0.00	0.00	0.00
41.50	1.95	0.49	4.54	0.00	0.00	0.00
41.55	1.95	0.49	4.54	0.00	0.00	0.00
41.60	1.95	0.49	4.54	0.00	0.00	0.00
41.65	1.95	0.49	4.54	0.00	0.00	0.00
41.70	1.95	0.49	4.54	0.00	0.00	0.00
41.75	1.95	0.49	4.54	0.00	0.00	0.00
41.80	1.95	0.49	4.54	0.00	0.00	0.00
41.85	1.95	0.49	4.54	0.00	0.00	0.00
41.90	1.95	0.49	4.54	0.00	0.00	0.00
41.95	1.95	0.49	4.54	0.00	0.00	0.00
42.00	1.95	0.49	4.54	0.00	0.00	0.00
42.05	1.95	0.49	4.54	0.00	0.00	0.00
42.10	1.94	0.49	4.54	0.00	0.00	0.00
42.15	1.94	0.49	4.54	0.00	0.00	0.00
42.20	1.94	0.49	4.54	0.00	0.00	0.00
42.25	1.94	0.49	4.54	0.00	0.00	0.00
42.30	1.94	0.49	4.54	0.00	0.00	0.00
42.35	1.94	0.49	4.54	0.00	0.00	0.00
42.40	1.94	0.49	4.54	0.00	0.00	0.00
42.45	1.94	0.49	4.54	0.00	0.00	0.00
42.50	1.94	0.49	4.54	0.00	0.00	0.00
42.55	1.94	0.49	4.54	0.00	0.00	0.00
42.60	1.94	0.49	4.54	0.00	0.00	0.00
42.65	1.94	0.49	4.54	0.00	0.00	0.00
42.70	1.94	0.49	4.54	0.00	0.00	0.00
42.75	1.94	0.49	4.54	0.00	0.00	0.00
42.80	1.94	0.49	4.54	0.00	0.00	0.00
42.85	1.94	0.49	4.54	0.00	0.00	0.00
42.90	1.94	0.49	4.54	0.00	0.00	0.00
42.95	1.94	0.49	4.54	0.00	0.00	0.00
43.00	1.94	0.49	4.54	0.00	0.00	0.00
43.05	1.94	0.49	4.54	0.00	0.00	0.00
43.10	1.94	0.49	4.54	0.00	0.00	0.00
43.15	1.94	0.49	4.54	0.00	0.00	0.00
43.20	1.94	0.49	4.54	0.00	0.00	0.00
43.25	1.94	0.49	4.54	0.00	0.00	0.00
43.30	1.94	0.49	4.54	0.00	0.00	0.00
43.35	1.94	0.49	4.54	0.00	0.00	0.00
43.40	1.94	0.49	4.54	0.00	0.00	0.00

43.45	1.94	0.49	4.54	0.00	0.00	0.00
43.50	1.94	0.49	4.54	0.00	0.00	0.00
43.55	1.94	0.49	4.54	0.00	0.00	0.00
43.60	1.94	0.49	4.54	0.00	0.00	0.00
43.65	1.94	0.49	4.54	0.00	0.00	0.00
43.70	1.94	0.49	4.54	0.00	0.00	0.00
43.75	1.94	0.49	4.54	0.00	0.00	0.00
43.80	1.94	0.49	4.54	0.00	0.00	0.00
43.85	1.94	0.49	4.54	0.00	0.00	0.00
43.90	1.94	0.49	4.54	0.00	0.00	0.00
43.95	1.94	0.49	4.54	0.00	0.00	0.00
44.00	1.94	0.49	4.54	0.00	0.00	0.00
44.05	1.94	0.49	4.54	0.00	0.00	0.00
44.10	1.94	0.49	4.54	0.00	0.00	0.00
44.15	1.94	0.49	4.54	0.00	0.00	0.00
44.20	1.94	0.49	4.54	0.00	0.00	0.00
44.25	1.94	0.49	4.54	0.00	0.00	0.00
44.30	1.93	0.49	4.54	0.00	0.00	0.00
44.35	1.93	0.49	4.54	0.00	0.00	0.00
44.40	1.93	0.49	4.54	0.00	0.00	0.00
44.45	1.93	0.49	4.54	0.00	0.00	0.00
44.50	1.93	0.49	4.54	0.00	0.00	0.00
44.55	1.93	0.49	4.54	0.00	0.00	0.00
44.60	1.93	0.49	4.54	0.00	0.00	0.00
44.65	1.93	0.49	4.54	0.00	0.00	0.00
44.70	1.93	0.49	4.54	0.00	0.00	0.00
44.75	1.93	0.49	4.54	0.00	0.00	0.00
44.80	1.93	0.49	4.54	0.00	0.00	0.00
44.85	1.93	0.49	4.54	0.00	0.00	0.00
44.90	1.93	0.49	4.54	0.00	0.00	0.00
44.95	1.93	0.49	4.54	0.00	0.00	0.00
45.00	1.93	0.49	4.54	0.00	0.00	0.00
45.05	1.93	0.49	4.54	0.00	0.00	0.00
45.10	1.93	0.49	4.54	0.00	0.00	0.00
45.15	1.93	0.49	4.54	0.00	0.00	0.00
45.20	1.93	0.49	4.54	0.00	0.00	0.00
45.25	1.93	0.49	4.54	0.00	0.00	0.00
45.30	1.93	0.49	4.54	0.00	0.00	0.00
45.35	1.93	0.49	4.54	0.00	0.00	0.00
45.40	1.93	0.49	4.54	0.00	0.00	0.00
45.45	1.93	0.49	4.54	0.00	0.00	0.00
45.50	1.93	0.49	4.54	0.00	0.00	0.00
45.55	1.93	0.49	4.54	0.00	0.00	0.00
45.60	1.93	0.49	4.54	0.00	0.00	0.00
45.65	1.93	0.49	4.54	0.00	0.00	0.00
45.70	1.93	0.49	4.54	0.00	0.00	0.00
45.75	1.93	0.49	4.54	0.00	0.00	0.00
45.80	1.93	0.49	4.54	0.00	0.00	0.00
45.85	1.93	0.49	4.54	0.00	0.00	0.00
45.90	1.93	0.49	4.54	0.00	0.00	0.00
45.95	1.93	0.49	4.54	0.00	0.00	0.00
46.00	1.93	0.49	4.55	0.00	0.00	0.00
46.05	1.93	0.49	4.55	0.00	0.00	0.00
46.10	1.93	0.49	4.55	0.00	0.00	0.00
46.15	1.93	0.49	4.55	0.00	0.00	0.00
46.20	1.93	0.49	4.55	0.00	0.00	0.00
46.25	1.93	0.49	4.55	0.00	0.00	0.00
46.30	1.93	0.49	4.55	0.00	0.00	0.00
46.35	1.93	0.49	4.55	0.00	0.00	0.00
46.40	1.93	0.49	4.55	0.00	0.00	0.00
46.45	1.93	0.49	4.55	0.00	0.00	0.00
46.50	1.92	0.49	4.55	0.00	0.00	0.00
46.55	1.92	0.49	4.55	0.00	0.00	0.00

46.60	1.92	0.49	4.55	0.00	0.00	0.00
46.65	1.92	0.49	4.55	0.00	0.00	0.00
46.70	1.92	0.49	4.55	0.00	0.00	0.00
46.75	1.92	0.49	4.55	0.00	0.00	0.00
46.80	1.92	0.49	4.55	0.00	0.00	0.00
46.85	1.92	0.49	4.55	0.00	0.00	0.00
46.90	1.92	0.49	4.55	0.00	0.00	0.00
46.95	1.92	0.49	4.55	0.00	0.00	0.00
47.00	1.92	0.49	4.55	0.00	0.00	0.00
47.05	1.92	0.49	4.55	0.00	0.00	0.00
47.10	1.92	0.49	4.55	0.00	0.00	0.00
47.15	1.92	0.49	4.55	0.00	0.00	0.00
47.20	1.92	0.49	4.55	0.00	0.00	0.00
47.25	1.92	0.49	4.55	0.00	0.00	0.00
47.30	1.92	0.49	4.55	0.00	0.00	0.00
47.35	1.92	0.49	4.55	0.00	0.00	0.00
47.40	1.92	0.49	4.55	0.00	0.00	0.00
47.45	1.92	0.49	4.55	0.00	0.00	0.00
47.50	1.92	0.48	4.56	0.00	0.00	0.00
47.55	1.92	0.48	4.56	0.00	0.00	0.00
47.60	1.92	0.48	4.56	0.00	0.00	0.00
47.65	1.92	0.48	4.56	0.00	0.00	0.00
47.70	1.92	0.48	4.56	0.00	0.00	0.00
47.75	1.92	0.48	4.56	0.00	0.00	0.00
47.80	1.92	0.48	4.56	0.00	0.00	0.00
47.85	1.92	0.48	4.56	0.00	0.00	0.00
47.90	1.92	0.48	4.56	0.00	0.00	0.00
47.95	1.92	0.48	4.56	0.00	0.00	0.00
48.00	1.92	0.48	4.56	0.00	0.00	0.00
48.05	1.92	0.48	4.56	0.00	0.00	0.00
48.10	1.92	0.48	4.56	0.00	0.00	0.00
48.15	1.92	0.48	4.56	0.00	0.00	0.00
48.20	1.92	0.48	4.56	0.00	0.00	0.00
48.25	1.92	0.48	4.56	0.00	0.00	0.00
48.30	1.92	0.48	4.56	0.00	0.00	0.00
48.35	1.92	0.48	4.56	0.00	0.00	0.00
48.40	1.92	0.48	4.56	0.00	0.00	0.00
48.45	1.92	0.48	4.56	0.00	0.00	0.00
48.50	1.92	0.48	4.56	0.00	0.00	0.00
48.55	1.92	0.48	4.56	0.00	0.00	0.00
48.60	1.92	0.48	4.56	0.00	0.00	0.00
48.65	1.92	0.48	4.56	0.00	0.00	0.00
48.70	1.92	0.48	4.57	0.00	0.00	0.00
48.75	1.91	0.48	4.57	0.00	0.00	0.00
48.80	1.91	0.48	4.57	0.00	0.00	0.00
48.85	1.91	0.48	4.57	0.00	0.00	0.00
48.90	1.91	0.48	4.57	0.00	0.00	0.00
48.95	1.91	0.48	4.57	0.00	0.00	0.00
49.00	1.91	0.48	4.57	0.00	0.00	0.00
49.05	1.91	0.48	4.57	0.00	0.00	0.00
49.10	1.91	0.48	4.57	0.00	0.00	0.00
49.15	1.91	0.48	4.57	0.00	0.00	0.00
49.20	1.91	0.48	4.57	0.00	0.00	0.00
49.25	1.91	0.48	4.57	0.00	0.00	0.00
49.30	1.91	0.48	4.57	0.00	0.00	0.00
49.35	1.91	0.48	4.57	0.00	0.00	0.00
49.40	1.91	0.48	4.57	0.00	0.00	0.00
49.45	1.91	0.48	4.57	0.00	0.00	0.00
49.50	1.91	0.48	4.57	0.00	0.00	0.00
49.55	1.91	0.48	4.57	0.00	0.00	0.00
49.60	1.91	0.48	4.57	0.00	0.00	0.00
49.65	1.91	0.48	4.57	0.00	0.00	0.00
49.70	1.91	0.48	4.58	0.00	0.00	0.00

49.75	1.91	0.48	4.58	0.00	0.00	0.00
49.80	1.91	0.48	4.58	0.00	0.00	0.00
49.85	1.91	0.48	4.58	0.00	0.00	0.00
49.90	1.91	0.48	4.58	0.00	0.00	0.00
49.95	1.91	0.48	4.58	0.00	0.00	0.00
50.00	1.91	0.48	4.58	0.00	0.00	0.00
50.05	1.91	0.48	4.58	0.00	0.00	0.00
50.10	1.91	0.48	4.58	0.00	0.00	0.00
50.15	1.91	0.48	4.58	0.00	0.00	0.00
50.20	1.91	0.48	4.58	0.00	0.00	0.00
50.25	1.91	0.48	4.58	0.00	0.00	0.00
50.30	1.91	0.48	4.58	0.00	0.00	0.00
50.35	1.91	0.48	4.58	0.00	0.00	0.00
50.40	1.91	0.48	4.58	0.00	0.00	0.00
50.45	1.91	0.48	4.58	0.00	0.00	0.00
50.50	1.91	0.48	4.58	0.00	0.00	0.00
50.55	1.91	0.48	4.58	0.00	0.00	0.00
50.60	1.91	0.48	4.59	0.00	0.00	0.00
50.65	1.91	0.48	4.59	0.00	0.00	0.00
50.70	1.91	0.48	4.59	0.00	0.00	0.00
50.75	1.91	0.48	4.59	0.00	0.00	0.00
50.80	1.91	0.48	4.59	0.00	0.00	0.00
50.85	1.91	0.48	4.59	0.00	0.00	0.00
50.90	1.91	0.48	4.59	0.00	0.00	0.00
50.95	1.91	0.48	4.59	0.00	0.00	0.00
51.00	1.90	0.48	4.59	0.00	0.00	0.00
51.05	1.90	0.48	4.59	0.00	0.00	0.00
51.10	1.90	0.48	4.59	0.00	0.00	0.00
51.15	1.90	0.48	4.59	0.00	0.00	0.00
51.20	1.90	0.48	4.59	0.00	0.00	0.00
51.25	1.90	0.48	4.59	0.00	0.00	0.00
51.30	1.90	0.48	4.59	0.00	0.00	0.00
51.35	1.90	0.48	4.59	0.00	0.00	0.00
51.40	1.90	0.48	4.60	0.00	0.00	0.00
51.45	1.90	0.48	4.60	0.00	0.00	0.00
51.50	1.90	0.48	4.60	0.00	0.00	0.00

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

Units Depth = ft, Stress or Pressure = tsf (atm), Unit Weight = pcf, Settlement = in.

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

LIQUEFACTION ANALYSIS

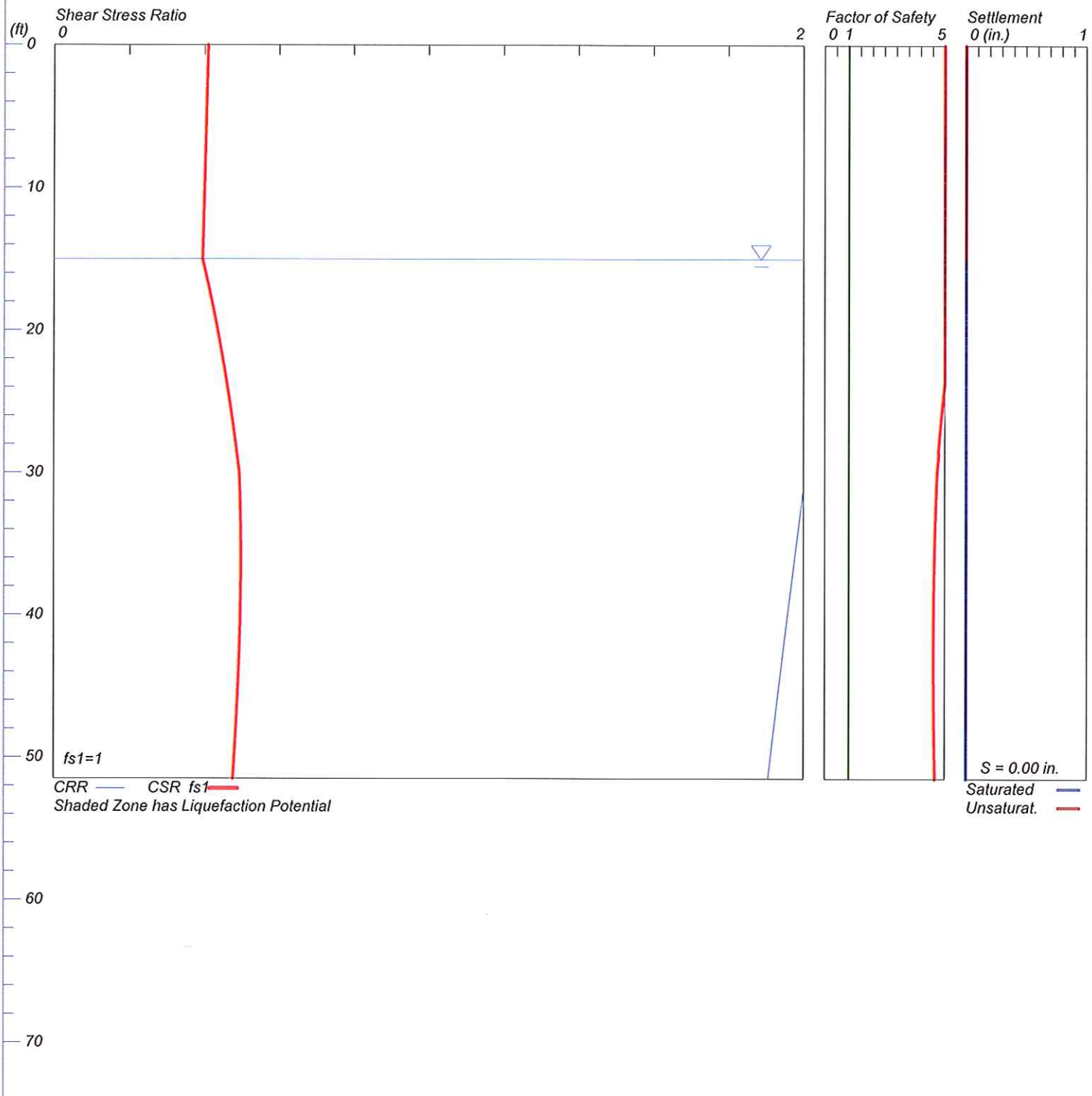
Xebec Signal Hill

Hole No.=B-4 Water Depth=15 ft

Ground Improvement of Fill=5 ft

Magnitude=7.1

Acceleration=0.629g



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LIQUEFACTION ANALYSIS CALCULATION SHEET

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Input File Name: D:\Liquefy5\16-6239-Xebec Signal Hill-B4.liq
Title: Xebec Signal Hill
Subtitle: 16-6239

Surface Elev.=
Hole No.=B-4
Depth of Hole= 51.5 ft
Water Table during Earthquake= 15.0 ft
Water Table during In-Situ Testing= 25.0 ft
Max. Acceleration= 0.63 g
Earthquake Magnitude= 7.1

Input Data:
Surface Elev.=
Hole No.=B-4
Depth of Hole=51.5 ft
Water Table during Earthquake= 15.0 ft
Water Table during In-Situ Testing= 25.0 ft
Max. Acceleration=0.63 g
Earthquake Magnitude=7.1

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Ishihara / Yoshimine*
3. Fines Correction for Liquefaction: Stark/Olson et al.*
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.25
7. Borehole Diameter, Cb= 1.15
8. Sampling Method, Cs= 1.2
9. User request factor of safety (apply to CSR) , User= 1
   Plot one CSR curve (fs1=1)
10. Use Curve Smoothing: Yes*
* Recommended Options

Fill on Top= 5 ft Fill Unit Weight= 125 pcf
Depth of this report is based on original ground surface, not based on fill
In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
0.0	12.0	106.0	NoLiq
6.0	50.0	126.0	NoLiq
11.0	41.0	125.0	NoLiq
16.0	30.0	110.0	3.8
21.0	56.0	110.0	3.8
26.0	49.0	110.0	3.8
31.0	60.0	110.0	3.8
36.0	28.0	110.0	3.8
41.0	30.0	110.0	45.0

46.0	32.0	110.0	45.0
51.0	26.0	110.0	45.0

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=0.00 in.
Total Settlement of Saturated and Unsaturated Sands=0.00 in.
Differential Settlement=0.000 to 0.000 in.

Depth ft	CRRv	CSRm	F.S.	S_sat. in.	S_dry in.	S_all in.
0.00	2.00	0.41	5.00	0.00	0.00	0.00
0.05	2.00	0.41	5.00	0.00	0.00	0.00
0.10	2.00	0.41	5.00	0.00	0.00	0.00
0.15	2.00	0.41	5.00	0.00	0.00	0.00
0.20	2.00	0.41	5.00	0.00	0.00	0.00
0.25	2.00	0.41	5.00	0.00	0.00	0.00
0.30	2.00	0.41	5.00	0.00	0.00	0.00
0.35	2.00	0.41	5.00	0.00	0.00	0.00
0.40	2.00	0.41	5.00	0.00	0.00	0.00
0.45	2.00	0.41	5.00	0.00	0.00	0.00
0.50	2.00	0.41	5.00	0.00	0.00	0.00
0.55	2.00	0.41	5.00	0.00	0.00	0.00
0.60	2.00	0.41	5.00	0.00	0.00	0.00
0.65	2.00	0.41	5.00	0.00	0.00	0.00
0.70	2.00	0.41	5.00	0.00	0.00	0.00
0.75	2.00	0.41	5.00	0.00	0.00	0.00
0.80	2.00	0.41	5.00	0.00	0.00	0.00
0.85	2.00	0.41	5.00	0.00	0.00	0.00
0.90	2.00	0.41	5.00	0.00	0.00	0.00
0.95	2.00	0.41	5.00	0.00	0.00	0.00
1.00	2.00	0.41	5.00	0.00	0.00	0.00
1.05	2.00	0.41	5.00	0.00	0.00	0.00
1.10	2.00	0.41	5.00	0.00	0.00	0.00
1.15	2.00	0.41	5.00	0.00	0.00	0.00
1.20	2.00	0.41	5.00	0.00	0.00	0.00
1.25	2.00	0.41	5.00	0.00	0.00	0.00
1.30	2.00	0.41	5.00	0.00	0.00	0.00
1.35	2.00	0.41	5.00	0.00	0.00	0.00
1.40	2.00	0.41	5.00	0.00	0.00	0.00
1.45	2.00	0.41	5.00	0.00	0.00	0.00
1.50	2.00	0.41	5.00	0.00	0.00	0.00
1.55	2.00	0.41	5.00	0.00	0.00	0.00
1.60	2.00	0.41	5.00	0.00	0.00	0.00
1.65	2.00	0.41	5.00	0.00	0.00	0.00
1.70	2.00	0.41	5.00	0.00	0.00	0.00
1.75	2.00	0.41	5.00	0.00	0.00	0.00
1.80	2.00	0.41	5.00	0.00	0.00	0.00
1.85	2.00	0.41	5.00	0.00	0.00	0.00
1.90	2.00	0.41	5.00	0.00	0.00	0.00
1.95	2.00	0.41	5.00	0.00	0.00	0.00
2.00	2.00	0.41	5.00	0.00	0.00	0.00
2.05	2.00	0.41	5.00	0.00	0.00	0.00
2.10	2.00	0.41	5.00	0.00	0.00	0.00
2.15	2.00	0.41	5.00	0.00	0.00	0.00
2.20	2.00	0.41	5.00	0.00	0.00	0.00
2.25	2.00	0.41	5.00	0.00	0.00	0.00
2.30	2.00	0.41	5.00	0.00	0.00	0.00
2.35	2.00	0.41	5.00	0.00	0.00	0.00
2.40	2.00	0.41	5.00	0.00	0.00	0.00
2.45	2.00	0.41	5.00	0.00	0.00	0.00

2.50	2.00	0.41	5.00	0.00	0.00	0.00
2.55	2.00	0.41	5.00	0.00	0.00	0.00
2.60	2.00	0.41	5.00	0.00	0.00	0.00
2.65	2.00	0.41	5.00	0.00	0.00	0.00
2.70	2.00	0.41	5.00	0.00	0.00	0.00
2.75	2.00	0.41	5.00	0.00	0.00	0.00
2.80	2.00	0.41	5.00	0.00	0.00	0.00
2.85	2.00	0.41	5.00	0.00	0.00	0.00
2.90	2.00	0.41	5.00	0.00	0.00	0.00
2.95	2.00	0.41	5.00	0.00	0.00	0.00
3.00	2.00	0.41	5.00	0.00	0.00	0.00
3.05	2.00	0.41	5.00	0.00	0.00	0.00
3.10	2.00	0.41	5.00	0.00	0.00	0.00
3.15	2.00	0.41	5.00	0.00	0.00	0.00
3.20	2.00	0.41	5.00	0.00	0.00	0.00
3.25	2.00	0.41	5.00	0.00	0.00	0.00
3.30	2.00	0.41	5.00	0.00	0.00	0.00
3.35	2.00	0.41	5.00	0.00	0.00	0.00
3.40	2.00	0.41	5.00	0.00	0.00	0.00
3.45	2.00	0.41	5.00	0.00	0.00	0.00
3.50	2.00	0.41	5.00	0.00	0.00	0.00
3.55	2.00	0.41	5.00	0.00	0.00	0.00
3.60	2.00	0.41	5.00	0.00	0.00	0.00
3.65	2.00	0.41	5.00	0.00	0.00	0.00
3.70	2.00	0.41	5.00	0.00	0.00	0.00
3.75	2.00	0.41	5.00	0.00	0.00	0.00
3.80	2.00	0.41	5.00	0.00	0.00	0.00
3.85	2.00	0.41	5.00	0.00	0.00	0.00
3.90	2.00	0.41	5.00	0.00	0.00	0.00
3.95	2.00	0.41	5.00	0.00	0.00	0.00
4.00	2.00	0.41	5.00	0.00	0.00	0.00
4.05	2.00	0.40	5.00	0.00	0.00	0.00
4.10	2.00	0.40	5.00	0.00	0.00	0.00
4.15	2.00	0.40	5.00	0.00	0.00	0.00
4.20	2.00	0.40	5.00	0.00	0.00	0.00
4.25	2.00	0.40	5.00	0.00	0.00	0.00
4.30	2.00	0.40	5.00	0.00	0.00	0.00
4.35	2.00	0.40	5.00	0.00	0.00	0.00
4.40	2.00	0.40	5.00	0.00	0.00	0.00
4.45	2.00	0.40	5.00	0.00	0.00	0.00
4.50	2.00	0.40	5.00	0.00	0.00	0.00
4.55	2.00	0.40	5.00	0.00	0.00	0.00
4.60	2.00	0.40	5.00	0.00	0.00	0.00
4.65	2.00	0.40	5.00	0.00	0.00	0.00
4.70	2.00	0.40	5.00	0.00	0.00	0.00
4.75	2.00	0.40	5.00	0.00	0.00	0.00
4.80	2.00	0.40	5.00	0.00	0.00	0.00
4.85	2.00	0.40	5.00	0.00	0.00	0.00
4.90	2.00	0.40	5.00	0.00	0.00	0.00
4.95	2.00	0.40	5.00	0.00	0.00	0.00
5.00	2.00	0.40	5.00	0.00	0.00	0.00
5.05	2.00	0.40	5.00	0.00	0.00	0.00
5.10	2.00	0.40	5.00	0.00	0.00	0.00
5.15	2.00	0.40	5.00	0.00	0.00	0.00
5.20	2.00	0.40	5.00	0.00	0.00	0.00
5.25	2.00	0.40	5.00	0.00	0.00	0.00
5.30	2.00	0.40	5.00	0.00	0.00	0.00
5.35	2.00	0.40	5.00	0.00	0.00	0.00
5.40	2.00	0.40	5.00	0.00	0.00	0.00
5.45	2.00	0.40	5.00	0.00	0.00	0.00
5.50	2.00	0.40	5.00	0.00	0.00	0.00
5.55	2.00	0.40	5.00	0.00	0.00	0.00
5.60	2.00	0.40	5.00	0.00	0.00	0.00

5.65	2.00	0.40	5.00	0.00	0.00	0.00
5.70	2.00	0.40	5.00	0.00	0.00	0.00
5.75	2.00	0.40	5.00	0.00	0.00	0.00
5.80	2.00	0.40	5.00	0.00	0.00	0.00
5.85	2.00	0.40	5.00	0.00	0.00	0.00
5.90	2.00	0.40	5.00	0.00	0.00	0.00
5.95	2.00	0.40	5.00	0.00	0.00	0.00
6.00	2.00	0.40	5.00	0.00	0.00	0.00
6.05	2.00	0.40	5.00	0.00	0.00	0.00
6.10	2.00	0.40	5.00	0.00	0.00	0.00
6.15	2.00	0.40	5.00	0.00	0.00	0.00
6.20	2.00	0.40	5.00	0.00	0.00	0.00
6.25	2.00	0.40	5.00	0.00	0.00	0.00
6.30	2.00	0.40	5.00	0.00	0.00	0.00
6.35	2.00	0.40	5.00	0.00	0.00	0.00
6.40	2.00	0.40	5.00	0.00	0.00	0.00
6.45	2.00	0.40	5.00	0.00	0.00	0.00
6.50	2.00	0.40	5.00	0.00	0.00	0.00
6.55	2.00	0.40	5.00	0.00	0.00	0.00
6.60	2.00	0.40	5.00	0.00	0.00	0.00
6.65	2.00	0.40	5.00	0.00	0.00	0.00
6.70	2.00	0.40	5.00	0.00	0.00	0.00
6.75	2.00	0.40	5.00	0.00	0.00	0.00
6.80	2.00	0.40	5.00	0.00	0.00	0.00
6.85	2.00	0.40	5.00	0.00	0.00	0.00
6.90	2.00	0.40	5.00	0.00	0.00	0.00
6.95	2.00	0.40	5.00	0.00	0.00	0.00
7.00	2.00	0.40	5.00	0.00	0.00	0.00
7.05	2.00	0.40	5.00	0.00	0.00	0.00
7.10	2.00	0.40	5.00	0.00	0.00	0.00
7.15	2.00	0.40	5.00	0.00	0.00	0.00
7.20	2.00	0.40	5.00	0.00	0.00	0.00
7.25	2.00	0.40	5.00	0.00	0.00	0.00
7.30	2.00	0.40	5.00	0.00	0.00	0.00
7.35	2.00	0.40	5.00	0.00	0.00	0.00
7.40	2.00	0.40	5.00	0.00	0.00	0.00
7.45	2.00	0.40	5.00	0.00	0.00	0.00
7.50	2.00	0.40	5.00	0.00	0.00	0.00
7.55	2.00	0.40	5.00	0.00	0.00	0.00
7.60	2.00	0.40	5.00	0.00	0.00	0.00
7.65	2.00	0.40	5.00	0.00	0.00	0.00
7.70	2.00	0.40	5.00	0.00	0.00	0.00
7.75	2.00	0.40	5.00	0.00	0.00	0.00
7.80	2.00	0.40	5.00	0.00	0.00	0.00
7.85	2.00	0.40	5.00	0.00	0.00	0.00
7.90	2.00	0.40	5.00	0.00	0.00	0.00
7.95	2.00	0.40	5.00	0.00	0.00	0.00
8.00	2.00	0.40	5.00	0.00	0.00	0.00
8.05	2.00	0.40	5.00	0.00	0.00	0.00
8.10	2.00	0.40	5.00	0.00	0.00	0.00
8.15	2.00	0.40	5.00	0.00	0.00	0.00
8.20	2.00	0.40	5.00	0.00	0.00	0.00
8.25	2.00	0.40	5.00	0.00	0.00	0.00
8.30	2.00	0.40	5.00	0.00	0.00	0.00
8.35	2.00	0.40	5.00	0.00	0.00	0.00
8.40	2.00	0.40	5.00	0.00	0.00	0.00
8.45	2.00	0.40	5.00	0.00	0.00	0.00
8.50	2.00	0.40	5.00	0.00	0.00	0.00
8.55	2.00	0.40	5.00	0.00	0.00	0.00
8.60	2.00	0.40	5.00	0.00	0.00	0.00
8.65	2.00	0.40	5.00	0.00	0.00	0.00
8.70	2.00	0.40	5.00	0.00	0.00	0.00
8.75	2.00	0.40	5.00	0.00	0.00	0.00

8.80	2.00	0.40	5.00	0.00	0.00	0.00
8.85	2.00	0.40	5.00	0.00	0.00	0.00
8.90	2.00	0.40	5.00	0.00	0.00	0.00
8.95	2.00	0.40	5.00	0.00	0.00	0.00
9.00	2.00	0.40	5.00	0.00	0.00	0.00
9.05	2.00	0.40	5.00	0.00	0.00	0.00
9.10	2.00	0.40	5.00	0.00	0.00	0.00
9.15	2.00	0.40	5.00	0.00	0.00	0.00
9.20	2.00	0.40	5.00	0.00	0.00	0.00
9.25	2.00	0.40	5.00	0.00	0.00	0.00
9.30	2.00	0.40	5.00	0.00	0.00	0.00
9.35	2.00	0.40	5.00	0.00	0.00	0.00
9.40	2.00	0.40	5.00	0.00	0.00	0.00
9.45	2.00	0.40	5.00	0.00	0.00	0.00
9.50	2.00	0.40	5.00	0.00	0.00	0.00
9.55	2.00	0.40	5.00	0.00	0.00	0.00
9.60	2.00	0.40	5.00	0.00	0.00	0.00
9.65	2.00	0.40	5.00	0.00	0.00	0.00
9.70	2.00	0.40	5.00	0.00	0.00	0.00
9.75	2.00	0.40	5.00	0.00	0.00	0.00
9.80	2.00	0.40	5.00	0.00	0.00	0.00
9.85	2.00	0.40	5.00	0.00	0.00	0.00
9.90	2.00	0.40	5.00	0.00	0.00	0.00
9.95	2.00	0.40	5.00	0.00	0.00	0.00
10.00	2.00	0.40	5.00	0.00	0.00	0.00
10.05	2.00	0.40	5.00	0.00	0.00	0.00
10.10	2.00	0.40	5.00	0.00	0.00	0.00
10.15	2.00	0.40	5.00	0.00	0.00	0.00
10.20	2.00	0.40	5.00	0.00	0.00	0.00
10.25	2.00	0.40	5.00	0.00	0.00	0.00
10.30	2.00	0.40	5.00	0.00	0.00	0.00
10.35	2.00	0.40	5.00	0.00	0.00	0.00
10.40	2.00	0.40	5.00	0.00	0.00	0.00
10.45	2.00	0.40	5.00	0.00	0.00	0.00
10.50	2.00	0.40	5.00	0.00	0.00	0.00
10.55	2.00	0.40	5.00	0.00	0.00	0.00
10.60	2.00	0.40	5.00	0.00	0.00	0.00
10.65	2.00	0.40	5.00	0.00	0.00	0.00
10.70	2.00	0.40	5.00	0.00	0.00	0.00
10.75	2.00	0.40	5.00	0.00	0.00	0.00
10.80	2.00	0.40	5.00	0.00	0.00	0.00
10.85	2.00	0.40	5.00	0.00	0.00	0.00
10.90	2.00	0.40	5.00	0.00	0.00	0.00
10.95	2.00	0.40	5.00	0.00	0.00	0.00
11.00	2.00	0.40	5.00	0.00	0.00	0.00
11.05	2.00	0.40	5.00	0.00	0.00	0.00
11.10	2.00	0.40	5.00	0.00	0.00	0.00
11.15	2.00	0.40	5.00	0.00	0.00	0.00
11.20	2.00	0.40	5.00	0.00	0.00	0.00
11.25	2.00	0.40	5.00	0.00	0.00	0.00
11.30	2.00	0.40	5.00	0.00	0.00	0.00
11.35	2.00	0.40	5.00	0.00	0.00	0.00
11.40	2.00	0.40	5.00	0.00	0.00	0.00
11.45	2.00	0.40	5.00	0.00	0.00	0.00
11.50	2.00	0.40	5.00	0.00	0.00	0.00
11.55	2.00	0.40	5.00	0.00	0.00	0.00
11.60	2.00	0.40	5.00	0.00	0.00	0.00
11.65	2.00	0.40	5.00	0.00	0.00	0.00
11.70	2.00	0.40	5.00	0.00	0.00	0.00
11.75	2.00	0.40	5.00	0.00	0.00	0.00
11.80	2.00	0.40	5.00	0.00	0.00	0.00
11.85	2.00	0.40	5.00	0.00	0.00	0.00
11.90	2.00	0.40	5.00	0.00	0.00	0.00

11.95	2.00	0.40	5.00	0.00	0.00	0.00
12.00	2.00	0.40	5.00	0.00	0.00	0.00
12.05	2.00	0.40	5.00	0.00	0.00	0.00
12.10	2.00	0.40	5.00	0.00	0.00	0.00
12.15	2.00	0.40	5.00	0.00	0.00	0.00
12.20	2.00	0.40	5.00	0.00	0.00	0.00
12.25	2.00	0.40	5.00	0.00	0.00	0.00
12.30	2.00	0.40	5.00	0.00	0.00	0.00
12.35	2.00	0.40	5.00	0.00	0.00	0.00
12.40	2.00	0.40	5.00	0.00	0.00	0.00
12.45	2.00	0.40	5.00	0.00	0.00	0.00
12.50	2.00	0.40	5.00	0.00	0.00	0.00
12.55	2.00	0.40	5.00	0.00	0.00	0.00
12.60	2.00	0.40	5.00	0.00	0.00	0.00
12.65	2.00	0.40	5.00	0.00	0.00	0.00
12.70	2.00	0.40	5.00	0.00	0.00	0.00
12.75	2.00	0.40	5.00	0.00	0.00	0.00
12.80	2.00	0.40	5.00	0.00	0.00	0.00
12.85	2.00	0.40	5.00	0.00	0.00	0.00
12.90	2.00	0.40	5.00	0.00	0.00	0.00
12.95	2.00	0.40	5.00	0.00	0.00	0.00
13.00	2.00	0.40	5.00	0.00	0.00	0.00
13.05	2.00	0.40	5.00	0.00	0.00	0.00
13.10	2.00	0.40	5.00	0.00	0.00	0.00
13.15	2.00	0.40	5.00	0.00	0.00	0.00
13.20	2.00	0.40	5.00	0.00	0.00	0.00
13.25	2.00	0.40	5.00	0.00	0.00	0.00
13.30	2.00	0.40	5.00	0.00	0.00	0.00
13.35	2.00	0.40	5.00	0.00	0.00	0.00
13.40	2.00	0.40	5.00	0.00	0.00	0.00
13.45	2.00	0.40	5.00	0.00	0.00	0.00
13.50	2.00	0.40	5.00	0.00	0.00	0.00
13.55	2.00	0.40	5.00	0.00	0.00	0.00
13.60	2.00	0.40	5.00	0.00	0.00	0.00
13.65	2.00	0.40	5.00	0.00	0.00	0.00
13.70	2.00	0.40	5.00	0.00	0.00	0.00
13.75	2.00	0.40	5.00	0.00	0.00	0.00
13.80	2.00	0.40	5.00	0.00	0.00	0.00
13.85	2.00	0.40	5.00	0.00	0.00	0.00
13.90	2.00	0.40	5.00	0.00	0.00	0.00
13.95	2.00	0.40	5.00	0.00	0.00	0.00
14.00	2.00	0.40	5.00	0.00	0.00	0.00
14.05	2.00	0.40	5.00	0.00	0.00	0.00
14.10	2.00	0.40	5.00	0.00	0.00	0.00
14.15	2.00	0.40	5.00	0.00	0.00	0.00
14.20	2.00	0.40	5.00	0.00	0.00	0.00
14.25	2.00	0.40	5.00	0.00	0.00	0.00
14.30	2.00	0.40	5.00	0.00	0.00	0.00
14.35	2.00	0.40	5.00	0.00	0.00	0.00
14.40	2.00	0.40	5.00	0.00	0.00	0.00
14.45	2.00	0.40	5.00	0.00	0.00	0.00
14.50	2.00	0.40	5.00	0.00	0.00	0.00
14.55	2.00	0.39	5.00	0.00	0.00	0.00
14.60	2.00	0.39	5.00	0.00	0.00	0.00
14.65	2.00	0.39	5.00	0.00	0.00	0.00
14.70	2.00	0.39	5.00	0.00	0.00	0.00
14.75	2.00	0.39	5.00	0.00	0.00	0.00
14.80	2.00	0.39	5.00	0.00	0.00	0.00
14.85	2.00	0.39	5.00	0.00	0.00	0.00
14.90	2.00	0.39	5.00	0.00	0.00	0.00
14.95	2.00	0.39	5.00	0.00	0.00	0.00
15.00	2.00	0.39	5.00	0.00	0.00	0.00
15.05	2.00	0.40	5.00	0.00	0.00	0.00

15.10	2.00	0.40	5.00	0.00	0.00	0.00
15.15	2.00	0.40	5.00	0.00	0.00	0.00
15.20	2.00	0.40	5.00	0.00	0.00	0.00
15.25	2.00	0.40	5.00	0.00	0.00	0.00
15.30	2.00	0.40	5.00	0.00	0.00	0.00
15.35	2.00	0.40	5.00	0.00	0.00	0.00
15.40	2.00	0.40	5.00	0.00	0.00	0.00
15.45	2.00	0.40	5.00	0.00	0.00	0.00
15.50	2.00	0.40	5.00	0.00	0.00	0.00
15.55	2.00	0.40	5.00	0.00	0.00	0.00
15.60	2.00	0.40	5.00	0.00	0.00	0.00
15.65	2.00	0.40	5.00	0.00	0.00	0.00
15.70	2.00	0.40	5.00	0.00	0.00	0.00
15.75	2.00	0.40	5.00	0.00	0.00	0.00
15.80	2.00	0.40	5.00	0.00	0.00	0.00
15.85	2.00	0.40	5.00	0.00	0.00	0.00
15.90	2.00	0.40	5.00	0.00	0.00	0.00
15.95	2.00	0.40	5.00	0.00	0.00	0.00
16.00	2.00	0.40	5.00	0.00	0.00	0.00
16.05	2.00	0.40	5.00	0.00	0.00	0.00
16.10	2.00	0.40	5.00	0.00	0.00	0.00
16.15	2.00	0.40	5.00	0.00	0.00	0.00
16.20	2.00	0.41	5.00	0.00	0.00	0.00
16.25	2.00	0.41	5.00	0.00	0.00	0.00
16.30	2.00	0.41	5.00	0.00	0.00	0.00
16.35	2.00	0.41	5.00	0.00	0.00	0.00
16.40	2.00	0.41	5.00	0.00	0.00	0.00
16.45	2.00	0.41	5.00	0.00	0.00	0.00
16.50	2.00	0.41	5.00	0.00	0.00	0.00
16.55	2.00	0.41	5.00	0.00	0.00	0.00
16.60	2.00	0.41	5.00	0.00	0.00	0.00
16.65	2.00	0.41	5.00	0.00	0.00	0.00
16.70	2.00	0.41	5.00	0.00	0.00	0.00
16.75	2.00	0.41	5.00	0.00	0.00	0.00
16.80	2.00	0.41	5.00	0.00	0.00	0.00
16.85	2.00	0.41	5.00	0.00	0.00	0.00
16.90	2.00	0.41	5.00	0.00	0.00	0.00
16.95	2.00	0.41	5.00	0.00	0.00	0.00
17.00	2.00	0.41	5.00	0.00	0.00	0.00
17.05	2.00	0.41	5.00	0.00	0.00	0.00
17.10	2.00	0.41	5.00	0.00	0.00	0.00
17.15	2.00	0.41	5.00	0.00	0.00	0.00
17.20	2.00	0.41	5.00	0.00	0.00	0.00
17.25	2.00	0.41	5.00	0.00	0.00	0.00
17.30	2.00	0.41	5.00	0.00	0.00	0.00
17.35	2.00	0.41	5.00	0.00	0.00	0.00
17.40	2.00	0.42	5.00	0.00	0.00	0.00
17.45	2.00	0.42	5.00	0.00	0.00	0.00
17.50	2.00	0.42	5.00	0.00	0.00	0.00
17.55	2.00	0.42	5.00	0.00	0.00	0.00
17.60	2.00	0.42	5.00	0.00	0.00	0.00
17.65	2.00	0.42	5.00	0.00	0.00	0.00
17.70	2.00	0.42	5.00	0.00	0.00	0.00
17.75	2.00	0.42	5.00	0.00	0.00	0.00
17.80	2.00	0.42	5.00	0.00	0.00	0.00
17.85	2.00	0.42	5.00	0.00	0.00	0.00
17.90	2.00	0.42	5.00	0.00	0.00	0.00
17.95	2.00	0.42	5.00	0.00	0.00	0.00
18.00	2.00	0.42	5.00	0.00	0.00	0.00
18.05	2.00	0.42	5.00	0.00	0.00	0.00
18.10	2.00	0.42	5.00	0.00	0.00	0.00
18.15	2.00	0.42	5.00	0.00	0.00	0.00
18.20	2.00	0.42	5.00	0.00	0.00	0.00

18.25	2.00	0.42	5.00	0.00	0.00	0.00
18.30	2.00	0.42	5.00	0.00	0.00	0.00
18.35	2.00	0.42	5.00	0.00	0.00	0.00
18.40	2.00	0.42	5.00	0.00	0.00	0.00
18.45	2.00	0.42	5.00	0.00	0.00	0.00
18.50	2.00	0.42	5.00	0.00	0.00	0.00
18.55	2.00	0.42	5.00	0.00	0.00	0.00
18.60	2.00	0.42	5.00	0.00	0.00	0.00
18.65	2.00	0.43	5.00	0.00	0.00	0.00
18.70	2.00	0.43	5.00	0.00	0.00	0.00
18.75	2.00	0.43	5.00	0.00	0.00	0.00
18.80	2.00	0.43	5.00	0.00	0.00	0.00
18.85	2.00	0.43	5.00	0.00	0.00	0.00
18.90	2.00	0.43	5.00	0.00	0.00	0.00
18.95	2.00	0.43	5.00	0.00	0.00	0.00
19.00	2.00	0.43	5.00	0.00	0.00	0.00
19.05	2.00	0.43	5.00	0.00	0.00	0.00
19.10	2.00	0.43	5.00	0.00	0.00	0.00
19.15	2.00	0.43	5.00	0.00	0.00	0.00
19.20	2.00	0.43	5.00	0.00	0.00	0.00
19.25	2.00	0.43	5.00	0.00	0.00	0.00
19.30	2.00	0.43	5.00	0.00	0.00	0.00
19.35	2.00	0.43	5.00	0.00	0.00	0.00
19.40	2.00	0.43	5.00	0.00	0.00	0.00
19.45	2.00	0.43	5.00	0.00	0.00	0.00
19.50	2.00	0.43	5.00	0.00	0.00	0.00
19.55	2.00	0.43	5.00	0.00	0.00	0.00
19.60	2.00	0.43	5.00	0.00	0.00	0.00
19.65	2.00	0.43	5.00	0.00	0.00	0.00
19.70	2.00	0.43	5.00	0.00	0.00	0.00
19.75	2.00	0.43	5.00	0.00	0.00	0.00
19.80	2.00	0.43	5.00	0.00	0.00	0.00
19.85	2.00	0.43	5.00	0.00	0.00	0.00
19.90	2.00	0.43	5.00	0.00	0.00	0.00
19.95	2.00	0.44	5.00	0.00	0.00	0.00
20.00	2.00	0.44	5.00	0.00	0.00	0.00
20.05	2.00	0.44	5.00	0.00	0.00	0.00
20.10	2.00	0.44	5.00	0.00	0.00	0.00
20.15	2.00	0.44	5.00	0.00	0.00	0.00
20.20	2.00	0.44	5.00	0.00	0.00	0.00
20.25	2.00	0.44	5.00	0.00	0.00	0.00
20.30	2.00	0.44	5.00	0.00	0.00	0.00
20.35	2.00	0.44	5.00	0.00	0.00	0.00
20.40	2.00	0.44	5.00	0.00	0.00	0.00
20.45	2.00	0.44	5.00	0.00	0.00	0.00
20.50	2.00	0.44	5.00	0.00	0.00	0.00
20.55	2.00	0.44	5.00	0.00	0.00	0.00
20.60	2.00	0.44	5.00	0.00	0.00	0.00
20.65	2.00	0.44	5.00	0.00	0.00	0.00
20.70	2.00	0.44	5.00	0.00	0.00	0.00
20.75	2.00	0.44	5.00	0.00	0.00	0.00
20.80	2.00	0.44	5.00	0.00	0.00	0.00
20.85	2.00	0.44	5.00	0.00	0.00	0.00
20.90	2.00	0.44	5.00	0.00	0.00	0.00
20.95	2.00	0.44	5.00	0.00	0.00	0.00
21.00	2.00	0.44	5.00	0.00	0.00	0.00
21.05	2.00	0.44	5.00	0.00	0.00	0.00
21.10	2.00	0.44	5.00	0.00	0.00	0.00
21.15	2.00	0.44	5.00	0.00	0.00	0.00
21.20	2.00	0.44	5.00	0.00	0.00	0.00
21.25	2.00	0.44	5.00	0.00	0.00	0.00
21.30	2.00	0.44	5.00	0.00	0.00	0.00
21.35	2.00	0.44	5.00	0.00	0.00	0.00

21.40	2.00	0.45	5.00	0.00	0.00	0.00
21.45	2.00	0.45	5.00	0.00	0.00	0.00
21.50	2.00	0.45	5.00	0.00	0.00	0.00
21.55	2.00	0.45	5.00	0.00	0.00	0.00
21.60	2.00	0.45	5.00	0.00	0.00	0.00
21.65	2.00	0.45	5.00	0.00	0.00	0.00
21.70	2.00	0.45	5.00	0.00	0.00	0.00
21.75	2.00	0.45	5.00	0.00	0.00	0.00
21.80	2.00	0.45	5.00	0.00	0.00	0.00
21.85	2.00	0.45	5.00	0.00	0.00	0.00
21.90	2.00	0.45	5.00	0.00	0.00	0.00
21.95	2.00	0.45	5.00	0.00	0.00	0.00
22.00	2.00	0.45	5.00	0.00	0.00	0.00
22.05	2.00	0.45	5.00	0.00	0.00	0.00
22.10	2.00	0.45	5.00	0.00	0.00	0.00
22.15	2.00	0.45	5.00	0.00	0.00	0.00
22.20	2.00	0.45	5.00	0.00	0.00	0.00
22.25	2.00	0.45	5.00	0.00	0.00	0.00
22.30	2.00	0.45	5.00	0.00	0.00	0.00
22.35	2.00	0.45	5.00	0.00	0.00	0.00
22.40	2.00	0.45	5.00	0.00	0.00	0.00
22.45	2.00	0.45	5.00	0.00	0.00	0.00
22.50	2.00	0.45	5.00	0.00	0.00	0.00
22.55	2.00	0.45	5.00	0.00	0.00	0.00
22.60	2.00	0.45	5.00	0.00	0.00	0.00
22.65	2.00	0.45	5.00	0.00	0.00	0.00
22.70	2.00	0.45	5.00	0.00	0.00	0.00
22.75	2.00	0.45	5.00	0.00	0.00	0.00
22.80	2.00	0.45	5.00	0.00	0.00	0.00
22.85	2.00	0.45	5.00	0.00	0.00	0.00
22.90	2.00	0.46	5.00	0.00	0.00	0.00
22.95	2.00	0.46	5.00	0.00	0.00	0.00
23.00	2.00	0.46	5.00	0.00	0.00	0.00
23.05	2.00	0.46	5.00	0.00	0.00	0.00
23.10	2.00	0.46	5.00	0.00	0.00	0.00
23.15	2.00	0.46	5.00	0.00	0.00	0.00
23.20	2.00	0.46	5.00	0.00	0.00	0.00
23.25	2.00	0.46	5.00	0.00	0.00	0.00
23.30	2.00	0.46	5.00	0.00	0.00	0.00
23.35	2.00	0.46	5.00	0.00	0.00	0.00
23.40	2.00	0.46	5.00	0.00	0.00	0.00
23.45	2.00	0.46	5.00	0.00	0.00	0.00
23.50	2.00	0.46	5.00	0.00	0.00	0.00
23.55	2.00	0.46	5.00	0.00	0.00	0.00
23.60	2.00	0.46	5.00	0.00	0.00	0.00
23.65	2.00	0.46	5.00	0.00	0.00	0.00
23.70	2.00	0.46	5.00	0.00	0.00	0.00
23.75	2.00	0.46	5.00	0.00	0.00	0.00
23.80	2.00	0.46	4.99	0.00	0.00	0.00
23.85	2.00	0.46	4.99	0.00	0.00	0.00
23.90	2.00	0.46	4.99	0.00	0.00	0.00
23.95	2.00	0.46	4.98	0.00	0.00	0.00
24.00	2.00	0.46	4.98	0.00	0.00	0.00
24.05	2.00	0.46	4.98	0.00	0.00	0.00
24.10	2.00	0.46	4.97	0.00	0.00	0.00
24.15	2.00	0.46	4.97	0.00	0.00	0.00
24.20	2.00	0.46	4.97	0.00	0.00	0.00
24.25	2.00	0.46	4.96	0.00	0.00	0.00
24.30	2.00	0.46	4.96	0.00	0.00	0.00
24.35	2.00	0.46	4.96	0.00	0.00	0.00
24.40	2.00	0.46	4.95	0.00	0.00	0.00
24.45	2.00	0.46	4.95	0.00	0.00	0.00
24.50	2.00	0.46	4.95	0.00	0.00	0.00

24.55	2.00	0.47	4.95	0.00	0.00	0.00
24.60	2.00	0.47	4.94	0.00	0.00	0.00
24.65	2.00	0.47	4.94	0.00	0.00	0.00
24.70	2.00	0.47	4.94	0.00	0.00	0.00
24.75	2.00	0.47	4.93	0.00	0.00	0.00
24.80	2.00	0.47	4.93	0.00	0.00	0.00
24.85	2.00	0.47	4.93	0.00	0.00	0.00
24.90	2.00	0.47	4.92	0.00	0.00	0.00
24.95	2.00	0.47	4.92	0.00	0.00	0.00
25.00	2.00	0.47	4.92	0.00	0.00	0.00
25.05	2.00	0.47	4.91	0.00	0.00	0.00
25.10	2.00	0.47	4.91	0.00	0.00	0.00
25.15	2.00	0.47	4.91	0.00	0.00	0.00
25.20	2.00	0.47	4.91	0.00	0.00	0.00
25.25	2.00	0.47	4.90	0.00	0.00	0.00
25.30	2.00	0.47	4.90	0.00	0.00	0.00
25.35	2.00	0.47	4.90	0.00	0.00	0.00
25.40	2.00	0.47	4.89	0.00	0.00	0.00
25.45	2.00	0.47	4.89	0.00	0.00	0.00
25.50	2.00	0.47	4.89	0.00	0.00	0.00
25.55	2.00	0.47	4.88	0.00	0.00	0.00
25.60	2.00	0.47	4.88	0.00	0.00	0.00
25.65	2.00	0.47	4.88	0.00	0.00	0.00
25.70	2.00	0.47	4.88	0.00	0.00	0.00
25.75	2.00	0.47	4.87	0.00	0.00	0.00
25.80	2.00	0.47	4.87	0.00	0.00	0.00
25.85	2.00	0.47	4.87	0.00	0.00	0.00
25.90	2.00	0.47	4.86	0.00	0.00	0.00
25.95	2.00	0.47	4.86	0.00	0.00	0.00
26.00	2.00	0.47	4.86	0.00	0.00	0.00
26.05	2.00	0.47	4.86	0.00	0.00	0.00
26.10	2.00	0.47	4.85	0.00	0.00	0.00
26.15	2.00	0.47	4.85	0.00	0.00	0.00
26.20	2.00	0.47	4.85	0.00	0.00	0.00
26.25	2.00	0.47	4.84	0.00	0.00	0.00
26.30	2.00	0.48	4.84	0.00	0.00	0.00
26.35	2.00	0.48	4.84	0.00	0.00	0.00
26.40	2.00	0.48	4.84	0.00	0.00	0.00
26.45	2.00	0.48	4.83	0.00	0.00	0.00
26.50	2.00	0.48	4.83	0.00	0.00	0.00
26.55	2.00	0.48	4.83	0.00	0.00	0.00
26.60	2.00	0.48	4.83	0.00	0.00	0.00
26.65	2.00	0.48	4.82	0.00	0.00	0.00
26.70	2.00	0.48	4.82	0.00	0.00	0.00
26.75	2.00	0.48	4.82	0.00	0.00	0.00
26.80	2.00	0.48	4.81	0.00	0.00	0.00
26.85	2.00	0.48	4.81	0.00	0.00	0.00
26.90	2.00	0.48	4.81	0.00	0.00	0.00
26.95	2.00	0.48	4.81	0.00	0.00	0.00
27.00	2.00	0.48	4.80	0.00	0.00	0.00
27.05	2.00	0.48	4.80	0.00	0.00	0.00
27.10	2.00	0.48	4.80	0.00	0.00	0.00
27.15	2.00	0.48	4.80	0.00	0.00	0.00
27.20	2.00	0.48	4.79	0.00	0.00	0.00
27.25	2.00	0.48	4.79	0.00	0.00	0.00
27.30	2.00	0.48	4.79	0.00	0.00	0.00
27.35	2.00	0.48	4.79	0.00	0.00	0.00
27.40	2.00	0.48	4.78	0.00	0.00	0.00
27.45	2.00	0.48	4.78	0.00	0.00	0.00
27.50	2.00	0.48	4.78	0.00	0.00	0.00
27.55	2.00	0.48	4.78	0.00	0.00	0.00
27.60	2.00	0.48	4.77	0.00	0.00	0.00
27.65	2.00	0.48	4.77	0.00	0.00	0.00

27.70	2.00	0.48	4.77	0.00	0.00	0.00
27.75	2.00	0.48	4.77	0.00	0.00	0.00
27.80	2.00	0.48	4.76	0.00	0.00	0.00
27.85	2.00	0.48	4.76	0.00	0.00	0.00
27.90	2.00	0.48	4.76	0.00	0.00	0.00
27.95	2.00	0.48	4.76	0.00	0.00	0.00
28.00	2.00	0.48	4.75	0.00	0.00	0.00
28.05	2.00	0.48	4.75	0.00	0.00	0.00
28.10	2.00	0.48	4.75	0.00	0.00	0.00
28.15	2.00	0.48	4.75	0.00	0.00	0.00
28.20	2.00	0.48	4.74	0.00	0.00	0.00
28.25	2.00	0.49	4.74	0.00	0.00	0.00
28.30	2.00	0.49	4.74	0.00	0.00	0.00
28.35	2.00	0.49	4.74	0.00	0.00	0.00
28.40	2.00	0.49	4.73	0.00	0.00	0.00
28.45	2.00	0.49	4.73	0.00	0.00	0.00
28.50	2.00	0.49	4.73	0.00	0.00	0.00
28.55	2.00	0.49	4.73	0.00	0.00	0.00
28.60	2.00	0.49	4.72	0.00	0.00	0.00
28.65	2.01	0.49	4.75	0.00	0.00	0.00
28.70	2.01	0.49	4.75	0.00	0.00	0.00
28.75	2.01	0.49	4.74	0.00	0.00	0.00
28.80	2.01	0.49	4.74	0.00	0.00	0.00
28.85	2.01	0.49	4.74	0.00	0.00	0.00
28.90	2.01	0.49	4.74	0.00	0.00	0.00
28.95	2.01	0.49	4.73	0.00	0.00	0.00
29.00	2.01	0.49	4.73	0.00	0.00	0.00
29.05	2.01	0.49	4.73	0.00	0.00	0.00
29.10	2.01	0.49	4.72	0.00	0.00	0.00
29.15	2.01	0.49	4.72	0.00	0.00	0.00
29.20	2.01	0.49	4.72	0.00	0.00	0.00
29.25	2.01	0.49	4.72	0.00	0.00	0.00
29.30	2.01	0.49	4.71	0.00	0.00	0.00
29.35	2.01	0.49	4.71	0.00	0.00	0.00
29.40	2.01	0.49	4.71	0.00	0.00	0.00
29.45	2.01	0.49	4.70	0.00	0.00	0.00
29.50	2.01	0.49	4.70	0.00	0.00	0.00
29.55	2.01	0.49	4.70	0.00	0.00	0.00
29.60	2.01	0.49	4.70	0.00	0.00	0.00
29.65	2.01	0.49	4.69	0.00	0.00	0.00
29.70	2.01	0.49	4.69	0.00	0.00	0.00
29.75	2.01	0.49	4.69	0.00	0.00	0.00
29.80	2.01	0.49	4.68	0.00	0.00	0.00
29.85	2.01	0.49	4.68	0.00	0.00	0.00
29.90	2.01	0.49	4.68	0.00	0.00	0.00
29.95	2.01	0.49	4.68	0.00	0.00	0.00
30.00	2.01	0.49	4.67	0.00	0.00	0.00
30.05	2.01	0.49	4.67	0.00	0.00	0.00
30.10	2.01	0.49	4.67	0.00	0.00	0.00
30.15	2.00	0.49	4.67	0.00	0.00	0.00
30.20	2.00	0.49	4.67	0.00	0.00	0.00
30.25	2.00	0.49	4.67	0.00	0.00	0.00
30.30	2.00	0.49	4.67	0.00	0.00	0.00
30.35	2.00	0.49	4.67	0.00	0.00	0.00
30.40	2.00	0.49	4.66	0.00	0.00	0.00
30.45	2.00	0.49	4.66	0.00	0.00	0.00
30.50	2.00	0.49	4.66	0.00	0.00	0.00
30.55	2.00	0.49	4.66	0.00	0.00	0.00
30.60	2.00	0.49	4.66	0.00	0.00	0.00
30.65	2.00	0.49	4.66	0.00	0.00	0.00
30.70	2.00	0.49	4.66	0.00	0.00	0.00
30.75	2.00	0.49	4.66	0.00	0.00	0.00
30.80	2.00	0.49	4.65	0.00	0.00	0.00

30.85	2.00	0.49	4.65	0.00	0.00	0.00
30.90	2.00	0.49	4.65	0.00	0.00	0.00
30.95	2.00	0.49	4.65	0.00	0.00	0.00
31.00	2.00	0.49	4.65	0.00	0.00	0.00
31.05	2.00	0.49	4.65	0.00	0.00	0.00
31.10	2.00	0.50	4.65	0.00	0.00	0.00
31.15	2.00	0.50	4.65	0.00	0.00	0.00
31.20	2.00	0.50	4.65	0.00	0.00	0.00
31.25	2.00	0.50	4.64	0.00	0.00	0.00
31.30	2.00	0.50	4.64	0.00	0.00	0.00
31.35	2.00	0.50	4.64	0.00	0.00	0.00
31.40	2.00	0.50	4.64	0.00	0.00	0.00
31.45	2.00	0.50	4.64	0.00	0.00	0.00
31.50	2.00	0.50	4.64	0.00	0.00	0.00
31.55	2.00	0.50	4.64	0.00	0.00	0.00
31.60	2.00	0.50	4.64	0.00	0.00	0.00
31.65	2.00	0.50	4.64	0.00	0.00	0.00
31.70	2.00	0.50	4.63	0.00	0.00	0.00
31.75	2.00	0.50	4.63	0.00	0.00	0.00
31.80	2.00	0.50	4.63	0.00	0.00	0.00
31.85	2.00	0.50	4.63	0.00	0.00	0.00
31.90	2.00	0.50	4.63	0.00	0.00	0.00
31.95	2.00	0.50	4.63	0.00	0.00	0.00
32.00	2.00	0.50	4.63	0.00	0.00	0.00
32.05	2.00	0.50	4.63	0.00	0.00	0.00
32.10	2.00	0.50	4.63	0.00	0.00	0.00
32.15	2.00	0.50	4.63	0.00	0.00	0.00
32.20	1.99	0.50	4.62	0.00	0.00	0.00
32.25	1.99	0.50	4.62	0.00	0.00	0.00
32.30	1.99	0.50	4.62	0.00	0.00	0.00
32.35	1.99	0.50	4.62	0.00	0.00	0.00
32.40	1.99	0.50	4.62	0.00	0.00	0.00
32.45	1.99	0.50	4.62	0.00	0.00	0.00
32.50	1.99	0.50	4.62	0.00	0.00	0.00
32.55	1.99	0.50	4.62	0.00	0.00	0.00
32.60	1.99	0.50	4.62	0.00	0.00	0.00
32.65	1.99	0.50	4.62	0.00	0.00	0.00
32.70	1.99	0.50	4.61	0.00	0.00	0.00
32.75	1.99	0.50	4.61	0.00	0.00	0.00
32.80	1.99	0.50	4.61	0.00	0.00	0.00
32.85	1.99	0.50	4.61	0.00	0.00	0.00
32.90	1.99	0.50	4.61	0.00	0.00	0.00
32.95	1.99	0.50	4.61	0.00	0.00	0.00
33.00	1.99	0.50	4.61	0.00	0.00	0.00
33.05	1.99	0.50	4.61	0.00	0.00	0.00
33.10	1.99	0.50	4.61	0.00	0.00	0.00
33.15	1.99	0.50	4.61	0.00	0.00	0.00
33.20	1.99	0.50	4.61	0.00	0.00	0.00
33.25	1.99	0.50	4.60	0.00	0.00	0.00
33.30	1.99	0.50	4.60	0.00	0.00	0.00
33.35	1.99	0.50	4.60	0.00	0.00	0.00
33.40	1.99	0.50	4.60	0.00	0.00	0.00
33.45	1.99	0.50	4.60	0.00	0.00	0.00
33.50	1.99	0.50	4.60	0.00	0.00	0.00
33.55	1.99	0.50	4.60	0.00	0.00	0.00
33.60	1.99	0.50	4.60	0.00	0.00	0.00
33.65	1.99	0.50	4.60	0.00	0.00	0.00
33.70	1.99	0.50	4.60	0.00	0.00	0.00
33.75	1.99	0.50	4.60	0.00	0.00	0.00
33.80	1.99	0.50	4.60	0.00	0.00	0.00
33.85	1.99	0.50	4.59	0.00	0.00	0.00
33.90	1.99	0.50	4.59	0.00	0.00	0.00
33.95	1.99	0.50	4.59	0.00	0.00	0.00

34.00	1.99	0.50	4.59	0.00	0.00	0.00
34.05	1.99	0.50	4.59	0.00	0.00	0.00
34.10	1.99	0.50	4.59	0.00	0.00	0.00
34.15	1.99	0.50	4.59	0.00	0.00	0.00
34.20	1.99	0.50	4.59	0.00	0.00	0.00
34.25	1.99	0.50	4.59	0.00	0.00	0.00
34.30	1.98	0.50	4.59	0.00	0.00	0.00
34.35	1.98	0.50	4.59	0.00	0.00	0.00
34.40	1.98	0.50	4.59	0.00	0.00	0.00
34.45	1.98	0.50	4.59	0.00	0.00	0.00
34.50	1.98	0.50	4.58	0.00	0.00	0.00
34.55	1.98	0.50	4.58	0.00	0.00	0.00
34.60	1.98	0.50	4.58	0.00	0.00	0.00
34.65	1.98	0.50	4.58	0.00	0.00	0.00
34.70	1.98	0.50	4.58	0.00	0.00	0.00
34.75	1.98	0.50	4.58	0.00	0.00	0.00
34.80	1.98	0.50	4.58	0.00	0.00	0.00
34.85	1.98	0.50	4.58	0.00	0.00	0.00
34.90	1.98	0.50	4.58	0.00	0.00	0.00
34.95	1.98	0.50	4.58	0.00	0.00	0.00
35.00	1.98	0.50	4.58	0.00	0.00	0.00
35.05	1.98	0.50	4.58	0.00	0.00	0.00
35.10	1.98	0.50	4.58	0.00	0.00	0.00
35.15	1.98	0.50	4.58	0.00	0.00	0.00
35.20	1.98	0.50	4.57	0.00	0.00	0.00
35.25	1.98	0.50	4.57	0.00	0.00	0.00
35.30	1.98	0.50	4.57	0.00	0.00	0.00
35.35	1.98	0.50	4.57	0.00	0.00	0.00
35.40	1.98	0.50	4.57	0.00	0.00	0.00
35.45	1.98	0.50	4.57	0.00	0.00	0.00
35.50	1.98	0.50	4.57	0.00	0.00	0.00
35.55	1.98	0.50	4.57	0.00	0.00	0.00
35.60	1.98	0.50	4.57	0.00	0.00	0.00
35.65	1.98	0.50	4.57	0.00	0.00	0.00
35.70	1.98	0.50	4.57	0.00	0.00	0.00
35.75	1.98	0.50	4.57	0.00	0.00	0.00
35.80	1.98	0.50	4.57	0.00	0.00	0.00
35.85	1.98	0.50	4.57	0.00	0.00	0.00
35.90	1.98	0.50	4.57	0.00	0.00	0.00
35.95	1.98	0.50	4.57	0.00	0.00	0.00
36.00	1.98	0.50	4.57	0.00	0.00	0.00
36.05	1.98	0.50	4.56	0.00	0.00	0.00
36.10	1.98	0.50	4.56	0.00	0.00	0.00
36.15	1.98	0.50	4.56	0.00	0.00	0.00
36.20	1.98	0.50	4.56	0.00	0.00	0.00
36.25	1.98	0.50	4.56	0.00	0.00	0.00
36.30	1.98	0.50	4.56	0.00	0.00	0.00
36.35	1.97	0.50	4.56	0.00	0.00	0.00
36.40	1.97	0.50	4.56	0.00	0.00	0.00
36.45	1.97	0.50	4.56	0.00	0.00	0.00
36.50	1.97	0.50	4.56	0.00	0.00	0.00
36.55	1.97	0.50	4.56	0.00	0.00	0.00
36.60	1.97	0.50	4.56	0.00	0.00	0.00
36.65	1.97	0.50	4.56	0.00	0.00	0.00
36.70	1.97	0.50	4.56	0.00	0.00	0.00
36.75	1.97	0.50	4.56	0.00	0.00	0.00
36.80	1.97	0.50	4.56	0.00	0.00	0.00
36.85	1.97	0.50	4.56	0.00	0.00	0.00
36.90	1.97	0.50	4.56	0.00	0.00	0.00
36.95	1.97	0.50	4.56	0.00	0.00	0.00
37.00	1.97	0.50	4.55	0.00	0.00	0.00
37.05	1.97	0.50	4.55	0.00	0.00	0.00
37.10	1.97	0.50	4.55	0.00	0.00	0.00

37.15	1.97	0.50	4.55	0.00	0.00	0.00
37.20	1.97	0.50	4.55	0.00	0.00	0.00
37.25	1.97	0.50	4.55	0.00	0.00	0.00
37.30	1.97	0.50	4.55	0.00	0.00	0.00
37.35	1.97	0.50	4.55	0.00	0.00	0.00
37.40	1.97	0.50	4.55	0.00	0.00	0.00
37.45	1.97	0.50	4.55	0.00	0.00	0.00
37.50	1.97	0.50	4.55	0.00	0.00	0.00
37.55	1.97	0.50	4.55	0.00	0.00	0.00
37.60	1.97	0.50	4.55	0.00	0.00	0.00
37.65	1.97	0.50	4.55	0.00	0.00	0.00
37.70	1.97	0.50	4.55	0.00	0.00	0.00
37.75	1.97	0.50	4.55	0.00	0.00	0.00
37.80	1.97	0.50	4.55	0.00	0.00	0.00
37.85	1.97	0.50	4.55	0.00	0.00	0.00
37.90	1.97	0.50	4.55	0.00	0.00	0.00
37.95	1.97	0.50	4.55	0.00	0.00	0.00
38.00	1.97	0.50	4.55	0.00	0.00	0.00
38.05	1.97	0.50	4.55	0.00	0.00	0.00
38.10	1.97	0.50	4.55	0.00	0.00	0.00
38.15	1.97	0.50	4.55	0.00	0.00	0.00
38.20	1.97	0.50	4.54	0.00	0.00	0.00
38.25	1.97	0.50	4.54	0.00	0.00	0.00
38.30	1.97	0.50	4.54	0.00	0.00	0.00
38.35	1.97	0.50	4.54	0.00	0.00	0.00
38.40	1.97	0.50	4.54	0.00	0.00	0.00
38.45	1.97	0.50	4.54	0.00	0.00	0.00
38.50	1.96	0.50	4.54	0.00	0.00	0.00
38.55	1.96	0.50	4.54	0.00	0.00	0.00
38.60	1.96	0.50	4.54	0.00	0.00	0.00
38.65	1.96	0.50	4.54	0.00	0.00	0.00
38.70	1.96	0.50	4.54	0.00	0.00	0.00
38.75	1.96	0.50	4.54	0.00	0.00	0.00
38.80	1.96	0.50	4.54	0.00	0.00	0.00
38.85	1.96	0.50	4.54	0.00	0.00	0.00
38.90	1.96	0.50	4.54	0.00	0.00	0.00
38.95	1.96	0.50	4.54	0.00	0.00	0.00
39.00	1.96	0.50	4.54	0.00	0.00	0.00
39.05	1.96	0.50	4.54	0.00	0.00	0.00
39.10	1.96	0.50	4.54	0.00	0.00	0.00
39.15	1.96	0.50	4.54	0.00	0.00	0.00
39.20	1.96	0.50	4.54	0.00	0.00	0.00
39.25	1.96	0.50	4.54	0.00	0.00	0.00
39.30	1.96	0.50	4.54	0.00	0.00	0.00
39.35	1.96	0.50	4.54	0.00	0.00	0.00
39.40	1.96	0.50	4.54	0.00	0.00	0.00
39.45	1.96	0.50	4.54	0.00	0.00	0.00
39.50	1.96	0.50	4.54	0.00	0.00	0.00
39.55	1.96	0.50	4.54	0.00	0.00	0.00
39.60	1.96	0.50	4.54	0.00	0.00	0.00
39.65	1.96	0.50	4.54	0.00	0.00	0.00
39.70	1.96	0.50	4.54	0.00	0.00	0.00
39.75	1.96	0.50	4.54	0.00	0.00	0.00
39.80	1.96	0.50	4.54	0.00	0.00	0.00
39.85	1.96	0.50	4.54	0.00	0.00	0.00
39.90	1.96	0.50	4.54	0.00	0.00	0.00
39.95	1.96	0.50	4.53	0.00	0.00	0.00
40.00	1.96	0.50	4.53	0.00	0.00	0.00
40.05	1.96	0.50	4.53	0.00	0.00	0.00
40.10	1.96	0.50	4.53	0.00	0.00	0.00
40.15	1.96	0.50	4.53	0.00	0.00	0.00
40.20	1.96	0.50	4.53	0.00	0.00	0.00
40.25	1.96	0.50	4.53	0.00	0.00	0.00

40.30	1.96	0.50	4.53	0.00	0.00	0.00
40.35	1.96	0.50	4.53	0.00	0.00	0.00
40.40	1.96	0.50	4.53	0.00	0.00	0.00
40.45	1.96	0.50	4.53	0.00	0.00	0.00
40.50	1.96	0.50	4.53	0.00	0.00	0.00
40.55	1.96	0.50	4.53	0.00	0.00	0.00
40.60	1.95	0.50	4.53	0.00	0.00	0.00
40.65	1.95	0.50	4.53	0.00	0.00	0.00
40.70	1.95	0.50	4.53	0.00	0.00	0.00
40.75	1.95	0.50	4.53	0.00	0.00	0.00
40.80	1.95	0.50	4.53	0.00	0.00	0.00
40.85	1.95	0.50	4.53	0.00	0.00	0.00
40.90	1.95	0.50	4.53	0.00	0.00	0.00
40.95	1.95	0.50	4.53	0.00	0.00	0.00
41.00	1.95	0.50	4.53	0.00	0.00	0.00
41.05	1.95	0.50	4.53	0.00	0.00	0.00
41.10	1.95	0.50	4.53	0.00	0.00	0.00
41.15	1.95	0.50	4.53	0.00	0.00	0.00
41.20	1.95	0.50	4.53	0.00	0.00	0.00
41.25	1.95	0.50	4.53	0.00	0.00	0.00
41.30	1.95	0.50	4.53	0.00	0.00	0.00
41.35	1.95	0.50	4.53	0.00	0.00	0.00
41.40	1.95	0.50	4.53	0.00	0.00	0.00
41.45	1.95	0.50	4.53	0.00	0.00	0.00
41.50	1.95	0.50	4.53	0.00	0.00	0.00
41.55	1.95	0.50	4.53	0.00	0.00	0.00
41.60	1.95	0.50	4.53	0.00	0.00	0.00
41.65	1.95	0.50	4.53	0.00	0.00	0.00
41.70	1.95	0.50	4.53	0.00	0.00	0.00
41.75	1.95	0.49	4.53	0.00	0.00	0.00
41.80	1.95	0.49	4.53	0.00	0.00	0.00
41.85	1.95	0.49	4.53	0.00	0.00	0.00
41.90	1.95	0.49	4.53	0.00	0.00	0.00
41.95	1.95	0.49	4.53	0.00	0.00	0.00
42.00	1.95	0.49	4.53	0.00	0.00	0.00
42.05	1.95	0.49	4.53	0.00	0.00	0.00
42.10	1.95	0.49	4.53	0.00	0.00	0.00
42.15	1.95	0.49	4.53	0.00	0.00	0.00
42.20	1.95	0.49	4.53	0.00	0.00	0.00
42.25	1.95	0.49	4.53	0.00	0.00	0.00
42.30	1.95	0.49	4.53	0.00	0.00	0.00
42.35	1.95	0.49	4.53	0.00	0.00	0.00
42.40	1.95	0.49	4.53	0.00	0.00	0.00
42.45	1.95	0.49	4.53	0.00	0.00	0.00
42.50	1.95	0.49	4.53	0.00	0.00	0.00
42.55	1.95	0.49	4.53	0.00	0.00	0.00
42.60	1.95	0.49	4.53	0.00	0.00	0.00
42.65	1.95	0.49	4.53	0.00	0.00	0.00
42.70	1.95	0.49	4.53	0.00	0.00	0.00
42.75	1.95	0.49	4.53	0.00	0.00	0.00
42.80	1.94	0.49	4.53	0.00	0.00	0.00
42.85	1.94	0.49	4.53	0.00	0.00	0.00
42.90	1.94	0.49	4.53	0.00	0.00	0.00
42.95	1.94	0.49	4.53	0.00	0.00	0.00
43.00	1.94	0.49	4.53	0.00	0.00	0.00
43.05	1.94	0.49	4.53	0.00	0.00	0.00
43.10	1.94	0.49	4.53	0.00	0.00	0.00
43.15	1.94	0.49	4.53	0.00	0.00	0.00
43.20	1.94	0.49	4.53	0.00	0.00	0.00
43.25	1.94	0.49	4.53	0.00	0.00	0.00
43.30	1.94	0.49	4.53	0.00	0.00	0.00
43.35	1.94	0.49	4.53	0.00	0.00	0.00
43.40	1.94	0.49	4.53	0.00	0.00	0.00

43.45	1.94	0.49	4.53	0.00	0.00	0.00
43.50	1.94	0.49	4.53	0.00	0.00	0.00
43.55	1.94	0.49	4.53	0.00	0.00	0.00
43.60	1.94	0.49	4.53	0.00	0.00	0.00
43.65	1.94	0.49	4.53	0.00	0.00	0.00
43.70	1.94	0.49	4.53	0.00	0.00	0.00
43.75	1.94	0.49	4.53	0.00	0.00	0.00
43.80	1.94	0.49	4.53	0.00	0.00	0.00
43.85	1.94	0.49	4.53	0.00	0.00	0.00
43.90	1.94	0.49	4.53	0.00	0.00	0.00
43.95	1.94	0.49	4.53	0.00	0.00	0.00
44.00	1.94	0.49	4.53	0.00	0.00	0.00
44.05	1.94	0.49	4.53	0.00	0.00	0.00
44.10	1.94	0.49	4.53	0.00	0.00	0.00
44.15	1.94	0.49	4.53	0.00	0.00	0.00
44.20	1.94	0.49	4.53	0.00	0.00	0.00
44.25	1.94	0.49	4.53	0.00	0.00	0.00
44.30	1.94	0.49	4.53	0.00	0.00	0.00
44.35	1.94	0.49	4.53	0.00	0.00	0.00
44.40	1.94	0.49	4.53	0.00	0.00	0.00
44.45	1.94	0.49	4.53	0.00	0.00	0.00
44.50	1.94	0.49	4.53	0.00	0.00	0.00
44.55	1.94	0.49	4.53	0.00	0.00	0.00
44.60	1.94	0.49	4.53	0.00	0.00	0.00
44.65	1.94	0.49	4.53	0.00	0.00	0.00
44.70	1.94	0.49	4.53	0.00	0.00	0.00
44.75	1.94	0.49	4.53	0.00	0.00	0.00
44.80	1.94	0.49	4.53	0.00	0.00	0.00
44.85	1.94	0.49	4.53	0.00	0.00	0.00
44.90	1.94	0.49	4.53	0.00	0.00	0.00
44.95	1.94	0.49	4.53	0.00	0.00	0.00
45.00	1.93	0.49	4.54	0.00	0.00	0.00
45.05	1.93	0.49	4.54	0.00	0.00	0.00
45.10	1.93	0.49	4.54	0.00	0.00	0.00
45.15	1.93	0.49	4.54	0.00	0.00	0.00
45.20	1.93	0.49	4.54	0.00	0.00	0.00
45.25	1.93	0.49	4.54	0.00	0.00	0.00
45.30	1.93	0.49	4.54	0.00	0.00	0.00
45.35	1.93	0.49	4.54	0.00	0.00	0.00
45.40	1.93	0.49	4.54	0.00	0.00	0.00
45.45	1.93	0.49	4.54	0.00	0.00	0.00
45.50	1.93	0.49	4.54	0.00	0.00	0.00
45.55	1.93	0.49	4.54	0.00	0.00	0.00
45.60	1.93	0.49	4.54	0.00	0.00	0.00
45.65	1.93	0.49	4.54	0.00	0.00	0.00
45.70	1.93	0.49	4.54	0.00	0.00	0.00
45.75	1.93	0.49	4.54	0.00	0.00	0.00
45.80	1.93	0.49	4.54	0.00	0.00	0.00
45.85	1.93	0.49	4.54	0.00	0.00	0.00
45.90	1.93	0.49	4.54	0.00	0.00	0.00
45.95	1.93	0.49	4.54	0.00	0.00	0.00
46.00	1.93	0.49	4.54	0.00	0.00	0.00
46.05	1.93	0.49	4.54	0.00	0.00	0.00
46.10	1.93	0.49	4.54	0.00	0.00	0.00
46.15	1.93	0.49	4.54	0.00	0.00	0.00
46.20	1.93	0.49	4.54	0.00	0.00	0.00
46.25	1.93	0.49	4.54	0.00	0.00	0.00
46.30	1.93	0.49	4.54	0.00	0.00	0.00
46.35	1.93	0.49	4.54	0.00	0.00	0.00
46.40	1.93	0.49	4.54	0.00	0.00	0.00
46.45	1.93	0.49	4.54	0.00	0.00	0.00
46.50	1.93	0.49	4.54	0.00	0.00	0.00
46.55	1.93	0.49	4.54	0.00	0.00	0.00

46.60	1.93	0.49	4.54	0.00	0.00	0.00
46.65	1.93	0.49	4.54	0.00	0.00	0.00
46.70	1.93	0.49	4.54	0.00	0.00	0.00
46.75	1.93	0.49	4.54	0.00	0.00	0.00
46.80	1.93	0.49	4.54	0.00	0.00	0.00
46.85	1.93	0.49	4.54	0.00	0.00	0.00
46.90	1.93	0.49	4.55	0.00	0.00	0.00
46.95	1.93	0.49	4.55	0.00	0.00	0.00
47.00	1.93	0.49	4.55	0.00	0.00	0.00
47.05	1.93	0.49	4.55	0.00	0.00	0.00
47.10	1.93	0.49	4.55	0.00	0.00	0.00
47.15	1.93	0.49	4.55	0.00	0.00	0.00
47.20	1.92	0.49	4.55	0.00	0.00	0.00
47.25	1.92	0.49	4.55	0.00	0.00	0.00
47.30	1.92	0.49	4.55	0.00	0.00	0.00
47.35	1.92	0.49	4.55	0.00	0.00	0.00
47.40	1.92	0.49	4.55	0.00	0.00	0.00
47.45	1.92	0.49	4.55	0.00	0.00	0.00
47.50	1.92	0.49	4.55	0.00	0.00	0.00
47.55	1.92	0.49	4.55	0.00	0.00	0.00
47.60	1.92	0.49	4.55	0.00	0.00	0.00
47.65	1.92	0.49	4.55	0.00	0.00	0.00
47.70	1.92	0.49	4.55	0.00	0.00	0.00
47.75	1.92	0.49	4.55	0.00	0.00	0.00
47.80	1.92	0.49	4.55	0.00	0.00	0.00
47.85	1.92	0.49	4.55	0.00	0.00	0.00
47.90	1.92	0.49	4.55	0.00	0.00	0.00
47.95	1.92	0.49	4.55	0.00	0.00	0.00
48.00	1.92	0.49	4.55	0.00	0.00	0.00
48.05	1.92	0.49	4.55	0.00	0.00	0.00
48.10	1.92	0.49	4.55	0.00	0.00	0.00
48.15	1.92	0.49	4.55	0.00	0.00	0.00
48.20	1.92	0.48	4.56	0.00	0.00	0.00
48.25	1.92	0.48	4.56	0.00	0.00	0.00
48.30	1.92	0.48	4.56	0.00	0.00	0.00
48.35	1.92	0.48	4.56	0.00	0.00	0.00
48.40	1.92	0.48	4.56	0.00	0.00	0.00
48.45	1.92	0.48	4.56	0.00	0.00	0.00
48.50	1.92	0.48	4.56	0.00	0.00	0.00
48.55	1.92	0.48	4.56	0.00	0.00	0.00
48.60	1.92	0.48	4.56	0.00	0.00	0.00
48.65	1.92	0.48	4.56	0.00	0.00	0.00
48.70	1.92	0.48	4.56	0.00	0.00	0.00
48.75	1.92	0.48	4.56	0.00	0.00	0.00
48.80	1.92	0.48	4.56	0.00	0.00	0.00
48.85	1.92	0.48	4.56	0.00	0.00	0.00
48.90	1.92	0.48	4.56	0.00	0.00	0.00
48.95	1.92	0.48	4.56	0.00	0.00	0.00
49.00	1.92	0.48	4.56	0.00	0.00	0.00
49.05	1.92	0.48	4.56	0.00	0.00	0.00
49.10	1.92	0.48	4.56	0.00	0.00	0.00
49.15	1.92	0.48	4.56	0.00	0.00	0.00
49.20	1.92	0.48	4.56	0.00	0.00	0.00
49.25	1.92	0.48	4.56	0.00	0.00	0.00
49.30	1.92	0.48	4.57	0.00	0.00	0.00
49.35	1.92	0.48	4.57	0.00	0.00	0.00
49.40	1.92	0.48	4.57	0.00	0.00	0.00
49.45	1.91	0.48	4.57	0.00	0.00	0.00
49.50	1.91	0.48	4.57	0.00	0.00	0.00
49.55	1.91	0.48	4.57	0.00	0.00	0.00
49.60	1.91	0.48	4.57	0.00	0.00	0.00
49.65	1.91	0.48	4.57	0.00	0.00	0.00
49.70	1.91	0.48	4.57	0.00	0.00	0.00

49.75	1.91	0.48	4.57	0.00	0.00	0.00
49.80	1.91	0.48	4.57	0.00	0.00	0.00
49.85	1.91	0.48	4.57	0.00	0.00	0.00
49.90	1.91	0.48	4.57	0.00	0.00	0.00
49.95	1.91	0.48	4.57	0.00	0.00	0.00
50.00	1.91	0.48	4.57	0.00	0.00	0.00
50.05	1.91	0.48	4.57	0.00	0.00	0.00
50.10	1.91	0.48	4.57	0.00	0.00	0.00
50.15	1.91	0.48	4.57	0.00	0.00	0.00
50.20	1.91	0.48	4.58	0.00	0.00	0.00
50.25	1.91	0.48	4.58	0.00	0.00	0.00
50.30	1.91	0.48	4.58	0.00	0.00	0.00
50.35	1.91	0.48	4.58	0.00	0.00	0.00
50.40	1.91	0.48	4.58	0.00	0.00	0.00
50.45	1.91	0.48	4.58	0.00	0.00	0.00
50.50	1.91	0.48	4.58	0.00	0.00	0.00
50.55	1.91	0.48	4.58	0.00	0.00	0.00
50.60	1.91	0.48	4.58	0.00	0.00	0.00
50.65	1.91	0.48	4.58	0.00	0.00	0.00
50.70	1.91	0.48	4.58	0.00	0.00	0.00
50.75	1.91	0.48	4.58	0.00	0.00	0.00
50.80	1.91	0.48	4.58	0.00	0.00	0.00
50.85	1.91	0.48	4.58	0.00	0.00	0.00
50.90	1.91	0.48	4.58	0.00	0.00	0.00
50.95	1.91	0.48	4.58	0.00	0.00	0.00
51.00	1.91	0.48	4.58	0.00	0.00	0.00
51.05	1.91	0.48	4.59	0.00	0.00	0.00
51.10	1.91	0.48	4.59	0.00	0.00	0.00
51.15	1.91	0.48	4.59	0.00	0.00	0.00
51.20	1.91	0.48	4.59	0.00	0.00	0.00
51.25	1.91	0.48	4.59	0.00	0.00	0.00
51.30	1.91	0.48	4.59	0.00	0.00	0.00
51.35	1.91	0.48	4.59	0.00	0.00	0.00
51.40	1.91	0.48	4.59	0.00	0.00	0.00
51.45	1.91	0.48	4.59	0.00	0.00	0.00
51.50	1.91	0.48	4.59	0.00	0.00	0.00

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

Units Depth = ft, Stress or Pressure = tsf (atm), Unit Weight = pcf, Settlement = in.

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